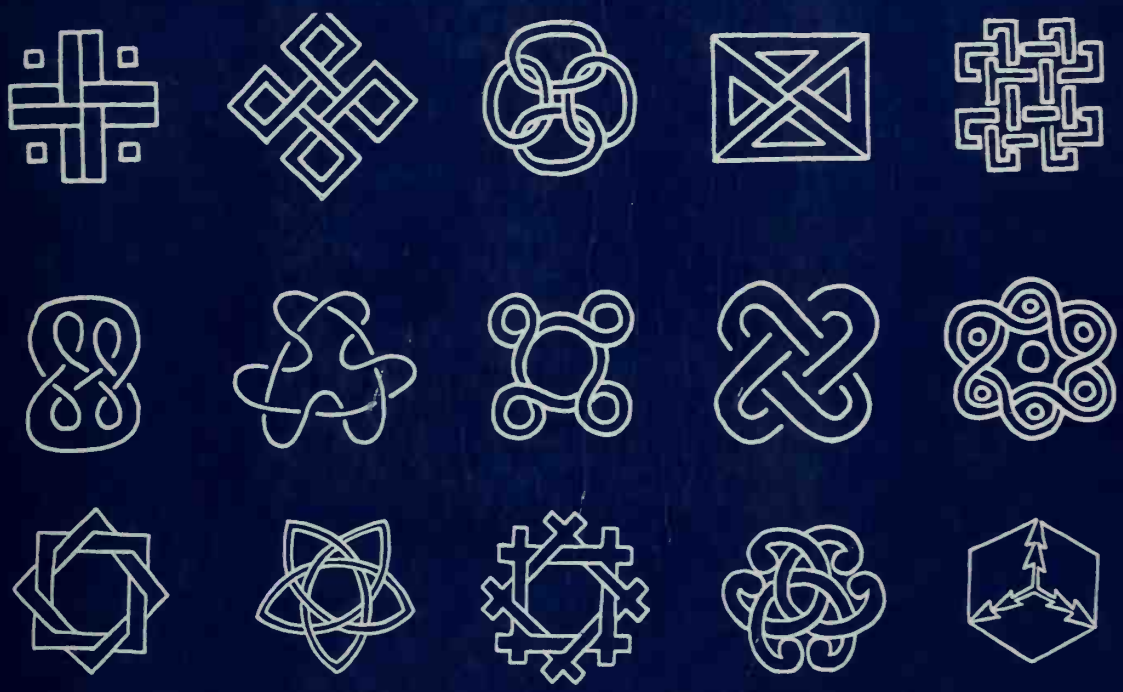
Signs and Symbols

Their Design and Meaning



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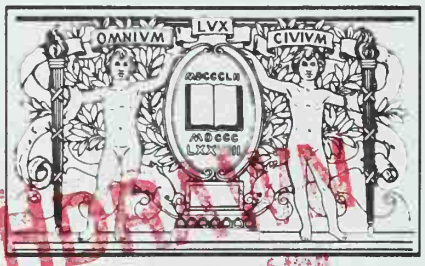

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Signs and Symbols

Adrian Frutiger

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Their Design and Meaning

Translated by Andrew Bluhm

VAN NOSTRAND REINHOLD
New York

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Part 1

Sign Recognition, Sign Formation

Words or speech, written or spoken, do not appear to play any part at all in the mechanism of my thought processes. The basic psychic elements of thought are certain signs and more or less clear pictures, which can be reproduced and combined "to order."

ALBERT EINSTEIN

Introduction: Three Themes

1. Disorder-order

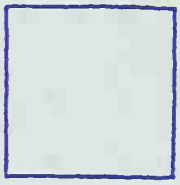
"In the beginning," says the Book of Genesis, "the earth was without form and void." For twentieth century humans it is difficult to imagine a void, a chaos, because they have learned that a kind of order appears to prevail in both the infinitely small and the infinitely large. The understanding that there is no element of chance around or in us, but that all things, both mind and matter, follow an ordered pattern, supports the argument that even the simplest blot or scribble cannot exist by pure chance or without significance, but rather that the viewer does not clearly recognize the causes, origins, and occasion of such a "drawing."

These basic considerations by way of introduction will make it easier to recognize and judge the origin, meaning, and statement of given signs in the course of this study.

On a given empty space – in this case illustrated by a square defined by lines, which symbolizes the concept of "emptiness" (1) – we try to scatter sixteen dots in a random, accidental manner. The illustration (2) shows how difficult it is to place the sixteen elements in such a way that they are situated *as though* by chance, without relation to one another, without evoking a certain structure, a picture, a geometric or figurative representation.

In contrast to this scattering, it is very easy to conceive and form a number of figures (3) or arrangements (4) with the same sixteen dots.

From the recognition of this fact we draw the paradoxical conclusion that the production of an ordered form is easier than the making of a disorder, a *nonform*.



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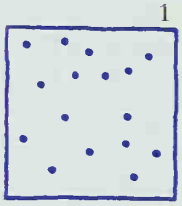

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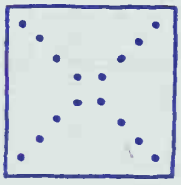

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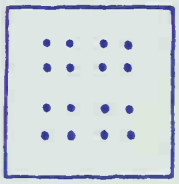

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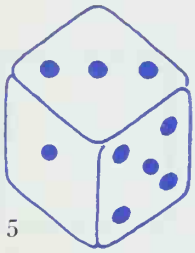
The reason can be found in the fact that, in our subconscious, we have grown up with the incision and stamp of primary figures, pictures, and schemata, which constantly influence our field of vision and our world of imagination.

It may even be that certain archetypical forms are inherited, and therefore present from the beginning, even in the mind of an unborn child. This is a point on which scientists are not agreed.

2. Remembering a figure



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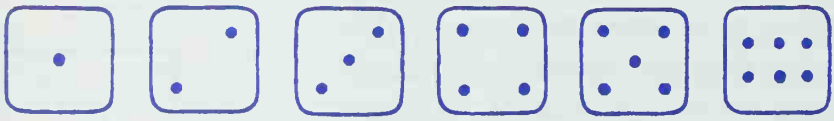
We will preface all considerations of sign production by a very simple test of pure memory. As the object of the exercise we choose dice, with the six images that must have created a pictorial impression in the mind of every reader. The intensity of the impression of the figure shown (5) and the strength of feeling that it releases will vary from one person to another, depending on their experience in encountering the signs: superficially as children or deeply as gamblers.



6

There are six figures (6) that are familiar to the dice player, who need neither "decode" nor count them. Recognition is spontaneous because they conform to a known pattern, a learned and experienced scheme of thought. A simple displacement of the dots to unaccustomed positions causes involuntary frustration to the viewer.

The displaced dot of the figure one (7) immediately creates uneasiness. The feeling of the idea of "center" (security, stasis) is anchored in the feeling of symmetry. All symmetrical arrangements are closer to the structure of our body and therefore more accessible, easier to understand, in contrast with asymmetry, which needs rather to be grasped by the mind. The displaced dot also raises the doubt as to whether it is not perhaps one half of the familiar figure two.

7

8

An alienating figure two (8) is far removed from the customary diagonal arrangement, which divides the face of the dice into two equal parts. Here the dots are not "fixed" but suspended. The association with eyes in a face is not to be ruled out.

9

The next figure (9) is not disturbing as a representation of three, although it is quite different from the traditional linear arrangement of the three dots on dice. What appears important to us here is the occurrence of an archetypal sign, the triangle, which naturally calls forth completely unaccustomed memories for the practiced dice player.

10

In the next figure (10) the archetypal sign of the rectangle is not found very disturbing as a representation of four, since the usual form is recognized, only in this case standing on one corner. It should be noted here, however, that from the quantity of *four* upward, the units normally have to be counted in order to be recognized. It can therefore be assumed that a figurative arrangement of the dots, like the rectangle, comes to the aid of instant recognition.

11

12

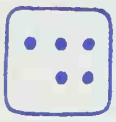
The second example of a disordered figure four (11) should clarify this point. *One* glance is no longer enough for recognition of the number (the eyes move back and forth).

13

The next figure (12) is difficult to make out as five. The reaction to "vertical" and "horizontal" is much quicker than to "diagonal." The first, instant impression is always of a cross.

14

In a completely new arrangement of five (13) the "horizontal-vertical" style is even more in evidence and it can also be seen that this figure comes into



15

16

17

18

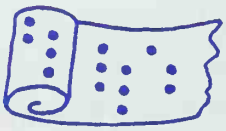
conflict with the viewer's deep-seated concept of the archetypal sign of the letter T.

The same applies to the next arrangement of dots (14), where the letter L emerges very clearly. Irritation is increased by the asymmetry. Counting the dots, one falls into confusion between the quantities *five* and *six*, in that the lower left dot is counted twice, once in the vertical row and once in the horizontal. The dice image of five is disturbed in many ways in this example and the player will not recall it.

Another arrangement of five (15) is also difficult to recognize. The comparison with the figure six (the most important, the winner) is so close that a sense of frustration overcomes all reasoning. Three examples of changes to the six (16, 17, 18) clearly show that the fixed memory picture can be wiped out by means of relatively small displacements.

In the first example of six the triangle form is well to the fore (16), and in the second example (17) disturbance is caused by marked asymmetry and the emergence of a triangular dot area. In the third example (18) an invisible line joins up the dots to make a circle. Counting is necessary in each case, though it is perhaps made somewhat easier in the final example through the indication of a hexagon.

The arrangement of dots on the dice is peculiarly like the coding of computer tape (19). A code is nothing other than a figure that the machine must recognize by comparing it with a programmed matrix that it has "learned." The process of recognition in human beings takes place in exactly the same way.



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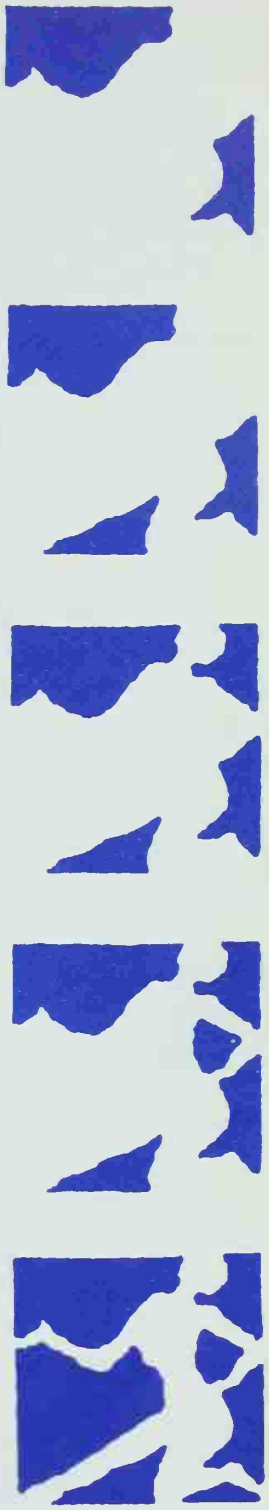
3. Light and shadow – black and white

We live in an age when there are many ways of converting what is thought into visible form. Throughout this book we are concerned only with a two-dimensional expression in the conventional sense of graphic drawing and communication, simply by placing one-colored ink on white paper. All other means of communication (audio-visual, cinematic, etc.) have been deliberately excluded. The object of the exercise is to concentrate on the essence of pure drawing and to limit ourselves to that.

The white surface of the paper is taken to be "empty," an inactive surface, despite the visible structures that are present. With the first appearance of a dot, a line, the empty surface is activated. A part, if only a small part, of the surface is thereby covered. With this procedure, the emptiness becomes white, or light, providing a contrast to the appearance of black. Light is recognizable only in comparison with shadow. The actual procedure in drawing or writing is basically not the addition of black but the removal of light. The sculptor's work also consists essentially of taking something away from the block of stone and in this manner forming it: the final sculpture is what remains of the material (20).

Seen in this way, signs acquire a completely different value with regard to their capacity to communicate. All the comments that follow are supported by this duality of "light and shadow," "black and white."



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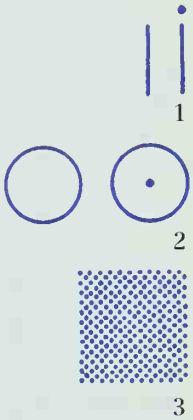
I. The Elements of a Sign

1. The dot

The dot, or point (German *punkt*) is, scientifically speaking, an abstract concept, which indicates with precise certainty the locality of a junction, a meaning, an intersection, etc. We speak of crossing points, meeting points, and also sore points, points of friction, and so on.In graphic terms the dot or point is a materialized area, recognizable by the human eye. It is the smallest graphic unit, as it were the "atom" of every pictorial expression.

A dot seldom appears as an individual element but generally takes its meaning from a relationship with another sign, such as the dot on the i, which gives the vertical line the meaning of a vowel (1); or the geometric dot in the middle of a circle, which thereby comes to symbolize the expression of "center" (2).

By lining up dots to form an area we create a graphic screen (*raster*) or tint. The dots are no longer regarded as isolated "atoms" but as a gray effect or the basis of the reproduction technique for halftone printing (3).



2. The line

a The imaginary line

The viewer draws an imaginary line from one dot to another. In ancient times, humans drew imaginary lines between stars as they gazed at the sky and the pictures thus formed from the constellations made the signs of the zodiac.

4

Dots arranged in a straight line at constant intervals are recognized as a line on which one is invited to write (4).

5

From the examples of dice patterns we have seen that the arrangement of three dots can evoke the idea of a triangle and that the formation of a hexagon of dots produces the idea of circular movement (5).

6

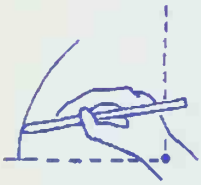
With a greater effort of the imagination one can also see a pair of crossed triangles, making the Jewish symbol of the six-pointed Star of David (6).

From these observations we conclude that the eye at first draws a line to represent the shortest distance between two points and is able to visualize crossovers only on further consideration.

b The line in itself

The prototype "line" is conceived from the start as a straight line. We take it that a juxtaposition of dots simulates a line, inviting completion. On this basis we could say that every linear expression consists of a dot set into motion. Such is the case, for example, when a pencil, of which the point forms a dot when touching the paper, produces a straight line through the movement of the drawing hand.

This is an abstract idea, since the drawing of a straight line without a ruler means taking thought with regard to the anatomy of the hand and arm. The spontaneous drawing of a line is conditioned by the nature of the shoulder, elbow, and wrist joints and naturally leads to a curvilinear movement (7). Note here that the drawing of a vertical line does not follow the same laws of motion as the drawing of a horizontal. The force of gravity will always assist the human hand to draw a vertical line with more certainty than a horizontal, which for many reasons is undefinable. We think first of the image of uneven land (hills, mountains), then of the comparison of the mainland with the endlessness of the universe,



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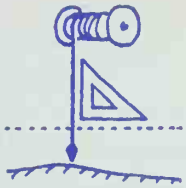
and not least perhaps of the deeply rooted realization that the earth is round and that therefore a straight horizontal line has no theoretical existence.

Stonemasons, bricklayers, and architects know for certain that the only fixed straight line is provided by the plumb line, from which all other dimensional measurements can be derived and established (8).



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c *Horizontal and vertical*

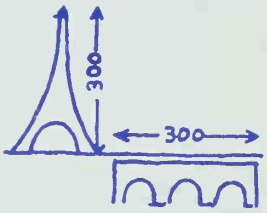
Humans have always moved on the horizontal plane. For this reason their optical capacity is mainly directed laterally, to take in the principal danger zones. As a result of age-old inherited exertions we find that our field of vision is much more extensive in the horizontal dimension than in the vertical (9).

9

We also know that, by comparison, the field of vision of fish and birds makes no differentiation between horizontal and vertical, since their movements and perceptions of danger are not only on the horizontal level but take in all directions in the air or water (10).

10

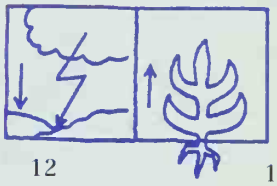
From these observations it clearly follows that the optical behavior of humankind is severely restricted. The estimation of a horizontal measurement bears no relation to that of a vertical. For example, we find a 300-meter tower to be enormously high, although 300 metres along the street is seen as a trifling distance (11).



11

Human movement is almost exclusively horizontal, so we appreciate the horizontal quite differently from the vertical. The horizontal is a concrete dimension which can be dominated, controlled, and paced out. The earth appears flat and the theoretical horizontal *is* an existing concept. In contrast, everything that *falls* on this earth follows a vertical movement and is therefore something that *happens*, without active human participation (e.g., lightning, rain, sunbeams), rather than *is* (12).

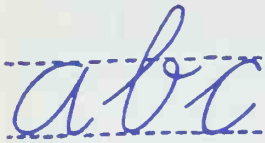
It is necessary to emphasize here the extent to which horizontal and vertical movements can produce quite different subconscious reactions.



12 13

Humans like to compare themselves with the vertical, the active element on a given plane and the symbol of living existence, which grows upward (13).

The horizontal is given: the vertical has to be made. Humans are accustomed to comparing their activity with passivity, and in the same sense a vertical exists only by comparison with a given horizontal. When learning to write, we place the letters on preprinted horizontal lines (14).



14

d The oblique line

In contrast to the certainty and precision with which a vertical is recognized, we find a certain questionable air of uncertainty about the oblique. An oblique position cannot be grasped with certainty, except perhaps in the case of the 45° angle, which can be judged by eye with a certain precision as the position halfway between horizontal and vertical (15).

15

The position of clock hands can be taken as an example, in connection with the division of the hours of the day. The most important position is given to the vertical, since the sun's position is at the zenith at midday, towards which it rises and from which it sets. In telling the time we can appreciate how sensitive the eye is to the constantly changing angle between the clock hands, even on dials without numbers, where the marking of the vertical and horizontal positions nevertheless remains indispensable (16).

16

The following points need to be made: an oblique line is always judged in relation to the nearest horizontal or vertical. The more an oblique line approaches or departs from one or the other of these (i.e., deviates from the ideal angle of 45°), the more its expression changes. The closer it approaches to the horizontal, the stronger is the impression of lifting (17), while a closer approach to the vertical strengthens the impression of falling (18).

17

18

Our custom of reading from left to right influences our judgment of an oblique line. One which runs from

19

20

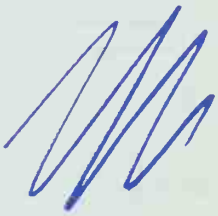
lower left to upper right gives the impression of "climbing" (19); the reverse, from upper left to lower right, indicates a "departure" (20).

21

e The curve

The vault of the sky and the terrestrial globe are the origins of the concept of the circle in the life of humans, who are aware of the vault and pass their lives within the circle (21). This feeling of the circle leads to a concept of eternity: sun and stars "turn" over humankind, who have always observed them. When humans look at the sky, from whatever point, they always find themselves to be in the center of a circle. Their proper place is always central and the human constellation is unavoidably egocentric. Wherever they go, humans take their center with them. It is for this reason that a circular curve gives the viewer a quite different feeling from the strict straight line.

22



23

In graphic expression there are two basically different kinds of curved lines, one derived from precise geometry (22) and the other the result of a spontaneous movement of the artist's hand (23).

The present study, which in accordance with its definition must "organize graphically," cannot concern itself with the pure, spontaneous expression of movement, although we are well aware that behind every geometrically based graphic concept there is a spontaneous impulse in the artist's intuition; or in other words, the graphic artist puts ideas into practice through the application of geometry.

24

It is clear that the ideal curved line is drawn with the aid of the compasses. A complete circle and segments of its circumference are dependent on a given invisible radius, whose presence enables the curved line to give rise to a feeling of precision and the presence of an invisible center (24).

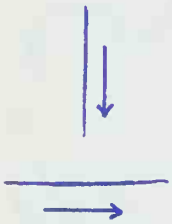
25

In the oval curve, the radius becomes a movable vector and here, too, there is the feeling of an invisible regularity (25).

26

Curves with constant radius, i.e., circles or segments of circles, produce only a primary expression, whereas curves with changeable radius (logarithmic curves) yield unlimited possibilities of expression.

All forms, of whatever nature, from the arabesque to the spontaneous freehand sketch, could in theory be divided up and reduced to geometric elements, even if minimal (26).

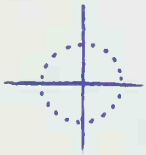


27

3. Relations between lines

a The manual movements of drawing lines

Some observations on the anatomy of the hand must precede the explanations given in this section. It is very significant that we speak of "drawing" a line, since the musculature of the hand is such that the movement of "drawing" (i.e., "pulling") a line (27) can be carried out more easily than a "pushing" movement.

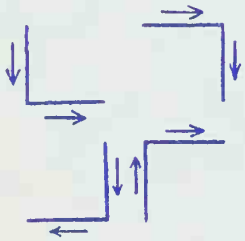


28

If we check this observation against the rapid drawing of a simple cross on paper, we find that the vertical is naturally drawn from *top to bottom* and the horizontal from *left to right* (assuming right-handedness). No particular effort is required to make a horizontal and a vertical intersect each other at any point (28) – unless, of course, the point of intersection has to denote a specific mathematical location. The ease of drawing a cross has the consequence that it is the most widely used sign of all. It is used for marking, counting, signing and even for oath taking.

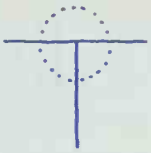
29

Let us consider a second kind of connection: a vertical line that touches a horizontal one at its extreme point (29). Here we notice two factors: First, we see that in principle the drafter does not lift away the pencil in order to draw the two lines, so that an abrupt halt and change of direction must be carried



30

out, taking account of the nature of the angle, which will be sharp or rounded off to a greater or lesser extent. Second, it can be seen from the next figure (30) that the first two angles are easier to draw than the second two, since the former pair are made with logically sequential movements, while the latter each require one pulling and one pushing movement of the hand.



31

The third connection between two lines consists of a T-shaped junction or "touching," which we may call "welding," where the end of one stroke touches the other line at any desired point (31). Analysis of the hand movement required shows a completely different approach: the point of connection forming the T calls for higher "tactile concentration" and a lifting of the hand in order to set it down again at a given point.

These reflections based on anatomical and physical conditions provide the necessary objectivity for a consideration of the three signs with regard to their morphology (the study of forms). Although all three are built from the same basic elements, a vertical and a horizontal, each has its own original power of expression.

32

The analysis of the *cross* as a prototype sign will follow later. At this point we may simply note that the appearance of a cross does not call forth any memory of an "object" (32).

33

In the *angle* sign the two basic elements have the tendency to unite in a movement in which one already senses the beginning of the definition of an area. For this reason the sign has a less absolute character than the cross and is rather the beginning of a drawing to be completed (33).

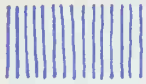
34

The *T-sign*, because of its point of contact, awakens the memory of "construction," also "balance" (34).

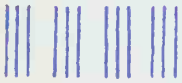
Thus these reflections lead to the conclusion that the three forms of connection – cross, angle and "welding" – are completely different from one another and cannot be united.

b Alignment and rhythm

35



36



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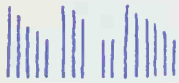


38

Two parallel lines do not make a sign but rather express an order of counting, an expression that is strengthened further by the addition of a third line (35). A larger number of closely set parallel lines produces the graphic effect of the materialization of an area (36), a system that is also known as "hatching."

This kind of alignment, repeated at regular intervals, allows the visualization of a concept of "rhythm" (37). The basic stroke becomes a "signal" for a measurement that does not necessarily have equal intervals. By varying the lengths of the strokes, an alignment of this kind can be made to evoke an image of musical time (38).

These considerations naturally draw us away from the sign as such into the field of applied art, where linear repetitions are used for the representation of frameworks, friezes, textiles, etc.

c Proximity

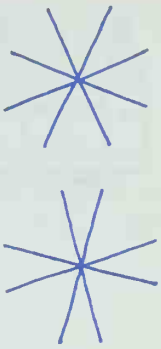
39

The expression of grouped signs or sign elements depends on the intervening space that connects or separates them. Sign elements standing close to one another are seen together as a whole, in contrast to those with wide spaces, which are understood as separations. A familiar example is the difference between letterspacing and word spacing in print. The word spaces must be distinctly larger in order to allow the groups of letters to stand out as self-contained words (39).

Equal intervals in a row of vertical lines allow the space between the "bars" to be seen as a continuous background, but as soon as pairs of lines draw closer to one another the uniformity of the background disappears. The smaller spaces stand out and are "materialized" by their proximity. In other words, the viewer sees a lattice of six bars in the first example and a fence of three posts in the second (40).

40

A further example shows clearly that distance is seen as something spatial and proximity as the representation of something objective. In the first example four straight lines cross at their center with equal intervals, producing the image of a wheel. In the second example the lines have been displaced so that the intervening spaces are different. The closeness of two lines produces the impression of a wheel, whereas the wider spaces are more strongly felt as intervals. The second sign is therefore less of a wheel, much more of a cross (41).



41

4. The morphology of signs

a The "geography" of perception

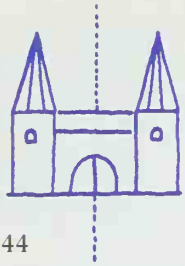
42

43

We take it that the viewers of a sign not only take a certain standpoint but also occupy a geographical position in relation to the sign itself. In the case of a square, they will regard themselves as being either inside (42) or outside it (43). Within the space, concepts such as floor, walls, and corners are perceived. Seen from the outside, an object such as a cube or a window is perceived.

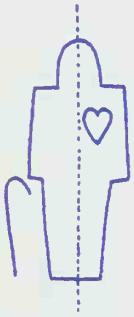
b Symmetry and asymmetry

When humans regard any object (in our case a sign) they first seek to take up a firm position with regard to their underlying terms of reference. In most cases this position will be symmetrical: horizontal (level) *and* vertical (gravitational). This approach is certainly connected with the fact that the human body is outwardly symmetrical. (The passage of time in which humans are situated from moment to moment is also perceived as symmetrical: backward = the past, for-



44

wards = the future, with humans in the present, the center, the here and now.) We feel soothed and reassured when we see a symmetrical figure or construction, although we know that its interior is asymmetrically arranged for functional reasons. A symmetrically built castle (44) is almost certain to be divided asymmetrically in its interior. The only exceptions are perhaps churches, theaters and cinemas, which have a central function.



45

It must be emphasized that the human is constantly faced with the opposition between an external symmetry and the asymmetrical functioning of the body's interior (45). The heart does not beat in the middle of the body, the person works with the right hand, and in modern life the driver must learn to steer a car on one side of the road with a wheel on the other side of the car. The question eventually arises: Has humankind become *centerless*?

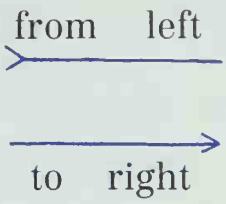
46

The sequence of written language in the West is asymmetrical. We read from left to right, in a given course of time: beginning to end. Some of the twenty-six letters used are designed symmetrically and some asymmetrically (46). When reading or writing capital letters we are no longer aware that A and O have symmetrical forms while B, C, and D are asymmetrical. (Curiously enough, all the vowels except E are symmetrical: A I O U Y.)

47

We know that the Phoenicians and even the early Greeks wrote in a symmetrical way, with lines reading alternately from left to right and from right to left (the same movement as that of a farmer ploughing a field) (47). The letters therefore had to be "turned around" anew on each line, with the result that asymmetrical letters were written to face both ways. In the course of time this procedure became incompatible with the forms of the letters, which were impressed into the human mind as archetypes, since two basic forms had to be "programmed." This circumstance led to the asymmetrical development of reading and writing, with lines always beginning at the left and being read from left to right (48). (This break with tradition

occurred around 650 B.C. in the Greek and Etruscan cultures.) For this reason we are now strongly influenced, when looking at a sign, by the innate sense of direction from left to right. (Different conventions influence Hebrew, read from right to left, and Chinese, read from top to bottom.)



48

In contrast to this acceptance of asymmetric written characters it can be seen that isolated signs, proprietary symbols and coats of arms (49), and above all signals (50) are in the first instance recognized and understood symmetrically. This does not mean that a signal must necessarily be designed symmetrically for clarity and precision, but that it should be placed on a symmetrical background (shield), because a shield is viewed *centrally*. Written and printed characters, on the other hand, follow a completely different asymmetrical law.

49

We will consider the deeper sense of symmetry in symbols in Part 3.

50

c *Morphological Table 1*

The viewer's attitude toward a figure is very complex. In order to understand the procedure of taking in the meaning it is necessary to begin with a diagram with simple divisions, offering the best chances of comprehending the origin of the procedure. For this reason the first morphological table has been formed of only one square containing a cross, in order to avoid all "parasitic" or "anecdotal" influences.

The diagram figures are built up from three vertical and three horizontal lines, which, when superimposed, alternately touch, cross, and supplement one another (51). Mathematically, 49 variants (7 x 7) can be produced with these six strokes. We call this procedure the completion of a program, seeking out all the possibilities contained in a given structure.

51

Looking at Table 1, the reader first recognizes that the very simple signs begin at the top left with A1, condensing toward the lower right, to end with the completed sign G7.

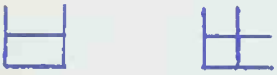
A1 G 7

D4

C3

C5

C7 G3 G7



C6 E6

In the center of the page is the cross D4, the unequivocal meeting of the vertical with the horizontal. This central position provides the crossing point or point of separation from which the four points of the compass proceed. The cross is the most abstract sign and encloses the smallest area, since it has no interior. The angles are not seen as the corners of a space because the crossing of the lines does not call forth the image of a "corner." Crossing means "crossing out" rather than "drawing."

The square, C3, appears as the exact opposite of the cross. When one looks at the whole page, the square stands out strongly; its inner area appears whiter; the enclosed space is of active importance, encapsulated from the page. Most viewers of a closed square like to identify with it: the square is the primitive expression of the object, the property, the dwelling.

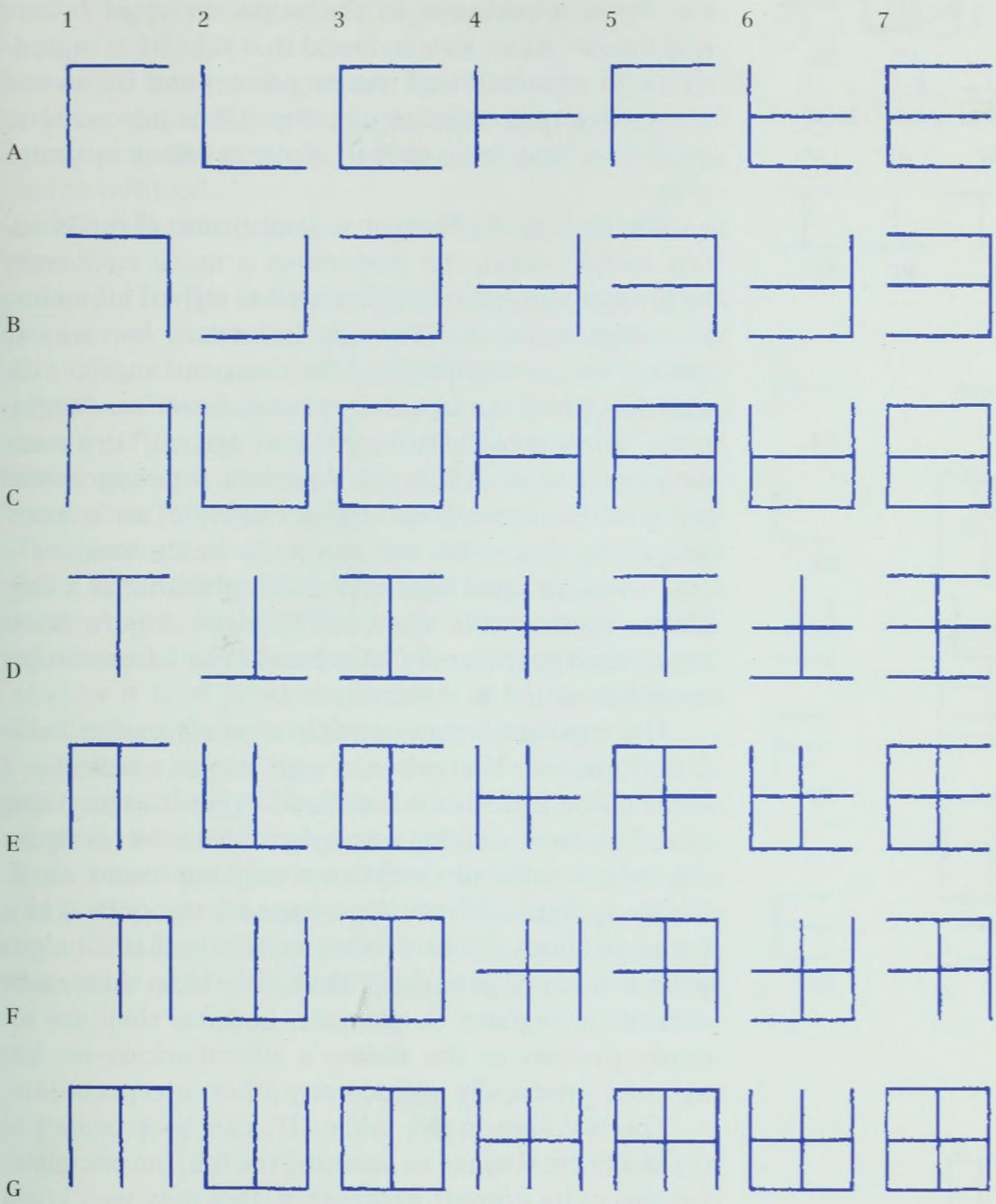
From these first two observations we conclude that signs with unenclosed areas tend to evoke abstract perceptions, while enclosed areas awaken memories of objects.

As typical illustrations of this point, a piece of furniture is at once spontaneously recognized in C5, a symbol for some kind of construction in C7, curtains in G3, and a window in G7. In figure C6 one recognizes a container for liquid. In most cases a free line can be seen as figurative only when it occurs in connection with an enclosed object. It is then recognized as a thin, strokelike object: table legs in C5 or glass panels in C6. With a greater stretch of the imagination, E6 could be taken to show a downward-swimming fish, its body represented by the closed square and its thin fins by the outward running lines.

Returning to the unenclosed signs with a more abstract expression, the following observations may be made: human zones of feeling can be divided into two concepts by means of this simple experiment above-below and left-right.

Sign C1 arouses the feeling of protection, while C2 is rather felt to be a trap or pitfall. Screening from above is of vital importance for people in northern

Morphological Table 1

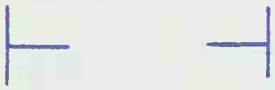


C1 C2 D5

climates, protecting them from rain and cold, but for someone from a hot climate D5 might mean shade and wind = coolness. In the same sector of "above and below" it can also be found that sign D1 is regarded as an expression of hanging down and D2 as one of growing and standing up. Sign D3 is perceived as a pillar, a support, a pair of scales, even as a symbol of law.

D1 D2 D3

The feeling of left-right is mainly one of the Western world, where the movement is made customary by the teaching of writing from left to right. This feeling is rooted in us and strongly influences our way of seeing. Let us consider, as the clearest example, the sign A4, which undoubtedly means "start" or "beginning," while B4 is "destination" or "arrival." In a more developed way, A1 could therefore be experienced as "give" (command) and its opposite, B2, as "expect" (obey). In figure B6 we can very easily imagine a ship's rudder, and figure A5 is recognizable as a flag, blown by the wind from left to right. Figure B5 is recognized more easily as a hand-held banner being moved from left to right.


A4 B4

A1 B2

B6

A5 B5

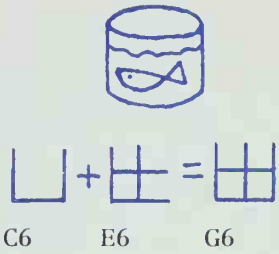
The most important point to be recognized in Table 1 is, however, that when a sign image resembles a letter of the alphabet it is difficult to see it as anything else. The most striking example of this effect is figure A7, which without doubt can only represent an E. Beside it, figure B7 could perhaps be recognized as a flying swallow. From this we conclude that all signs with a form approaching that of a letter are more difficult to register as pictures, because they are already present in the viewer's subconscious as letters and practically exclude any other interpretation.

A7 B7

The last sign in the table, G7, can be accepted in the intellectual sense as meaning the full, the complete, but not in its graphic expression. One may well know that a multitude of objects, animals, signs, and letters are contained in it, but can extract them only with difficulty. The completely enclosed nature of the square and the absolute symmetry of the cross have covered over the images.

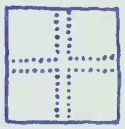
G7

Figure G6 could be regarded as an anecdotal illustration of this form of "coding" in such a consolidated sign. Among other objects, it "conceals" the fish of figure E6 in the water tank of C6. Alchemical, cabalistic, and many other symbol-laden signs, including those of medieval masons, consisted of such quasi-pictorial symbols, whose key was known only to the initiated.

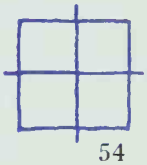


We will return to the subject of coded symbols in Part 3.

So far as the theoretical expression of this sign is concerned, there is another interesting aspect that has not yet been analyzed: the division or subdivision of an area. An exactly surrounded area is divided into new interiors by lines drawn in and "welded" to the sides, giving it a completely new effect: the original strength of impression of the white square is disturbed. The meaning of the inner lines can no longer be defined figuratively. Their role has become that of "division," since the cross strokes border the right and left, upper, and lower squares (52). From the graphic point of view it is of great importance to know whether a line is given the role of *drawing* or *dividing*.


52

53


54

In this analysis, the meaning of "welding" comes out very strongly. The "unwelded" cross (53) involuntarily loses the expression of the dividing stroke. Even where the lines are drawn out beyond the frame (54), although the cross still divides the square, the latter still keeps its autonomous character, because the visible ends of the lines allow both figures to appear in full.

d Morphological Table 2

In order to simplify the exposition of the rules as far as possible, we have kept to the same basic signs in Table 2, only allowing the lines to be broken off in the center at their "welding points." By this means the number of possible new figures is greatly increased and only a selection of typical groups is shown in the table.

Row A consists of completely enclosed signs, and it should be noted that each figure recalls something of architecture, planning, division, or organization. The last figure in the row, A7, where the two elements touch at a crossing point, forms an exception. We find the same kind of form in the figure 8, in the sign for "infinite" (55) and in the hourglass sign (56).

55

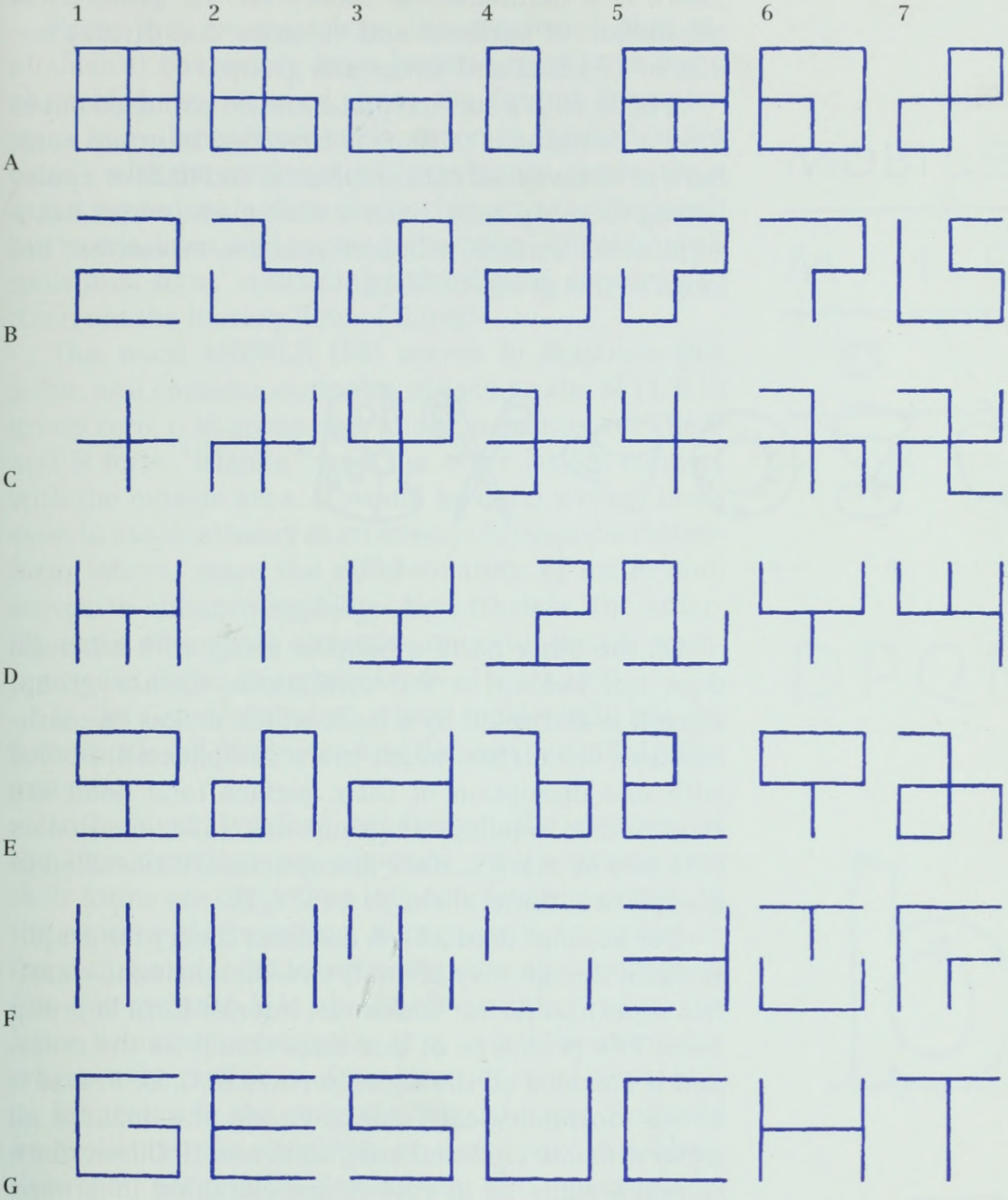
56

Rows B, C, and D consist only of open signs, where the beginnings and ends of the lines are visible. In row B the figures are made by the meandering of a *single* line, while in row C each figure is made of two lines, which cross over and give an open, radiating expression with the visible stroke endings. In row D, all the signs consist of "welded" elements. In E there are both closed and open elements: the enclosed areas have no dividing lines and only the last sign, E7, has a cross. The presence of enclosed areas again gives these figures strong reminders of objects: conductor's desk, rudders, pipe, frog, etc.

In row F there are no connections between the strokes, so the figures are not strictly speaking signs, but, through measured alignment, they become rhythmical expressions, particularly the first four. The last three give more of an indication of movement instructions in the functional or technical sense.

In the final row, G, the resemblance to letters is so strong that the line is involuntarily *read*, above all because the seven signs form the word GESUCHT (SOUGHT), of which the outline is familiar to the German reader. No thought is given to the lack of rounding in the letters G, S, U, and C: it is not even missed.

Morphological Table 2



5. Sign topology

There is a mathematical theory for the geometrical calculation of surfaces and volumes that divides bodies of all kinds and forms into groups.

A body with a surface that could be stretched out to form a continuous surface is classified in group zero. Seen in this way, all cubes, spheres, and balls or apples belong to group zero. Even a wine glass, which has a continuous surface, whether concave or convex, belongs to this group (57a, b).

57a b c d e f

On the other hand a hoop or a cup with a handle does not belong to the continuous surface group, since it is disrupted by a hole, which makes its mathematical calculation much more complicated. Bodies with *one* disruption of their surface (one hole) are classified in topological group one (57c, d). Bodies with two or more surface disruptions are classified in groups two, three, through *n* (57e, f).

Our attempt to establish a similar theory for graphic signs, though they are only two-dimensional, classifies signs that do not enclose an interior form in group zero. The prototype of this class would be the cross, and it includes all the signs in rows B, C, D, F, and G of our morphological Table 2. Group one includes all signs with *one* enclosed area, as in row E. Other, more complex signs as in row A are classified in groups two, three, through *n*.

It is of interest to examine the letters of the alphabet according to these criteria. We find that most upper- and lowercase letters in printing typefaces belong to group zero, as they have no enclosed forms. Only

five upper- and five lowercase letters belong to group one, and only capital B and the common form of lowercase g belong to group two.

From this we may draw the conclusion that alphabetical characters have become more and more abstracted, i.e., opened, from the former figurative signs (e.g., hieroglyphics) in order to connect more closely with the writing stock (parchment, paper, etc.). In this procedure, not too many white areas are isolated, but words, lines, and cages are "written" (filled in) with individual signs' remaining subordinate, so as not to interrupt the literary flow of thought.

The word MOBILE (58) serves to illustrate this point, as it contains examples of each group: M I L E in group zero, O in group one, and B in group two. The O and B form "islands," and the other letters connect with the outside area. It would be quite wrong, however, to use this theory in an attempt to open the closed-form letters, since the differentiation of expression serves to enhance legibility. Nevertheless, the lettering artist often finds attractive opportunities of opening closed forms in certain kinds of work (59).

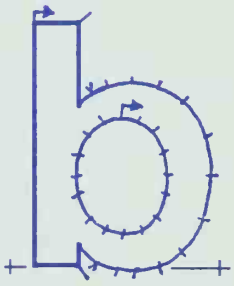
In the Greek alphabet, which incidentally has far fewer enclosed forms, we find the very beautiful letter omega Ω.

In modern typeface production the outlines of the type drawings are digitized, which means that their forms are divided up into coordination points. In the process of typesetting, these quanta are called up from storage in order to reconstitute the sign concerned. For this purpose it is absolutely essential, when the letter belongs to group one or *n*, to tell the computer whether the outline is of the inner or outer kind (60).

Returning to the general group of signs, it should be noted that the simplicity or complexity of a figure does not necessarily depend on the topographical classification given here. For example, a very complex maze can be laid out as a specimen of a topological sign of group zero. The basic conditions for this are the avoidance of crossings and the retention of visible beginning and ending to the line (61).

58

59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61

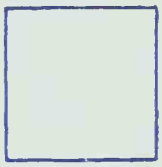
II. The Basic Signs

It appears from archaeological evidence that humankind has an innate feeling for geometry. Traces of primary signs of the same form are found in many regions of the earth, and it may be assumed that they expressed similar meanings for the most varied races at widely different times.

This survey is deliberately restricted to a small number of characteristic figures: the square, triangle, and circle among the closed figures; the cross and arrow among the open ones

1. The square

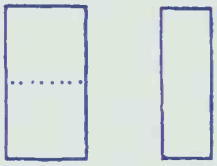
In studying morphological Table 1 we have already recognized the primary characteristics of this sign: a symbolic object, boundaried property, also a dwelling place with the feeling of floor, ceiling, walls, protection, etc. (1).



1

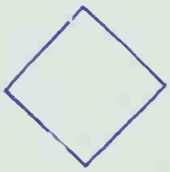
In the prehistoric sense it meant the earth's surface, at the same time indicating the four points of the compass. In the Chinese world of symbols, the four corners represented the outermost points of the earth.

As soon as the square becomes an oblong it loses its neutral, symbolic character. The viewer immediately looks for the intention of the difference between length and breadth. An oblong is recognized as such so long as one dimension is not less than half the other (2), at which point two squares are formed by a central dividing line. Oblongs with a greater difference between the sides begin to be felt as beams or pillars (3).



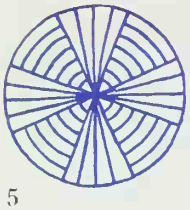
2 3

With the square standing on its corner (4) we come into the field of oblique lines. The view of this sign is disquieting, and its position on its point indicates a certain intention, which is why this form is used as the ideal background for traffic signs, especially in the United States.



4

2. The triangle



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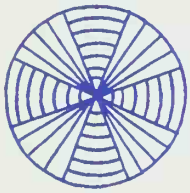
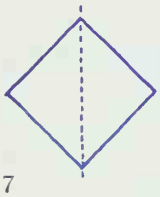


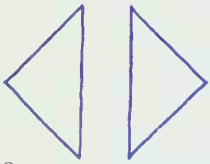
6

Before going into detail concerning the triangle, we enter the field of Gestalt psychology for a brief explanation of Rubin's experiment, which indicates that human attention is primarily attracted by vertical and horizontal movements. The first illustration (5) shows that the area marked with radii is immediately seen as a cross, standing *over* the disk marked with circles. On the other hand, the second illustration (6) gives rise to a marked doubt about the relative importance of the oblique cross and the circled background. It can therefore be said with absolute certainty that the human eye first seeks out the vertical and the horizontal. If neither of these dimensions is present, the viewer will try to imagine them in order to "place" the sign, which will be interpreted in relation to the person's physiological position, in terms of vertical (force of gravity) and horizontal (standing level).



7

It is therefore not surprising that the expression of a triangle is always first judged in relation to a vertical or a horizontal. In a square standing on its corner, the triangular form is already present, since the sign is bisected vertically or horizontally in the viewer's subconscious (7).

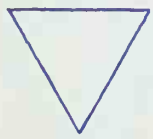


8

If we place the triangle vertically on its apex, it obtains a direction-giving character, with movement transferred from the vertical to the horizontal (8). The simple triangle is therefore much used as a direction sign, which succeeds so long as the directions are horizontal, left or right. Where the required direction is up, down, or even oblique, this form of direction sign can cause confusion (see description in Section 4, The arrow).

9

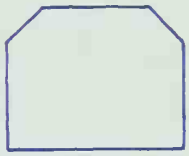
Triangles with a horizontal side (9, 10) form ideal backgrounds for signals (road signs, etc.) because of their symmetry. The triangle with horizontal base (9) conveys an impression of stability and permanence, like a pyramid. It is also the symbol for the expression "wait," rather like a mountain, whose only active function is to suffer erosion.



10

The reversed triangle, on the other hand, standing on its apex (10), has a much more active character. It is the symbol of a tool, an action, also of scales. The positioning is felt as a limitation in the long run (one cannot stand on one foot for long).

The first sign is a friendly symbol; the second rather tends to produce a reaction of alarm. The upward-pointing triangle also reminds us of the shape of a roof. It would be interesting for an architect to consider why an attic room with sloping ceiling (11) has such an intimate effect. There are certainly some psychological reasons. The right-angled upper line of a cubic room has something disquieting about it, whereas a broken upper angle gives rise to a feeling of the intimate rounding of security.



11

3. The circle

Modern humans probably have a more spontaneous relationship with the straight line than with the curve. Daily encounters with level ground and with all kinds of constructions are primarily based on the two principles of horizontal and vertical. We appreciate rounded forms with the senses rather than the mind. It should, however, be noted that there is a tendency to turn to softer and more humanistic forms in furniture and building – also in the aerodynamic forms of transport in aircraft, cars, etc. There is an effort to habituate humans to a new expression of their environment, but only the future will tell whether it makes them feel more free and secure or, on the contrary, more restricted.

In the circle, the viewer encounters the line with eternal recurrence, neither beginning nor ending, and going around an invisible but very precise centre. This compares with the idea of the course of time, which comes from nowhere and has no end.

For primitive humans, the circle was certainly of strong symbolic importance due to its association with sun, moon, and stars. Today, it is still associated with wheels and gears of every kind. Without the ability to

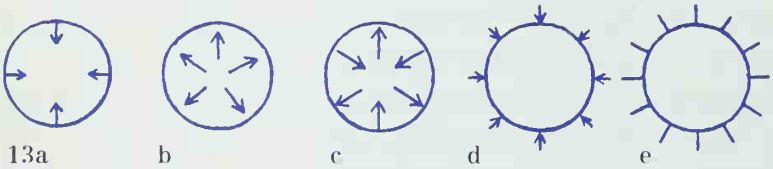
travel, modern life on the ever-widening area of our daily world would be hardly imaginable. We will therefore use the circle form to establish some differentiation in the psychological effect on the viewer.

Looking at a circle immediately calls forth the memory of some known object. The order in which the objects "appear" differs from one person to another. The sequence of objects that a person names on regarding a circle would make an interesting test. Here are some memories of objects seen. First are those in which the idea of volume is not necessarily recognized or looked for: sun, moon, discus (12a). With a greater effort of the imagination, calling up spherical volume, one is reminded of a ball or balloon (12b). Only later does the idea of the invisible center emerge, calling up a wheel, spinning top, or record (12c). It must be emphasized here that the invention of the wheel was of such importance to humankind as to implant its optical image strongly within us.

12a b c d e

It is understandable that a sign describes something material but it is also possible that the viewer of a circular form may have an opposite reaction and see the material, not *within* the circle but *outside* it, so that the image of a round hole may appear (12d).

It may also be the case that the line itself is recognized as the material, giving rise to the image of a hoop (12e) with which we played as children.



13a b c d e

The feelings are addressed more strongly by the circle than by any other sign. Depending on their

character, the viewers will place themselves either *inside* or *outside* the circle.

The feeling of being inside the circle can perhaps be interpreted as an impulse toward the center (13a) or a search for a mysterious unity of life. In the opposite sense, an active life radiates from the invisible center outward, to the circumference (13b). We find the same process at a given stage of growth, when new life develops from the egg. Enclosure becomes disquieting and is felt as claustrophobia.

These two feelings can also be experienced at the same time (13c), in which case one could speak of the pulsation of life within given zones, like the beating of the heart.

The circle can also be a protection from outside influences (13d). Here, too, we are reminded of the idea of the life-preserving eggshell. In psychology, the con-cept of the cover or wrapping is of the greatest import-ance. The infant leaving its mother's womb carries feelings of both protection and the vital breakout to independence. Our ambivalent feelings toward an opening are well known: feelings of pressure and anxiety mixed with those of security and protection. The natural circle of life is closed in this way: in the mysterious leaving of the place of security at birth and in the no less mysterious sexual drive, which urges humans to plant the seed of new life in the same place.

Standing outside the circle, we are reminded of the sun (13e), the indispensable life giver with its beams radiating from the circular form, and of the moon, which illuminates the night through reflection.

Since the invention of the wheel, the circle has also become a symbol of movement throughout human history. The movement is not that of an arrow, which flies through space, but more indirect, as a wheel by moving allows itself and the vehicle above it to move.

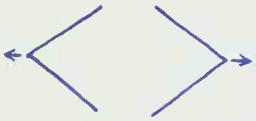
The eye itself has a muscular reaction in following the circular movement of the wheel (14). The feeling of "traveling, rolling" that one has in viewing it is triggered by the eye muscles. The fact that the circle has neither beginning nor end gives this circular

14

15

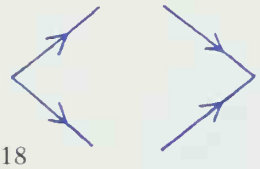
16

movement a certain feeling of insecurity (shade of panic), associated with the fact of the eternal recurrence. The direction of rotation is influenced by the movement of clock hands (15). Why do the hands of our clocks turn in this direction? On a sundial, the sign for midday is at the bottom, because the pointer casts its shadow downward, the morning hours being indicated on the left and the afternoon hours on the right. The arrangement of numbers on our clock dials is perhaps influenced by our custom of reading from left to right. This supposition can be supported by the fact that the Jews, who read Hebrew from right to left, possess some clocks that read "counterclockwise" (16).

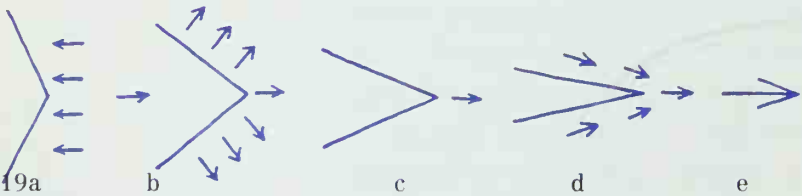

17

4. The arrow

When two oblique lines come together to form an angle, the expression of a movement or direction is produced in some form. Angles pointing to right or left (17) have a stronger movement than those pointing up or down, for the obvious reason that human movement is normally on a level. (Only in elevators does the vertically placed arrow obtain a clear expression of movement up and down.)


18

Mathematicians need the angle sign for the expression of "greater than" and "less than" (18). This concept is more difficult to grasp optically, but it shows that the inner area enclosed is subconsciously grasped, while only in second place is the expression of the line itself consciously and deliberately "seen."


19a b c d e

The expression of the angle sign as a direction pointer alters considerably with the degree of the angle. One that is greater than 45° is seen rather as

a resistance against an oncoming force, such as a dam (19a). A 45° angle sign is recognized as a moving sign, but only with slow and difficult movement, like a snow plough (19b). At about 30° the angle sign can be compared to an earth plough (19c). Only from about 20° downward does the angle sign become an arrow (19d). The inner area is small and less visible; the sharp point produces a reaction of danger, against which viewers must protect themselves. The angle sign has become a weapon.

In the formal arrow sign (19e), i.e., an angle with a central stroke, lengthened out, the inner areas are exaggerated and doubled by the division.

This sign is certainly one of the earliest to have been used by humans, being closely associated with the problem of "survival" (hunting) or "injury" and protection from injury: a matter of life and death. The arrow sign awakens feelings of aggression and anxiety, both of which are basic to our psychological make-up and to our existence as a whole.

20

The arrow sign is taken in two stages: as the flying weapon with the arrival of the wounding point and the barbs holding it into the flesh.

The addition of a vertical line (20) gives even clearer expression to the concepts of firing and striking.

21

Where the arrow shaft line is not straight but takes on a curved form (21), the idea of "weapon" is changed into a signal: turn left or right, go around a traffic island, etc.

We will consider the symbolic expression of the arrow in more detail in Part 3.

5. The cross

We would like to call the cross the "sign of signs." The crossing point of the two lines, as already mentioned, has something that is abstract and invisible but so precise that mathematicians, architects, geographers, and geologists make constant use of it to indicate the exact position of a point (22).

22

Curiously enough, mathematics has chosen this sign to mean "plus." One wonders why a vertical stroke could not be used to indicate plus, as a horizontal stroke means minus. The reason is probably that the vertical stroke gives the primitive figure 1 (a notch or scratch) and is therefore no longer available for a more complex expression such as "add."

At this point, an interesting ethnological note may be made: the Eskimos have a very marked sense of the horizontal but the use of the vertical is almost unknown to them. Perhaps the reason lies in the construction of the igloo (23), for which the plumb line is not needed. In their script, a vertical stroke means "ice," perhaps in association with the vertical movement of breaking or cutting blocks of ice.

23

The "plus" sign does not awaken any feelings in the viewer, but as soon as one arm or the other is slightly lengthened, the sign loses its plainness and makes way for psychological reactions. The most striking alteration is made by lengthening the vertical downward (24). In this way the sign of the Christian faith immediately appears. The presence of this sign has deeply marked the whole Western world for nearly 2000 years. We will return to the numerous modifications and alterations of the Christian cross in Chapter II (on symbol signs). Here it need only be pointed out that the proportions of the raised horizontal correspond to the human body (as the whole figure of the crucified Christ), which certainly accounts for its deep symbolical significance.

24

To show how irritating and strange a distorted cross appears to us, we need only bring the cross piece below the center (cross of St Peter, who was crucified head downward).

25

The diagonal cross has a basically different meaning. Mathematicians use it as the multiplication sign. The X-shaped cross can stand for a signature and also be used for deletion or reference marking. Not least, it can represent the protective gesture of crossed arms over the head.

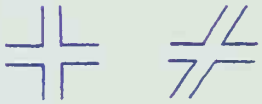
As soon as the angle of the two strokes is reduced

from 45°, a new expression comes about: the human figure appears, with arms and legs, in a standing (26a) or lying (26b) position. The sign has a gesturing expression particularly when it is standing "on one leg," but one also recognizes concepts such as deletion, signal, and barrier (26c).

26a b c d e

The sign loses its abstract character still more with a displacement of its crossing point. The different inner spaces arouse ideas such as "open at the top" for container or glass (26d) or "open at the bottom" for tent or shelter (26e).

The normal cross or plus sign is the absolute embodiment of symmetry. The four right-angled inner spaces (27) located around a central point fix the sign to the paper so strongly that any idea of movement or rotation is impossible. As a contrast, it can be seen that when the verticals are made oblique, the inner spaces change to acute and obtuse angles (28), giving an expression of dynamism. The two concepts of *static* and *dynamic* refer to the vertical stance of the standing man (29) and the position of the forward (or left to right) walking or running person (30).



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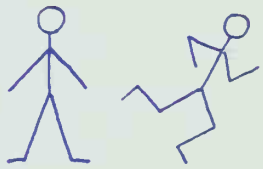
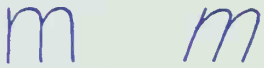


29 30

The basic differences of these expressions are particularly familiar to typographers. Normal letters are upright (31), whereas italic is used for emphasis (32) and often for the citation of a "spoken" text. The fact that italics "slope forward" is related to our custom of reading from left to right, once again in connection with the running person.



31 32

An anecdotal example of this theme is a sketch of a racing car, to which the artist has given oval, oblique wheels to emphasize the idea of speed (33).

33

III. Joining Signs Together

There is not a very large number of basic, elementary signs. It is also very difficult to establish from which point a sign is to be regarded as lapidary or fully formed. In special cases it could be said, for example, that an arrow consists of three straight lines and a square of two angle signs or four straight lines. Basically, this consideration is of only secondary importance in the present connection.

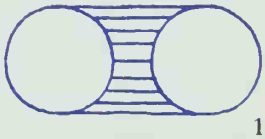
Our starting point is rather that a sign is to be regarded as having an independent existence when its visual meaning is absolutely unequivocal. This is the case when a square is seen and understood as a square and not as four straight lines, and a cross as a cross, not a horizontal stroke divided by a vertical one. The intersection of the two lines should make it impossible to miss the totality of the cross.

This preamble serves mainly as a basis for the following description of the laws of assembling various signs.

The combining of signs, apart from its purely graphic aspects, also creates a mental, philosophical, or "alchemical" impression. If, for example, a cross and a circle are combined, a wide field of symbolic expression is opened up to the mind. We will constantly come across this aspect of the signs becoming language, through juxtaposition and combination, in Parts 2 and 3 of this work, but our first concern at present is the purely aesthetic effect of the graphic combination of signs on the viewer.

1. Relations between signs of the same form

Two adjacent circles are seen as a pair sign when the area between them is at least as great as their inner areas (1).



1

2

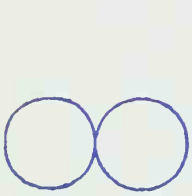
This question of the space between signs is one of the most important aspects of typeface quality. The layperson does not realize how finely the spaces between letters (2) must be specified by the manufacturer so that reading can proceed undisturbed in the printed word or sentence.

3

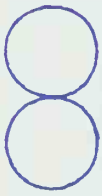
4

Just as letters are formed into a word image by being brought together, so complete signs are formed, from a certain distancing, through the coming together of individual sign elements (3). Complete connection is naturally obtained through touching (4), crossing over or complete overlapping.

As a first example, let us consider two touching circles, first in a horizontal alignment (5a). This connection expresses a condition of equality. In its complexity it could be the sign for friendship or brotherhood. Two circles arranged vertically (5b) evoke the idea of a hierarchy, with upper and lower; the effect of the sign is of a rather precarious balance and it is like a statue or monument. In the third, oblique association (5c), some aggression comes into play and the expression is more of pulling or pushing. (The graphic repre-sentation of "gears" or "rotation" seems an obvious use of this sign.)



5a



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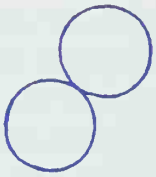

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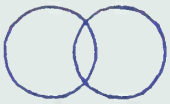


d

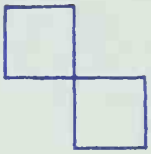
Observation of the three first examples reminds us once again of the three different elementary expressions: horizontal, vertical, and oblique.

It is clear that we are still within the realm of the linear sign: the thickness of the stroke has no specific value of its own, so the lines of the two circles join together and also form a figure 8, the eye following the stroke just as well in two circular formations as in alternating from one circle to the other. We recog-

nize here the character of the figure 8 and also, in the case of the horizontally placed sign, the sign for "infinity," a symbol of eternal recurrence.

The fourth example (5d) is included in this series only to illustrate the total change of expression when the two circles overlap (see comments on figure 9).

With the connection of two squares (6), we encounter a similar effect to that of the figure 8 formed by two circles. The two signs meet at one corner, making a cross form clearly visible. The eye follows the straight lines and goes around one sign after the other, alternately, in opposite directions. The perpetually crossing lines have a kind of charm of their own.



6

Two adjacent squares (7) with one common side merge very strongly into a new sign, a long rectangle. The center stroke is no longer seen as two side strokes but only as a division.

7

When two squares are staggered against one another (8), the individual elements stand out clearly, more so than in the first and second examples, because neither a crossing nor a dividing stroke is perceived. Of the three examples, this sign best represents the idea of "assembly."

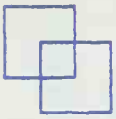
8

A further important step in our considerations is provided by the overlapping of signs (9). We overlap two forms, automatically producing a third inner area common to the two signs. In the mathematical theory of sets, this operation is designated with the signs and the common area is called the "intersection." The overlapping of figures leads to an infinite number of possibilities, of which only a few can be mentioned here.

9

The first point to note is that the "luminosity" of the single enclosed sign, as already described, is substantially reduced by overlapping with another sign. The newly created area formed from the overlap has its own radiance, which is naturally obtained at the expense of the two original signs. The geometrical shape of the new area is in most cases different from that of the originals: in our circular example, the central shape is that of a lens.

In two further examples of overlapping equal squares (10) or triangles (11) the matter is simplified insofar as a new square and a new triangle are produced, i.e., members of the family of the original signs.



10

11

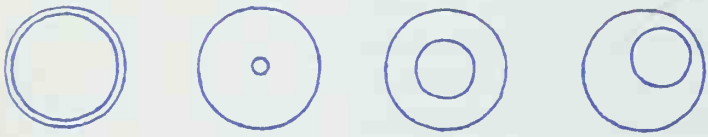
When two equal geometrical areas are superimposed and one of them is rotated, other new signs appear, in most cases giving the impression of an autonomous sign. Superimposed pentagons (12a), squares (12b), and triangles (12c) produce star signs of all kinds, with various forms of radiation having deeper symbolic content, to which we will return in more detail. Two superimposed rhomboids (12d) or ovals (12e) develop very interesting new signs, and, as in the

12a b c d e

case of the star shapes, the crossovers create new geometrical forms. The division of the basic figure makes a sign much richer.

It is *not* possible to create any new sign by superimposing and turning two circles of equal radius.

Two circles with different radius, placed con-centrically, produce the figure of a hoop in the first example (13a). If the inner circle is much smaller, the sign reminds us of a record or a target (13b).



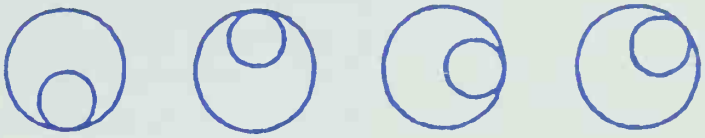
13a b c d

If the inner circle has approximately half the radius of the outer one (13c), the main impression is of a

wheel (naturally derived from the idea of a car wheel with tire). In all three cases the inner circle is seen rather as a hole than as anything positive.

When the same inner circle is shifted from the center (13d) there is a sudden change of view. The idea of the inside of a tube comes to mind, with perception of its entry and exit in perspective. It also reminds us of a cone seen from above.

When the small circle touches the circumference of the large one it is no longer recognized as a tube exit. The sign as a whole loses its three-dimensional expression and becomes diagrammatic again.



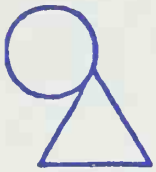
14a b c d

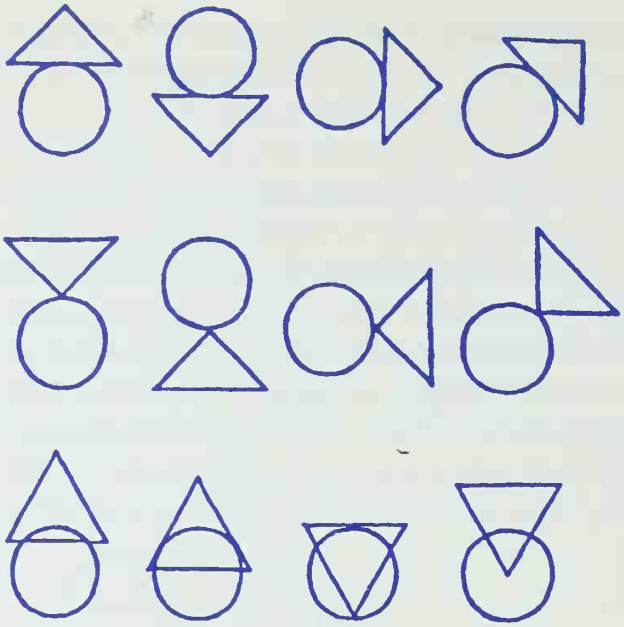
In the lower position (14a), the sign gives the impression of a point of rest, a standstill. If, on the other hand, the small circle is placed at the top (14b), the impression given is of instability, of a falling droplet.

Placed horizontally at the side (14c), the small circle gives a feeling of balancing and is also associated with a spirit level. In the oblique position (14d) a movement is recognized, the rolling of a ball, and only in this position does the perspective of a cone tend to reappear.

2. Relations between signs of different forms

It is clear that associations between different forms immediately stimulate the creative impulse much more. From thousands of possibilities, we choose the circle and the triangle (15). The acts of juxtaposing and intersecting the signs lead in most cases to considerations similar to those covered in the previous section. The reader's imagination will identify in these examples associations such as sheltering, balance, loudspeaker, and even a primitive human figure.





15

The superimposition of two signs of different forms produces a new consideration: a small triangle in a large circle (16a) no longer awakens the impression of an object seen in perspective. Its appearance remains purely two-dimensional. Also in the converse case of a small circle within a large triangle, the effect is purely graphic and two-dimensional (16b). Depending on the

16a b c d e

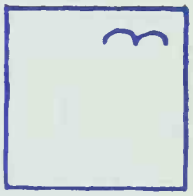
relative sizes of the two signs, holes cut in a geometrical shape are seen. However, if the inner sign touches the outer (16c, d), even this material notion disappears, to leave a purely graphic expression of the outer sign divided into parts by the inner one. The overlapping of two different signs (16e), where the lines cross,

provides results similar to those of overlapping equal shapes, as described in figure 12.

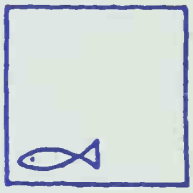
3. The expression of the inner area

It seems important at this point to take in a general, less technical account of the meaning of the internal area of closed forms. A closed sign, whatever its shape, but principally a square or rectangle, is not only a sign but above all the enclosure and bordering of a surface. This is most readily apparent when a second sign, figure, or object is placed within it. In such cases we will call the outer border the volume and the sign within it the object. This automatically produces a geographical situation, the area being divided into sections with different meaning and power of expression, producing concepts such as upper, lower, pushed into a corner, and displayed in the center (see also figures 16a, b).

In Oriental art in particular one often finds a frame within which pictorial representations are placed. In the presence of such a close association with the clearly bordered area, a flying bird can be drawn only in the upper part (17). Even when the lower part remains empty, it still has its expression, for emptiness does not mean "nothing." On the contrary, absence receives a mental expression in the very first place. Nonpresence is just as important as presence. The swimming fish in the lower part of the picture (18) has the same relation to the total volume as the bird in the upper part.

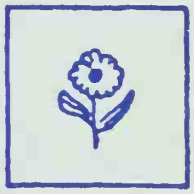


17



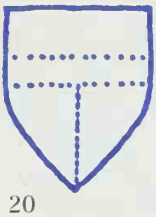
18

It is still customary to regard the borders of an area as a frame, perhaps rightly, as the borders isolate the area from its background. The object or figure (19) placed in the middle has the consequent effect of being "on show." The expressive value of the whole area remains anonymous because of the emptiness surrounding the object.



19

A similar example of space evaluation is known to us through the division of the shield in heraldry (20). The interior of the shield or coat of arms follows very strict conventions of division, in which the symbolic value of



20

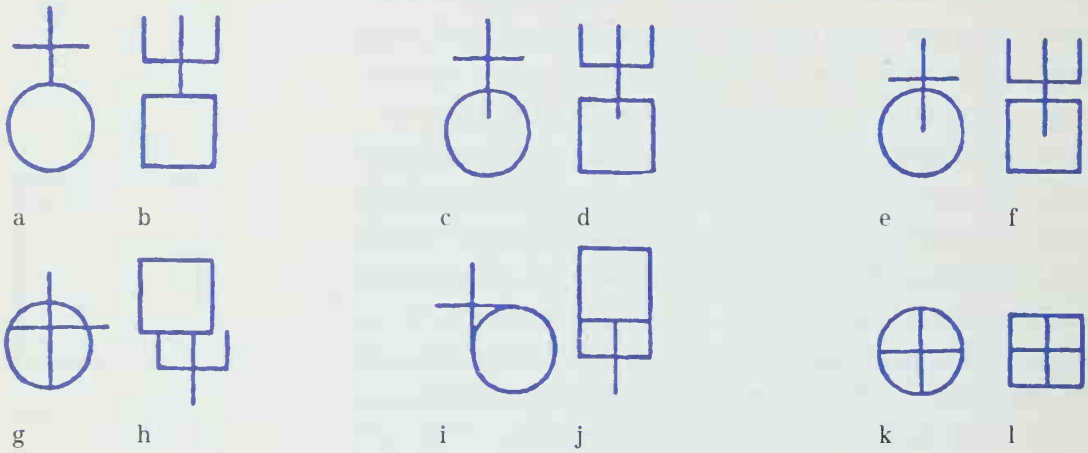
signs and attributes has to take up a certain hierarchical position, showing quite clearly whether the symbol stands for the lord, the subject, or the whole people.

A further example of this principle is provided by the ancient Hebrew representation of the earth (21). The upper half of the divided circle represents the land, the dot the people of Israel. The horizontal is the sea, and below it the remainder of the earth is divided into east and west.

21

4. Relations between closed and open signs

As illustrative examples we choose two pairs of signs: the cross with a circle and the square with a trident.



22

So long as the open sign is "welded" to the closed sign with one end on one line, the association appears in an ideal way, because this assembly produces a new and easily "readable" combined sign, with a relationship which can be rich in meaning (22a, b). With some overlapping, the two individual signs become more easily recognizable, while their association changes its meaning through the crossing of the incoming stroke and a certain feeling of volume is produced (22c, d, e, f). As soon as "welding points" are produced by the connection of several line endings, the power of expression of the individual sign suffers, as does that of the combined sign in most cases (22g, h). When the

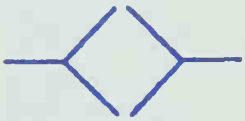
two signs are put together in such a way that the lines either cover, prolong, or cross over each other, the expression of the signs changes to such an extent that they are usually unrecognizable (22i, j).

A complete fusion of the two signs (22k, l) once again produces fully coded signs.

5. Experiment with two fork signs

The best illustration of the theme of "combination of open signs" is provided by two open fork signs (as for road junctions). We will meet part of this series of signs again in the philosophical sense in the table concerned with dualism, but here they are considered only in their purely formal aspects.

Two opposed forks (23) either attract or repel each other, depending on the value given to the triangular shape, which may be seen either as an arrow or as an angle sign (in mathematics, greater or lesser than).



23

By coming together, the extremities join up (24) and form a square, which was already present in imagination. In this way the two forks completely lose their character and the square prevails.

24

A further inward movement reveals the forks once again (25), showing clearly the importance of the stroke endings. The reduced square loses much of its autonomy through the shortening of its sides and the reemergence of the two fork shapes.

25

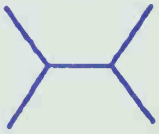
If the two signs are centrally superimposed (26), the original fork shapes disappear completely and can be recalled to the mind's eye only with a great effort, since the arms of the signs have been changed into three newly formed and extended straight lines. The resulting shape is a much more simply structured, symmetrical star.

26

Further displacement produces two arrow signs (27), but the fork shapes remain recognizable.

27

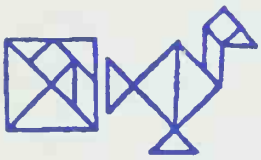
Only through the restoration of the inner space of the angles (28) do the two signs reappear as such, although the merging of the common horizontal lines



28

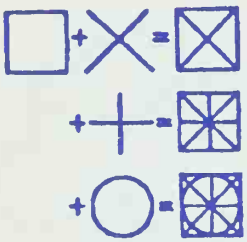
once again gives a stronger impression of a single sign than of two signs joined together.

6. The "complete" sign



29 30

The Chinese invented a game called "tangram," using squares divided into seven parts each, jigsaw-fashion. The players must use their imagination to assemble abstract or figurative pictures with the seven parts (30). The game has no "winners" but is a mental, contemplative, and perhaps also creative exercise.



31

We have tried to design a similar game based on our Western way of thinking and seeing. For this purpose, we form one complete sign from the basic signs of the square, triangle, circle, and cross already mentioned in our considerations (31). This piling up of the different elements produces such a complex and opaque expression that it can no longer be called a sign, but rather a schema with thousands of possibilities. On the basis of this grid pattern, the formation of signs consists of removing some elements, so that only those remaining are made visible and recognizable.

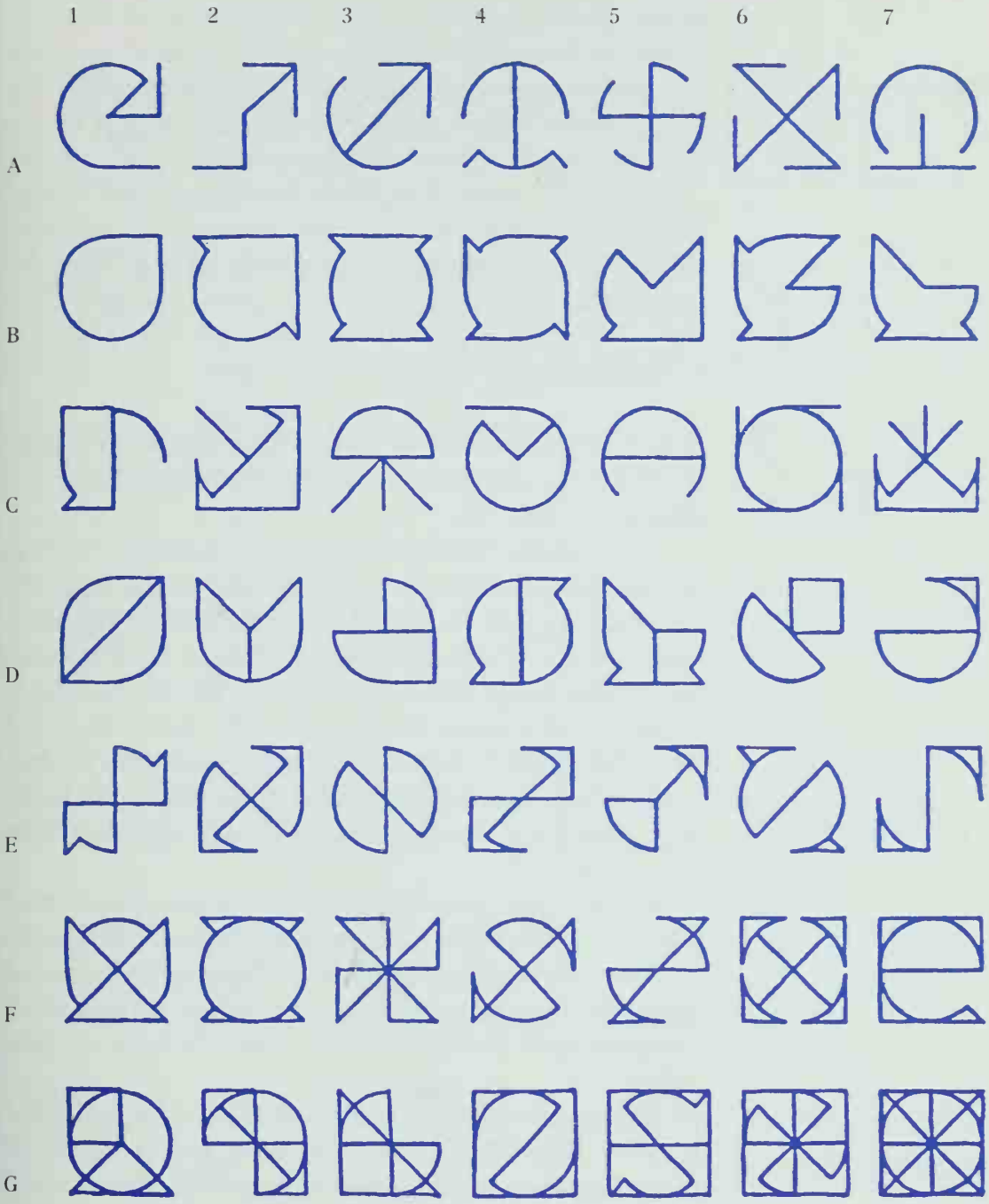
We have made a selection from a vast number of possible results and show them here assembled into two tables. Perhaps the reader will be encouraged to continue the game by finding further figures to add to the tables.

a Morphological Table 3: abstract signs

The display makes it clear that the signs have been classified as open or closed, simple or assembled. Our attempt at topological arrangement underlies this grouping by rows of signs.

In the first horizontal row, A, we recognize open, linear signs with welded and crossed connections and, in the last of the row (A7), the indication of a connection through proximity. The second row, B, consists only of closed forms with a single outline (topological group 1).

Morphological Table 3



The third row, C, also contains signs with a single enclosed area, but with the addition of freestanding lines. Rows D and E contain signs with two enclosed areas, connected either by dividing lines, crosses, or extended lines. In the last two rows, F and G, we have signs of the topological group *n*, i.e., with many enclosed areas, which are connected by means of all the possible methods mentioned previously.

Finally, G7 is the completely assembled sign, which, as already mentioned, no longer has any expression of its own and can be understood only as a schema for construction.

b Morphological Table 4: object signs

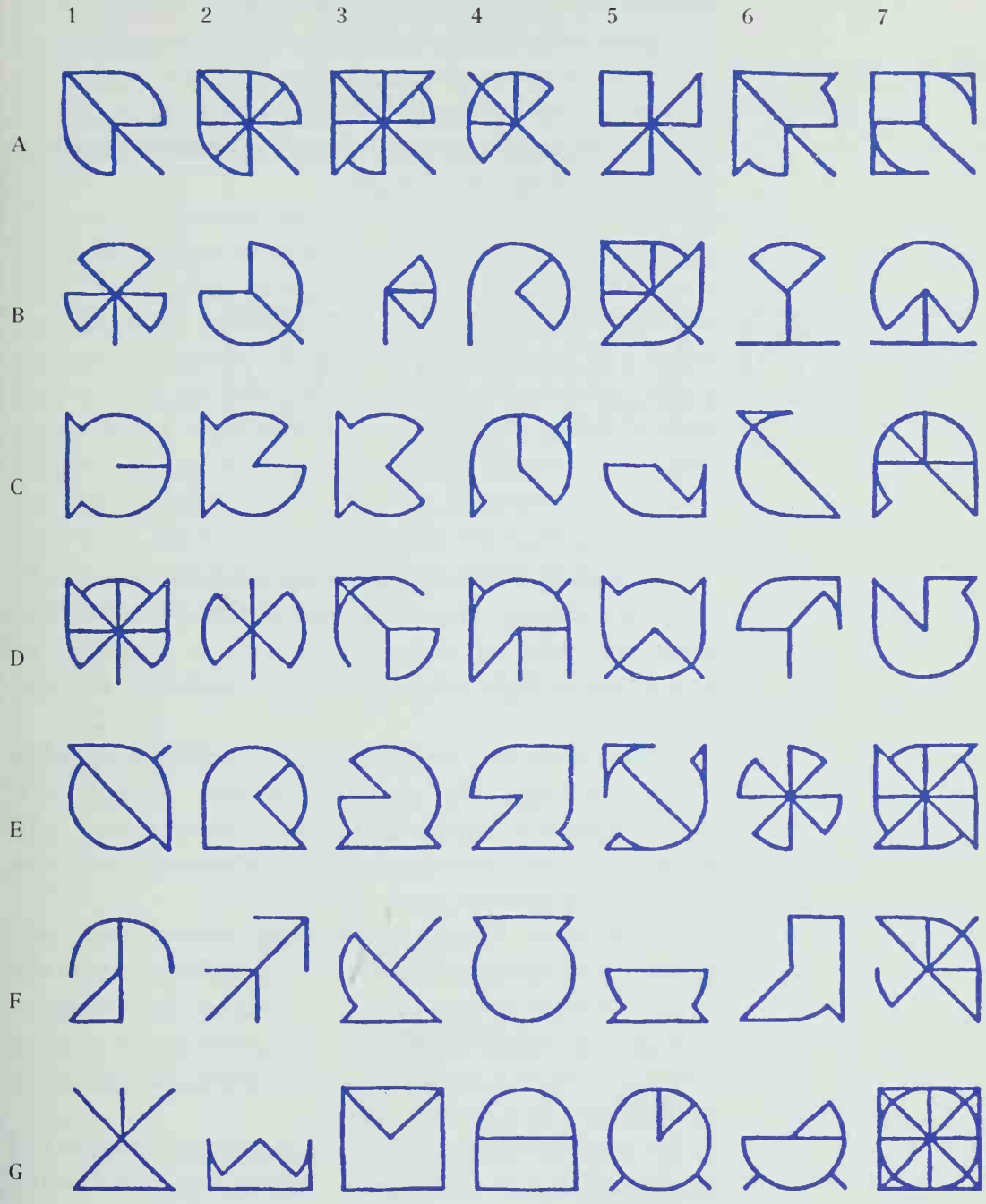
A number of "figurative" signs, also produced simply by removing elements from the basic structure, are shown in Table 4.

The first two rows, A and B, show stylized botanical shapes: leaves, flowers, outlines of trees. In the third and fourth rows, C and D, we see stylized fauna: a flatfish with closed and open mouth, a pike, a crab, butterflies, birds, mice, cats, a hen, etc. From row E a variety of objects is recognizable: helmets, wind wheel, crossbow, radar, head, boot, umbrella, crown, cradle, etc., until finally, at the lower right, the basic sign reappears, almost like a schematic concession to simplicity.

Readers are thus confronted with the question of why the wealth of possibilities in the basic sign or "grid" were not immediately apparent. This is a fundamental question concerning all human creative activity after completion of the work: Why didn't I think of that before?

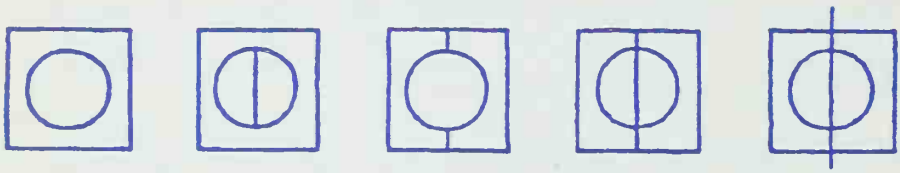
This experiment may also provide a stimulus for creative activities. To overcome the anxiety of contemplating a blank sheet of paper it is often helpful to divide the white area with a grid pattern on which to build up a sign. As examples, see also the sections on stonemason's signs (Part 3, Chapter VI) and pictogram systems (Part 2, Chapter III).

Morphological Table 4



7. Between diagram and figure

The viewer of the two preceding tables may have noticed the principle by which a sign is consciously accepted, namely the extent to which it approaches a figurative form. By limitation to a strict stylization, prescribed by the basic figure, the concept of "seeking" a form which already exists in the subsconscious is strengthened still further.



32a b c d e

This problem can be taken up again by means of a little experiment. The combined sign of a circle within a square (32a) is at first sight only a diagram, an indication of the many possibilities that may be seen within it.

When a central stroke is added to the circle (32b), the latter suddenly gains a greater meaning: it approaches the representation of a round object (nut, beetle, etc.), while the square frame is perceived only as a support, pedestal, plate, etc.

In another figure the straight line divides the background area instead of the circle (32c), making the square awaken the viewer's interest much more strongly. In this drawing one recognizes more easily a circular hole in a two-part square plate, or perhaps a netball held in a square frame.

In the fourth sign (32d), the two basic elements of circle and square reappear, but the vertical stroke divides the whole image into two parts. The crossing of circular and vertical lines once again gives the sign the appearance of a technical drawing. It has become a diagram again: the figurative possibilities and asso-

ciations practically disappear and the sign also loses some of its attractiveness.

In the last figure (32e), the diagrammatic character is further emphasized by the extension of the central line, which makes the two stroke endings visible.

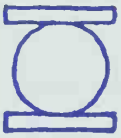
8. Puzzle signs

In connection with the appearance of an object in the most simplified form of sign, mention may be made here, though only marginally to our considerations, of the game of puzzle signs. Anything with a double meaning awakens interest, giving occasion to a visual and mental puzzle. The signs concerned are purely object signs, only coded by choosing a point of view which conceals the figure's normal outline or perspective. Our small selection shows a Mexican on a bicycle, seen from above (33); a priest seen from below (34); a fried egg seen from the side (35); and a tomato sandwich made by a beginner (36).

33

34

35



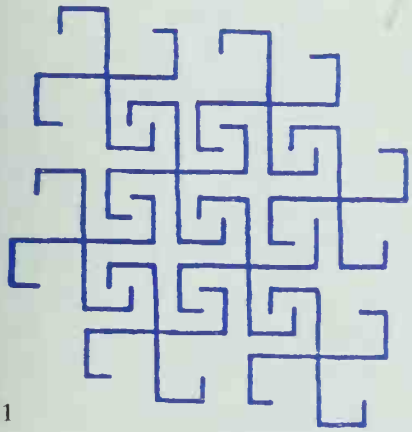
36

IV. The Sign in Ornaments

The subject of ornaments is of interest in the present connection only insofar as the sign, in its capacity as "single statement," forms the basis of the pattern, remaining present and recognizable within it. The field of ornamentation consisting of pure geometry or rows of objects, however stylized they may be, should deliberately be kept separate, since the two concepts of "decorating" and "dressing with symbols" are subject to completely different conditions and laws. The viewer has a different relation to each of these.

The sign assembled to make an ornament hides itself as a unit and becomes a part of a structure. The individual sign is often hardly recognizable anymore, but its mysterious presence encourages the search for its meaning, its statement.

To illustrate this theme we have limited ourselves to three elementary forms: the cross, the swastika, and the square. Most of the examples shown are inspired by ornaments to be found in medieval Ethiopian monasteries, where some are built into the brickwork of walls and others are painted on.



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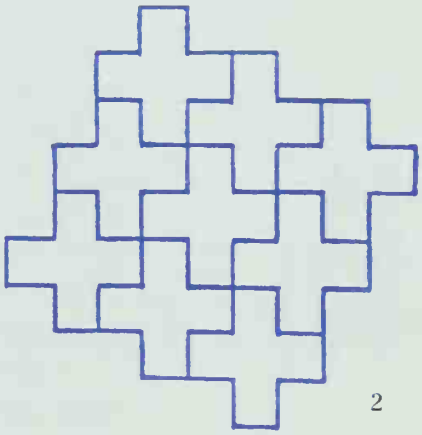
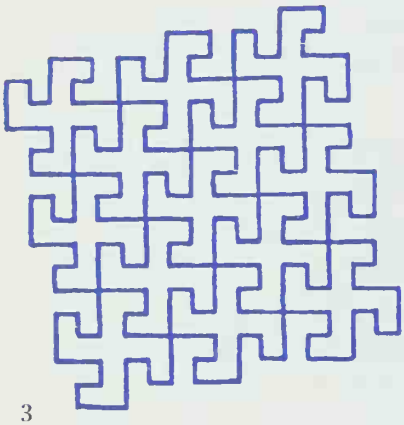


2

The first ornament (1) is formed from a linear swastika with four visible turned-back ends. On closer inspection one can make out another swastika sign in white in the background, with two-dimensional surface and a rather shadowy effect.

The second ornament (2) consists of the same linear elements, except that the stroke endings of the swastikas are not turned back but joined to one another. This has the effect that the linear sign of the swastika becomes at the same time the outline of a cross with two-dimensional surface, emerging from the background. Unlike the first ornament, this arrangement could therefore also be painted in two dimensions.



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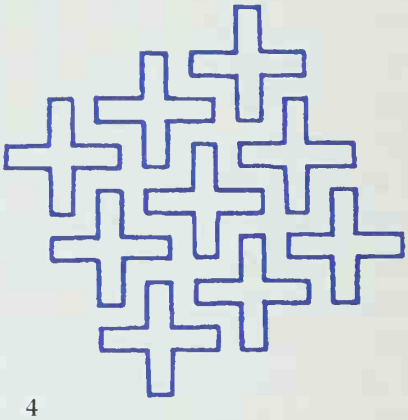
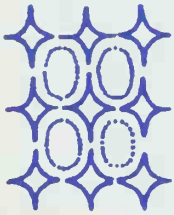


4

The third example (3) has a similar basic structure. All the lines meandering through the surface are at the same time line signs and separation lines between the interlocking, two-dimensional swastika signs.

The fourth example (4) consists of completely separated two-dimensional cross shapes. On closer inspection, however, the background between the crosses emerges as a series of connected swastika shapes.



5

In the same manner, ovals appear as the background in a structure of concave lozenge forms (5). In most arrangements of simple shapes, the intervening spaces of the background appear more or less clearly as the expression of complementary shapes.

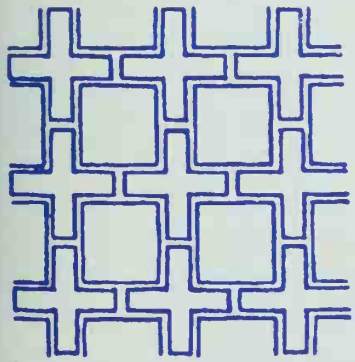
A further sequence (6) shows the interplay of two different sign elements: the two-dimensional cross and

the square. A symmetrical arrangement of the crosses produces squares as the background form between four crosses.

The final example (7) consists of a superimposition of signs, in this case a simple repetition of a single square form, which is able to call forth a number of other appearances through the overlapping of the squares, depending on whether the area enclosed by a line is seen as background or sign.

The reader will have noticed that the choice of these few examples has been determined by the presence of a simultaneous expression of *line sign* and *background*, so as to draw attention once again to the expressive value of interior space and interval, openness and closure of a sign, and the effects of crossed and "welded" lines.

In the background there stands one of the main points of our argument: the symbolic expression of the sign, which cannot always be clearly recognized in ornamental uses, but runs through the interweaving of the structure like a mysterious presence, like a keynote situated between the conscious and the subconscious.



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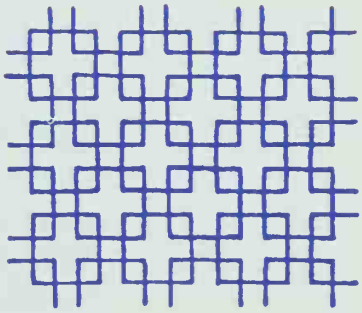

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V. Signs of Dualism

Through all of humans' feelings, thoughts and efforts to understand themselves and their environment there runs the constant theme of coming to terms with duality. Consciousness of life and death, here and hereafter, good and evil, mind and matter, and all other concepts born of opposition has led to a great variety of dogmas, worldviews, religions, and philosophies. It is not our function here to try to explain these complex matters, but we must be quite clear that we possess feelings of belonging to duality groups, of which the most elementary is certainly that of the masculine and the feminine principles.

Nor should we forget that the mere fact of our conscious activity during the day, in contrast with our subconscious (and unconscious) absence during the night, represents life's most important condition of duality, from which we cannot dissociate ourselves.

As the most striking graphic expression of this unity of reasoning we show here the sign of the wisdom of Tao-te-ching (1). Within the unity of a circle, two fully complementary droplet or vesicle forms are joined. The two are separated not by a line but by the bordering colors black and white, and within each form a dot of the opposite color establishes their unconditional equality and completeness. At a later stage in this work we will go into more detail concerning the deeply symbolic, dualistic representation of the wisdom of the I-ching in the context of Asiatic scripts.

1

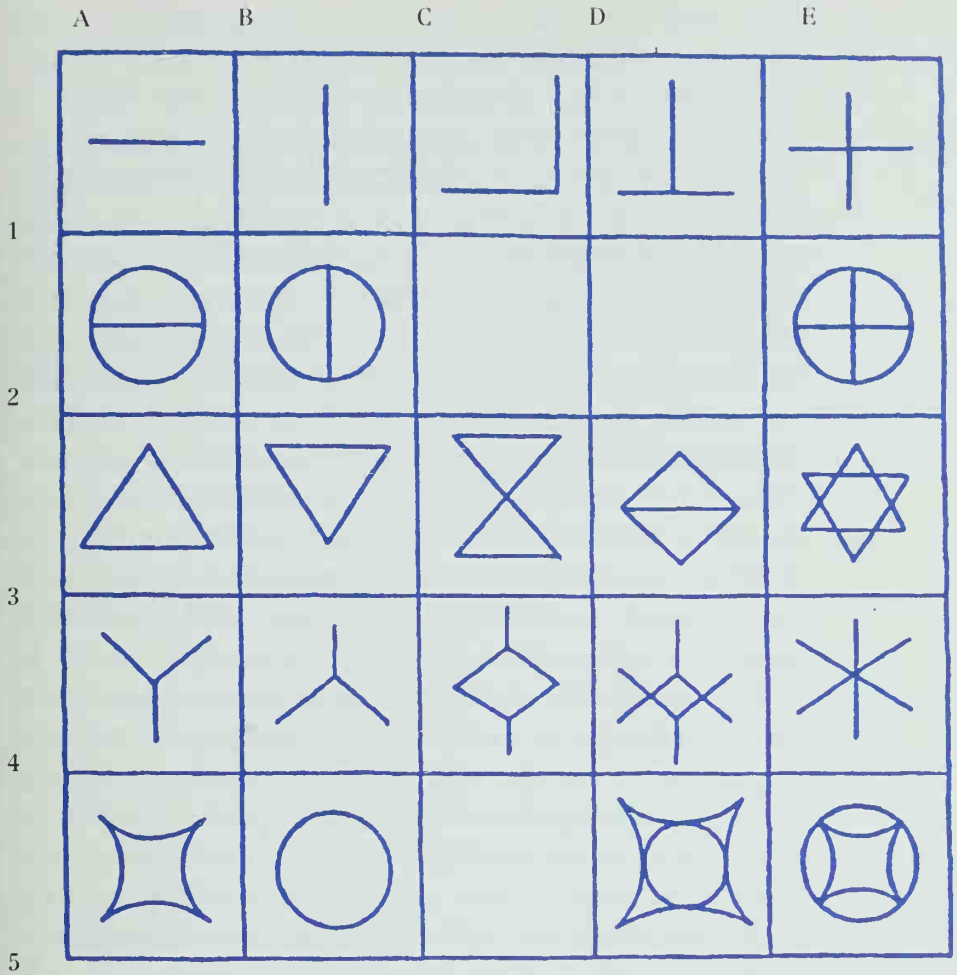
For the sake of comparison we have assembled some typical dualistic signs into a table. On the lines of the medieval concept of duality, the feminine, nurturing, stable elements of duality are placed in the first vertical row, A; the second vertical row, B, contains the masculine, active, thrusting signs. In the third row, C,

the same signs are found in a first stage of contact, which we may call "meeting." In the fourth row, D, the signs are in some cases still more closely linked, but it is not until the final row, E, that the total interpenetration of the two elements produces new unities.

The top horizontal row consists of the most simplified possible expressions. At the top left (1A) is the horizontal stroke, which in Christian symbolism denotes waiting humankind; the vertical stroke next to it (1B) represents God's message (the Gospel). In the third space (1C) the lines meet at one end. This figure of the right angle serves as the sign of law, of righteousness. In (1B) we find the vertical meeting the horizontal in the middle, giving the feeling of a stronger connection between the two, a welding. This produces the idea of balance, of judgment. The sign of completion is finally found in (1E), where the horizontal and vertical elements *cross* in the middle. In the Christian sense this is the act of God, which "redeems" humankind. The sign of Christ has endured for centuries in this monumentally simple form.

At the second level we find a medieval representation of Genesis. The first circle (2A) represents the earth with the horizon, comprising the surface of the water and the vault of the sky. Next to it, in (2B), the circle is divided vertically, designating sun and moon, day and night. In (2E), the combination of the two signs, with the penetration of earth and light, gives us the symbol of life.

In the third horizontal row, we first have the upward-pointing triangle (3A). Resting on its horizontal base, like a mountain, awaiting erosion, it represents the feminine principle. Next to it, the triangle standing on its point, active like a tool, in expectation of "penetration" represents the masculine principle (3B). In (3C) the two triangles meet at their points. The resulting extension of their lines forms a new, high X-cross, a very harmonious sign for meeting, and in the Middle Ages the sign for time (the hourglass). In (3D) the two triangles are joined at their base, making a divided square standing on one corner. This is the sign of unity



and peace. The two triangles overlap in (3E), forming a sign with a deep sense comparable to that of the cross. The Jewish interpretation is of the heavenly penetrating the earthly, and it forms the Star of David, symbol of the Jewish faith.

At the fourth level we return to the fork sign, already described. In the Middle Ages it was the symbol of the Trinity. For Pythagoras it was a schematic representation of the course of life: the straight road, which at a certain point divides into the "good" and "bad" ways. Open at the top, it is the symbol of the waiting soul (4A), while open below (4B) it symbolizes "the coming of the

Redeemer." In (4C) the two signs, touching at their extremities, are combined to make a unified new sign. This junction makes the forks disappear and they close up to make a rhomboid sign, as it were an embodiment of the abstract. In (4D) the two crossing forks become visible again, forming the sign of recognition. The total unification of the two signs at a central point (4E) produces a completely new star sign. The fork signs have disappeared.

In the fifth row, we add one more expression of duality, which presents one of the clearest and most interesting expressions of extremes purely by means of its shape, free from any mythical or philosophical associations. The signs here are a concave "square" (5A) and, in opposition to it, a circle (5B). It is immediately apparent to the viewer that the true square does not form the strongest contrast to the circle, as could easily be assumed, but that it is this four-sided figure with strongly concave sides, combining four segments of the circle arranged in the reverse direction to make a very aggressive sign, with its corners ending in radiating lines. The superimposition of these two signs (5D, 5E) produces graphically attractive figures, but their expression is less evocative of the idea of duality since the forms partly cancel each other out by producing completely new shapes: curved peaks in (5D) and lens forms in (5E).

Before ending this chapter on dualism, mention must be made of the Platonic myth of the androgyne, which suggests that each of us is the complementary half of a being that has been separated into two halves, like a flatfish (2).

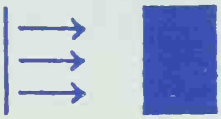
2

VI. The Solid

1. From line to solid area

All our considerations so far have been based on a purely linear form of expression: the drawn stroke, whose thickness did not come into consideration in the production of lines. In the two-dimensional creation of graphic forms, the line represents the simplest and purest means of expression, but at the same time the most mobile and versatile.

The realization that a line is produced by a moving point can be carried over to the solid, which is produced by a line moving across the dimension of its width (1). If we take the production of a piece of textile as a comparison: we start with the fiber, which is spun into a thread, and this thread is lined up to make a two-dimensional cloth (2). The drafter is aware of being able to produce solid areas by stippling, hatching, etc., in the same way that a thread produces a cloth by being woven, plaited, or knitted.



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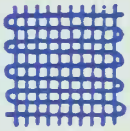


2

When the structure of the alignment becomes lost in the solid area, the latter becomes condensed, fully covering the surface of the background, and is therefore seen as a change of material (3). The printer or painter in this case speaks of a "glossy" or "mat" surface. A printed solid of good quality is one that closely follows and reveals the structure of its substrate. Expressions such as "gappy," "set-off," and "linty" refer to the disagreeable effect when the printed area loses the expression of its structure. The same applies in textile manufacture to lint and felt, which are not woven but made of shredded or compressed fibers.

3

It would be appropriate at this point to speak of screens and halftones, but this subject leads in another direction. We will continue to limit our comments to the contrast between black and white.

a Thickness of the lines

In order to provide a useful vocabulary of line thickness for the considerations that follow, we propose a classification in which we deliberately use material expressions that will make it easier to visualize the categories. A simple sign, a cross in a square, is enough to illustrate this subject, to define the lengths of stroke, and to achieve a uniform proportion of length and thickness.

4a b c d e

We describe a thin line as a *thread* (4a). This is a stroke of schematic character, where the eye does not take the thickness into account, although there may be recollections of fine materials such as threads, glass, or rays.

We call the second degree of thickness a *bar*, rod, or stem (4b). This means that the stroke is no longer an abstract expression but has taken on a slender body. The thread has become string. For the first time, a black-white contrast appears between the black framework and the white interior. The stroke is seen not only as a line but as a two-dimensional area.

We call the third degree of stroke thickness a *beam* (4c). This is the thickness of a mast or a wall, as well as the normal thickness of our printing characters, to which the eye has become accustomed in their proportional relation with the intervening white space.

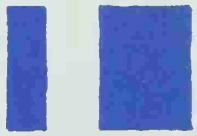
Strokes one degree thicker are described as *trunk* (4d) or pillar, as an expression of massive, supporting elements. This corresponds to the thickness of our bold printing types; the idea of "powerful" comes to mind, and in the illustration the interior spaces have about the same value as the surrounding black areas.

The last category of two-dimensional strokes is described as *mass* (4e). The concept of "line" disap-

pears and the interior spaces are seen as openings in the background area.

To summarize, the categories of line thickness are thread, bar, beam, trunk, mass.

A line is regarded as such, i.e., as a movement in length, so long as its thickness does not exceed a certain proportion to its length (5). A line that is thicker than half its length loses the dynamic expression of a stroke and receives the static expression of a rectangular solid area (6).



5 6

As the maximum contrast between these two concepts of dynamic and static, we show a thread line (7), as the most dynamic expression of straight movement, next to a massive solid, the square (8), as a static expression.

7 8

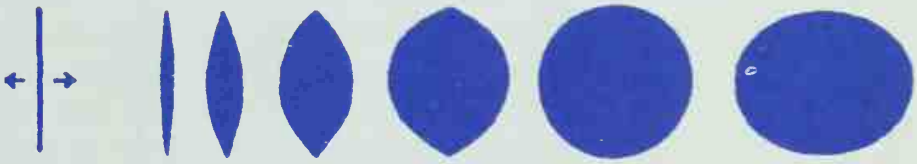
Every rectangular solid area could thus be analyzed on the basis of its development from a simple line. We must make it clear, however, that we are not concerned here with a geometrical understanding of form construction but are seeking a "geometry of feeling," in order to understand the effect that signs have on us.

b The swelling and shrinking of lines

In most cases a thread line is seen as an abstract concept, used for crossing out, framing, or bordering, but as soon as the thickness changes within the stroke this anonymity disappears and the line receives new qualities (9a, 10a).

9a b c

A line which begins with thread thickness and ends with bar thickness (9b) is certainly still judged to be a line movement but the resulting cone shape has its own concrete statement: one thinks of a beam of light, a needle, or a sharp weapon. From a certain

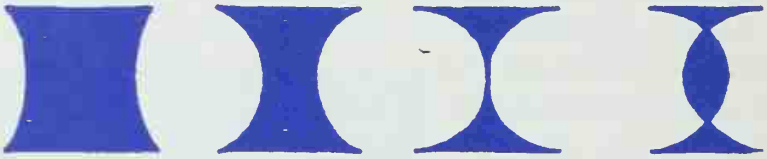


10a b c d e f g

degree of swelling, the line suddenly disappears and the sign is seen as a triangle (9c).

Starting with a fine line, this can be swollen in the middle while retaining fine points (10a) to make a lens-shaped solid (10b, 10c), which can be further extended to make a circle (10f), followed by a horizontal oval (10g). This series clearly shows that when the full circle is reached, the upper and lower points disappear and that they never return in the oval.

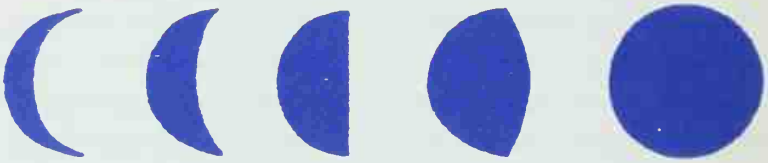
11



12a b c d

The converse of this development is provided by the static square (11), the sides of which progressively bend inward (12a, b) until the two resulting curves meet in a line (12c) and then cross over the central point to make another lens shape (12d).

13



14a b c d e

In a third example, a semicircular line (13) fills in up to the vertical, thereby producing all stages of the sickle shape (14a, b) up to the semicircle (14c) and beyond it (14d) to the full circle (14e). This form cycle is known to

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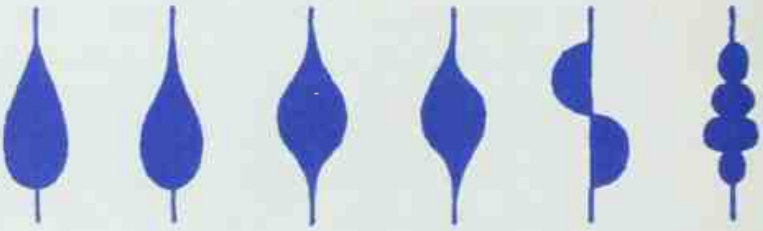

16a b c d e f

everyone from the appearance of the moon and is therefore one of the most strongly marked of our subconscious memories.

An asymmetrically swelling or shrinking line (15) leads to endless variations of form (16a to f) that it would be useless to detail. There are only two that we would like to mention, both of them being associated with the geometry of feeling: the flame shapes (16a to d), which often appear in symbolic representations of the spirit, and the droplet form (16b), a symbol of water or tears.

17

Developed on a curved line, the droplet shape becomes a vesicle (17), a form that plays an important role in Gothic ornamentation.

In the chapter on duality, we have already considered the laws of concave and convex forms. The preceding examples are all related to this principle. The following observation may be added: convex curving (18), i.e., the form bending outward, is an expression of an active movement, pressing forward, and is the beginning of the drawing of an object. Concave curving (19), on the other hand, is only possible in an object that already exists and therefore rather represents a regressive movement, rather retrospective than prospective.

18 19

Many psychological considerations of symbolism, closely linked to one another through their ambivalence, could be taken up in this section.

c The tape shape

Considerations of the development of our scripts will draw attention, in Part 2 of this work, to a writing instrument whose function is described here, namely the broad-nibbed pen. On being applied to the paper, this produces a fine line, not a point. Set into motion, this nib width is an illustration of the "line in movement" as already described, producing a solid area (20). A fine and a thick line are both available with the broad-nibbed pen. Lines can be made thicker or thinner, according to definite conventions of writing technique, by varying the position and movement of

20

21

the pen. In this fact lie all the secrets of calligraphy, which has formed most Western scripts through the centuries (21).

2. The white sign on a black background

a From outline to negative

In morphological Table 1 it was established that the intensity of the white radiation of the paper is greatest in the fully enclosed sign of the square. This proposition can here be taken further, but in connection with the thickness of the stroke.

As a point of departure we take a cross formed by a thread line (22a). The degree of brightness of the interior form of the sign is still indeterminate in this first example. On the other hand, in the second example, drawn with the thickness of a "bar" (22b), the white

22a b c d e

interior appears brighter than the whiteness of the paper outside the sign. In the third example, drawn with "beam" thickness (22c), this effect is even stronger. In the fourth example, with the "trunk" stroke thickness, the expression of the sign is reversed: the black outline is no longer clearly seen as a line but appears as a solid area, in which the white cross occupies a smaller area. In the final example (22e) the cross shines forth from the mass of the surround as an autonomous sign in negative form.

Any form of positive sign set on a white background (23) has a more independent expression than that which appears in negative on a black background (24),

because the background itself has a formal outline (unless it is a complete sheet of black paper). It cannot be denied that the interior negative shape is influenced by that of the black surround, thereby obtaining a new kind of expression. The two shapes have a kind of interplay with each other. It is also often the case that the outer shape makes a different statement from the inner one, as shown in our example (24), where a white cross, which has its own statement, is placed on the background of a shield. The two together make a coat of arms.

23 24

Another graphic reality needs to be mentioned in this connection, namely that two identical signs, one in black on white and the other in white on black, do not have the same appearance. The negative sign always looks larger and thicker than the positive one (compare 23 and 24), the reason being the greater radiance of white light against a black background. Where type matter is concerned, the difference needed to correct this optical illusion can amount to 10% of the thickness (boldness) of the character.

Another way of expressing a sign in negative form is shown in the adjacent example (25), where the negative cross contains a second positive. A linear outline, this time negative, is once again expressed, giving the sign a certain mysterious deepening.

25

This method of graphic contrast provides an invitation to produce all kinds of other playful versions by displacing the inner cross. Where the displacement is strictly parallel, the horizontal and vertical thicknesses differ, producing a relief effect (26). Where the displacement is out of parallel (27), two completely separate crosses become visible.

26

In this third example, the black and the white cross are seen as two-dimensional at first glance and the idea of a surrounded shape, as recognized in figure 25, has virtually disappeared in figure 27.

27

b Varying brightness of an interior shape

28

29

A white circular area in the center of a larger black circular area has a radiance of constant brightness on its surface (28), but if the inner circle is moved to the edge of the outer one, there is a feeling that the brightness has been reduced with the weakening of the black-white contrast. This produces the feeling of a vault, emphasized by the suggestion of a spherical form in the white part of this drawing (29).

c Indications of form

Two or more solid-area signs placed close to each other somehow give an independent expression to the space between them. The simplest example is once again

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31

32

33

provided by the cross: four small square areas arranged in a rectangle (30) suggest a white cross in the intervening space. The closer the squares come together, the more clearly is the cross expressed. It is best visible when its arms are of medium thickness (31). Where the interval is reduced to white lines, the thickness of the cross is no longer seen as two-dimensional but as strokes or threads, giving it more the sense of a division of the black solid area (32).

Similar examples could be made with many other shapes, such as the four triangles with concave curvature (33), which give rise to the appearance of a large circle between them.

34

The well-known example of the two facing silhouettes (34) between which a white vase appears certainly belongs in this section. In Gestalt psychology, this is

known as a *kippfigur* (oscillating figure). The change from one representation to the other depends on the viewer's powers of imagination. Both figures are present in the memory with about equal value.

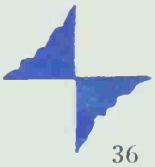
3. The chessboard pattern

White and black squares are lined up alternately to make the chessboard or checkered pattern (35). This and all its graphic derivatives catch the eye very strongly, and it is for quite definite reasons of visibility that the judge at a motor race waves a checkered flag.

35

The chess pieces, black and white, stand opposite each other on a neutral territory, on whose structure the procedure of the game is arranged. On viewing the chessboard we feel a certain graphic vibration caused by the fact of taking in the constantly alternating black and white elements as either figure or background, without coming to a conclusion.

We also notice that at the crossing points, where the corners of the black and white squares meet, there is a practically insoluble graphic problem: in drawing such a crossing it is impossible, in fact, to make both the black and the white corners touch each other. Either the black points meet (36) or a white interval allows the white points to meet (37). Long observation and contemplation of this impossible double meeting point can lead to optical fatigue.



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The very aggressive effect of this visual phenomenon is often used in present-day graphics and fine art (op art, Albers, Vasarely), and it also occurs in older forms of ornamentation. Used at the right place and in small amounts it provides a useful stimulus, but when used to excess in textiles, mural decoration, etc., it becomes "indigestible."

Our illustration (38) shows schematically the hinge-like, vibrant effect obtained at the vertical line of junction of the two negative-positive signs, through the simultaneous coming together of black and white pairs of corners.

38

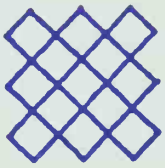
VII. The Simulation of Volume

Every form of graphic expression is basically tied to the two-dimensional. Consciousness of this limitation to the surface has impelled drafters and painters, through the centuries, to "break" out of the plane of the picture, stepping forward from it or penetrating into its depth. Objects that in earlier times were placed next to each other on the same plane were subsequently moved one behind the other. Small and large were identified with far and near; joined together by vanishing lines, they gave rise to the art of perspective. Objects were modeled by the use of light and dark, and the inclusion of shadows completed the simulation of three-dimensional space.

In the field of signs, we here make use of some extremely simplified models to analyze the appearance of volume.

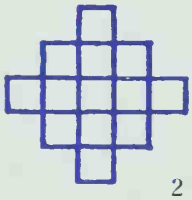
1. Superimposed layers

Two constructed signs, a cross and a square, are concentrically superimposed. The first experiment is to examine the same double sign in both an oblique and a horizontal-vertical position. The comparison shows that in the oblique position (1) the cross and the square are hard to recognize: one sees rather an assembly of small squares, forming a chessboard type of pattern.



1

In the upright version (2), on the other hand, both the vertical-horizontal cross and the square appear clearly in stratified form. We observed the same fact in the first chapter, pointing out that, because of their physical constitution, humans obviously react first to positioning on the horizontal-vertical axis and need to



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overcome a certain resistance before taking oblique positions into account. (See also the example from Rubin, Part 1, Chapter II).

In a tabulation (3), the simple omission of some of the stroke elements produces variations in this double figure from which the following observations may be noted. To start with, the basic sign is repeated (3a). Because of its 12 crossing points, it is seen rather as a ground plan or diagram. In (3b), the cross sign appears much more clearly as an object and the square is seen as "transparent." Figure (3c) is an intermediary stage in which no clear appearance of volume can be recognized. This is because of the crossover place of the arms, which produces four stroke crossings in the interior. In (3d) the sides of the square are interrupted, but despite this effect it is immediately recognized as a square and the lines are extended under the cross shape by the imagination. The same stratification effect appears clearly in (3e): the cross is presumed to exist behind the square shape. These figures are examples of an optical effect in which, through the indication of details around the edge of an object in the foreground, the mind's eye sees and completes the presumed object in the background. These two examples should give a clear demon-stration of the psychological phenomenon of "remembering" a sign.

Figures (3f) and (3g) are once again less meaningful as examples of stratification: a greater effort is required to see three superimposed panels in (3f), i.e., a square and a cross divided into two pieces.

In (3g), by contrast, the stronger appearance is of a frontal view of a pile of wooden blocks *or* a whipping top or gyroscope: the sign is typically ambiguous and responds to two different archetypes in the viewer's mind, either blocks of wood or the rotary movement of a top, depending on the strength of the memory picture of one or the other. In (3h, i, j), plaiting effects are recognizable; (3h) looks like a belt buckle with straps drawn through it; (3i) is a vertical tape plaited with three horizontal tapes, and in (3j) a cross shape penetrates a buckle from front to back.

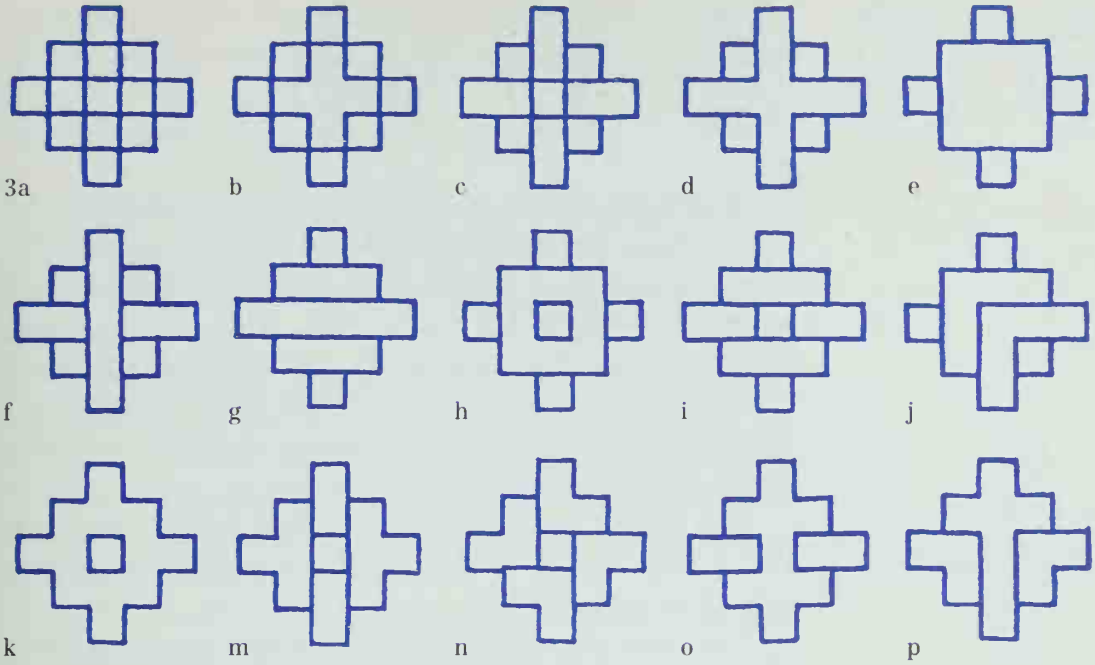


Figure (3i) is also reminiscent of an assembly of bricks (cf. 3g), with a clearly recognizable hole in the middle.

The figures in the last row are all frontal views of rather flat cutout objects (3k), having a greater effect of thickness in the presentation of the substance of a mechanical clamping process in (3m) or turning in (3n). Particular forms of construction appear in (3o) and (3p). The emergence of the Cross of Lorraine in (3o) and the Cross of Christ in (3p) give the observer some idea of the multitude of archetypes held in the subconscious.

2. Plaiting

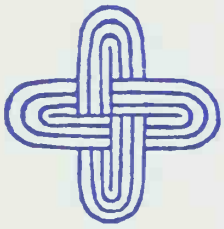
Starting once again from a schematic drawing, this time of two superimposed rings, the next example gives the impression of a technical drawing or an abstraction, because of its many crossings-over (4a).

As soon as the crossing lines have been removed, a cutout object appears, even if flat and without relief (4b).

4a b c d e

When the circles of the first ring are complete but those of the second interrupted where they cross the first, our power of imagination completes the covered parts to make a full circle (4c). The effect of two superimposed objects appears clearly, thus indicating the third dimension of depth. When the drawing of the two rings simulates an interlinking, an almost tangible impression of relief is produced (4d).

The higher the number of interlinkings is, the more an impression of an interlaced entanglement is perceived as volume (4e).



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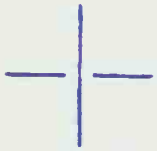
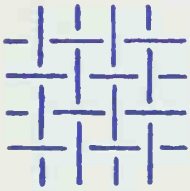
This kind of interlacing band is an important basic element in ornamental painting and sculpture, to be found all over the world. One of the oldest examples is the Oriental "Gordian knot." This form of expression is also found in runic inscriptions, on the capitals of Roman columns, and in Oriental painting.

3. "Suggestive" white



6

Any two elements – line or solid – can be joined together in either of two ways: by means of a clear junction or "welding" (already mentioned) or with the aid of a simulated connection, which is only apparent. The latter type is purely optical and relies on proximity, consisting of a juxtaposition of two elements with a minimum of white space separating them (6). This arrangement brings out two facts: first, that a figure assembled with such a minimal white interval is easily broken down into its basic elements; second, that the gaps in the strokes, mainly applied at the crossover points, make one stroke pass over the other in the viewer's imagination. By extending the same technique to a number of parallel strokes, alternating with white, the three-dimensional effect of the interweaving is strengthened (7) and the eye imagines a textile structure with over-



7

8

lapping threads. The effect of volume is even stronger when the "woven" lines have a certain thickness (8).

4. Perspective

It is the nature of a sign to be two-dimensional, lacking the concept of "volume." Pictograms are almost always drawn as silhouettes and the effect of volume is an exception.

In the graphic design of a sign it is often very tempting to make the figure stand out from its background level by trying to give it an apparently three-dimensional volume. For this purpose there are, of course, many other possibilities than those described in the last two sections.

In the present context it does not seem appropriate to enter into a discussion of perspective drawing as such. It is much more to the point to give a brief indication of the new possibilities given to a sign by the perspective extension of its linear expression.

The most important starting point for our observations is the angle of vision. This must be chosen "naturally." i.e., deliberately; otherwise it is difficult for the viewer to recognize the intention of volume in the drawing. This fact is clearly shown by the transparent Kopfermann cube.

9

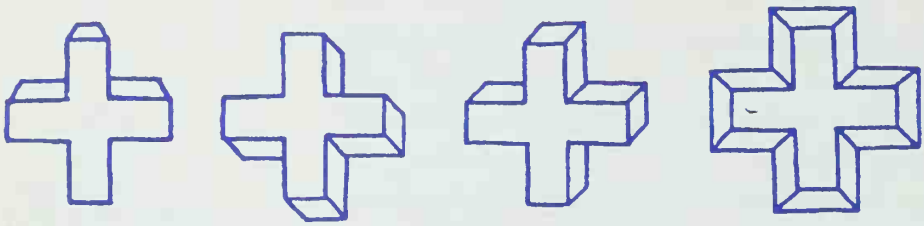
The angle of vision of the first drawing (9) can be regarded as deliberately chosen to make all the corners and all the sides visible. In the second drawing (10) two of the vertical edges merge into one another: the angle of vision is strictly symmetrical on the vertical axis and the cube is already rather less clear. In the third drawing (11) the cube is hard to identify. The coming together of the points of intersection now has such an "abstract" character that the drawing is no longer recognized as an "object" but once again as a pure "sign."

10

11

When the same rules are applied to a sign as for the graphic expression of volume, it can be seen that volume is hard to recognize when the vanishing point is exactly central and symmetrical. In the case of the

first cross (12a), there is no expression of depth in the lower half. In the next two examples, on the other hand, where the angle of vision happens to be slightly lateral, all parts of the surface are projected toward the vanishing point and the signs appear three-dimensional (12b, c). Comparing these two signs, viewers become aware of their own "position of observation," which in (12b) is below the cross and in (12c) above it.



12a b c d

There is a further possibility, in addition to perspective, of giving a sign an "engraved" form of relief, namely the addition of beveled edges (12d). This kind of representation often causes difficulty for the viewer in deciding whether the object is in low or high relief, a phenomenon that becomes still more marked in the case of shadowing, as follows.

13

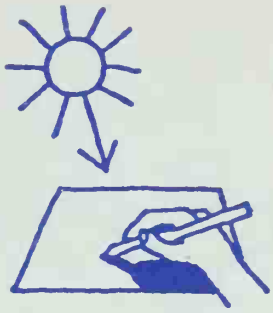
5. The shadow

a The illuminated object

Perspective representation easily leads to the use of the black-white contrast, in order to emphasize the effect of a strong relief, through imaginary illumination, by shading in the receding surfaces (13).

The orientation given to the shadowed parts is very important as it allows the viewer to imagine the direction from which the rays of an invisible light source are coming. Most people use the right hand for drawing, so that from their earliest attempts in childhood they intuitively try to find the best way of illuminating a picture surface, which is where the light comes from the upper left, so that the drawing hand does not cast any shadow on the surface of the paper (14). Experi-

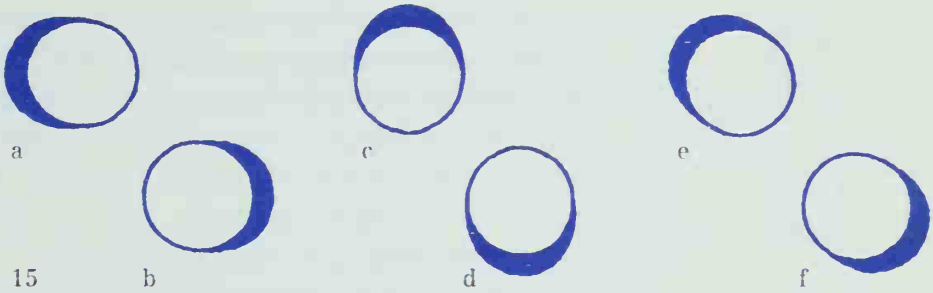
ence shows that photographs of engraved inscriptions, reliefs, and other three-dimensional structures can give the viewer the impression of either low or high relief, depending on whether the object is illuminated from the "correct" or "incorrect" side.



14

The examples of white circles in relief, with shadows thrown in different directions (15), show that the reproduction of an upward-facing cylinder that is felt to be "correct" is the one with the shadow at lower right (15f), since the light appears to come from the upper left. The converse example, with the shadow at the upper left, gives the impression of a circular pit with part of its wall in shadow (15e).

Examples (15a, b, c, d) are of unusual angles of illumination and are more precise concerning the source of the light: the horizontal directions represent evening (15a) and morning (15b) and the vertical direction midday (15d), with the rays of light coming from the zenith.



15

On the other hand, illumination coming vertically from below gives a quite unreal, theatrical effect (15c) and is often used in film production for the weird or fantastic effect.

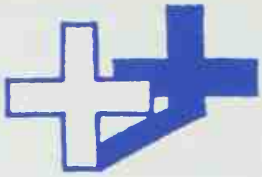
b Thrown shadows

Another way of providing a sign with contrast consists of projecting a thrown shadow onto an imaginary background. In the first example (16) the black shadow cross appears to be behind the white cross, giving the effect of a cutout figure separated from its background and throwing its shadow onto a vertical rear wall.

The thrown shadow may also be projected onto a horizontal floor, taking on a perspective form (17).

16

17

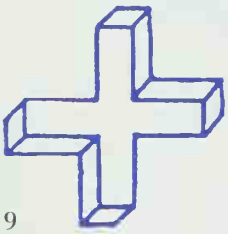


18

In the final example (18), the thrown shadow shows the presence of both a floor and a wall in the background, on which the sign once again appears without perspective, in shadow and in a somewhat ghostly manner, standing upright.

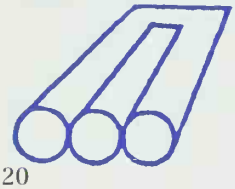
6. Unusual volume

It is not difficult for a drafter to irritate the viewer by means of unusual perspectives or the use of tricks. The next example (19) still shows the same cross but with two different vanishing points on the same object. The normal view of the object is disturbed: although the white surfaces are recognizable, they appear twisted and incomprehensible.



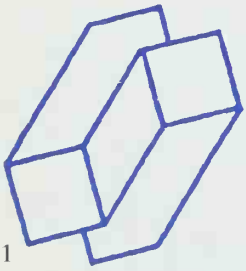
19

In the second example (20), the artist has given free rein to fantasy by first establishing the main feature of the object, i.e., the three circular ends, and then omitting the connection of one of them. It is also noticeable that the tubes run out quite unrealistically into flat and cornered ends.



20

The Kippfigur (oscillating figure) by Josef Albers (21) is even more deceptive. The perspective changes, while one is looking at it, from one beam to the other, arousing a certain interest but at the same time an unpleasant feeling of confusion.



21

7. Optical illusions

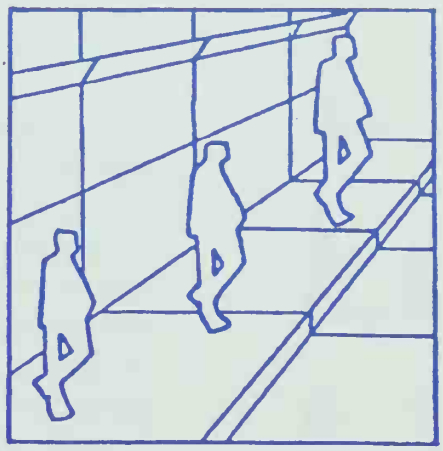
It is not possible for the human eye to grasp a figure in a purely "objective," that is, a purely geometrical, way. This fact is proved by experiments with optical illusions, all of which are based on the principle of an overlaying or combining of two or more graphic elements, which mix up different levels of recollection in the viewers, causing confusion between intellectual, geometric exactitude and that which is visually felt. Most of these optical sign tricks are based on combinations of structures simulating direction or volume, with geometrically exact figures laid over them.

Two typical examples of optical volume effects are shown to conclude the chapter on the simulation of volume.

A square, laid over a receding perspective structure, appears distorted into a trapezoid (nonparallel) shape (22).

Three human figures drawn to exactly the same size, placed on a pavement in perspective, are seen as a dwarf in front, an average person in the middle, and a giant at the far end (23).

22

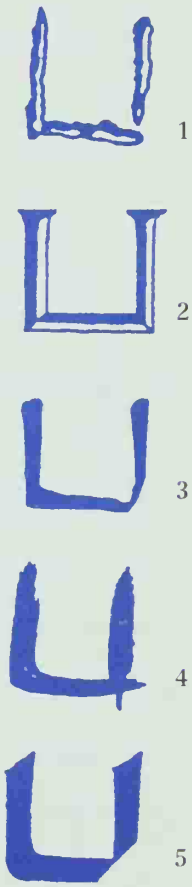


23

VIII. The Diversity of Appearance

1. Drawing and material

If we follow the evolution of signs and scripts we find that their outward forms have undergone very many changes, stylizations, and simplifications in the course of time. This is mainly due to the means of writing used over many centuries and differing from one geographical zone to another. The materials used have determined the production of suitable tools with which information could be drawn and recorded. Thus, for example, in ancient Egypt hieroglyphics were chiseled into stone and later written on papyrus; in northern lands runes were engraved on wood, bone, and stone; in Mesopotamia signs were stamped into clay tablets, and in southeastern regions, writing was scratched onto long, dry palm leaves.

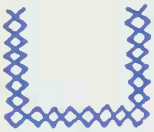


a The tools

In the dawn of human history, the first recorded statements were made by unskillful scratching or cutting of stone or wood (1). This engraving in depth allowed the signs to be perceived not only optically but by touching with the hand. This sense of the anchoring of a statement in a permanent material has retained its effect, for even today a monument or gravestone is inscribed with hammer and chisel, not with painted letters (2).

Drawing on the surface in two dimensions, or painting onto lighter materials such as boards, skins, or leaves, not only extended but also speeded up the possibilities of expression. These factors helped to determine the growth of communications. Ink- bearing instruments, apart from the primitive, dye-soaked stalk (3), are chiefly the brush (4) and the quill (5). The

6



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two latter tools are based on the principle of the storage of ink, allowing a number of signs to be written without raising the hand. This quality has likewise led to the cursive style of our handwriting.

There are other possibilities of expression, for example, in textiles, through weaving (6), knitting (7), and also coloring. These techniques have also given new forms to signs, of which an obvious example is the symbolic ornamentation of carpets woven in the East. A strong simplification of the sign forms is made unavoidable by the texture of the woven thread; the same applies to knitting.

Techniques of burning (8) on wood, bark, and other materials convey their own forms of expression.

The peculiar character of each of these forms of expression has built up a wealth of formal characteristics over the millennia, thus providing one aspect of the concept of "style."

Today we possess tools and materials that allow us an almost total freedom of form in the technique of application (pencil, brush, ballpoint, felt-tip, spray gun) and in foil cutting, photography, etc. This fact does not necessarily make it any easier for the artist to choose the right method.

At the same time, the techniques of electronic recording have developed so far that the graphic artist can now work out a design directly on the video screen. Digitally recorded linear drawings can be distorted as required through mathematical shifting of their coordination points. A simple outline drawing can be projected as a volume in all directions, shadowed, and "painted." Nevertheless, the screen remains an instrument that, although it may well simplify design work, cannot in any way replace knowledge of the heritage of tradition.

9

10

b The stroke ending

It would be interesting to make a study of the multifarious techniques of sign formation, but at this point we must restrict ourselves to one important detail: the

appearance of the ending of a stroke. A simple drawn line covers a distance with a beginning and an end. Where these ends are not thickened or marked off in some way, the stroke being simply cut off, the line appears to hang in a void, or in mathematical terms to be lost in infinity (9). This graphic situation makes the viewer rather uncertain as to where the beginning and end are exactly situated. In technical drawings, diagrams, and plans, freestanding lines are marked off with small cross strokes (10) to make their expression unequivocal. Almost all techniques of writing and drawing have produced their own different ways of marking line endings. Thus in the chiseling of Roman capital letters, the stroke ending was slightly overemphasized (11) in order to strengthen the effect of light and shade at this point, giving the sign a better hold on the surface.

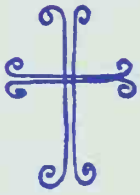
11

We find many kinds of entry and exit strokes in calligraphic scripts (12), all emphasized to a greater or lesser degree depending on the pen, its positioning, and the character of the scribe. In Western countries, the broad-nibbed pen has been mainly used. In other language regions, e.g., in South India and Indonesia, the use of a pointed stylus on dry palm leaves has often led to strengthenings at the beginning and end of the character in the form of a small curlicue (13).

12

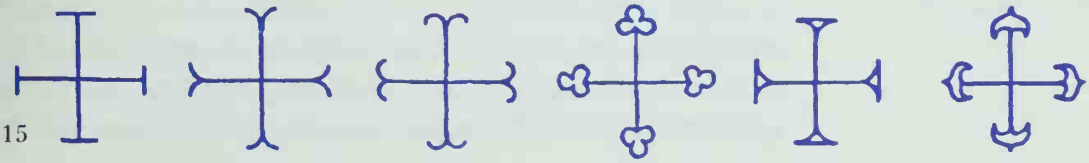
13

Where the symbolic sign is concerned, it is interesting to consider the cross shape as an example from this point of view. The stroke endings of this sign were, in fact, the only elements that could be altered or decorated throughout the centuries, and this in the most varied forms, expressing the spirit of the age, the faith, or the individual. It is noteworthy that practically all handicrafts have come into play for the expression of such an important sign: for example, the blacksmith could make artistic flourishes out of these endings (14).



14

In heraldry and in all fields of ornamentation, these

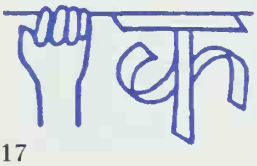


15

strengthenings of stroke endings have been used to enrich the expression of the sign, often bearing a symbolism of their own, as shown in our array of cross forms (15), where symbols such as anchor, cloverleaf, and lily are recognizable.

16

Another thought on the subject of "endings" is that of a comparison with the human body. The letters of our alphabet are placed on a baseline, like a floor, which is why they have been given horizontal endings at their base, like feet, which we call serifs (16). Curiously enough, the opposite course was taken in India, where we find scripts of the Sanskrit language with their characters hanging from above, as though from a line (17).

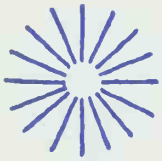


17

c The right tool for the right material

Three important factors have influenced and helped to determine the pictorial expression of the most varied epochs: the choice of the right tool, the available materials, and, not least, the limitations of time applying in each case to the act of writing or drawing. It is very important to follow developments of style with these factors in mind.

18



19

2. The value of interior and intermediary space

A reputed saying of Lao-tzu: There are sixteen spokes (18) in the wheel, but they alone do not make the wheel, which is formed by the skillful arrangement and division of the fifteen spaces in between (19).

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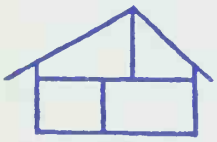


21

Throughout this work we have brought out the importance of interior space or white space. In addition to the quality of the stroke there is that of the space that is enclosed. Our valuation of volume should not be subordinate to our judgment of the strokes used. Graphic work in two dimensions (20) can be compared with the three-dimensional work of an architect (21), where the same rules of the quality of materials and space apply. The finest building materials can enclose

very ugly and unattractive spaces, while a simple brick building, if well planned, can create rooms that are harmoniously arranged and invite occupation.

Correspondingly, it is not only the quality of the type drawing, the printing, or the refinement of a technique that ensures the quality of a sign: it is likewise the white space within or between the signs that confirms the power of expression of the work as a whole.

In most artistic activities this contrast between material and space, white and black, removal and retention is one of the most important factors in creativity. In the two-dimensional graphic field it is of decisive importance to balance the two opposite weights in such a way that the black expression of form harmonizes with the immaterial expression of the white to produce a statement that achieves perfection and permanence on the paper.

22

Our illustration (22) shows the "sculptural" quality of the white space that exists between two well-drawn letters.

The beauty of a sign is often the result of a struggle between the resistance of the material and its conquest by the instrument: in stonemasonry, wood carving, and ironworking, but also in punch cutting and printing.

By contrast, the Oriental way of thought and expression, mainly in China and Japan, puts the creative act more into the mastery of a gesture with which the brush lays the sign on the paper.

The answer to the question whether the creative act comes spontaneously from the painting or writing hand or whether it is built up constructively in drawing, scoring, or cutting depends on the individual's gift and training. It would be misleading to overstate the value of one process or the other, in view of the diversity of technical possibilities now available, including our wealth of iconographical knowledge, brought by all kinds of modern methods of picture transmission.

One point of which creative persons must be aware is that they should remain true to their material, in order to produce the right structure with the right

tool from the chosen material, as was naturally the case in earlier times as a result of more restrictive circumstances.

23

3. The image

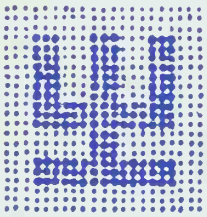
The image of a picture comes about through the contrast between drawing and background. Today, this bringing to view of a sign has become relatively simple, since a multitude of technical means are available.

The great majority of possible two-dimensional, i.e., graphic, contrasts could be reduced to the following groups:

a Black-white

Black-white is the most impressive of two-dimensional contrasts: it is the symbol of the opposites of dark (night) and light (day), which are anchored in duality. The dividing line between these two elements produces an extremely sharp edge, which gives the form its absolute expression (23). Here it is immediately apparent whether an outline is taut and sharp or whether, in accordance with the nature of freehand drawing, it has a more ragged appearance.

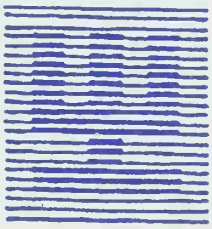
All the techniques of graphic reproduction are based on the fundamental contrast between the applied black and the existing white background.



24

b Colors

The second aspect of two-dimensional pictures consists in the contrast of colors. The greatest antithesis between background and sign is achieved through the use of complementary colors, e.g., a red sign on a green background. One could find the least degree of contrast by using the same color range for sign and background with a slight change of tone, e.g., a red sign on an orange background. Between these two extremes there lies the extensive world of the art of coloring, with its wealth of possibilities of contrast.



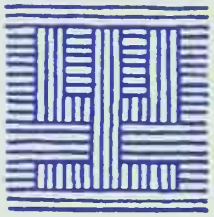
25

c Halftones

Between black and white there is an infinite progression of gray tones, forming the path that leads the eye from light to dark. In the graphic reproduction of pictures the halftones are produced by screening, in which an assembly of many dots makes the eye see an area of gray (24).

This technique makes it possible to reproduce gray-tone pictures with all the shades of modeling and effects of depth.

Degrees of gray can likewise be achieved with a line screen (25). Television also works on this principle, the picture on the screen being resolved into lighter or darker parts of lines. The sharpness of outlines inevitably suffers through this technique of reproduction.



26

d Structures

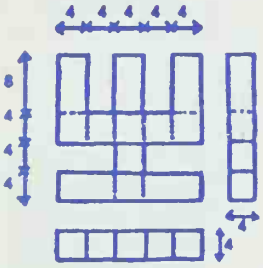
A contrast is not necessarily dependent on the use of light and dark but can also be produced by alterations in the structure of the surfaces. A sign drawn with vertical hatching on a background of horizontal hatching (26) comes to view quite clearly, even though the gray value of the whole picture is uniform. This form of image theoretically approaches the contrast of complementary color, in that the gray scale likewise has no meaningful importance in itself, the contrast being made visible only by the different color wavelengths.

4. Picture quality

The level of quality of a graphic product is determined by the demands that it has to fulfill with regard to the reader or viewer. The product may be a precise, optically measurable statement or, by contrast, a piece of documentation for general information. Furthermore, a graphic representation may be aimed to stimulate contemplation and is then almost exclusively directed toward aesthetic criteria. Between a geometrical

drawing and a painted icon there is such a wealth of different kinds of pictures that we must attempt to reduce them to main categories, such as the following three.

a Schematic or "dimensional" illustration



27

Geometric forms, architectural plans, geographical maps, scientific diagrams, and so on, all require a precision of statement that can leave no doubt in the reader's mind. Thus the map serves for the exact orientation of a place, so that distances and areas can be measured on it, to a given scale. This kind of documentation is an *exact* description, from which information can be directly taken with precision, including items that cannot be seen in reality. Thus the ground plan of a house also shows the under-floor heating and underground services. The drawing and reproduction of these graphic statements generally require great care, since they are a direct means of communication between object and understanding.

To illustrate this category, we show the familiar candlestick sign in the form of a technical drawing (27) with exact statements about the dimensions, scale, etc., of an object existing or to be manufactured outside this book.

b Naturalistic illustration

The greater part of graphically reproduced illustrations shows objects or happenings, taken (mostly photographically) in approximately the same conditions as the human eye is able to perceive them. The reproduction loses the third dimension of depth, which is simulated and bridged over by means of perspective and light effects. In many cases color is also lacking and the information has to suffice by means of black-white contrast and halftone gradations.

28

The photographic picture is basically nothing other than a visual "support," with the aid of which the viewer constantly reassembles inner pictorial re-

collections in order to find a meaning and a connection in the information given.

In place of the geographical map of the first category, we could here use an aerial photo of the same territory. The photographic information is certainly not so precise as that of the topographical map and cannot serve as a reliable indication of scale, but it contains a greater wealth of interpretable elements such as the nature, structure, and housing development of the land; all kinds of vegetation; and so on.

In this category, the candlestick sign is reproduced as a real object (28). The picture provides general information about the material used and method of manufacture, but without a verbal description there can be no knowledge of its exact dimensions, location, or functionality.

c Artistic or "contemplative" illustration

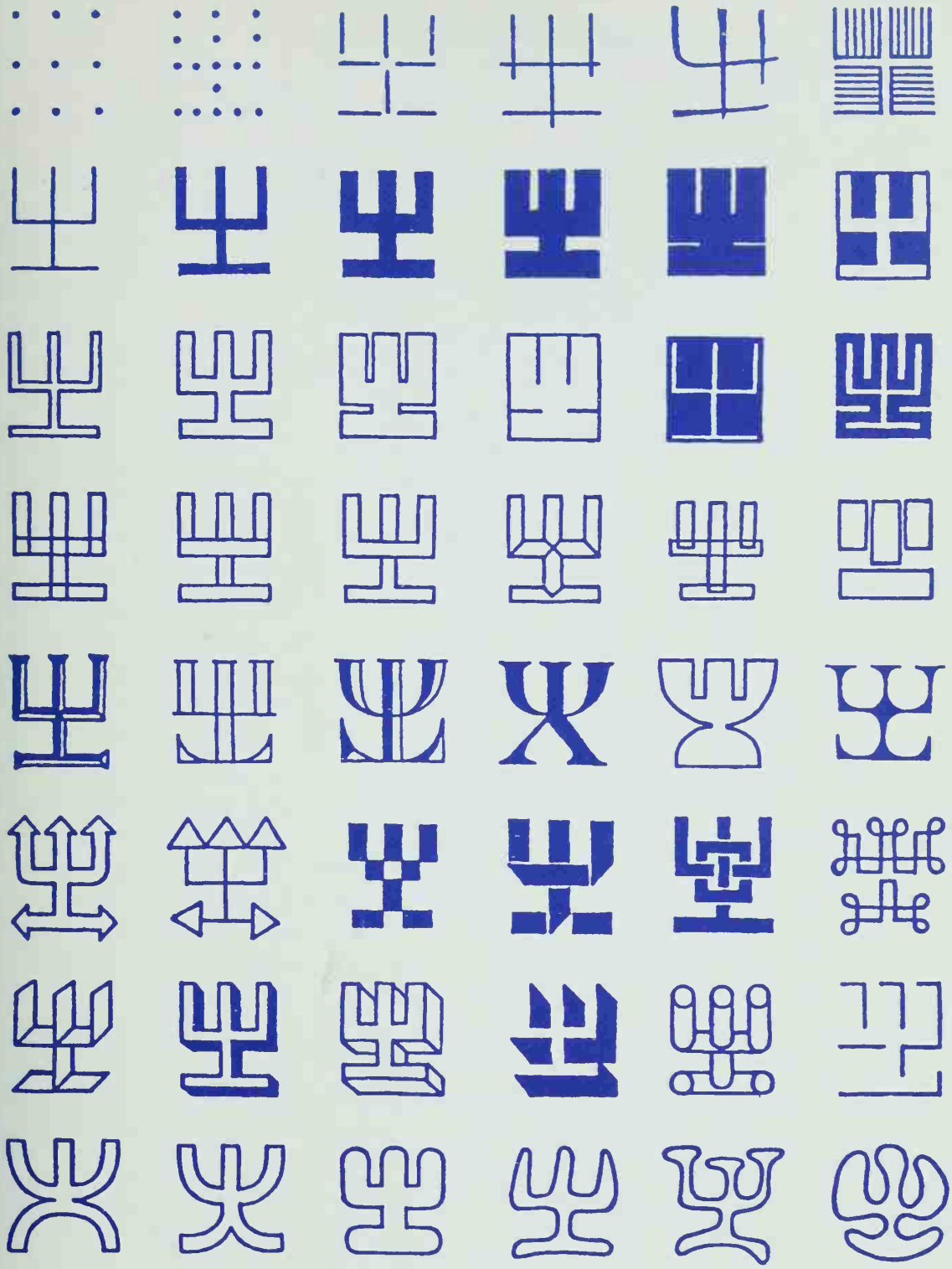
29

The same landscape that was shown in the first category as a map and in the second as a photograph could appear in this third category in the form of an artistic illustration or painting. A strip of yellow still says "cornfield", but it is principally an ornamental element for the purposes of an overall aesthetic effect. The painter or graphic artist has the gift of so describing and decorating a thing as to produce a pictorial image from a purely objective and thematic origin, so that the basic information is retained but is ornamentally clothed in such a way as to awaken a contemplative reaction in viewers. If a picture moves viewers in any way, they like to hang it on the wall, framed or simply with a drawing pin: they want to contemplate it for a longer period, live in its presence. In addition to its expression of feeling it is also a matter of ornament, symbol, and recollection for viewers.

The example of the candlestick sign leads us in this case to a contemplative type of illustration in the form of a "graphic" (29).

Attempt at a visual synthesis

The final table in Part 1 shows an assembly of many possible interpretations of the candlestick, as a summary of what has been said so far. The mental effort and manual work involved in the two-dimensional representation of an object sign can be regarded as basic for all graphic activities.



Part 2

Speech-Fixing Signs

O mon âme! le poème n'est point fait de ces lettres que je plante comme des clous, mais du blanc qui reste sur le papier.

Oh my soul! The poem is not made of these letters which I set in like nails, but of the white which is left on the paper.

PAUL CLAUDEL

PART 2: SPEECH-FIXING SIGNS

I. From Thought to Picture

1. Prototypes

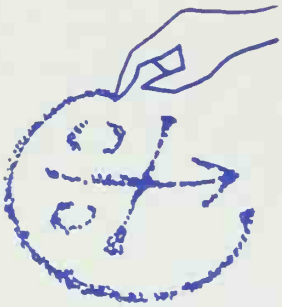
Rock drawing

The origin and development of human intelligence, as a subject of research, now exercise more fascination than ever before. New discoveries of evidence of prehistoric "thought" are constantly accumulating like the pieces of a jigsaw puzzle, while work goes on all the time on their logical arrangement. Records in the form of scratched, cut, and painted markings on rock walls have survived from the Ice Age about 60,000 years before our era, and it is tempting to see these "memorials" as precursors of our script. In a very broad sense they certainly are precursors, but in no way could they be regarded as directly connected examples of what is today called a script, even a pictographic script.

In those early times, humankind was fully occupied with much more vital undertakings than any attempt to make a first record of speech. Cave paintings are much better evaluated as a means of magical conjuration, produced through fear of the supernatural, purely for reasons of survival and the satisfaction of natural instincts.

2. Speech and gesture

Before writing there was speech, a *kind* of speech, a system of communication developing over millions of years. It can be assumed to have consisted partly of sounds from the beginning but was undoubtedly supported by other forms of expression that did not exclusively address the sense of hearing. All species of animals send and receive information, but it is expressed in the realms of *all* the senses: sight, hearing, touch, smell, taste. It can therefore be assumed that an orig-



Written in sand

inal "language" did not consist of sounds alone but also of many gestures, contacts, sniffings, etc. This consideration leads to the question of how far "body language" might have been a *part of the origin* of written records.

An inner need still leads speakers to support what they are saying by means of sketches or figurative gestures. If on a beach, for example, we can hardly resist drawing with the finger on the smooth surface of the sand as a means of clarifying what we are talking about.

In the Neolithic age, much closer to our historical times, humans tried more and more to recognize and grasp their own limitations of time and space. Becoming conscious of life and death provided a motive for invention, for the drive to self-endorsement. It would seem to be a natural, though later continuation of this process of development to express past experience and future plans, hopes, and fears and also to wish to record such new perceptions.

When one contemplates a prehistoric drawing, the idea also emerges that an accompanying explanatory, ritual, or narrative speech of sounds and gestures must have existed in close association with the picture.

The drawings have come down to us, but the speech, and with it the meaning of the signs, has not been directly handed down.

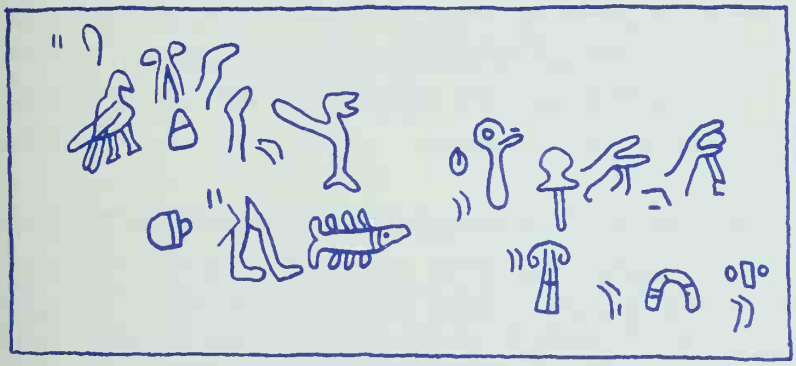
Protohistoric "narrative," ca. 10,000 B.C.

In our view, the development of the "graphic" recording of expressed thought lies within a two-track development of spoken sounds on the one hand and descriptive gestures on the other. Gradually this complementary mode of expression led toward the use of the same signs in association with the same statements. At that moment the pictures became a script, which fixed what was thought and spoken in such a way that, without limitations of time, it could ever and again be represented, that is to say, "read off."

II. Speech Fixing

Writing, in the sense of a genuine record of thought and speech, can be said to have actually existed from the time at which drawings or signs appear in direct relation with spoken syllables, words, or phrases.

The first "scribes" of early times can be supposed to have existed in the fifth millenium B.C. in the Middle East. With the aid of signs known as pictograms, they made schematic representations of objects, dates and actions. Writing in the proper sense, however, did not begin until the moment when they started to arrange the signs horizontally or vertically in rows, corresponding to their own linear train of thought. Thus alignments of signs gradually began to appear and, through constantly repeated use, were further developed into continuous script cultures.



Early Hethitic pictograms, ca. 4000 B.C.

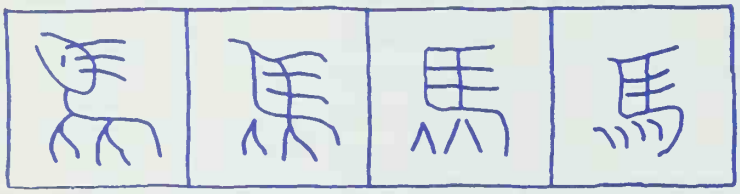
1. Two ways of script developnent

Pictorial signs were certainly at the origin of all scripts that have come into existence through a natural course of development. In the study of the laborious and widely differing routes toward the definite graphic fixing of a language, two main categories can be identified.

a Scripts "remaining" pictorial

This category includes all scripts which have undergone no revolutionary change, even over hundreds of years, but have kept their signs at the pictorial stage, even though stylized. The living proof of this is the Chinese script. For example, the sign for a horse is clearly recognizable in its archaic form, and although this has later been somewhat systematized, the basic strokes and movements are still present in the modern sign (four legs, head, tail, etc.).

Development of Chinese characters

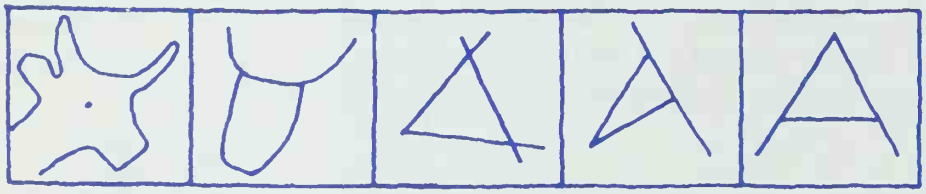


Horse (archaic) Horse (modern)

b "Alphabetical" scripts

This category includes all those scripts whose original picture signs have been changed over the centuries to purely phonetic signs, their strokes being reduced to the most extreme simplification. This is most clearly expressed in the Latin alphabet. Our illustration shows, in the first panel, an early pictorial sign for a bull, "aleph," with all the details such as ears, horns, and an eye. As the sign develops, the pictorially significant parts of the image are left out bit by bit until the letter A crystallizes as a pure abstraction.

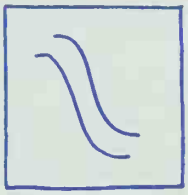
Development of Latin characters



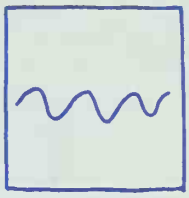
From the hieroglyph to the modern phonetic character A

2. A common origin?

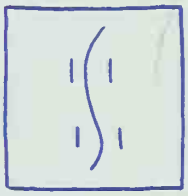
Three archaic signs for water



Mesopotamia



Egypt



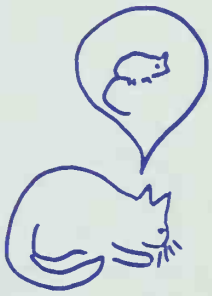
China

Those who study the history of the numerous written languages of our civilization search in vain for a common origin of sign formation. Many attempts have certainly been made to discover affinities and associations between the primitive scripts of different regions and continents, but it has never been possible to establish them incontrovertibly and it is improbable that they will ever be found.

Nevertheless there are some irrefutable analogies between elementary signs, at least in the pictorial representation of objects which must have been common to all peoples. We need only think of the representation of human and animal figures and typical weapons such as arrows. The moon was surely represented all over the world as a sickle shape, a mountain as a triangle, and water as a wave line, but these facts do not in any way indicate the existence of an original script, or *urschrift*, but rather of keen powers of observation and a special sense of interpretation possessed by the early scribes.

3. Inherited archetypes?

The idea that certain figures are anchored deep in our subconscious, from birth, as inherited "archetypes" with a common symbolic interpretation should also be mentioned here. Does a kitten have a mental picture of "mouse" before it sees one for the first time, or does a child recognize fire as "danger" before it has been burned? This gives rise to a fundamental question which goes far beyond the scope of our inquiry, namely, whether a pictorial notion can be inborn or whether it must first be experienced in order to enter the subconscious as a memory.

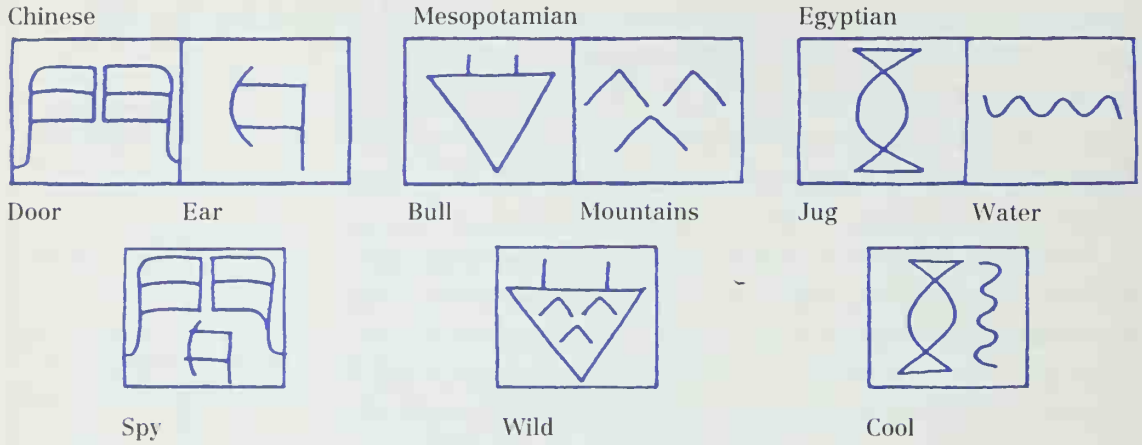


Inborn archetype?

4. From pictogram to ideogram

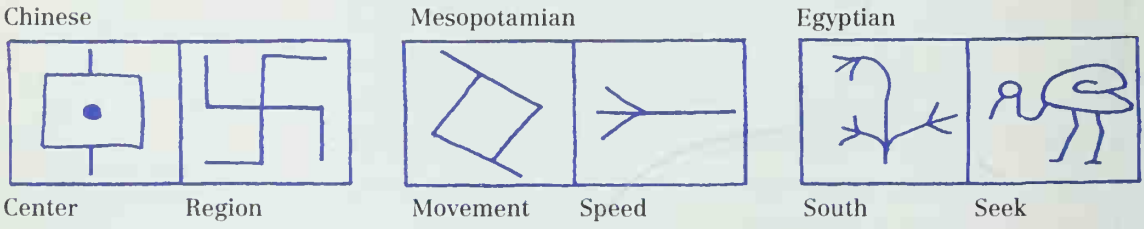
In a combined illustration, we attempt to compare signs from three major cultures and demonstrate some basic principles of these pictographic scripts.

The top row shows (left to right) archaic forms of Chinese signs, precursors of Mesopotamian cuneiform, and hieroglyphics from Ancient Egypt. Each style shows



two object signs: door and ear in Old Chinese, ox and mountain in early Mesopotamian, jug and water in Egyptian hieroglyphics. In the lower row, each pair of signs is combined to give a new meaning with a more complex expression. The combination expresses one quality in accordance with the two signs: an ear behind the door means "listen" or "eavesdrop," the mountains in the ox's head mean "wild" (the ox longs for the mountains), and the water in association with the jug means "fresh" or "cool."

Three further examples each show two pictograms with abstract meaning. In Chinese a dot (an arrow) in the target means "center" and the swastika of the four



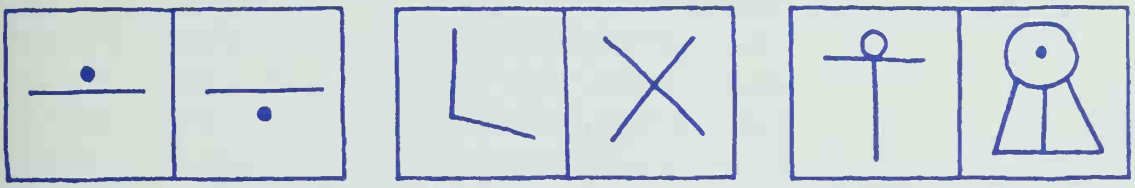
wind directions stands for "region." The original cuneiform sign for the sun means "movement" and the arrow stands for "speed." In the third panel, two purely figurative hieroglyphic signs illustrate abstract con-

cepts: the plant leaning toward the sun means "south" and the bird with head down stands for the verb "seek."

Our last example shows six signs at the border of the pictorial: a dot placed above or below a line means "above" or "below" in Chinese; an obtuse angle means "sink" and a diagonal cross "protect" in Mesopotamian. In the Egyptian cross sign for "Godhead" a human figure is still recognizable, and in the hieroglyph for "day" the sun's rays in the morning, evening, and midday still have an explanatory function.

From this series of examples it can be seen how a pictogram is able to be changed into an ideogram in a first stage of development.

Chinese Mesopotamian Egyptian



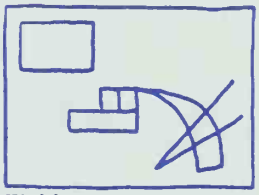
Above Below Sink Protect Godhead Day

5. Determinatives

It would be appropriate to describe here the innumerable main processes in the development of all language systems and grammars, but this would far exceed the bounds of our purely graphic considerations.

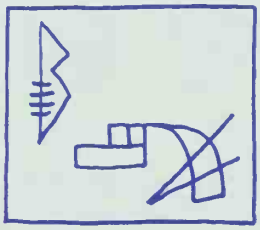
As a striking example we refer at this point to only one of the important rules, that of the "determinative," which played such an important part in the early rules of writing.

The Sumerian object sign for "plough" becomes a determinative sign when it stands next to the rectangle meaning "piece of ground," thereby stating that it is a "field."

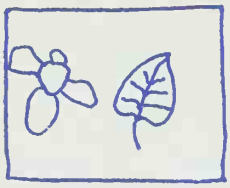


Field

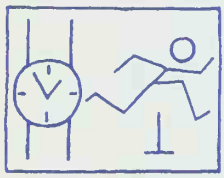
The same "plough" sign becomes the determinative for "farmer" when it stands next to the pictogram for "man" or "person." The additional cross strokes in the "man" sign are indications of hierarchical value or rank.



Farmer



Bee and leaf
belief



Uhr-sprung

6. From ideogram to phonogram

One of the most important developments in the recording of speech is provided by the use of a pictogram to reproduce a syllabic sound, not to record a concept.

This makes the pictogram into a phonogram. In punning, or rebus form, our illustration shows the German word *ursprung* (origin) represented by pictures of *uhr* (watch) and *sprung* (leap).

In English, a phonogram might be composed of pictures of "bee" and "leaf" to spell "belief."

In this way, syllable signs were made from picture and idea signs: not only the meaning of an inscription but also its pronunciation was permanently fixed in writing.

III. The Graphic Wealth of Pictograms

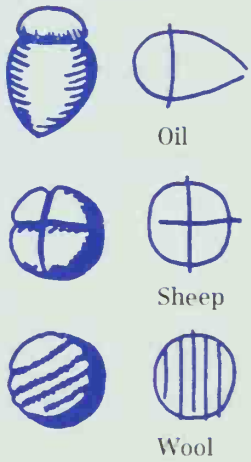
1. From Sumerian pictograms to cuneiform

In Mesopotamia, between the rivers Tigris and Euphrates, even before 4000 B.C., there lived a people of unknown race, the Sumerians, whose fascinating culture is still largely hidden in the mists of history. They probably immigrated from the northeast as nomadic tribes, to settle in the land between the two rivers, a fertile plain where they developed their culture under hard climatic conditions. Such difficulties had no small influence on their intellectual, economic, and social character. Like their Semitic successors, the Sumerians had a logical and scientific turn of mind, a fact that is clearly visible from the background of their writings.

The earliest examples of Sumerian script come from the fourth millennium B.C. and are generally regarded as the oldest examples of records that can truly be described as "writing." They are pictograms scratched in clay, in which the straight line is already strongly predominant, indicating a very early use of the technique of impressing a spatula into clay. For the Neolithic period, the simplification of forms is quite astonishing, and the question naturally arises as to whether there are earlier, still undiscovered versions of these pictograms.

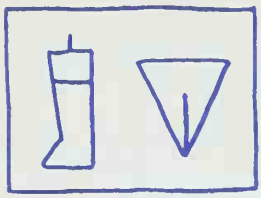
The strongly stylized drawings are either representations of complete objects or parts of these shown in more detail. One of the latest theories associates Sumerian pictograms with the many small clay objects of widely varying shapes found at many archaeological sites in the Middle East. Up to now, little attention has

Schmandt-Besserat theory



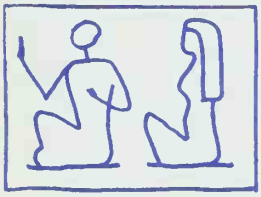
Clay objects as forerunners of script?

Sumerian



Man (penis) Woman (vulva)

Egyptian



Man Woman

been paid to these figures, which have been accorded minor importance as toys, ornaments, or amulets. It has now been discovered that many of these clay figures are amazingly similar to the earliest pictograms. For example, the pictograms for oil, sheep, wool, etc., are exact "drawings" of these objects, which go back thousands of years. They were often enclosed in hollow clay containers, as though inventoried for trade purposes, so that a given number of items was held in the container as an aid to memory. The numbers of cattle or sacks of grain thus recorded in these containers were later scratched on the outside in reduced and styliszed form. In this way, a sign is derived from a figurine. This theory probably provides the answer to the simplification of the images, which had become stylized a very long time *before* the first pictograms were drawn, in the form of molded clay figurines, which may be seen as the first examples of writing, in three dimensions, dating back to the eighth millennium B.C.

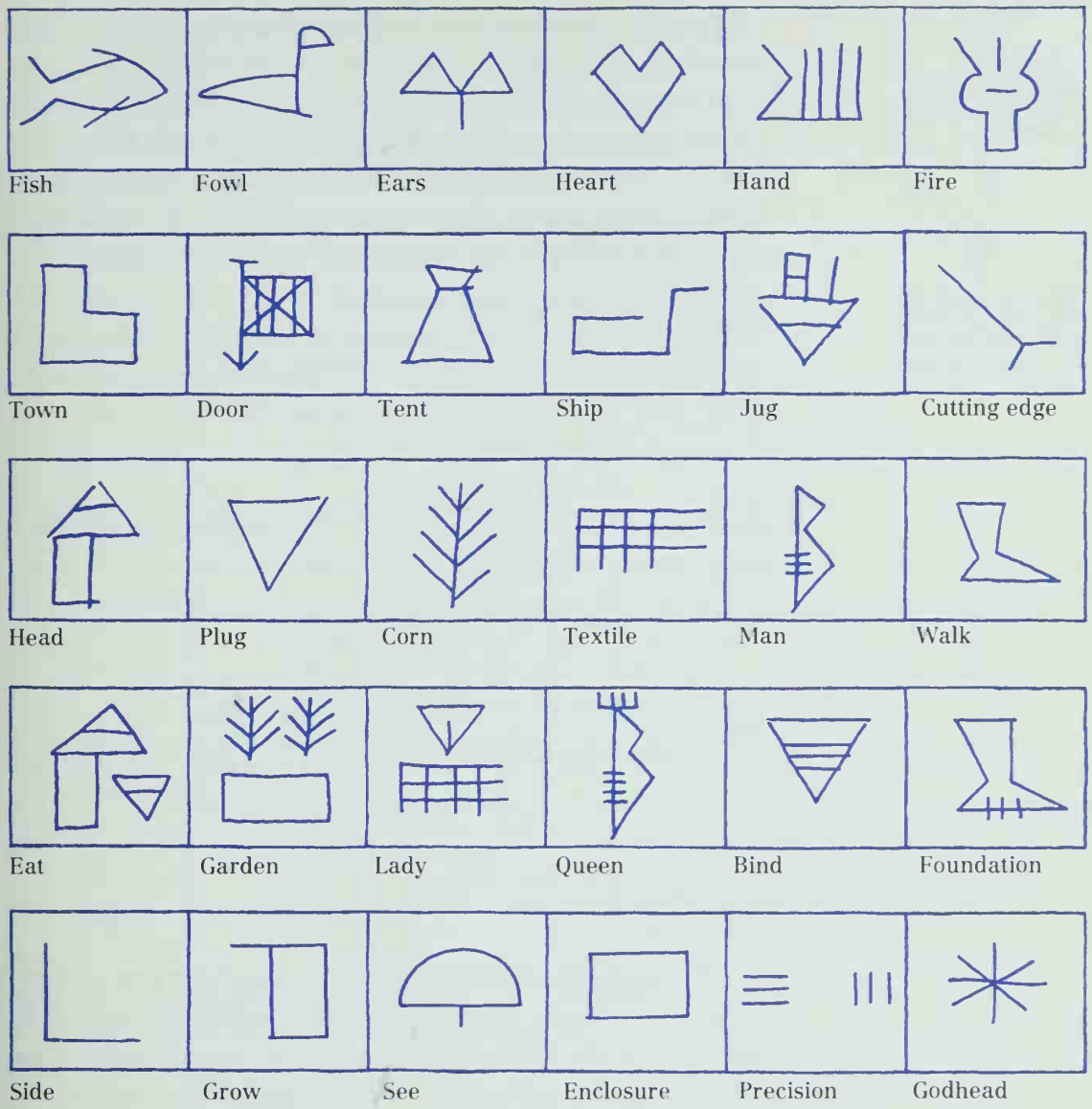
It is astonishing to compare the Sumerian signs for man (penis) and woman (vulva) with the contemporaneous Egyptian hieroglyphics for the same meaning. The hieroglyphs show the whole body, but their "legibility" is much less precise than that of the Sumerian signs.

Our table of illustrations shows how strongly the Sumerian style of writing was limited to essentials. Note the very marked graphic power of the stylization in, for example, the sign for "hand," in which the anatomical mechanism of the four outstretched fingers and the moving thumb is clearly schematized. Together with these signs, whose meaning can be easily read, there are also geometric signs with a more abstract sense (bottom row), which cannot be decoded without an explanation or learning process.

Of special interest is the combination of several signs to give new meanings through the use of the determinative system (last row but one).

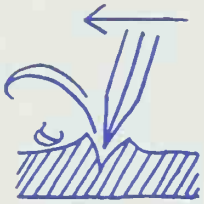
In the 3rd millennium B.C., the Sumerian style of writing changed completely. No other script known to us underwent such a significant metamorphosis. In

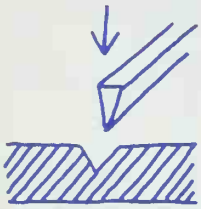
Earliest Sumerian pictographic script, ca. 3500 B.C., already tending toward the abstract (Barton, Unger)



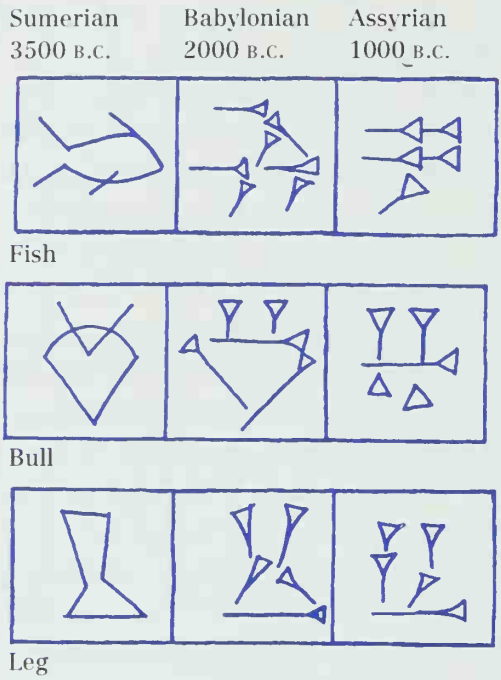
contrast to the mighty monuments of Egypt, which the viewer had to approach, the Sumerians possessed a more mobile temperament, making the idea of transport and the exchange of information the most important factor in writing. Clay tablets were the main material used. After baking in the sunshine or in fire, they could be transported and stored in piles.

Cuneiform, or "wedge-shaped" writing, owes its name to the individual, straight-line units with extend-


Scratching in clay


Impressing in clay

ed triangular form, produced by oblique pressure of the stylus into the clay. This impressing technique gradually came to be preferred to the technique of scratching, because when writing quickly it does not produce any shavings or ridges at the edge of the stroke, which would be an obstacle to firing and storing in piles. Cuneiform script provides a typical example of how script forms have been developed not only by conscious thought but from the very nature of the material.



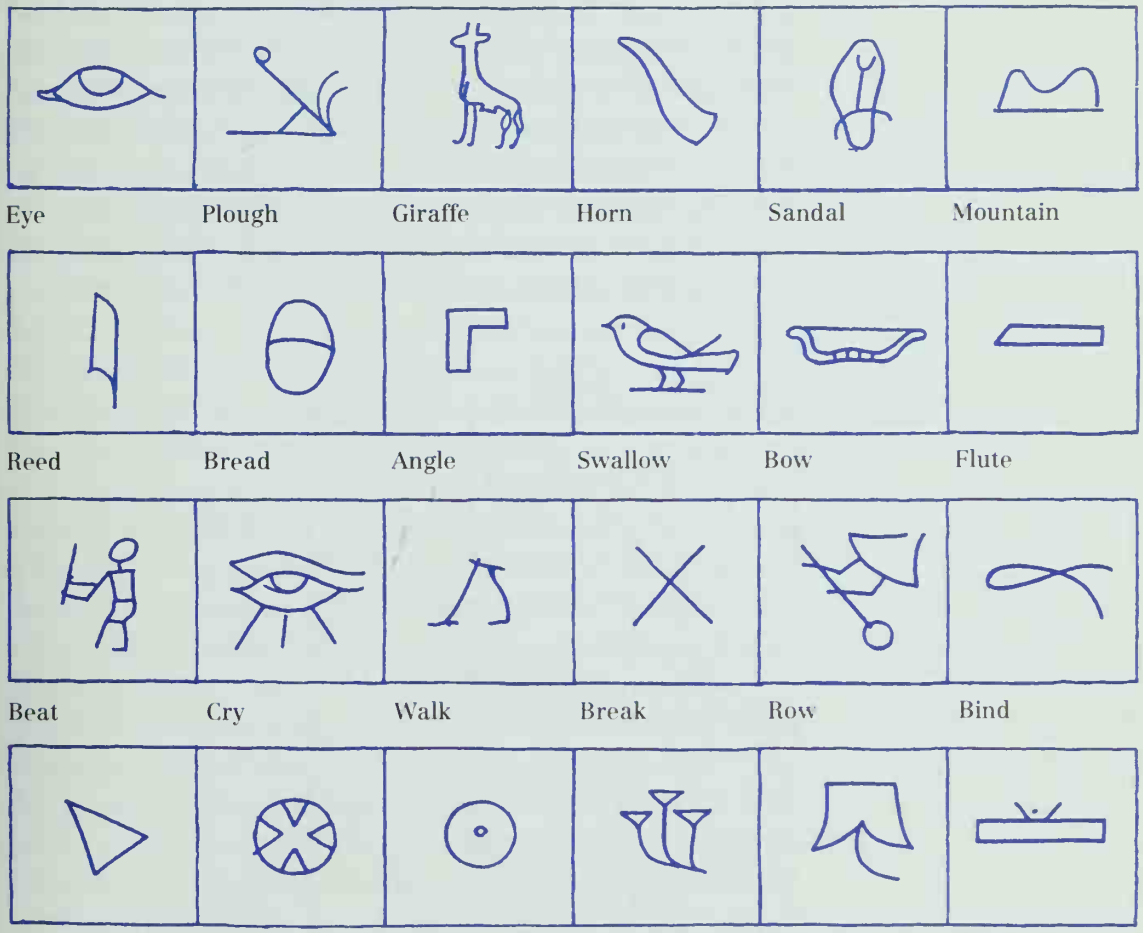
Through the three millennia before our era, cuneiform signs were further altered, simplified, and also adapted to the languages of neighboring peoples. The original pictographic use of the signs became phonetic in time, and their number was gradually reduced. Around the middle of the first millennium B.C. the script was fully formed and used throughout the Semitic language region as a "means of thought transport," but then gradually replaced by the Aramaic alphabetical script. The failure of cuneiform script to survive into our times can be ascribed to the fact that, with its 1000 or so complex-formed word and syllable signs, it proved inferior to the Aramaic alphabet with its 22 signs.

2. Egyptian hieroglyphics

The Nile Valley and its delta are the arteries of Egyptian life. In the rhythm of the seasons, the great river floods wide areas of the land, laying down fertile mud at high water. The valley was the cradle of a people rich in fantasy, gifted for the observation of nature, and apt to become absorbed in the works and words of the gods.

Fascinated by the powers of nature, the Egyptian people tried to conjure them by means of magical signs. As the cult of the sun, and its opposite cult of death, became stronger, the richer became the treasury of hieroglyphs (sacred carvings).

Some Egyptian pictograms, ca. 3000 B.C., still immediately recognizable

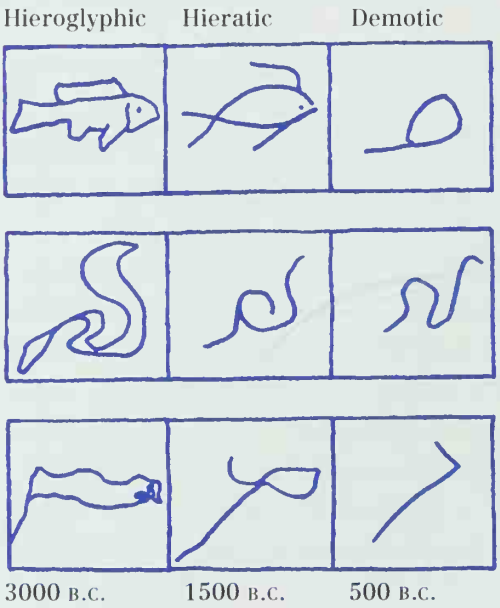


During the fourth millennium, huge monuments were built with materials from the cliffs bordering the Nile valley. On a similar scale, great signs intended to outlast time and death were engraved upon them.

The expression "hieroglyph" applies exclusively to pictograms. Created by the priests, guardians of religious and political tradition, these signs retain an astonishing stability of form through three millennia. They mirror the wealth of their environment in brilliant stylization and proportioning.

Our preceding table shows a small selection of striking hieroglyphs. In the two first rows we recognize representations of objects, in the third row activities, the last row contains signs mainly used as determinatives.

In parallel with the monumental, traditional form of the hieroglyphs, the more cursive hieratic script was developed as early as the third millennium. The chiseled figurative signs were "flowingly" imitated on papyrus with a reed pen, which brought a simplification of form. In the course of the first millennium B.C., the writing style became crystallized to an even simpler form, known as demotic, in which the connection with the original pictograms is hard to recognize.



The Egyptian script culture is now seen as the most important basis of our Western alphabet. We will return in more detail to the hypothetical derivation of our written characters in the chapter concerned with alphabetic scripts.

3. Cretan scripts

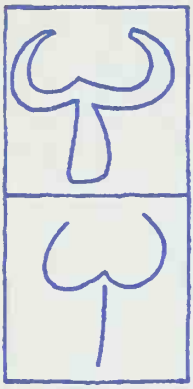
Between cuneiform and hieroglyphics, the two pillars that we like to see as supporting the script culture of the West, there is evidence of numerous parallel cultural developments such as those of the islands of Crete and Cyprus, or the Syrian and even the Indian script cultures. It may also be assumed that all these peoples came under the influence of the Babylonians and Egyptians through growing trade and migrations, thereby also adopting some of their expressions of culture. Nevertheless it must be borne in mind that each people has its own resources of inventiveness.

Because of its insular position, the culture of Crete remained largely separate from any close contact with neighboring peoples. This fact is clearly evident from the character of its script. Although there is evidence of early influence by Egyptian pictograms, the entire written expression of the island has an independent manner of speech recording, whose graphic originality fascinates the viewer as much as its enigmatic character.

The pictograms of the earliest cultural era of Crete appear around 2000 B.C. They are strongly figurative, although very substantial intellectual simplifications are already present in them, for example, in the sign of the crossed arms, which bears a complete train of thought within itself. Comparison with the original hieroglyphic signs and the syllabic signs derived from these provides a very clear illustration of the difference between a figurative drawing outlining the object and, next to it, a disembodied, purely linear sign formation (Linear B). This brings back to mind the fact that closed outline signs tend to resemble objects (see Part 1, mor-

More than a picture: a train of thought

Ox 2000 B.C.

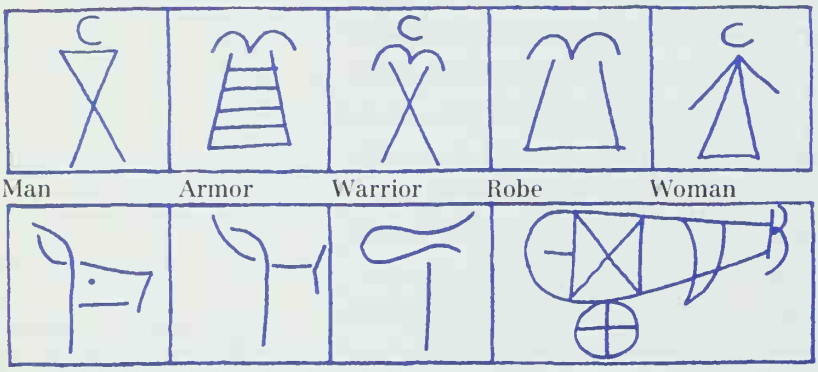


"ru" 1500 B.C.

phological Table 1, square and cross), while open signs with visible stroke endings point to a more abstract, less pictorial use of the sign. Five hundred years of attrition changed the drawing of an ox into the syllabic sign for "ru."

In Cretan inscriptions, ideograms and syllabic signs could both be used in the same line, which explains why their definitive deciphering has not yet been achieved. Since our subject is not linguistics, we restrict our illustration to a few examples of striking signs. It is interesting to contrast the representations of man and woman, comparing them further with the signs for robe and armor. Legs hidden by clothing were, from the start, the pictorial expression for the womanly. In the warrior sign, the robelike shape of the armor is left out in order to express the masculine form clearly. There is also much fascination in the various kinds of representation of animal species (pig, calf, sheep) and in the diversity of statements on the chariot panel from Knossos.

Interpretation of signs from the chariot panel at Knossos (Evans)

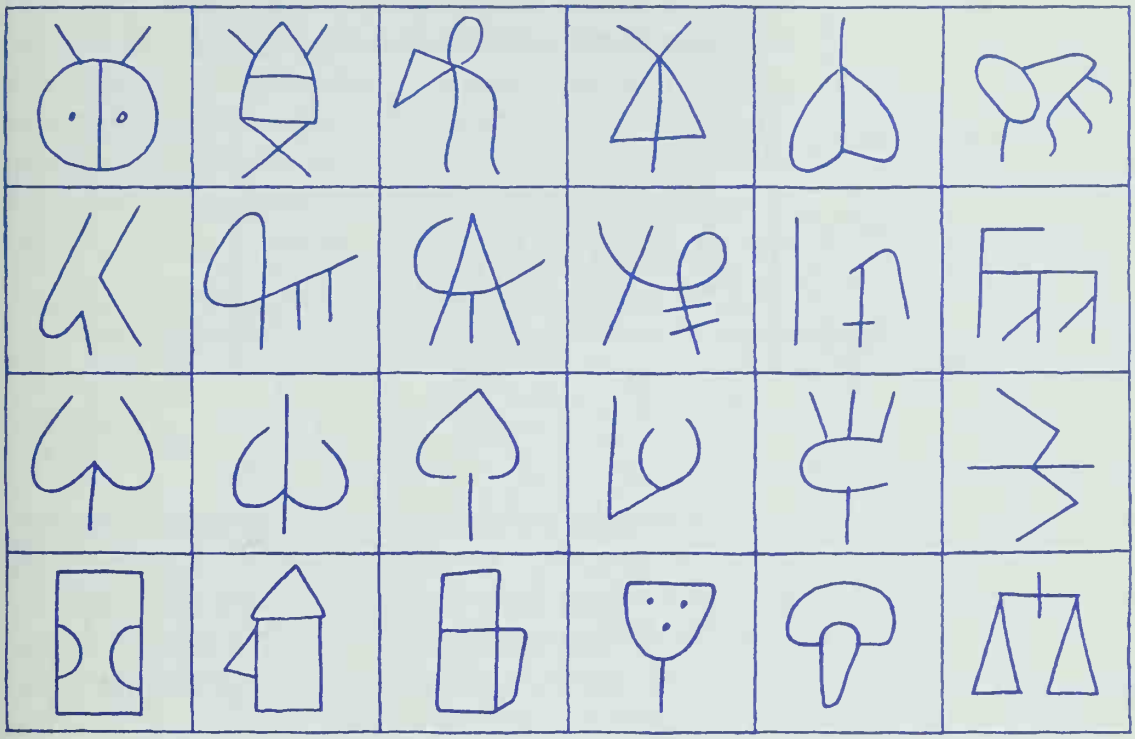


Cretan writing signs have their mysterious effect on the viewer because their form implies pictorial statements based on objects, while leaving the uninitiated in complete doubt about the explanatory key. It is probable that the refined pictorial signs assembled here were already largely used as syllabic characters.

Experts still disagree about the extent of influence of Cretan script culture on the Mediterranean region as a whole.

At all events, the graphic wealth of Cretan script signs radiates such mental power to the uninitiated as to leave no doubt about the island's cultural value in relation to the mainland.

Pictorial-syllabic script from Crete, 1500 B.C.



The mysterious area between concrete illustration and abstract sign

4. Hethitic pictographic script from Syria

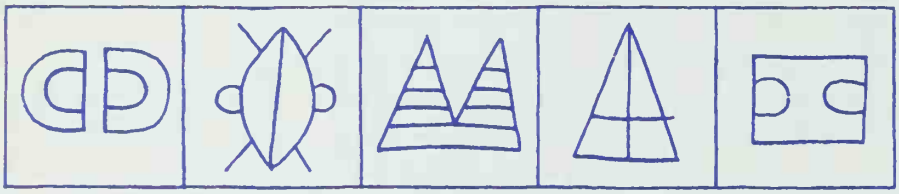
The Hethitic people lived in Syria, on the eastern seaboard of the Mediterranean, in the second millennium B.C. The examples of writing remaining to us from this realm consist of very beautiful, distinguished rows of characters, cut into stone and later scratched into a variety of materials in linear fashion.

It is supposed that the creation of the Hethitic pictographic script was stimulated and influenced both by Egyptian hieroglyphics and by the Mesopotamian cuneiform script of the neighbors on the opposite bank of the Euphrates. A relationship with the Cretan picto-

graphic script is also assumed, but in studying typical signs one can also recognize the effect of an autonomous inventiveness.

In most cases no pictorial statement can be clearly recognized, since even in the oldest examples the signs are strongly abstract. Examples of oddly "unreadable" concept signs are those that have been interpreted as meaning house, sun, king, land, and God.

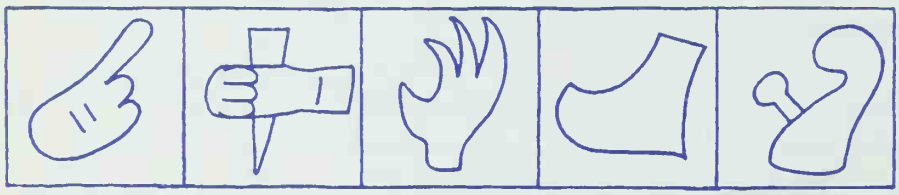
Hethitic ideograms, 1000 B.C. (Friedrich)



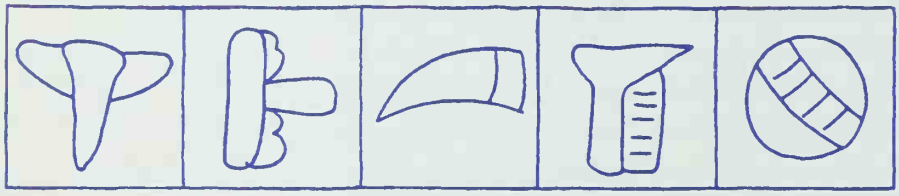
House Sun King Land God

In common with all the scripts so far mentioned, Hethitic pictograms were gradually adapted for the fixing of syllables and even single letters, but there was no simplification for ease of writing, which in other scripts produced alphabetical characters. Inscriptional use of Hethitic died out around 700 B.C.

Hethitic pictograms interpreted as syllabic signs (Gelb)



ga ta ká du rpa

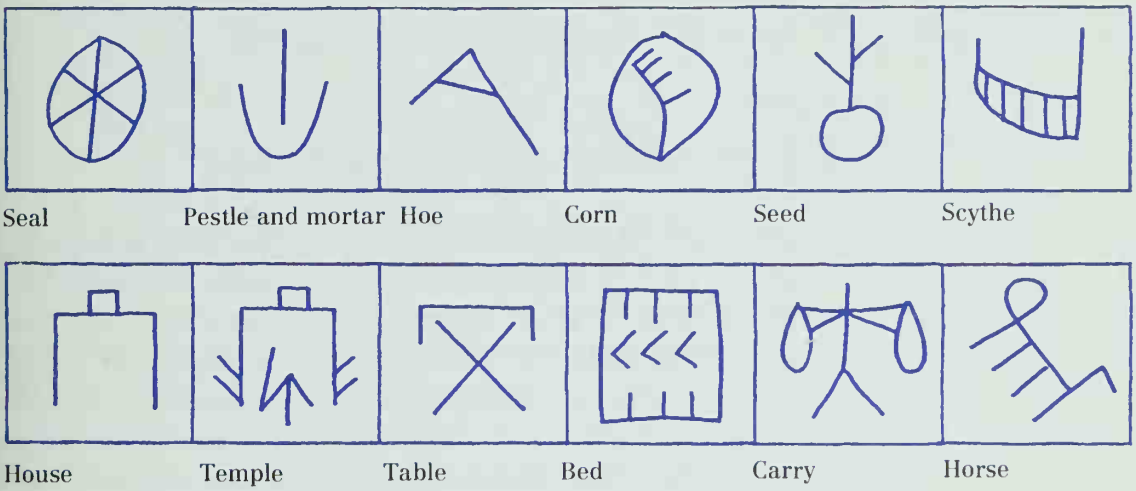


hu ka la ri ru

5. Pictographic script from the Indus Valley

Not very long ago discoveries of a "Proto-Indian" culture, which developed in parallel with the Egyptian and Babylonian civilizations, were made in the Indus Valley in northwest India, now Pakistan. The oldest examples of script, from the third millennium B.C., have survived in the form of stone and copper seals or punches. The pictograms themselves are either carved in relief, molded, or embossed in metal plates. Here, too, the diversity of materials and techniques used certainly furthered the development of a strikingly stylized design of forms.

Interpretations of Indus Valley pictograms (Meriggi)

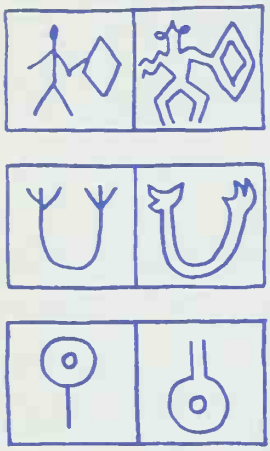


Archaeologists have not yet been able to decipher this script. An important reason for this seems to be that there are almost no clear points of reference for a language used in the region during the period in question. The number of signs in existence, around 250, is too small for a purely pictographic script, leading to the conclusion that the Indus script comprises a mixture of word and syllable signs. There is no evidence of any connection with the various Indian scripts developed 2000 years later.

The great antiquity of the Indus script and the fact that traces of it have been found from time to time in other parts of the Middle East give the archaeologist's

Unrealistic comparison by Hevesey

Indus Valley — Easter Island



2500 B.C. — 1400 A.D.

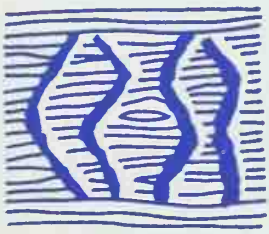
imagination grounds for a great many hypothetical conclusions, in particular as evidence of the first large-scale migrations or even permanent emigrations to other regions and islands, 2000 years before the historical Indo-Germanic migration. For example, there is an amazing similarity between the Indus script and the pictograms of Easter Island (ca. 1000 A.D.), but no historical or geographical connection is possible since the two scripts are separated by more than 3000 years and half the circumference of the earth.

From a purely graphic point of view, what we notice is the basic difference in sign formation between the two: the early Indus script, with its linear form of expression, is already on the way to simplification; the much later Easter Island script has a rather primitive style, still depicting the whole object.

6. Pictographic script of Easter Island

We take the opportunity of this comparison to consider the Easter Island script more closely, above all because of its graphic charm. It does not represent any important stage in relation to the development of the idea of "writing," because it does not appear until the middle of the first millennium A.D. It is assumed that the signs of the "talking wood," which mainly represent all kinds of living creatures (men, penguins, fish) and also objects (rudders, weapons), were principally used as memory aids for singing; but no scientifically based decipherment into language has yet been achieved.

It is interesting for us to make the acquaintance of another pictographic script in which, once again, the use of a given material (wood) and technique (carving) has led to a specific type of sign form. With timber, there is less resistance to cutting across the wood fibre direction than along it. This difference leads the wood carver to direct strokes almost exclusively across the grains because line movements can be more freely executed in this direction than with the grain. This practically excludes horizontal and fully circular forms.



Sign cutting in timber

Thus many signs are left open at the doubled stroke endings, producing human figures with no feet, cropped hands, and generally sloping heads.

A strongly structured material forces the hand to unify individual figures. The beauty of a written document is to be found in, among other things, the evenness of the aligned images, which mysteriously combine, like a woven cloth, to make a unified whole. A point of particular interest about the Easter Island script is the harmony between the spacing within the signs and the spaces between them and between the lines.

"Speaking wood" from Easter Island

This observation can also be taken as an indication that the panels had more of a contemplative use, so that they did not necessarily have to be readable but simply beautiful. The peculiar method of writing, in which every second line is upside down, making constant turning necessary for reading, also indicates a strong ritual element in the reading process, with its constant turning of the object.

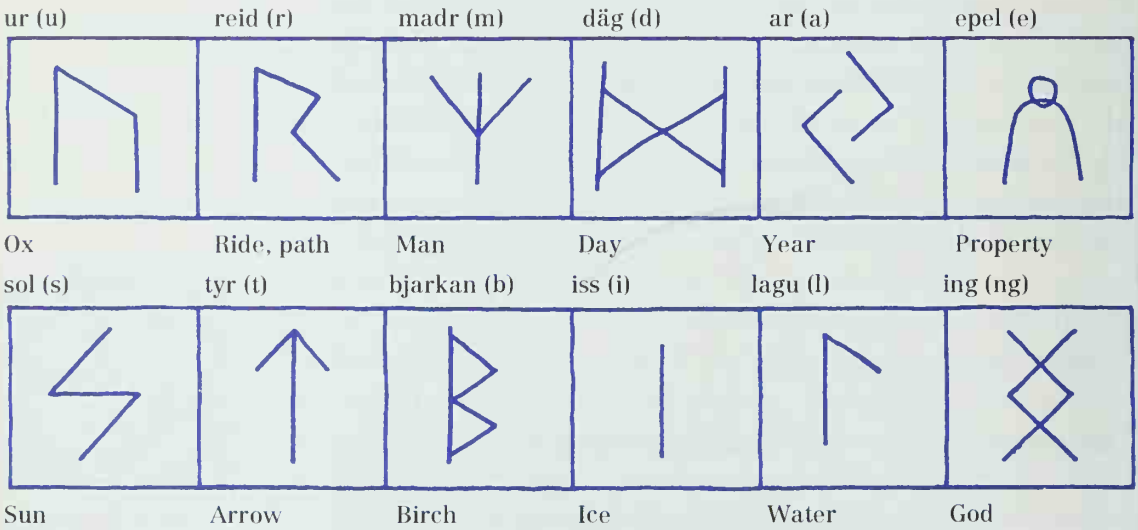
7. Runic script

Without any real historical or geographical justification, we would like to mention runic scripts at this point in our observations on pictography, mainly for reasons

of writing technique, in connection with that of the Easter Island pictograms. Runic scripts, which were developed at some unidentifiable time during the first millennium B.C. in the colder regions of forested northern Europe, were also very substantially formed by the basic material, wood. The examples that have escaped decay are inscriptions cut into stone, but the form of the signs leaves no doubt about the original use of panels of wood. Runes consist mainly of cross-grain vertical and oblique strokes. In addition to the factor of the lesser resistance of the material to cutting in this direction, as already mentioned in connection with Easter Island, there is also the consideration that in a damp climate the wood may become soaked, causing the fibers to swell and lines cut in the fiber direction to close up and become illegible.

It cannot be established with certainty whether an original northern pictorial *urschrift* preceded the later runic syllabic and alphabetical script. Rune stones prove that a runic script already existed before the adoption of Latin script forms in the first and second centuries A.D.; but it is assumed that the original signs at first had no direct speech-recording function but rather were secret signs for prophecy, cult uses, and magic. This view is supported by the strongly abstract nature of the signs, indicating that they were deliberately kept obscure.

Runes and their pictorial names (Jensen)

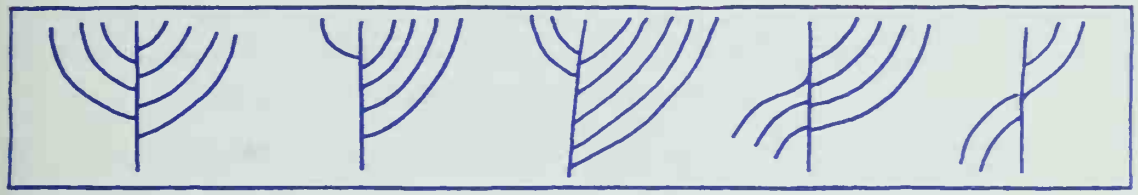


Etymological comparisons have revealed the names of some runic signs, and study of the old Germanic rune alphabet shows that these names refer to an original pictographic style of script, which can still be recognized in certain signs (ox, man, arrow, etc.).

The mysterious branching runes of the far north are encoding systems for secret texts. The runic signs were ordered into alphabetical rows at an early stage, and the branching runes showed the position of a letter in its row by the number of branches.

The first sign shown here means fourth letter (right) in third row of the alphabet (left).

Runic signs, conditioned by the climatic circumstances, have an amazing simplicity and could have been invented only by people with a strong sense of graphic economy.



Branching runes, a secret script

8. Chinese scripts

a Wisdom of the I-ching

Yang and Yin

The formal restraint of the runic signs leads us to a comparison with another intellectual reduction of form, which may appropriately be introduced here as a point of entry into the realm of Chinese scripts. The subject is the wisdom of the I-ching, whose origin lies in the distant era of the third millennium B.C. According to tradition, it was the Emperor Fu-hsi who established a system of signs to record the orally transmitted wisdom. This involves the philosophical concepts of "yang" (masculine principle) and "yin" (feminine principle), which we have already considered in the chapter on dualism, as expressed in the very beautiful sign of the complementary black and white vesicles (bladder shapes) uniting to form a circle. It is probable that the

Yarrow stalk casting

Yang

Yin

I-ching was based on the casting of yarrow stalks, using complete and broken stalks, believed to have been used by magicians and priests for purposes of prayer and oracle. The illustration of the stalks in the I-ching script was by an unbroken line for "yang" and a broken line for "yin." The signs were assembled from these two basic elements, in the first place into eight trigrams or elementary figures. The eight signs show the basic elements of the world in an almost "figurative" manner, emphasizing the dualistic concepts "yang" and "yin" as follows:

1

1 Three yang lines mean *heaven*; also father, head, hardness.

2

2 Three yin lines mean *earth*; also mother, garment, tenderness.

3

3 A yang line between two yin lines means *water*. The active element, the stream, is represented between the placid banks of the land.

4

4 A yin line between two yang lines means *fire*. In this sign, heaven stands above and below earth. lightning returns from heaven to earth.

5

5 Heaven once over earth twice is an almost graphic representation of the idea of *mountains*.

6

6 Heaven twice over earth once means *wind*, which is also the voice of heaven. The same sign also means *forest*, because the wind is audible in it.

7

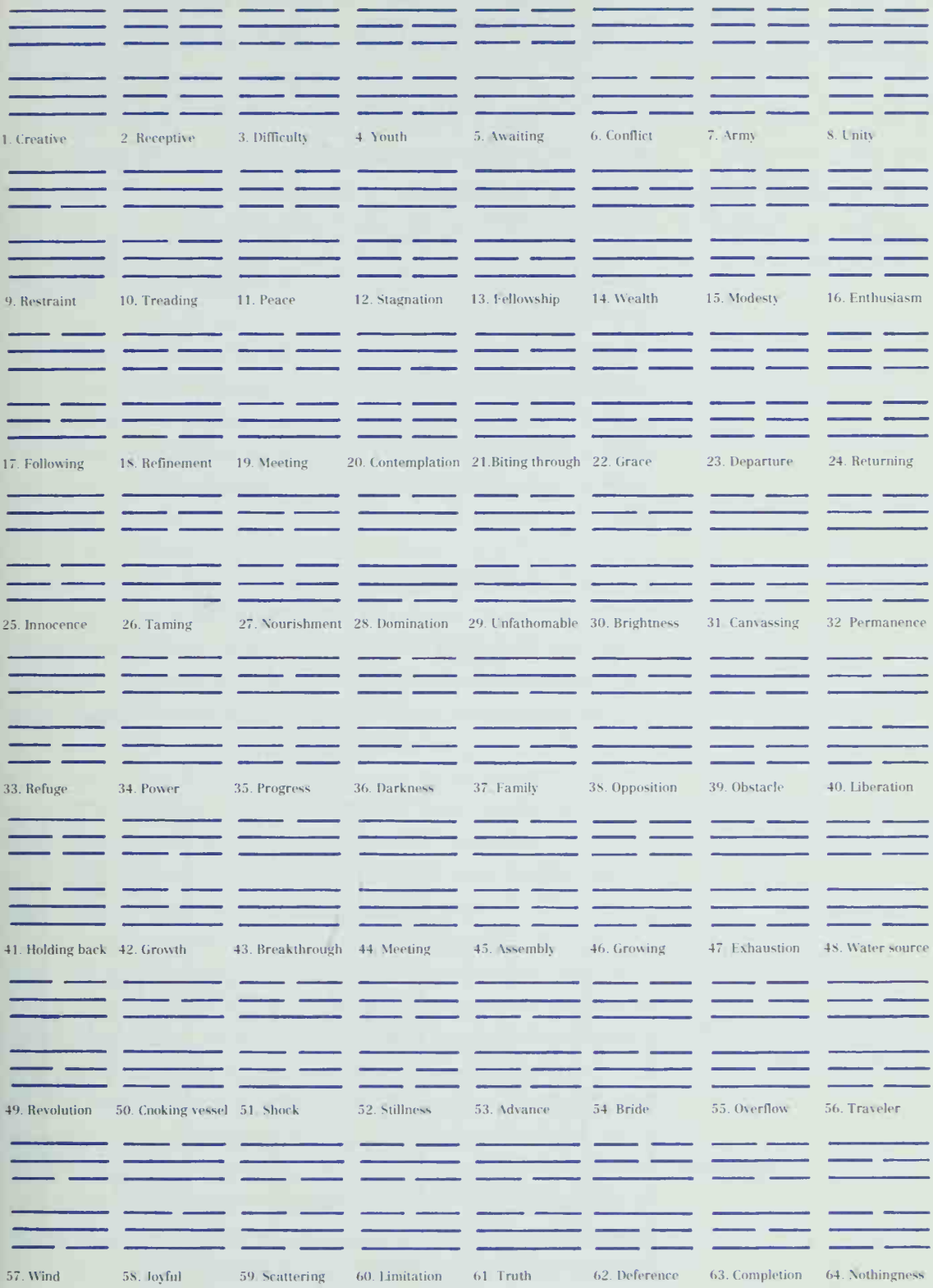
7 Earth once over heaven twice means *lake*. With a certain exercise of the imagination one can see the reflection of the sky in the water.

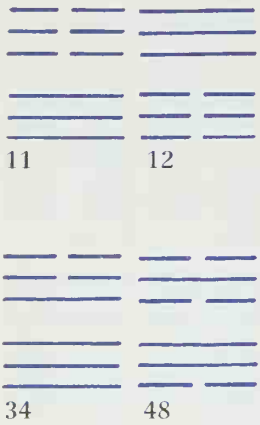
8

8 Earth once over heaven twice means *thunder*. The power relationships are reversed and there is a relief of tension.

The entire wisdom of the I-ching is expressed with these eight basic trigrams, by pairing them to make hexagrams, or six-line signs. This produces the sixty-four signs of wisdom (see table), a few of which we will try to explain in a rather simplified manner.

The 64 hexagrams of the wisdom of the I-ching (free interpretation after Wilhelm)





11 The earth is carried by heaven. The creator has penetrated the earth. The sign means peace.

12 Heaven is completely separated from earth, and there is no connection between above and below. The sign means distance, stagnation, decay.

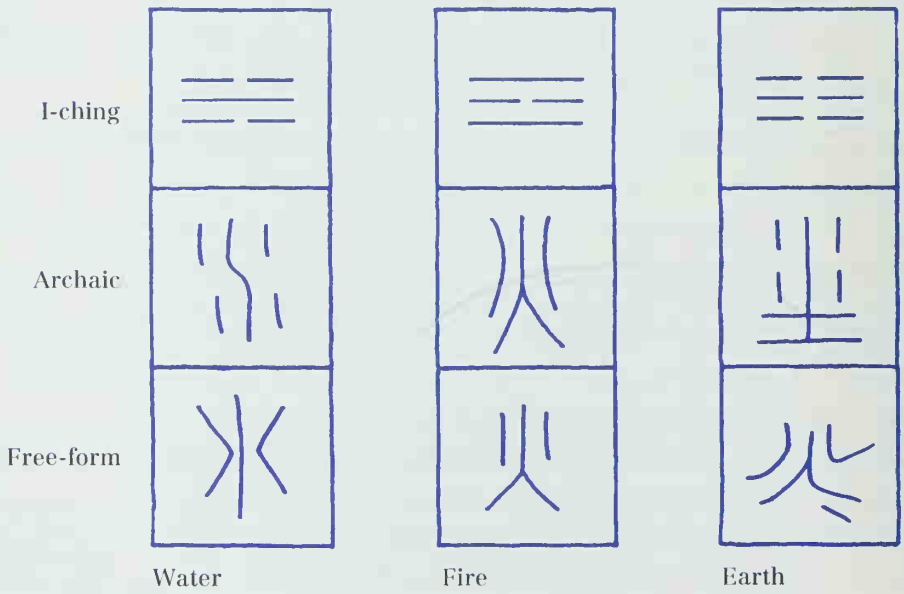
34 The thunder trigram over heaven expresses something of creativity, power and size.

48 The trigram for water over the one for forest means spring or well, where the water that falls from heaven gushes out again.

Our table shows all the signs of the wisdom of the I-ching. A detailed description would take too much space here, but in our view an intensive contemplation of this fund of thought provides an excellent study not only of thought itself but of the abstraction of expression.

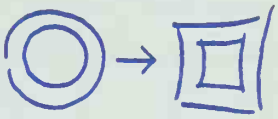
b Chinese pictographic script

Whether the signs of the I-ching acted as godfather to the archaic Chinese script can only be a matter of opinion, based on feeling. For example, the prehistoric sign



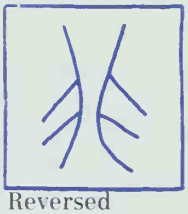
for water can be very closely compared with that of the I-ching. Could not traces of the yin and yang signs also be found in the pictographs for fire and earth?

In any case, it is quite clear that Chinese script looks back to very early symbolic expressions and objects. For example, it was the custom to send a ring to an exile as a sign of reconciliation and return. The old, round ring sign was turned into a square through the use of the writing brush and the sign still means "return." This example involves the explanation of why Chinese brush-stroke writing divided original circular and curved forms into short, straight parts. Pushing movements cannot be made with the brush: the brush hairs are drawn across the paper, and changes of direction cannot easily be made without a break. For the rectangular ring sign, the hand is lifted four or eight times, and it should be noted that the points of junction are not always precisely closed, giving the word pictures a very "signlike" effect in every case.

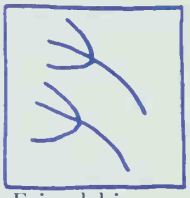


Ring of reconciliation

Because of the existence of many dialects, it is certain that gestures played an important role among the Chinese for better mutual understanding. This fact is clearly apparent in their writing. As examples, we show three signs in which different positions of the hands are used to explain the statement. In the first example the hands are turned away from each other to mean "reversed"; in the second case they are outstretched and welcoming, to mean "friendship"; and in the third, the hands over the head in a submissive salute mean "prince." In our introductory chapter we have already given some examples of typical characteristics of pictographic script from the Chinese system. The basic rules of Chinese speech recording are fascinatingly exotic and also attractive for people with Western ways of thinking. As we cannot go into more detail at this point, it must suffice to show a few striking examples of the earliest Chinese writing in a table.



Reversed

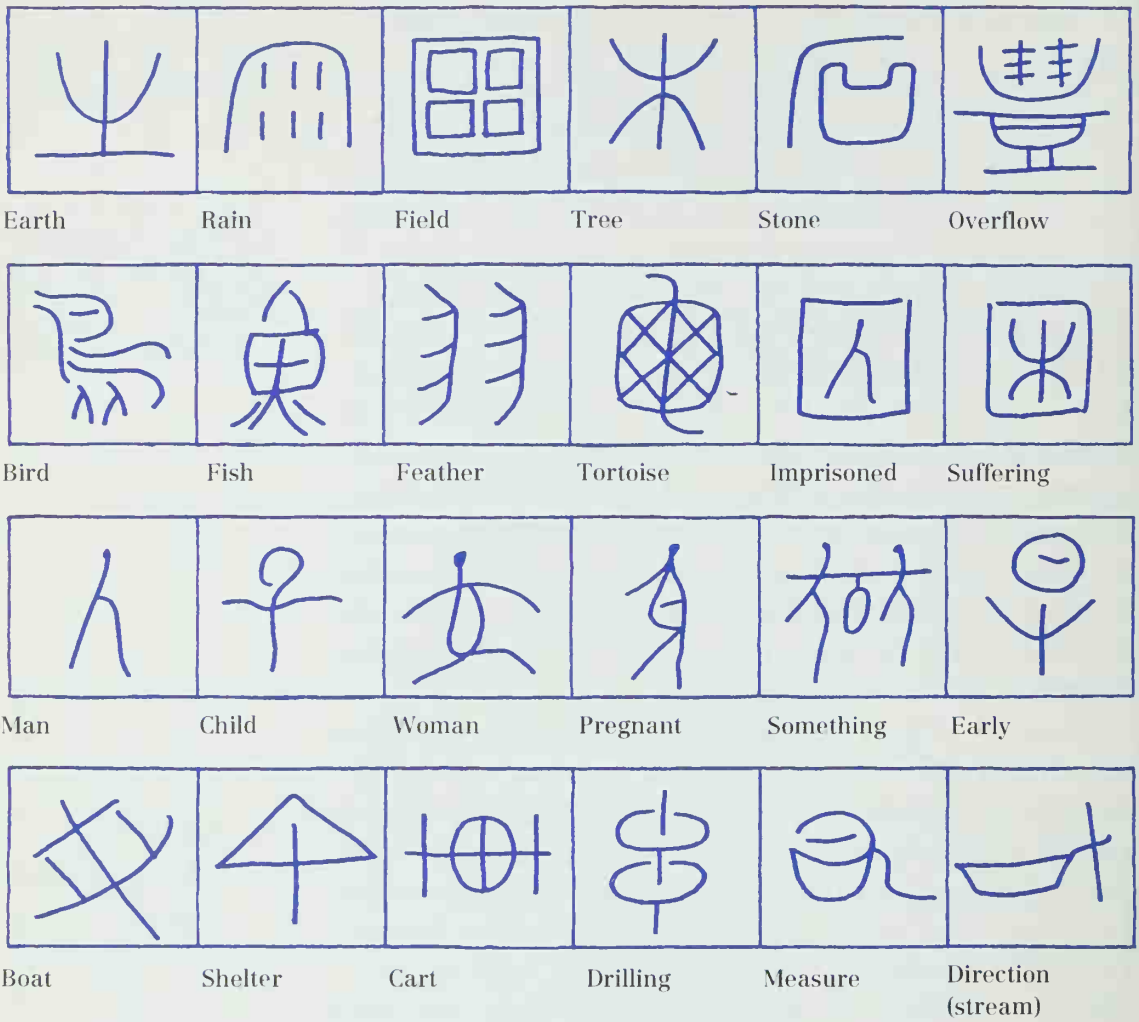


Friendship

Prince

Chinese writing today comprises tens of thousands of signs and the development of new combinations of signs is not yet ruled out. The characteristics of the very strongly monosyllabic language are probably responsi-

Archaic Chinese pictograms

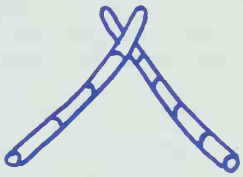


ble for this enormous number. For example, the syllable "fu" may mean send, rich, father, woman, skin (depending on intonation), among other concepts. Each of these concepts must be expressed in combination with another sign in order to be distinguished and understood by the reader. That is one of the reasons why it has never been possible to reduce Chinese writing to a simple syllabic or alphabetical script. On the other hand, it has retained the advantage of being readable beyond provincial and national boundaries – in Korea and Japan, for example – as an ideographic script of the entire widespread and multilingual population of East Asia.

c Chinese writing and architecture

A final observation on the formal connections between architectural and calligraphic expression may be added here. The typical bowing of sloping and cross beams in Oriental buildings is associated with the elasticity of the relatively heavy-laden bamboo trunks of the rafters and ridgepoles. The image of the bowed line becomes a principal feature of the townscape. Chinese writing has, in a certain sense, endorsed this expression, in that all laterally sloping strokes, which are present in the great majority of signs, extending downward, describe a bowed line. The calligraphic brush, invented around 200 B.C., is probably partly responsible for this trend, but the directions of the bowings are not always absolutely "handy." We are therefore inclined to believe in a certain relationship between building style and calligraphy as an expression of culture in Far Eastern scripts, in rather the same way as Gothic script is compared with medieval cathedral styles.

Writing



Bamboo architecture

9. Pre-Columbian American scripts

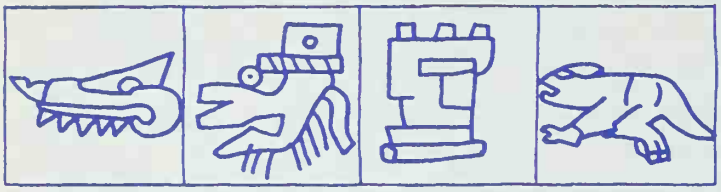
The examples of the script cultures of the New World so far discovered are few in comparison with those of "old Europe" and about 4000 years less ancient.

From the Incas, only the preliminary stages of script formation are known in the form of knotted strings, whereas the Aztecs and the Mayas from the region of present-day Mexico have left fascinating examples of scripts.

The autonomous culture of Central America was suddenly and cruelly interrupted in the course of its development by the conquests of the Spanish colonists. At this time the script was halfway between the pictorial and the phonetic.

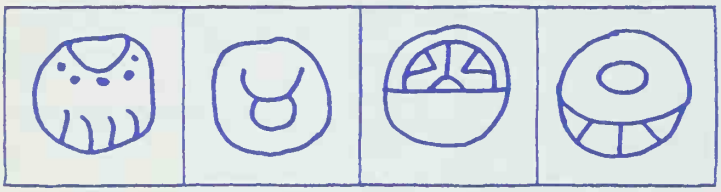
A broad span of speech-recording style is to be observed between the European and the American concepts, corresponding to the great distance between the continents. For this reason decipherment is greatly hindered, since there are practically no possibilities of

comparison. All that can be analyzed with certainty today are the signs for numbers in astrological calendar manuscripts and in the monumental stone inscriptions of the mysterious Maya buildings. In comparing the two



Aztec signs for month names

Imaginative illustration

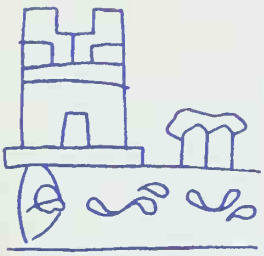


Maya signs for day names

Rounded-off ideograms

cultures of the Aztecs and the Mayas, which are relatively close together in time and place, we are particularly struck by the extent of the difference in sign formation in their scripts. Thus the Aztec way of writing the names of the months features figurative representations of fantastic objects and creatures, while the 18 Maya month signs have a very strong abstraction, easily recognizable from the fact that all the signs are contained within a circular border.

a Aztec pictographic script

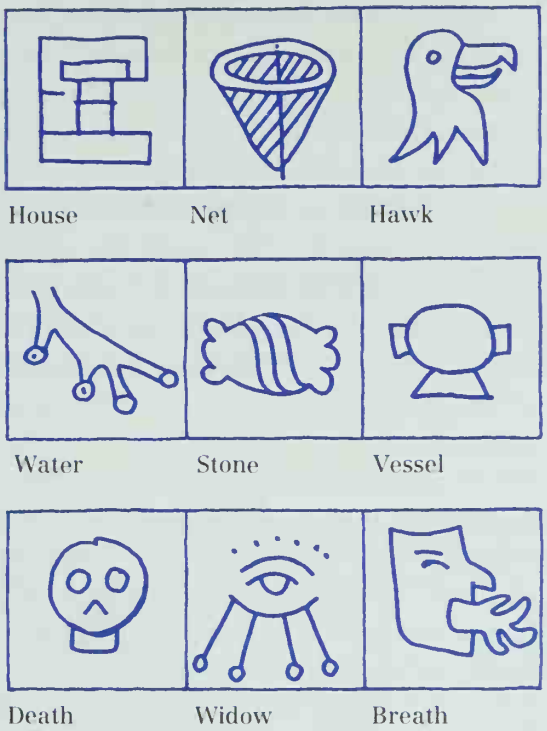


Rebus

The Aztecs used object signs either as simple pictograms or in rebuslike combinations. Such words as "house," "net," and "hawk," are easily recognizable from our own culture; however, the unusual signs for water, stone, and vessel already need an explanation, as do the ideograms for death, widow, and breath.

The rebus for "temple people," on the other hand, assumes a knowledge of the Aztec language. The word is "teocaltitlan," and it is assembled from the following other words: at lower left "te" (lips), then "o" (path, represented by footprints), above these "cal" (house) and "tlan" (teeth).

Aztec pictograms, 1100 A.D. (Seler)



b Maya pictographic script

Speech recording in the Maya culture was probably built up in the same manner, although the strongly abstract signs have led to differences of opinion between experts, since a nonfigurative representation gives occasion for more diverse interpretations. A few simple pictograms should suffice here as examples.

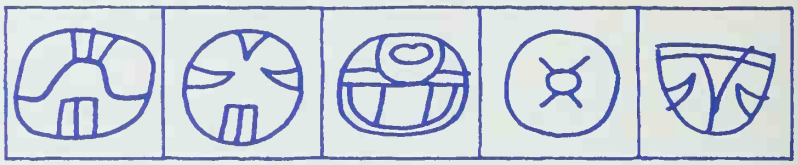
In studying the inscriptions chiseled in relief in stone, one is astonished by the power of imagination and the composition of grouped pictures, the interpretation of which is more than ever a subject of keen concern among experts. Our illustration shows the grouping of a calendar inscription from Copan. In its lower right part, the sign for a day name already illustrated is recognizable. Interpretations of the most varied tendencies are constantly being made in an attempt to establish connections of meaning between the elements of individual sign groups. On the one hand there is the

Where is the solution to the puzzle?

theory of a syllabic script in which the signs have completely lost their pictographic sense; on the other hand, investigations are in progress on the basis of a more complex structuring of this mysterious script culture, where pictures, ideas, and sounds may be mixed in one group sign.

Whether these mysterious witnesses of an alien culture suppressed by Western invasion will ever surrender their secrets remains to be seen. We conclude this chapter on ancient pictographic scripts with this problem of all that still remains open in their interpretation.

Simple ideograms of the Maya script, 1000 A.D. (Beyer)



Fire Death Night Maize Stone

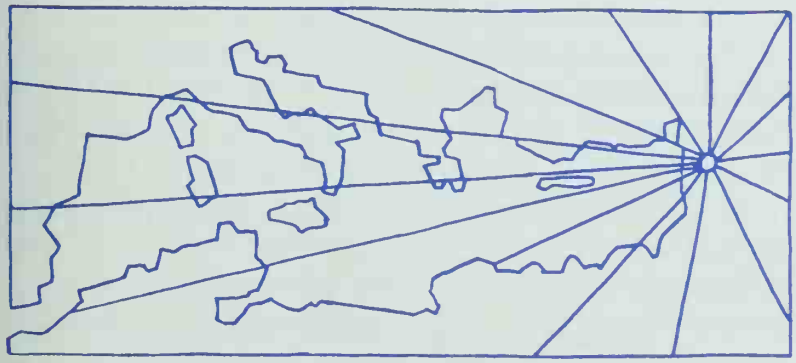
IV. The World's Alphabets

1. Invention and spread of letters

At the end of the second millennium B.C., a large number of writing systems were used in the Near East region to record a wide variety of languages and dialects.

The Phoenicians, a small trading nation, lived at that time on the eastern shores of the Mediterranean, maintaining regular contacts with most parts of the Mediterranean world by land and by sea. This trading activity made it necessary for them to understand many tongues and scripts, so it is not surprising that it was in this country, at this time, that a certain unification or synthesis of scripts was developed. This process involved the inspired innovation of fixing consonants (b, d, g, etc.) for the first time, as the minimum phonetic units instead of combining them into syllabic signs (ba, di, gu, etc.). Thus the Phoenician consonantal signs, which are today generally recognized as the prototypes of all alphabetical scripts, came into existence around the turn of the first millennium.

Our table follows this graphic metamorphosis in the form of a family tree, using the first letter of our alphabet as the example. At the center of the table, as in a melting pot, is the Phoenician sign "aleph," whose origin, as mentioned in the previous chapter, is due to a



Phoenician influence in the Mediterranean zone

crystallization from Egyptian, Sumerian, Cretan, and probably other forms of pictogram and ideogram. It is clear that in the time span of nearly 2000 years (3000 to 1000 B.C.) covered by the upper part of the table, many intermediary steps have been left out, mainly because certain noteworthy stages of development have not yet been discovered. Nevertheless, the complete connection cannot be doubted, since it appears in such an obvious manner.

Within a relatively short time the Phoenician alphabet attained a certain perfection of formation and a reduction to 22 selected sound signs. It is therefore not surprising that this system of writing drove out practically all other systems comparatively quickly. In the course of the first millennium B.C., the alphabet spread, through Aramaic, to become an international means of understanding throughout the Near East, extending into North Africa, Asia Minor, and even as far as India.

Such processes of distribution are known from all kinds of historical developments. Since there were no close and standardizing communications between countries in those times, new and individual sign forms of national character were developed in isolation from one another. In this way, the main branches, remaining to this day, were developed in the early part of the first millennium B.C.: Semitic-Arabic, Indian, and Western scripts, from which the world's alphabets of today are derived (see lower part of table).

In the fixing of Semitic languages, the Phoenician principle of consonant signs was retained, so that Hebrew and Arabic are today written only in consonants, sometimes accompanied by accents or pointing to indicate the vowels (central stem of table).

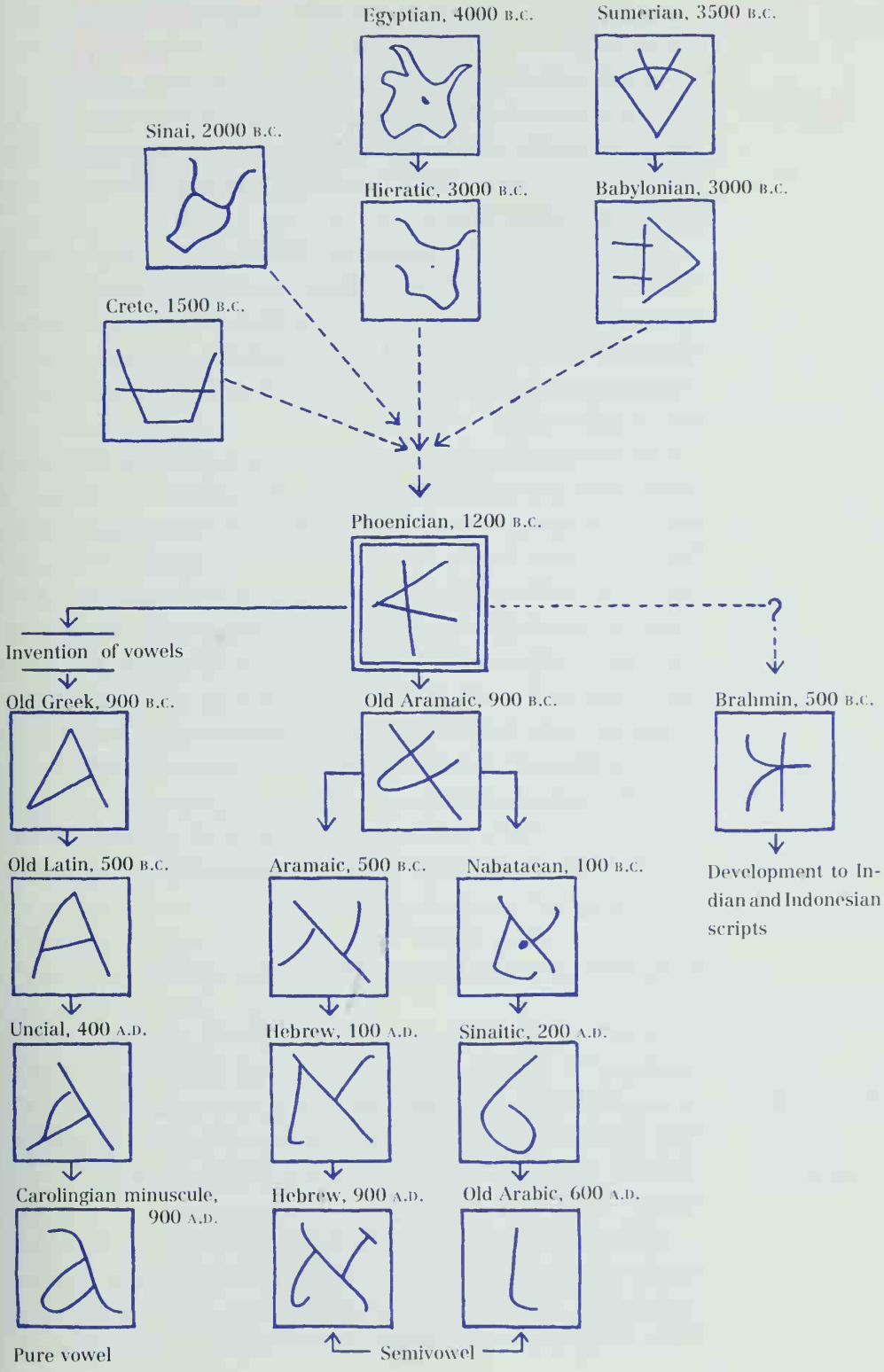
Vocalized scripts

Hebrew
Arabic

Indian and Indonesian languages, despite the probable derivation of their writing from the Phoenician, have retained a complicated syllabic principle that cannot be explained here because of lack of space.

In the development of Western scripts (left-hand stem of table) another important factor comes in. The Hellenes found it necessary to develop further the imprecise vowel fixing of the Phoenicians, which was adequate for Semitic languages but not for the writing of

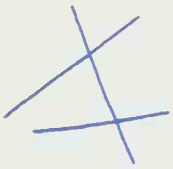
Graphic summary of the development of the phonetic sign A



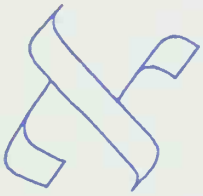
the highly inflected old Greek language. It is assumed that A and E are derived from the aspirated sounds "ha" and "he," I from the sibilant sound "j," O from the difficult glottal "ain" sound, and U from the "W" sound.

This invention of vowel signs may be regarded as one of the most important stages in the development of speech fixing and it opened the way to elevating the Latin script to become an internationally unifying means of communication.

The "family tree" table has deliberately been drawn with uniformly neutral strokes, the better to express its basic formal connections, but it should be emphasized that the actual styles of the different language signs were greatly influenced by the writing instruments and materials used.



Stylus



Pen

Brush

In Phoenician and the older forms of Greek and Latin scripts one can still see traces of the monumental, while in later versions the fluency of the writing hand has more and more influence on form. It is also noticeable that in the earliest signs the use of the stylus is still evident, while the broad-nibbed pen brings about new and clear forms in Hebrew and Latin. (Hebrew signs do not include any circular movements, prompting the question as to how far the character of cuneiform lives on in it through the assembly of signs exclusively from straight-line shapes.)

Arabic scripts include an element of closed curvature that can be ascribed to the earlier use of a writing brush.

2. A summary of the world's script groups

In order to provide a clear overview of the world's scripts, we have indicated in broad outline the main forms used on a world map. Only the most characteristic version of each script family is shown; otherwise 15 different alphabets still in use would have had to be shown for India alone.

Scripts have always been among the most important carriers of culture. Religion, even more than trade, law, or science, was the main user of script, and priests have often monopolized the art of writing as a sacred activ-

ity. For this reason, a corresponding religion can be broadly associated with each of the script cultures shown, as the medium of its expression in the past and still today to a certain extent.

At the geographical center, the birthplace of alphabets, stands quadratic Hebrew, which has scarcely altered at all during *3000 years* of devoted maintenance of the Jewish tradition.

To the northwest are the Greek and Latin cultures from which Christianity proceeded, with branches into Eastern Orthodoxy (Cyrillic scripts) and, above all, in the directions of the Catholic and Reformed faiths, which cover more than half the world and formed scripts derived from Roman capitals, up to the Renaissance minuscule.

To the south and east it was the Mohammedan faith of Islam that spread the Arabic form of writing over North Africa and Asia Minor and as far as the foothills of the Himalayas.

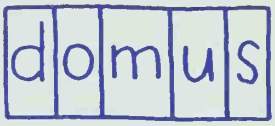
In northern India a completely independent script, Devanagari, became the sacred expression of the Hindu faith and is today the official national script of India.

Around 500 B.C., in the same region, the Buddhist faith appeared beside the ancient Hindu system, spreading mainly toward the southeast and bringing into existence the scripts, derived from Devanagari, of the Pali languages of Indonesia.

It can easily be seen from our map that the Western development of script (Latin) has clearly recognizable individual forms, the reason for which is the inclusion of vowel signs, an ever more important aid to recognition and speed in reading.

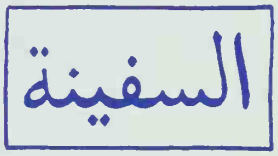
In southern scripts, vocalization by means of diacritical signs (accents) ensures that writing retains its flow. A comparison also makes it immediately apparent that the clear division of single letters in European scripts made it possible to use techniques of reproduction for the intensive development of printing types, whereas in the southeast the use of handwriting is still fully retained. This presents one of the main difficulties in adapting Oriental scripts to modern methods of typesetting.

Single character setting



Western style

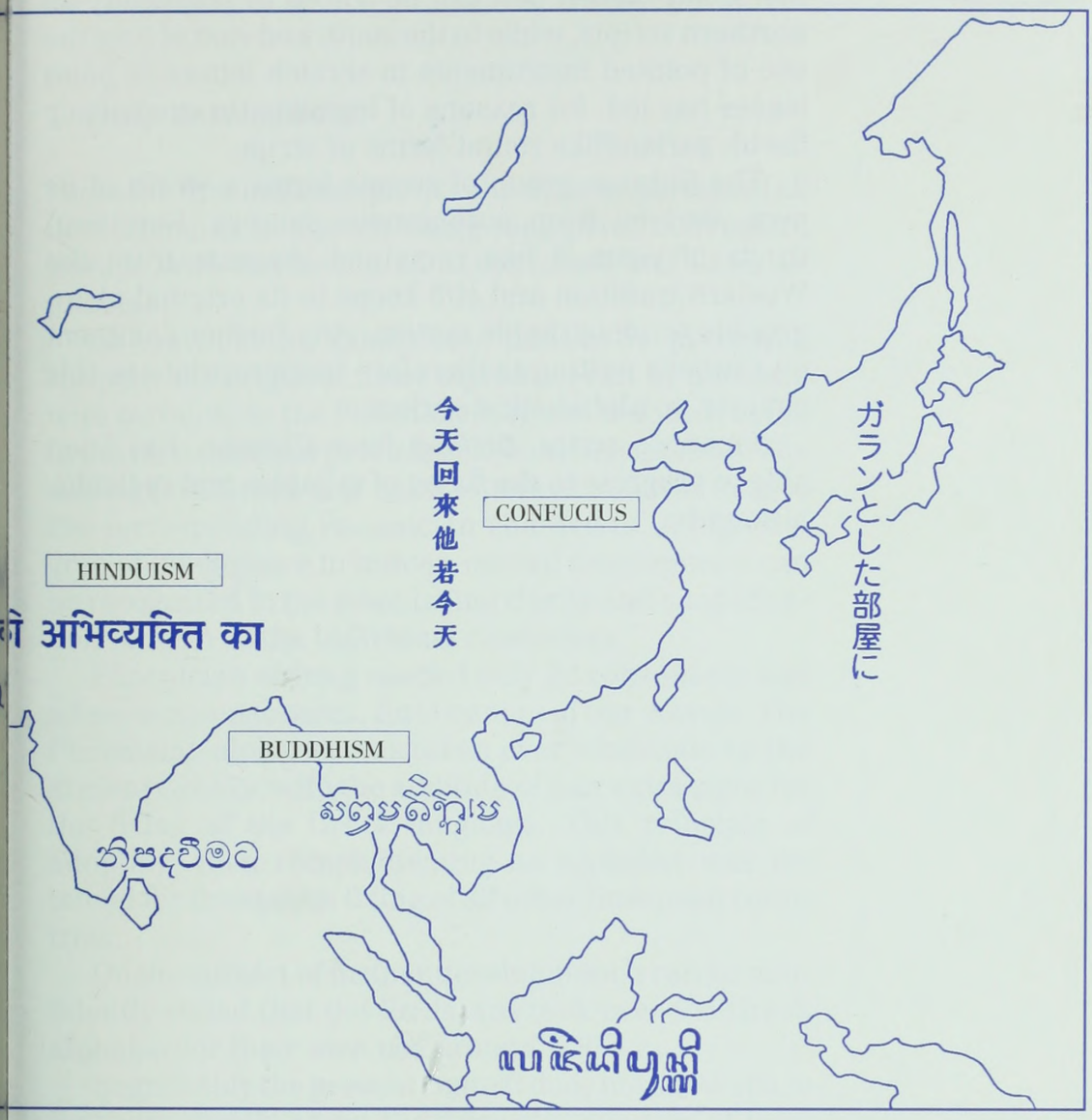
Oriental style



Joined up

Religions as main carriers of the world's script cultures

The scripts illustrated show the principal forms of alphabet of the script cultures of today


HINDUISM
अभिव्यक्ति का
今天回來他若今天
CONFUCIUS
ガランとした部屋に
BUDDHISM
සත්‍යමේවජයතේ
නිපදවීමට
ᨿᨾᩣᨾᩣᨿᨾᩣᨿᨾᩣᨿ

With regard to the techniques of writing instruments, it may once again be observed that the use of the broad-nibbed pen can be traced in practically all northern scripts, while in the south and east of Asia the use of pointed instruments to scratch letters in palm leaves has led, for reasons of legibility, to excessively florid, garlandlike round forms of script.

The Chinese group of scripts forms a world of its own, derived from autonomous sources. For thousands of years it has remained separate from the Western tradition and still keeps to its original pictographic or ideographic system. Any further comment on Chinese writing is therefore inappropriate to this chapter on alphabetical scripts.

Japanese script, derived from Chinese, has been able to progress to the fixing of syllables and individual sounds.

V. The ABC of the Western World

1. Early development

From the first millennium B.C., the most important of all developments in speech fixing took place in Western Europe with the formation of the Greek and Latin alphabets.

As shown in the "family tree" table in the preceding chapter, the origin of these alphabets can be ascribed with certainty to the Phoenician, which is shown in full in the next table (large letters enclosed in squares). The subsequent Greek and Latin letters are shown next to the corresponding Phoenician characters. A high degree of intelligence in human mental development can be recognized in the astonishing clarity and simplification of form of the individual characters.

Phoenician writing needed only 22 consonants and a few semiconsonants, forerunners of our vowels. The Phoenician alphabet was taken over wholesale by the ancient Greeks, with the addition of four extra signs for the fixing of the Greek language. This principle of adopting, then complementing an alphabet was retained for the speech fixing of all other European countries.

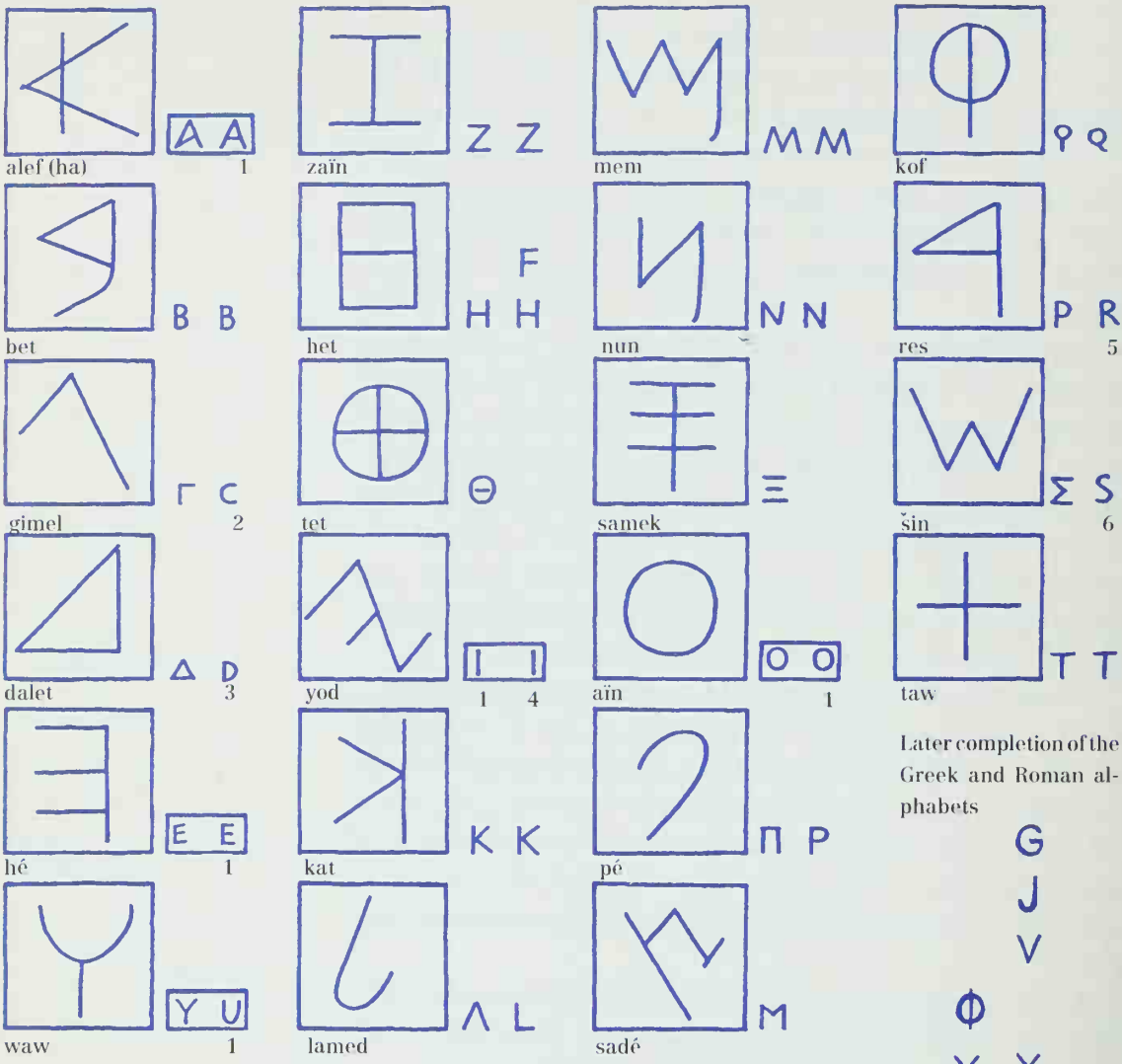
On the subject of further development it can be confidently stated that the Etruscans took over the Greek alphabet for their own use around 500 B.C.

Regrettably the present context does not allow space for more details about the linguistic nuances of local sign formation, although it would be very interesting to see. For example, how Λ became L, Γ became C and Σ became S; or how two O signs were not needed for Latin, so that the omega sign Ω was "undeveloped" to make an extra consonant.

In this connection, interested readers are referred to two comprehensive linguistic works in German: *Die Schrift in Vergangenheit und Gegenwart* by H. Jensen (Berlin, 1958) and *Geschichte der Schrift* by Johannes

Origin of the ABC in the Phoenician alphabet (1200 B.C.)

The corresponding Greek and Roman letters are shown next to the Phoenician signs



Later completion of the Greek and Roman alphabets

G
J
V
Φ
X X
Ψ
Ω W

1 The five principal vowel signs

2 From the Corinthian <

3 From the Corinthian D

4 In Old Greek ϟ ʅ

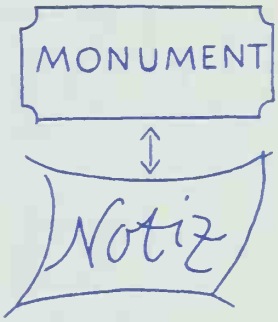
5 In Old Greek P is already written as R

6 From the Etruscan ϵ ϟ ϟ

Friedrich (Heidelberg, 1966). Nor can we give further details about the development of individual letters, since our graphic subject matter would become overloaded with considerations of social history and linguistics.

2. Capitals and small letters

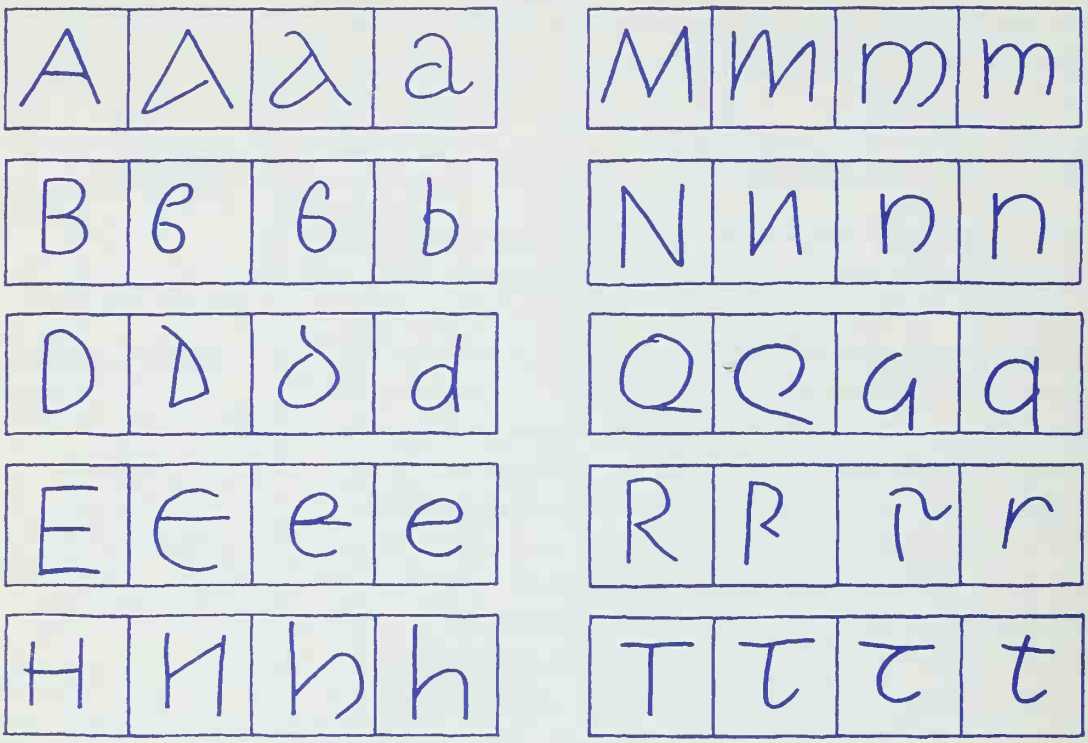
All over the world and at all times there have been two basic forms of expression in the usage of script. On the one hand is the monumental style used on rock walls, on palaces, and also on traffic signs; on the other there is the current, handwritten form used in notices, in correspondence, and in chancellery records, etc.



It was always necessary to produce these two kinds of writing with basically different instruments on different kinds of material, with the result that their forms have correspondingly remained different. Capital or monumental writing has kept to its original form because of the permanence of its material, chiefly stone; current or cursive writing has greatly altered through the centuries because of the constant use of more ephemeral materials such as wax tablets and paper.

a The transition from capitals to small letters

Before embarking on the subject of the various writing instruments and methods of duplication it seems important to us to show a table of the various stages of development of typical letters in simplified stroke form, in order to gain a better idea of the governing movements of the hand as a basic consideration. In the table, the reader can follow the process of development from capitals to small letters. The main point that this table illustrates is the transformation of the monumental straight lines to curves, with the simplification of the hand movements and through more rapid writing. Typical examples are the pairs A a, E e, m m, T t. Another important characteristic is the creation of ascenders and descenders, indispensable for the clear identification of simplified small letter forms. It is only the ascenders and descenders that distinguish b d p q, or h and n.



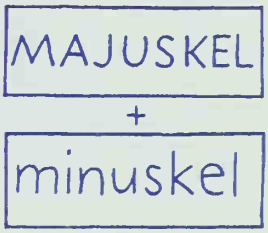
How small letters were developed from capitals through more fluent writing

From the comparison of the capitals and small letters of the Western alphabet, which today serves as the basis for most European languages, it can be clearly seen that the purely Latin letters have generally undergone a major transformation in their development from one to the other (see A a, B b, D d, E e, etc.). In other, later stages of speech fixing for English, German, etc., new signs were taken over directly from their monumental forms in the Greek and Latin alphabets and have therefore not undergone the historical process of reduction to minuscules. Thus the letters K k, W w, and Y y have virtually retained their capital-letter

Not all capitals have produced small letters

form unaltered. The same applies to X x and Z z, seldom used in Latin; U and V were practically interchangeable. It follows from these considerations that oblique movements were transformed into curves and straight lines by the natural tendency to flowing in handwriting (see A a, M m, N n), a process that has not been applied to the later "added-on" letters.

Another point needs to be emphasized in connection with the subject of large and small letters. Although Western speech fixing has theoretically taken place with *one* alphabet of 26 sound signs, to which specific accents and ligatures have been added to suit the language concerned, it is noteworthy that the original form of capital letters has not been driven out by minuscules. On the contrary, they have coexisted since the Middle Ages. Today writers have, so to speak, *two* alphabets at their disposal: capitals, which express something elevated with their majestic appearance in architectural inscriptions, headings, or writing out of proper names, and minuscules or small letters, which have become the vehicle used for written exchanges of every kind and in the broadest sense. It seems to us an enrichment of the highest value to be able to call upon capitals and small letters for written expression. Attempts to reduce the alphabet to the lowercase alone (mainly in Germany) bring such an impoverishment that we oppose the movement most decisively.



Ceremonial - everyday

b Toward a theory of reduced hand movements

The appearance of our letters has been transformed, in printing and in writing, from stiff Roman capitals to a supple and flowing minuscule. As already mentioned, this has been achieved through the simplification of hand movements in rapid calligraphy or handwriting. A desire for a clearer understanding of this reduction has prompted us to attempt to draw up a theory to illuminate this somewhat opaque phenomenon rather better.

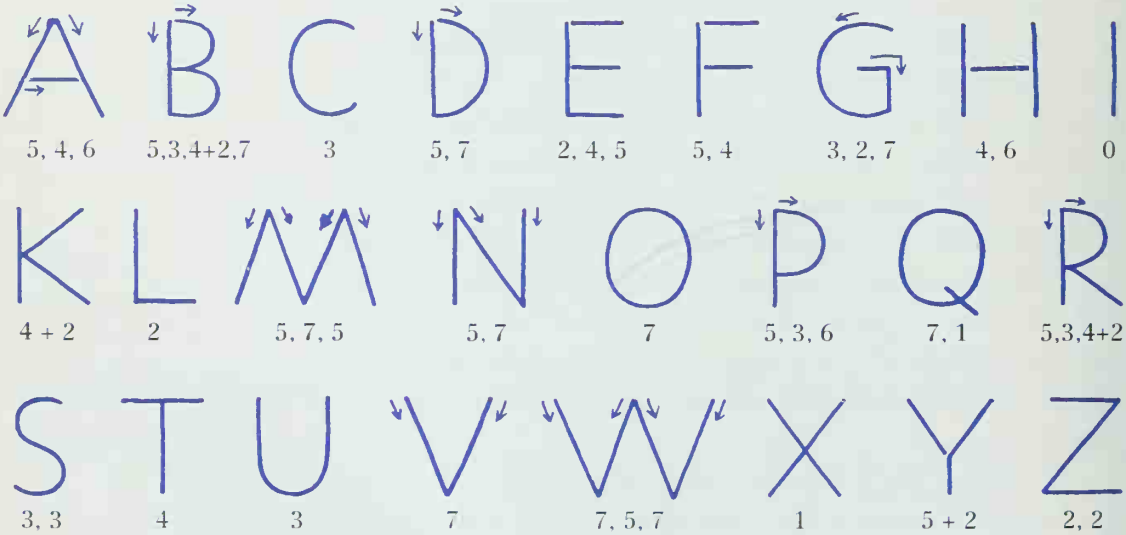
In Part 1, "Sign Recognition, Sign Design," we drew up a classification of the numbers of hand movements

required to draw given types of sign. Transferring this approach to letterforms, we find the following degrees of difficulty: 1, simple crossing; 2, right-angle change of direction; 3, curved change of direction; 4, welding in middle of stroke; 5, welding of two stroke endings; 6, welding at one end of stroke; 7, meeting of stroke beginning and ending.

1 2 3 4 5 6 7

Every sign of an inscriptional capital letter alphabet is produced by means of a given assembly of a given number of prescribed hand movements. In writing the letters, the rule applies that the strokes may only be *drawn*, as though with a pen, which does not permit any pushing movements.

Under each letter in the illustrations we give the numbers of the movements used. Thus the capital A consists of two oblique strokes welded together at the top (5) and a cross stroke to be placed between the two oblique strokes with degree 4 of difficulty at the left and degree 6 at the right. By this method, each letter is giv-

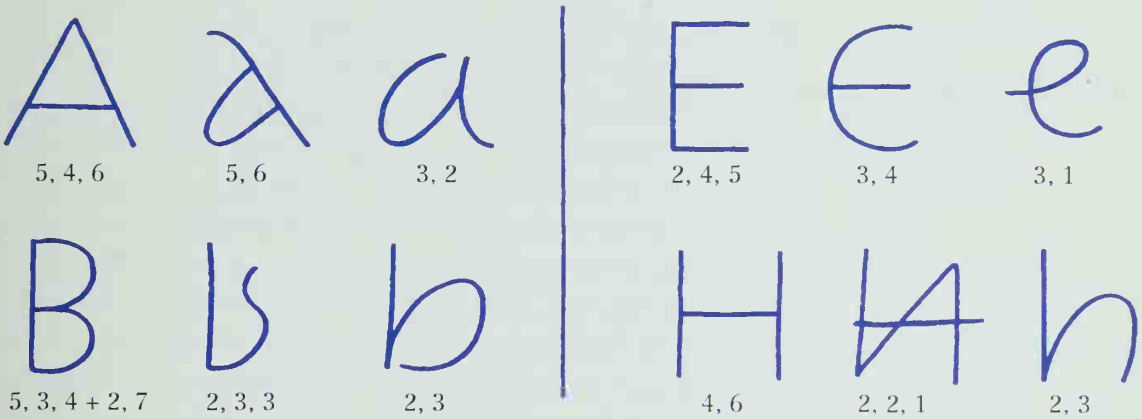


en a series of numbers that, when added together, express a level of difficulty in writing.

Returning to the subject of the reduction of hand movements, the comparison of capitals and small letters shows that the intermediary form of semiminuscules and especially the final form of minuscules have greatly reduced difficulty levels.

Thus the total of 15 for capital A goes down to 5 for the small handwritten a. Even more striking is the reduction of B from 21 to 5 for small b.

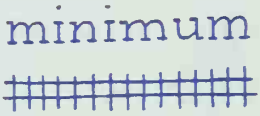
We realize that this attempt at a theory is incomplete, but it is given here only as an indication for a better understanding of a problem that is in any case difficult to express in verbal form.



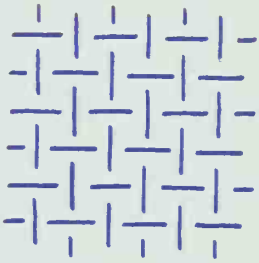
VI. Development of Form through Writing and Printing Techniques

We have divided the story of the development of Western script into two separate sections. The preceding chapters have already explained the progress from pictograms to the basic alphabetical signs. We now turn to the consideration of writing and printing methods. The use of a wide variety of materials and techniques may not have brought any fundamental changes to the forms of letters, but it has given them a new appearance and a new style in every epoch.

The first point to note is that with the progressive use of script in larger quantities the individual signs of a common alphabet have undergone a process of adaptation or equalization, giving a cohesive expression to words, lines, and pages. This coming together of individual letterforms does not necessarily lead to a loss of legibility, since a practiced reader does not spell out a text letter by letter but takes in word images and even whole phrases at a glance. The lining-up of script signs therefore becomes a kind of textile, in which matter and space, or thread and mesh, form a legible "fabric." On the basis of this comparison we have divided this chapter on text script into two parts corresponding to thread and mesh, i.e., into the black of the stroke formation and the white of the intermediary space.



Equalization process of small letters

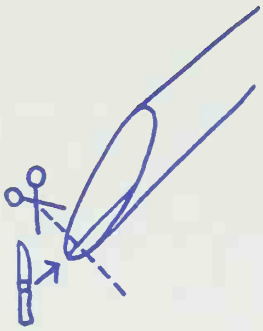


"Fabric" is made from thread and mesh

1. Black stroke formation

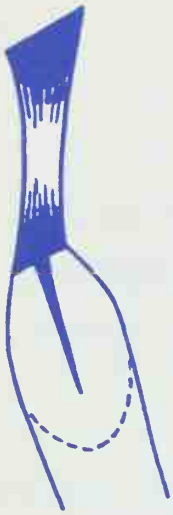
a Calligraphy

The use of a variety of writing instruments in association with different materials such as papyrus and parchment has determined the aesthetic standards of each kind of script.



Hollow pen (quill)

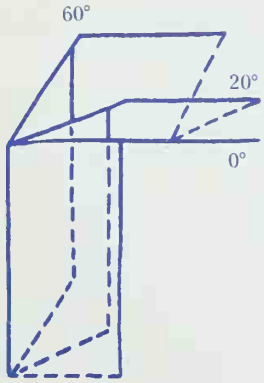
One of the favorite writing instruments of all time has been the hollow pen, which found widespread use because of its attractive qualities for the scribe and has remained the most important tool of calligraphy for more than two thousand years. It is therefore understandable that such a long-lasting use of an instrument has strongly marked the development of letterforms with its own qualities. Hollow pens have been made from reeds, but as the more usual name of "quill pen" implies, they have more often been cut from the feathers of poultry (geese). The quill is obliquely cut, the resulting point being split lengthwise and the apex cut across for reasons of stability. This produced an instrument enabling the scribe to write more quickly, since the hollow tube formed a reservoir that substantially reduced the frequency of dipping the pen in the inkpot. Furthermore, the taut softness of the nib had the attraction of allowing a greater or lesser amount of ink to flow through its slit onto the paper as a result of stronger or weaker pressure. This controlled flow of ink made it possible to thicken and point the upper and lower stroke endings, thereby emphasizing the alignment of letters into a line of script.



Variation of stroke thickness

It is well known that the beauty of a page of calligraphy mainly consists in this repeated "weaving" of the script.

Another and even more important means of stroke-ending formation is obtained by the positioning of the pen. Cutting the end of the nib gives the pen the capacity to draw strokes of different thickness, depending on the extent to which it is turned. Individual handling of the broad strokes has provided the means for a deliberately contemporary expression in every age.



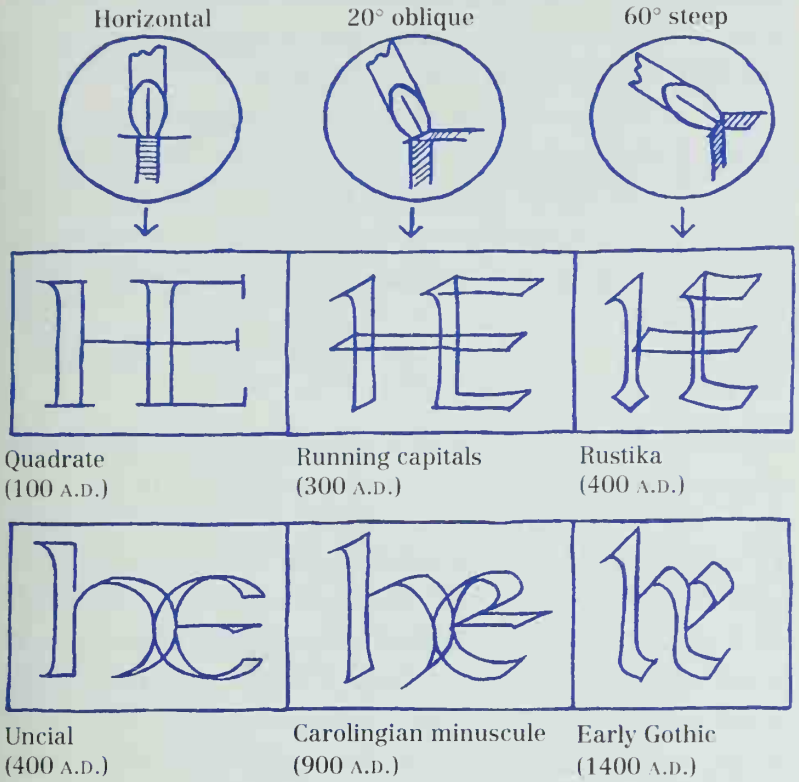
Angles of quill pen

Our illustration of this point clearly shows the variations of script style associated with different angles of the pen.

(The HE monogram used in the examples has been deliberately chosen in order to establish a comparable association of form with the candlestick sign used at the end of Part 1. The monogram only has to be turned through a quarter-circle to the left to show the candlestick.)

Horizontal pen position

In the times of early Roman calligraphy the positioning of the pen was still rather formal, being held more or



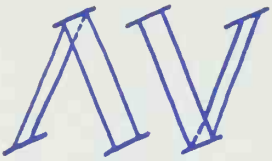
less horizontally, as shown in the illustration. This position gives the script a broad form of construction in which the maximum width of the nib draws the verticals and its minimum edge draws the fine horizontals and serifs.

The same horizontal positioning of the pen is to be found again in the early uncial scripts, whose rounded forms, in association with the appearance of ascenders and descenders, already point toward minuscule forms.

Oblique pen position

A positioning better suited to the writing hand is the angle of about 20°, which also leads to the forms of ordinary handwriting. The middle row of the illustration shows the semicursive Roman capitals that have the stroke proportions regarded as "normal" by the human eye. The vertical is thicker than the horizontal, while

Typical writing angle



Upstroke light, downstroke heavy still applies

the hairlines or bridging strokes are oblique and occur only in the rounded forms. The oblique upstrokes are thin, whereas the oblique downstrokes carry the full width of the nib. This typical style of expression has been retained to this day as the norm in all printing types for letters such as A, K, V, and W.

In the center of the lower row is an example of Carolingian minuscule, which has the same positioning of the pen and obeys the same rules concerning stroke thickness. A characteristic feature is that the oblique positioning of the pen tends to give the letters a narrower form.

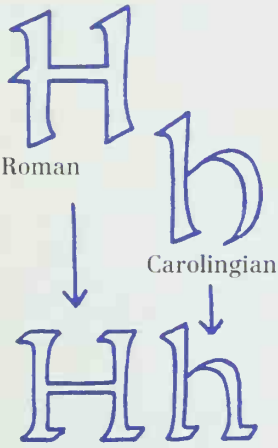
Rustika

Steep pen position

Curiously enough, we find a tendency to an unusually steep positioning of the pen at the end of two of the most important cultural epochs of our civilization. In the upper example, capital letters toward the end of the Roman Empire take on the "Rustika" style. The emphasis on the expression of the line of script obtained, as already mentioned, by thickened and pointed stroke endings, has the effect of decorating the letters in the interests of ornamentation rather than maximum legibility.

Gothic Textura

Script underwent a similar change in the development of the Gothic minuscule during the Middle Ages, when the positioning of the pen likewise became steeper and the upper and lower stroke endings were even more strongly emphasized. This way of writing gave a very beautiful texture to the written pages, in which one can recognize the mystical aspect of the use of writing for religious purposes.



Roman

Carolingian

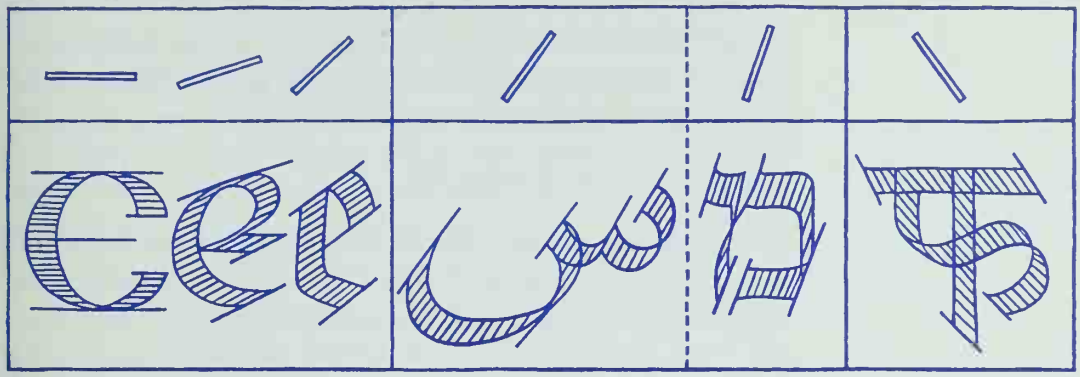
Humanistic

The humanists of the Renaissance returned to the two kinds of script shown in the center of our illustration for the production of a Latin style of script with a "natural" positioning of the pen. The styles taken as models were the Carolingian minuscule, from which humanistic minuscule is directly derived, and the semicursive Roman capital letter forms, which are still in full use today in their original style.

b Pen positioning in other linguistic sectors

In the context of the question of pen positioning it is a natural step to take a look beyond the boundaries of Ro-

Pen positioning in different script cultures



Latin, from capitals to minuscules Arabic Hebrew Indian

man letterforms to those of other linguistic families. Our next illustration shows varieties of script using different pen positioning. At the left are the three groups of Latin calligraphy already mentioned, starting with the horizontal pen position, then the 20° angle now regarded as the norm, and finally the somewhat decadent-seeming steep angle of Gothic lettering.

In the middle of the illustration are two characters from the Semitic languages of the Near East: at left an Arabic character with quite a steep pen position and next to it a Hebrew letter, where the almost vertical inclination of the fine upstroke accounts for the strongly horizontal impression of quadratic Hebrew script.

At the right of the illustration is a character from the Devanagari script of India, written with a positioning of the writing instrument that is almost exactly opposite to our own. Here all the fine transfers of the curves are on a NW-SE axis. This manner of writing is due to the use of reed and bamboo instruments, the stability of which allows a pushing as well as a drawing movement, but no modulation of stroke through change of pressure as is the case with the flexible quill pen. It must be added that the Semitic scripts of the central group are written from right to left, while both the Western and the Indian scripts move from left to right. Arabic scripts are

built up mainly from widely swinging pushing movements, almost invariably rounded at the base. Contrary to that of Arabic, Hebrew calligraphy largely uses drawing movements, even though the characters are aligned from right to left.

This presentation of the writing techniques of various script cultures is only intended to be an indication, since a more detailed study would go far beyond the boundaries of the present work.

c *Engraving and printing*

In the course of the 15th and 16th centuries, calligraphy yielded a large part of its influence on letter formation to Gutenberg's newly invented technique of printing. (We deliberately pass over the progression from Gothic to black-letter and chancellery scripts in order to avoid interrupting the story of the development of Roman letters, today's world standard.) Our illustration enables the results of the various printing processes to be recognized.

Punch-cutting for letterpress

Letterpress is the technique of the raised printing surface, as invented by Gutenberg. The letterforms are cut in relief on the polished end of a steel punch. After hardening, the punch is struck into a block of copper to form a matrix, from which relief printing types are cast. This process calls for a resistant design of the letters. In punch cutting a large amount of material must be taken out, in matrix stamping the details of the engraving must be supported by a strong material base, and in printing the use of ink and rough, dampened paper led to the formation of a powerful image which was unsharp in its details. From this period of early printing in the 16th century we have inherited the very robust, clearly formed typefaces known as Elseviers or Old Style, which have been taken as models for the most widely used typefaces of today.

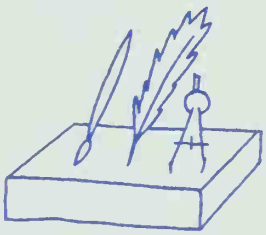
Copper engraving

Gravure or *intaglio* printing is shown in the center of the illustration. In the 18th century the technique of copperplate engraving, i.e., printing from characters below the surface of the plate, had a determining effect on letterforms. The letters were cut into a highly polished copper plate *in depth*. The ink was applied to the

plate and the surface wiped clean, so that ink remained in the hollows. Under heavy pressure, dampened paper picked up the ink from the engraved letters to reproduce their forms.

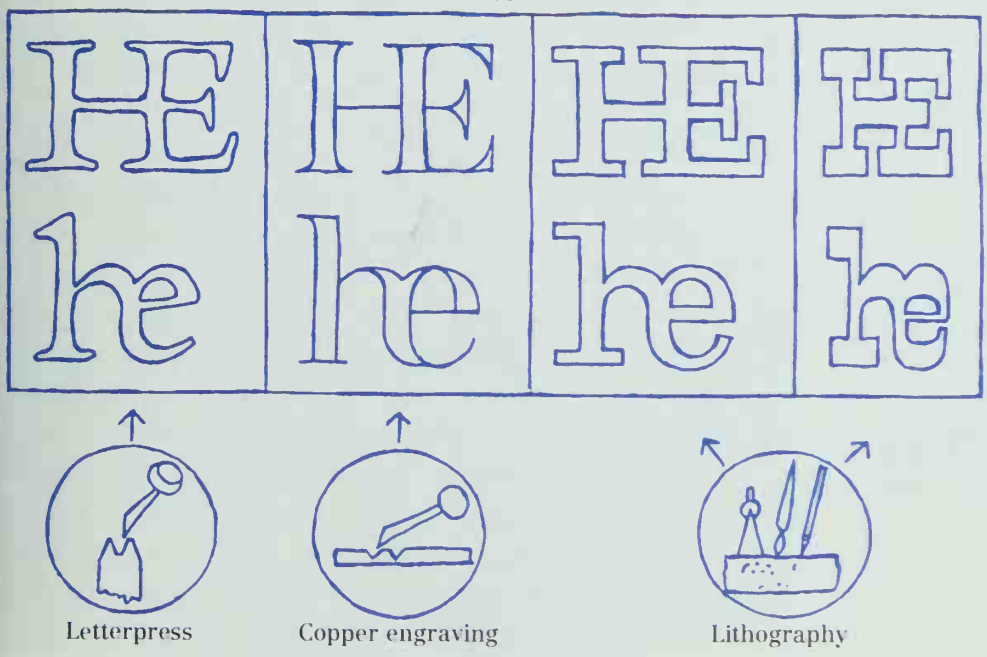
Those who are familiar with this technique will easily see how it led to a considerable alteration of typeface style at that time – as can be seen from the typefaces of Bodoni, Walbaum, Diddot, etc. The technique of copper engraving encouraged the artist to produce very fine hairlines and projections. The increased contrast between very fine bridging strokes and heavy downstrokes gave the letters an appearance which is still in use today under the name of Didonic or Modern.

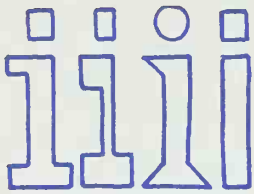
Lithography (at right of illustration) is a printing technique, that was developed at the end of the 18th century. The polished surface of a slab of limestone freed artists from the engraving tool and file, allowing them to use the brush, pen, ruler, and compasses or even to draw completely freehand. The drawing made on the stone with fatty ink was chemically fixed, so that prints could be taken from it in accordance with the well-known principle of water-repellent printing ink.



Lithography

Printing techniques and their influence on type forms





Liberation of form through new techniques

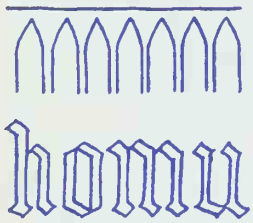
It is easy to see that this revolutionary technique created a completely new situation for type design. Liberation from the engraving tool inevitably brought innovation to the style of lettering. Serifs and bridging strokes were thickened at will, producing the "slab-serif" (Egyptian and Clarendon) type styles, the triangular serifs of typical Roman alphabets, and also sans-serif typefaces, whose origin lies in the development of lithography.

The influence of 19th century lithography on the development of letterpress typefaces is clear. The type libraries of the foundries became much richer as type design experienced a liberation, which in many cases went so far as a certain degeneration. We will return to this development in more detail in Chapter VII, section 2, "Deviations from the basic forms."

2. Interior white space

a Architecture and script

Romanesque

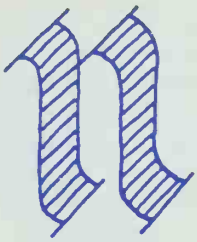


Gothic

Script forms are often compared with styles of architecture and we agree that the spirit and intellectual climate of each age find expression both in the corresponding style of building and in the lettering style of manuscripts and subsequently of printed books. The history of script development is in a certain sense a "graphology" of past cultures, but only when seen from a considerable distance in time, and we must beware of oversimplifications and superficial comparisons in this respect. Nevertheless it is striking to see how, for example, the concept of the rounded arch and its appearance in Romanesque or Norman architecture closely corresponds to the tendency toward rounding in practically all the letters of the contemporaneous uncial alphabet.

Nor can we ignore the fact that the narrowing down to the Gothic or Perpendicular style of building, with the introduction of the pointed arch, shows astonishing similarities to the lettering style of the same era, the Middle Ages. This narrowing tendency in masonry may

be ascribed to both economic and religious factors. The pillars became finer, bringing a reduction of the mass of stone, so that by the logic of static laws the rounded and strongly spread arches of the Romanesque gave way to the narrower and more stable, pointed vaulting of the Gothic style. A spirit of rivalry between cities and countries stimulated an ambition to build ever higher church towers, encouraging the master masons to carry out the most daring projects, which have come down to us in the cathedrals of the Middle Ages.



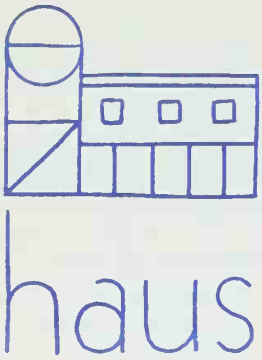
Steep pen position leads to narrowing and pointed curves

Similar motives can be found for the development of script styles in Gothic times. It seems probable that calligraphers tried to make the maximum use of the costly parchment used as the writing material, by narrowing the letters. The easiest way to condense a quill-pen script is to turn the pen to a steeper angle of contact, so that the verticals become thinner, while the bridging lines and starting and finishing strokes inevitably become pointed.

In addition to these more technical aspects, there was the attitude of mind which held both the cathedrals and the holy writings to be not merely objects of use but, to a certain extent, the expression of a cult, as it were, a connecting link between the here and the hereafter. From this point of view, considerations of the functionality of the building and the legibility of the script played a secondary part; the center stage was occupied by an appreciation of space based on spirituality and ceremony and a highly ornamental style of lettering.

The Renaissance

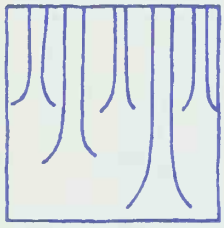
A further and even more significant example of a parallel between architecture and script is shown by the Renaissance style, in which the rebirth of Greco-Roman styles in architecture may be compared with the revival of roman capital letters and Carolingian minuscule. During this era, in the 16th century, the humanists broke up the framework of strict religious dogmatism. Script was "deconsecrated" through its use by the early printers for the dissemination of nonreligious literature. This led to the establishment of the first roman typefaces, which have survived the centuries to form the basis of our Western style of script.



The new functionalism

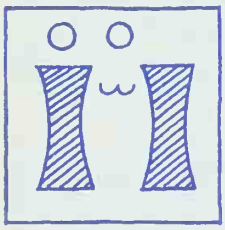
Similarities between styles of architecture and lettering can be followed in periods after the revolution of form produced by the Renaissance – if not in the design of basic forms, where A a, B b, etc., have become fixed communication codes, at least in their outward appearance, the "clothing" of the letters. The reader may compare, for example, the refined architectural style of the 18th century with the "Modern" typefaces of the period (Didot, Bodoni) or consider the *Jugendstil* of around 1900, which produced identical effects in building and lettering styles.

During the 20th century, this identity of style has become a *conscious* search for uniformity, as, for example, in the 1930s, when both architectural and lettering styles were subject to the "new functionalism." Pure geometry took precedence over freehand: all straight lines were drawn with a ruler and all curves with the compasses.



Forest space

The structural comparison of architecture and script makes it possible to illustrate the mentality of an era more clearly or, we may say, to experience it more intensively in *spatial* terms.



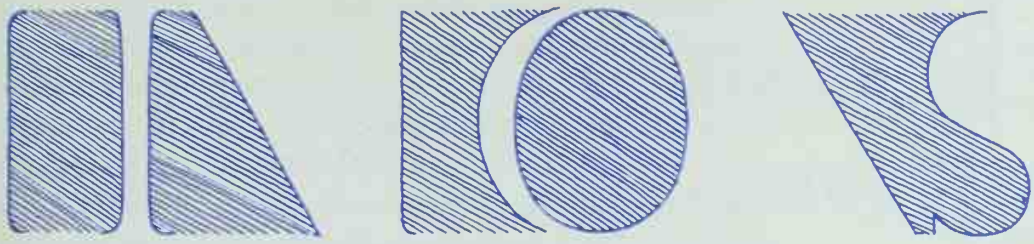
Matter and space

b Space

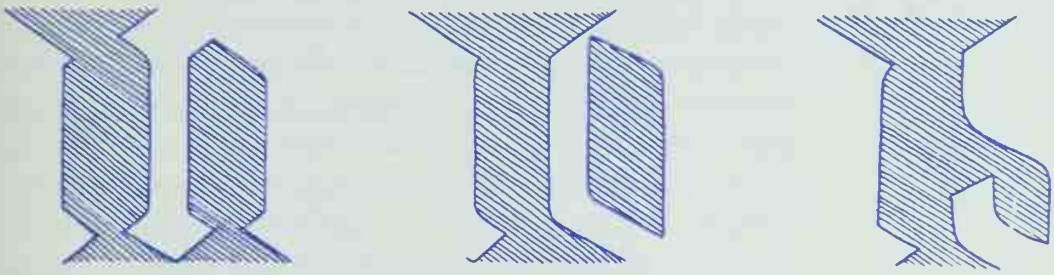
From architecture we learn that graphic expression is also composed of two main elements: (1) the material (stone, wood, etc.), in our case compared with the black pen stroke, and (2) the spatial element, which in architecture is that which is actually *used*, but in the graphic field is usually given less attention.

In this kind of approach to the question of matter and space we are again faced with the dualism of black and white, form-producing and form-containing. In connection with consideration of the thickened stroke endings (serifs) we arrive at comparisons with deeply implanted images from nature, for example, that of a forest, where the tree trunks, with their swelling bases like living, slightly concave pillars, create the essential quality of the forest interior.

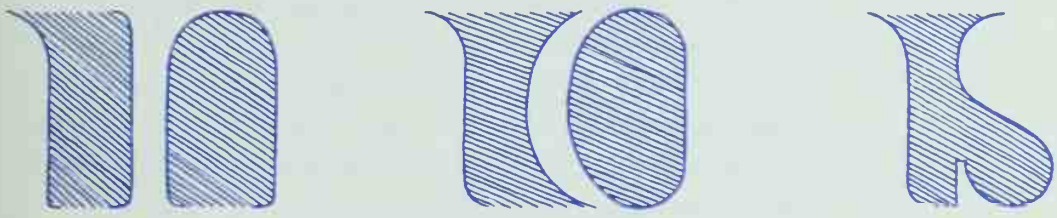
Interior spacing from three major eras of script



The monumental in Roman capital letters

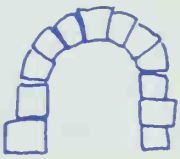


Vertically stressed equalization in the "mesh" of Gothic



Standardization of forms for maximum legibility in modern text typefaces

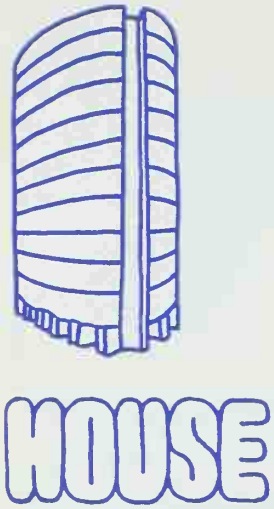
With a greater effort of the imagination we may find a comparison with concave letter strokes, which bring convex "feminine" forms into appearance between the "masculine" elements.



Form through material

In a reversal of the normal visual impression, the intermediary and interior spaces of a script appear like sculptural figures, whose character determines its rhythm and style.

In our illustration, the interior spaces or "counters" of the same letters are shown in the three styles men-



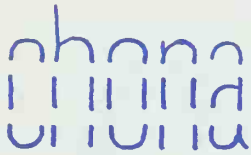
Liberation of form through new materials

tioned as of importance in the development of our script. First are the strong geometrical contrasts of Roman capital letters (right angle, triangle, circle); then come the uniform spaces of Gothic black-letter, which change every curved or oblique movement throughout the alphabet into a straight "mesh." As a logical result, so to speak, of this historical progression, the series is completed by the Renaissance script, developed to a state of mature legibility, with balanced proportions of spacing that have been polished to create the legibility standard of today.

This illustration may prompt the reader to take the same point of view in the observation of other artistic creations, not only script, for the judgment becomes keener with experience. Returning to the subject of architecture, it can be said that it is the space between the walls, windows, and pillars that determines quality. The noblest marble can hardly bring beauty to carelessly proportioned space, while rough wooden beams may well enclose outstandingly comfortable arrangements of space. *Art does not lie in the materials but in the spaces in between.*

Well-used material is often an aid to finding the correct proportions for the space concerned. That is why the products of old techniques, such as wood and stone, quill pen and steel punch, can be beautiful and correct in form, because they lie within the limits imposed by the material.

Nowadays materials like concrete, steel, glass, and plastics – or in the graphic sector, phototype and offset printing – offer "unlimited" possibilities of expression. It is this universal "liberation" that forms the crux of all the creative difficulties of our century. Basically, we are all seeking new "boundaries" within which we can construct, in order to avoid living in a vacuum.

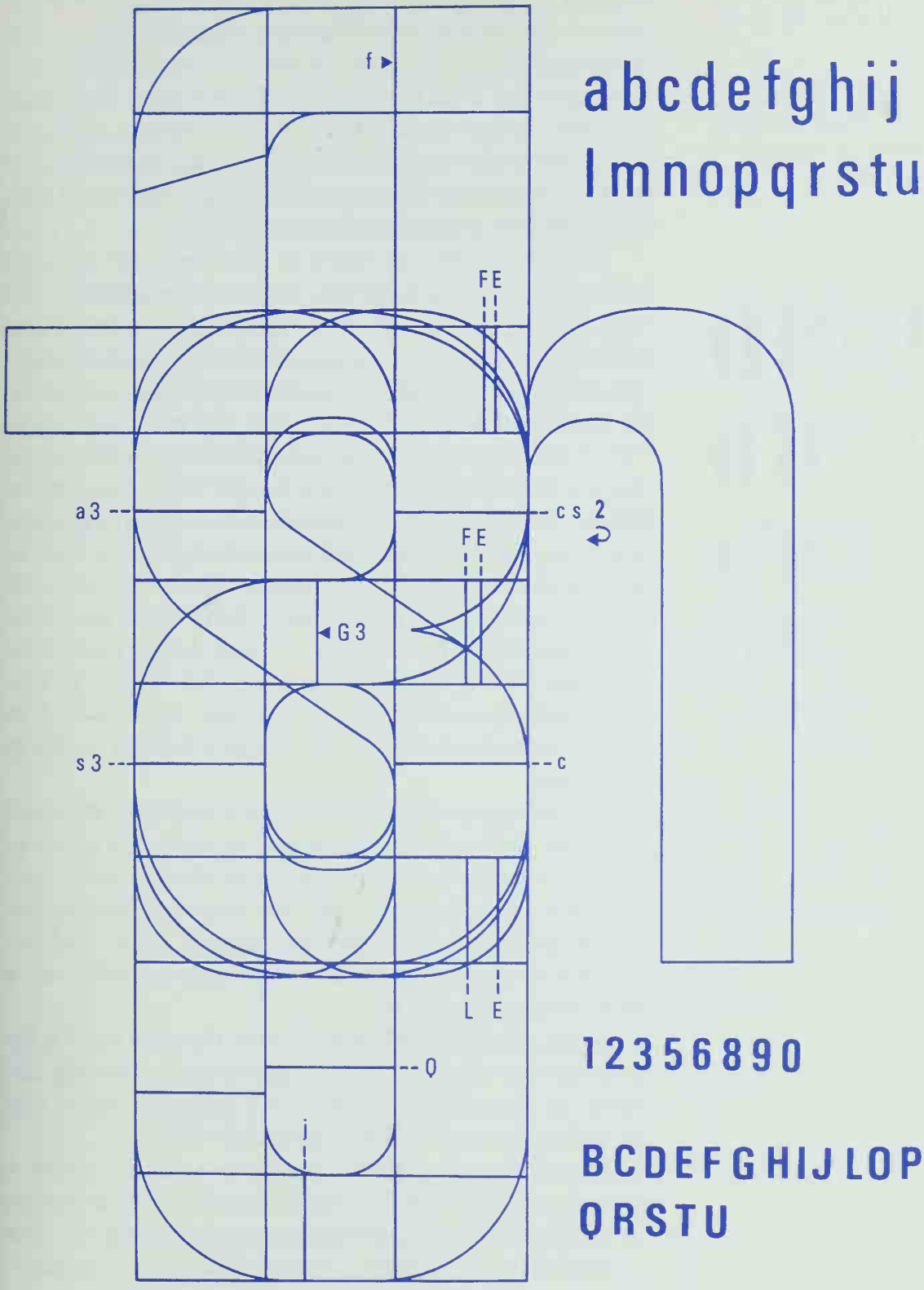


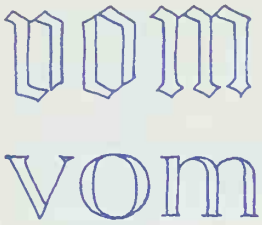
Common center parts

3. On the family likenesses of letters

The beauty of a script or typeface does not consist primarily in its individual forms but in the combination of signs. The most beautiful pages of text are those in

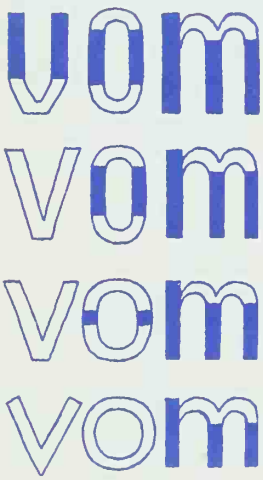
Construction grid of an alphabet





Family likeness and legibility

which all the letters are assembled to form a whole in perfect harmony. Within an established style, the letters are given a quite definite association of form. The weight of the strokes, the white of the counters and letterspacing, and the shapes of serifs and crossings, etc., are uniformly designed within a group of 26 letters. This uniformity allows unlimited combination of signs to form any word, sentence, or language. (This is technically known as "correlation.")



Four steps of formal relationship

As a schematic example to illustrate this law we have chosen a condensed sans-serif alphabet, designed with a maximum of uniformity in the formation of all its characters. (The central portion of almost every letter consists of identical vertical parts.) Sizes, weights, and widths for the entire alphabet are established by means of a common grid, from which 20 of the 26 lowercase letters can be derived. The capital letters, in this case small capitals with a small x-height, are also present in the grid, to the number of 17 out of 26, together with 8 of the 10 figures. The attentive reader will have observed that the missing signs are those that have oblique elements. A black-letter lowercase alphabet, in which the oblique strokes of k, v, w, etc. have been transformed into vertical signs, could in theory be constructed in its entirety from a uniform basic grid.

Insufficient relation of forms

In contrast to such an extremely vertically stressed alphabet, the basic grid for a normal alphabet with optimum legibility is rather more complicated in its construction. For example, all the rounded letters are clearly differentiated from the straight ones, and the oblique strokes must be harmoniously included as a third contrasting form.

In the designing of an alphabet, the degree of relationship between the letter signs must be clearly defined. In a sans-serif typeface, for example, there can be various stages in the unification of form.

In the examples given here, the top line shows a condensed version with a high degree of vertical stress, in which even the v has been forced into the grid. This typeface may well have a harmonious overall appear-

ance, but it can be used only in large sizes as a display face, being practically unreadable in text sizes because of the weak differentiation of its characters.

The second row also shows a condensed face, but one that includes oblique strokes and has a slightly oval-shaped o.

The third specimen is a sans-serif with the customary form construction, in which the individual characters are well differentiated but still have a distinct family resemblance.

In the fourth example, it is clear that the great differences between the geometrically triangular v, the compass-drawn o, and the vertically stressed m comprise too much diversity of form, hindering the flow of recognition of word images in text settings because of the aggressiveness of the individual characters.

The secret of a good text face lies in the fine coordination of the letters to form a community that is rich in contrast, while still retaining a family likeness.

VII. Manipulated Letterforms

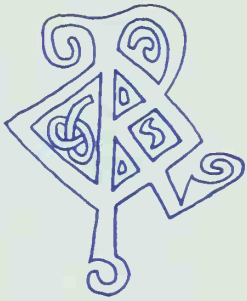
For a wide variety of reasons, whether for practical or ornamental purposes, the basic letterform is often *deliberately* altered and manipulated. We may divide these deviations into two clearly distinguishable groups.

The first group covers variations or *extensions*, where the basic form always remains recognizable and only the dimensions of the character have been altered in their proportions. For example, limitations of width force the lettering into a narrower or condensed form, as in newspaper headlines or on traffic signs, while horizontally extensive surfaces such as building fronts and long walls call for wider or extended characters.

Laterally pressed

Vertically pressed

The second kind of deviation is mainly a process of decoration or transformation of letters into a pictorial form. As an example we show an initial from an Irish manuscript, which can only be legible in association with the subsequent letters of the first word of the chapter.


Irish initial

1. Purely proportional variations

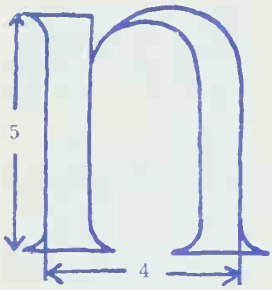
a Width

The width of the text typefaces generally used today has acquired quite definite proportions through hundreds of years of use. This "standard outline" is determined by the ratio between the black vertical downstrokes and the intervening white spaces (counters and letterspacing). This ratio gives a typeface the feature that is also technically known as its *width*.

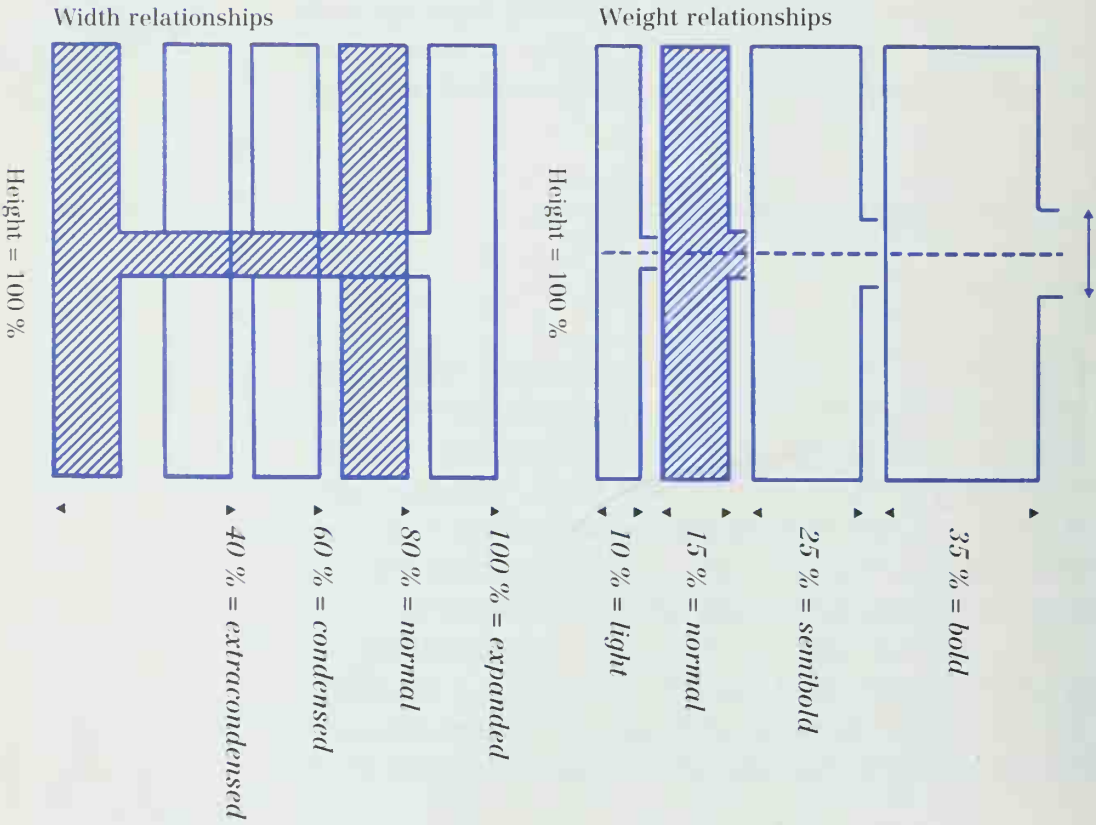
To illustrate this standard and the variations derived from it we must restrict ourselves to a single letter, choosing H because of its simple construction. All the other letters of an alphabet are proportioned in re-

lation to this H form and coordinated into a whole in accordance with the law of "family likeness" described in the preceding chapter.

The outline of a capital H is perceived by the reader as "normal" when its width is about one-fifth less than its height. In other words, the basic grid of a normal alphabet is founded on a vertical rectangle drawn approximately in the proportion of 4 (width) to 5 (height). Turning to the lowercase alphabet, we find the same proportions in the outline of a normal n. It should be noted that the basic outline is governed by the thick strokes; the serifs must here be considered as a stylistic accompaniment, like "grace notes."



Within a type style or typeface family, variations deviating from the standard width are produced today more than ever before. In this way, both "condensed" or "narrow" and "expanded" or "wide" versions are developed. The ratios of height to width are shown in our illustration combining a variety of stylistic proportions. From this it can be seen that, for example, a letterform



only half as wide as it is high is evaluated as "condensed," and one that is based on a square shape is known as "expanded."

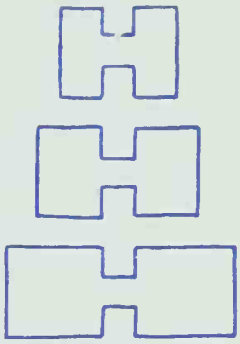
In connection with the width of a typeface it is important to realize that 99 percent of text faces, i.e., those from which the reader obtains large quantities of information, have *normal* width, while the variations in style are used for short pieces of information such as headlines, captions, and works of reference such as telephone directories and address lists.

b Weight

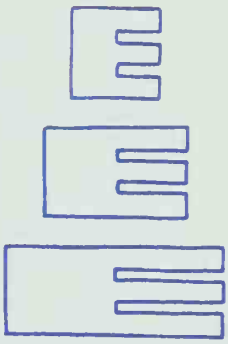
The vertical stroke width seen as *normal* by the reader corresponds to the basic stroke that we classify as a "beam" in the detailed account given in Part 1, Chapter V. A capital I of normal weight has a width approximately 15% of its height. The concept of "normal" is here felt with great sensitivity by the reader, since thinner strokes are immediately judged to be "thin" or "light" and heavier ones are seen as "semibold" or "bold." These variations are unsuitable for large quantities of text.

As the illustrations clearly show, the horizontal stroke weights do not follow the same logic as the verticals. For example, in the lighter versions of a sans-serif face, the horizontal and vertical strokes have almost equal weight, whereas in the bold versions the horizontals are usually kept much thinner than the verticals. One of the main reasons for this difference lies in the linear, horizontal layout of our system of writing. As a consequence, the width extension of a bold capital H, for example, is practically unlimited, whereas the law of absolutely *identical heights* for all letters unquestionably limits the stroke weights of the three horizontal bars of a capital E to a definite maximum that cannot be exceeded.

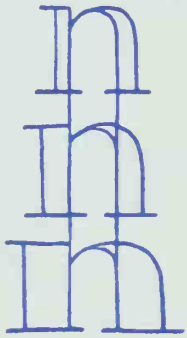
That is the reason why the variations of weight in our system of lettering can only be described as one-dimensional, since in theory they can be extended only in the width of the verticals.



Unlimited variations of verticals



Limited variations of horizontals



Purely vertical variations of weight

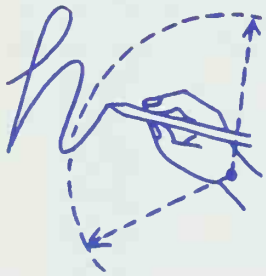
This fact is shown even more clearly when we compare the weight variations within a "Modern" (Didonic) typeface family with one another. In a serifed roman typeface of this kind, the alterations are almost exclusively limited to the verticals; the horizontals, the serifs as fine transitional lines, remain unchanged as something static, rather like the visible parts of a skeleton.

c Slope

The static expression of a standard typeface is built upon the laws of *vertical* stroke drawing and horizontal, linear assembly of lines (see general comments on vertical, oblique, etc., in Part 1, Chapter II). Ever since the beginning of printing with roman types in the 16th century, accompanying cursive, or italic, types have been produced, characterized by their *oblique* strokes.

The German name of *kursiv* for italic typefaces expresses the "flowing" nature of the style, suggesting the forward-sloping character of handwriting. The English name *Italic* derives from the fact that early printers based these type forms on the script of the Italian chancelleries.

The use of a sloping typeface to mark some difference from the general text has become standard. (The use of a boldface for this purpose is not popular because an alteration of "color" interrupts the flow of reading much more strongly than a change of structure from upright to sloping.)



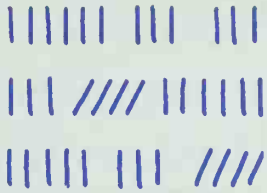
The turning arc of the wrist

This means that at least two "registers" are available to authors, in that they can *underline* words or sentences in the knowledge that they will be typeset in the alternative style, which in most cases is italic. The change from upright to sloping is now automatically accepted by the reader as a code for "different" or "emphatic."

The overall gray value of an italic text equates with that of an upright roman text. The difference in expression consists only in the structural alteration of sloping, and with serifed typefaces in the somewhat more

"cursive" form of the entry and exit points. The normal degree of slope is around 12°. Angles of less than 10° do not show enough difference from the vertical, while more than 16° of slope makes the character look as though it is falling over.

9° steep 12° normal 17° falling



Change of structure to draw attention

d The extended palette of typefaces

The preceding comments on a number of possible typeface variations in width, weight, and slope clearly indicate a phenomenon that can be seen as typical of the age of publicity in the second half of our century.

For hundreds of years, scribes and printers were content with a *single* style of lettering for the recording of thoughts and information. The repertoire consisted of capitals and small letters, accented characters, some ligatures, punctuation marks, and figures. This limitation of the means of expression may well be an important reason for the beauty that can impress us so strongly in the pages of old books.

Book typography finds all it needs in the more or less standard "triptych" consisting of the following designs within a given style:

1. Normal roman face for text.
2. Italic face for emphasis, subheadings, etc.
3. Boldface for various kinds of special distinction, headings, etc.

These three styles of typeface form, so to speak, a basic typographic unit, a standardized selection of three possible means of expression for literary typography.

a b c d e f g h i j
k l m n o p q r s t
u v w x y z
ß & § %
A B C D E F G H
I J K L M N O P
Q R S T U V W
X Y Z
1 2 3 4 5 6 7 8 9 0
. , : ; - ( ) ' « » / – ? !

The typographical repertoire

Baskerville
Baskerville
Baskerville

The typographer's traditional "triptych"

The technical and economic explosion of the 20th century brought the age of publicity to typography. The traditional palette of typefaces is no longer sufficient for the designer of advertisements, brochures, and posters. The verbal slogan requires a graphic equivalent, for which the traditional palette has no resources. To support the advertising text visually, typographic expression reaches out into all possible variations of style, which may range from *extralight condensed* to *ultrabold expanded.*

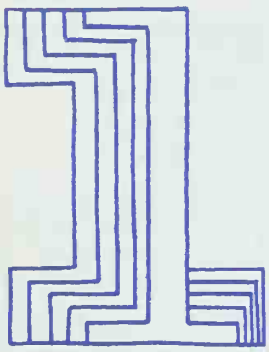
This need to manipulate letterforms also involves completely new considerations for the designer of typefaces. It is no longer simply a question of designing the individual forms of the letters. Right from the start, the plans of extension to a multitude of different versions must be included in the groundwork.

sparsam
kräftig
spontan
gedrängt
schwer
zuverlässig

Slogan headline

The purely "duplicating" aspect of this new drawing procedure practically forces the design of new typeface families into the realm of the computer. The results obtained with a computer-controlled drawing machine are astonishingly good, so long as they are kept under the direction of an expert typographer's critical eye.

This move into a multitude of typeface variations is not least a result of the rapid adoption of phototypesetting techniques, which permit, indeed virtually demand, that the typographic palette should become ever larger, since the production costs for a font carrier bear no comparison with the much higher costs that were once necessary for the production of a new set of matrices for hot-metal setting. Furthermore, most phototype systems provide direct access to 8, 12, 16 or many more alphabets.



Basic plan of sign extension

This multitude of type-mixing possibilities puts modern typography in danger of producing a chaotic type image through unskilled hands. The richer the material, the more disciplined must be the manner in which its handling is mastered.

The designer of a new text face nowadays no longer has the sole task of drawing the letterforms of a single series of alphabets, in much the same way as an ar-

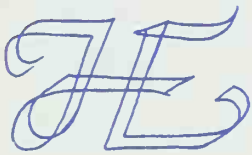
chitect designs the living rooms of a single-family house. The conception of a modern typeface consists rather in the extended, almost three-dimensional planning of an entire typeface family, with many divisions, in which the letters are so varied as to include such uncommon forms as "ultracondensed," "extraexpanded," "ultralight," or "superbold," and italic versions from "static" to "delicately sloped" or "rapid oblique." The underlying plan for a typeface is therefore now rather similar to landscape or town planning. Modern typography is no longer dedicated to the "domestic" book but reaches out into all fields of human activity, for which it needs a greatly extended palette of forms.

Complete plan of a typeface family (Univers)

2. Deviations from the basic forms

a Ornamental letters

Deviations of form from the basic letters that have become the standard for reading can be driven astonishingly far while still remaining legible, in the sense that the reader interprets the meaning of the ornamental letter from its association with the word or sentence.



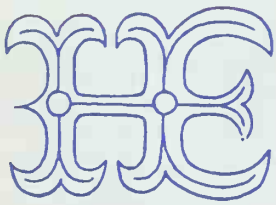
Virtuoso penmanship

Calligraphers in monasteries and chancelleries cultivated the happy art of penmanship so that it blossomed into individual forms in which lettering as such was only remotely recognizable as the basis of the design. For example, Gothic initials were subjected to a very dense style of ornamentation, completely filling in the surface of the letter. Chancellery scripts of the post-Renaissance period also included some very impressive virtuoso manipulations of the pen stroke.

The influence of this art of ornamental lettering was revived in the workshops of copperplate engravers, who produced a multitude of decorative scripts. These designs are still in use today for quite specific purposes, and the appearance of such scripts has itself become a factor in communication. For example, the script still known as "English copperplate," regularly used on visiting cards and invitations, conveys the conscious message of a distinguished status and also has an air of ceremony, comparable with evening dress and other formal wear. Its appearance is taken to be a symbolization of the "traditional" rather than the currently fashionable.

Ceremonial message

In the 19th century, lithography liberated the creativity of typeface design from the restrictions of engraving techniques. With the aid of pencil, brush, compasses, and chalk, a new art of decorative lettering was developed, no longer proceeding from the flowing hand of the calligrapher or the copper engraver's toolbox but freely invented and executed by the artist. Slab-serif and sans-serif faces made their first appearance, while letterforms suddenly took on all kinds of decorative forms with hatching, outlining, solid, and perspective effects and a wealth of ornamentations.



Lithographic freedom

b "Antiques"

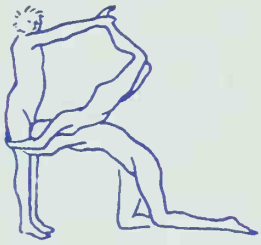
In the second half of the present century a kind of nostalgic obsession has developed in the increasingly acquisitive search for exaggeratedly ornamental "antique" letters. Old decorative typefaces are "disinterred," worked over, and prepared for the new techniques of phototype and dry transfer lettering. The negative judgment of "old-fashioned" is no longer applicable: on the contrary, it seems that an appreciation of "antiques" has also made its way into the world of typography.

Nostalgia

c "Figurative" alphabets

Even in the illuminated initials of medieval manuscripts there are many examples of figurative illustrations approximating to the form of letters.

This virtuoso play with the unification of an abstract expression (letter) with a figurative representation (plants, animals, humans) has attracted many illustrators of the past two centuries to design "figurative" alphabets. Most of these alphabet sheets have now been reissued, to the great delight of a wide readership. It is certainly the case that most of these initials have the humorous effect of a caricature, since there is something serious about letters in contrast to figurative designs, which have been bent or distorted "for the sake of the letter."



"Figurative" letter

There is no lack of contemporary examples of "figurative" alphabets, products of a cross-breeding between letter and object. As an appropriate typeface event of the 1960s we need only mention the "sausage alphabet," which provides a typical illustration of this possibly quite healthy "typeface iconoclasm."

d Letterforms of the future

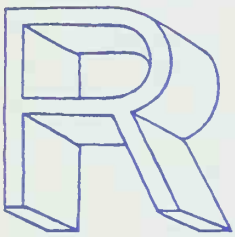
Environmental "inscription"

In the course of the present century, typefaces have left the sole realm of printed matter to become part of the general environment in such uses as direction signs and outdoor advertising.

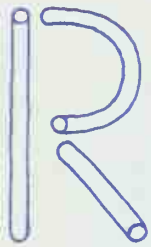
Fantasy

Some of these environmental forms of lettering have necessarily freed themselves from the two-dimensional character of writing and printing, to enter the three-dimensional field of architecture. By becoming *sculptural*, these letterforms have in certain ways *broken loose* from the confines of the strokes of the writing or engraving instrument, been simplified, and been changed. Three-dimensional letters are now manufactured from a great variety of materials. Characters are formed from straight and curved strip-lighting tubes. Lettering panels of all sizes and in the most glaring colors now have a major influence on the image of our daily environment, both urban and rural.

From stroke to volume



"Constructed" letter

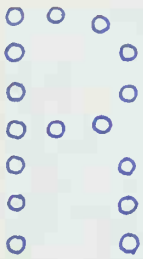


Neon tube letter

Unlike printed matter, which readers can bring into the field of vision just as they please, architectural and other outdoor lettering is forced on us without restraint as a part of our environment. Depending on the design of such lettering it may appear as an enrichment of the scenery, almost in the sense of an ornament. On the other hand, if badly designed, it is experienced as aggressive "pictorial noise" and in this way as a pollution of the environment. It will not be possible for our generation to achieve a realistic evaluation of this problem, since we have hardly yet begun to make critical judgments of our own typographical stage management of the environment from a very short distance in time.

Digital displays

In the field of information lettering a distinction must be made between permanent notices and movable, changing displays. The latter kind is built up on the principle of signs appearing and disappearing at one and the same place. Various answers to this complex task have been put forward during recent decades. On large-scale sites, for example, the signs can be made to appear in simple dot formation through the lighting up of programmed light-cell or lamp schemes.



Lamp script

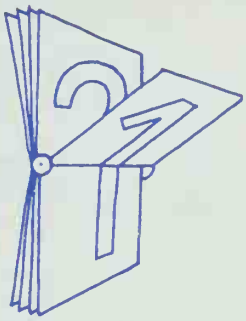
For medium-sized displays, a very successful mechanical system, still in use, consists of movable flaps on which letters and figures appear in a relatively well-drawn form.

In the field of the small-scale signal, more and more use is being made of the TV screen for the conveyance of information. Here the characters appear on the cathode ray tube with its usual line resolution, which once again imposes new limits of form for optimum legibility of the image.

As a final example of digital displays we show the "seven-bar" type of printout, which is used mainly for numerical figure signs as the output of electronic calculators. Using a reduced pattern of seven codes, consisting of three horizontal and four vertical strokes, it is possible to display all ten figures by purely electronic means, even though in a severely stylized and much impoverished form, simply by leaving out selected strokes.

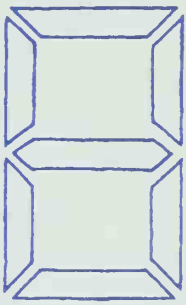
The immense popularity of the electronic pocket calculator has very quickly made this form of numbering into a second standard for reading off. It is amazing to see how rapidly the human capacity for adaptation can take effect when it is driven by necessity (in this case perhaps more drawn forward by the convenience of giving up mental arithmetic) to accept the authority of a new and stunted form of numerical sign system.

It is also interesting to note, on the other hand, that the forecast success of the same bar-grid figures in the field of time telling on wrist and pocket watches has not come about. The invention of chronometry through quartz vibration has made it possible to manufacture high-precision dial watches at minimum prices, and there has therefore been no change-over in this field. People prefer the more lively and pictorial "angle language" of the turning watch hands as a display of the time.

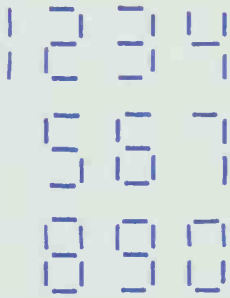


Flap display

TV screen script

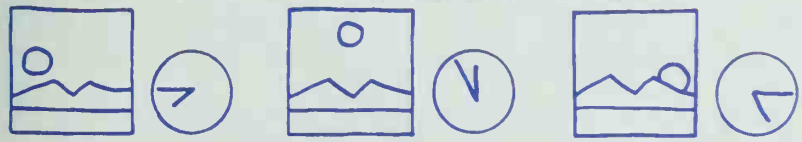


The seven bars



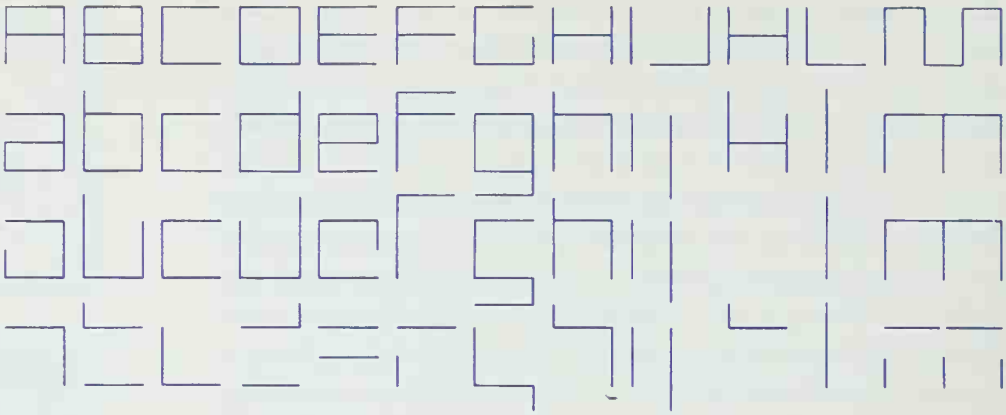
New sign language

The "angle language" of the clock face remains in use.



Morning Midday Evening

Reduction of form selection to the basic grid of a square

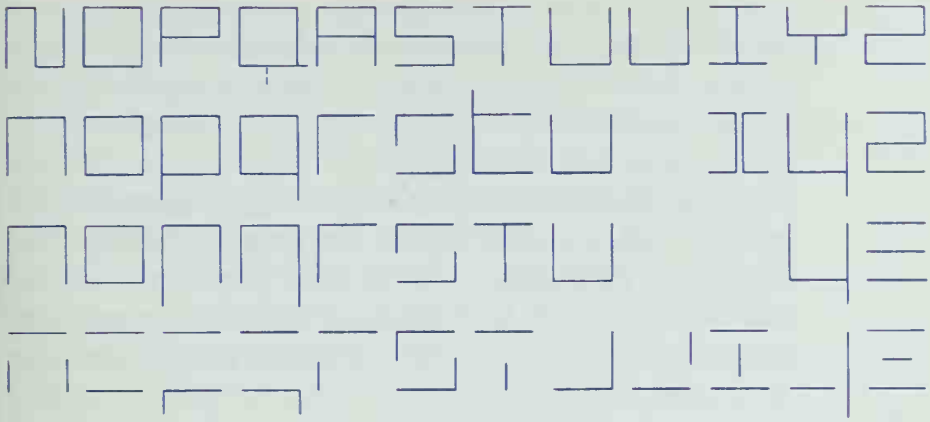


Experiments in extreme simplification

A graphic trend toward extreme simplification of letters, not in the sense of shorthand but in the reduction of the forms used, has lately led to various new attempts to make the alphabetical signs more uniform in one way or another. By way of explanation, we show two examples of the development of alphabets constructed on purely geometrical principles.

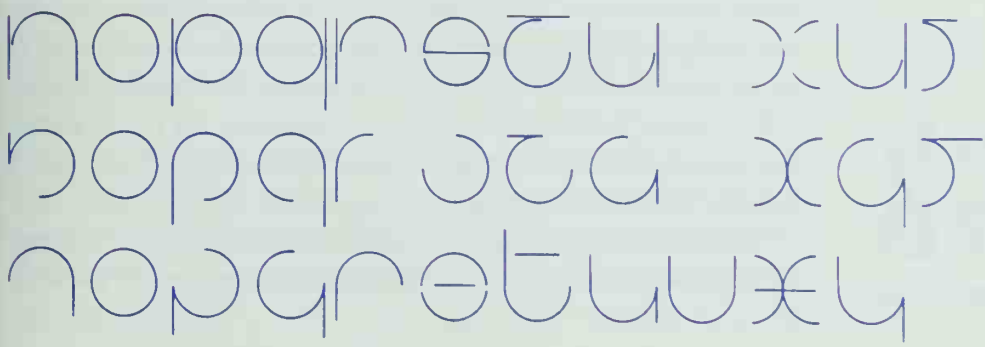
The first example shows an attempt to derive the entire alphabet from a square form. This enables a series of stages of recognizability to be ascertained. In the first place, all basically rectangular letters (E, F, H, T, etc.) have unobjectionable forms. In second place are the semirounded letters (C, G, P, S, U), whose legibility is based primarily on the direction of opening of the interior space. These can be easily recognized. Letters with typically oblique basic forms (M, N, Z, etc.) become difficult to recognize, and impossible results are obtained with B, D, and R, since these are asymmetrical characters with rounding on one side.

Circular forms in lowercase alphabets



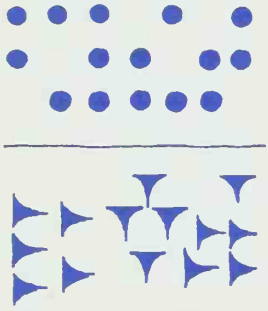
In the second row of the upper illustration, the same attempt is made with the lowercase alphabet. The same comments apply here as for the capital letters, with the additional observation that ease of recognition is increased by the presence of ascenders and descenders, and by the fact that the lowercase alphabet contains fewer symmetrical forms. The only really illegible small letters in this example are those that normally have oblique strokes. The two last rows of the illustration show experiments in further simplification so as to reduce the letters to the stage of complete illegibility, making them nothing more than purely decorative elements.

As a second example of the reduction of alphabetical forms, the other table shows experiments in building up letters on the basis of the circle. Here the capital letter alphabet has been deliberately left out as it is so difficult to express in rounded forms, whereas the small letters include a majority of signs based on curves. This conclusion provides further evidence for



the fact that the development of lowercase letters from capitals took place through the intermediary stage of handwriting, since the production of rounded forms comes much more naturally to the writing hand than the drawing of the straight lines required for the majestic forms of capital letters.

Simplified forms like these have a great appeal to the graphic artist, especially in designing lettering. The tables are intended to show, in a purely theoretical manner, where the boundaries of legibility appear to be situated. We will return to this theme briefly in a later section of this chapter.

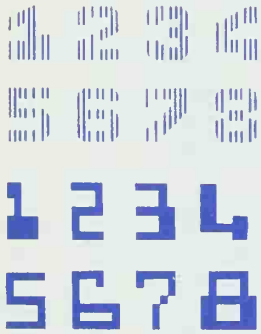


4000 years of culture?

Before leaving the subject of "script simplification" there is one more point to be made, concerning a curious aspect of form that becomes apparent if one compares, for example, a binary punched tape or card code with a fragment of script from a Sumerian cuneiform clay tablet. At least 4000 years of human civilization lie between these two systems of script recording, and it must be added that although cuneiform script was directly understandable to the reader, today's electronic code needs complex machinery for its decipherment.

This comparison is no more than a marginal comment, of interest from the purely graphic point of view. So far as the understanding of the binary code is concerned, it represents much more than mere phonograms or sound signs, since it forms the basis of a system of processing an enormously wide variety of data, in no way comparable with the patterns of thought of the ancient world.

Automatic reading

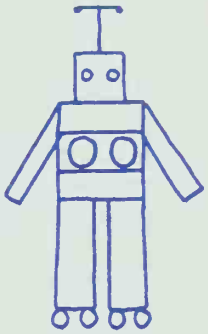


Stylized computer scripts

The technology of informatics is in the process of taking on giant dimensions as the quantity of text material to be processed grows incessantly. Computer operation being based on the binary system, all input must be converted into binary code, by means of punched cards, punched or magnetic tape, etc. In principle, this "translation" work can be undertaken only by human beings who are capable of understanding the written or printed input.

It was therefore of the first importance for the technicians to develop a script that could be read by both human and machine. This need was fulfilled by optical character recognition (OCR) scripts.

The first machine-readable scripts were extremely simplified typefaces, stylized to suit the geometrical laws of the early OCR machines. The widespread use of these scripts must have caused a deeply felt reaction among the broad mass of the readership. The disfigurement of a familiar form like that of our alphabet has a revolutionary, perhaps even a sinister effect, rather like that of the cartoon figure of a robot, which has almost become a symbol of "future shock."



A symbol of future shock

The first typefaces popularly known as "computer script" have long since become technically outdated, since modern reading machines are now able to recognize the complex forms of traditional letters without significant error. The design of an unstylized machine-reading typeface (OCR-B) has made the "robot" scripts obsolete, so that the danger of a distortion of the alphabet in the computer world has already been overcome.

Nevertheless, the brief period of use of these deviant styles of script led to the manifestation of a style that will remain characteristic of the period of the 1960s and 1970s.

Robot scripts

Boundaries of legibility

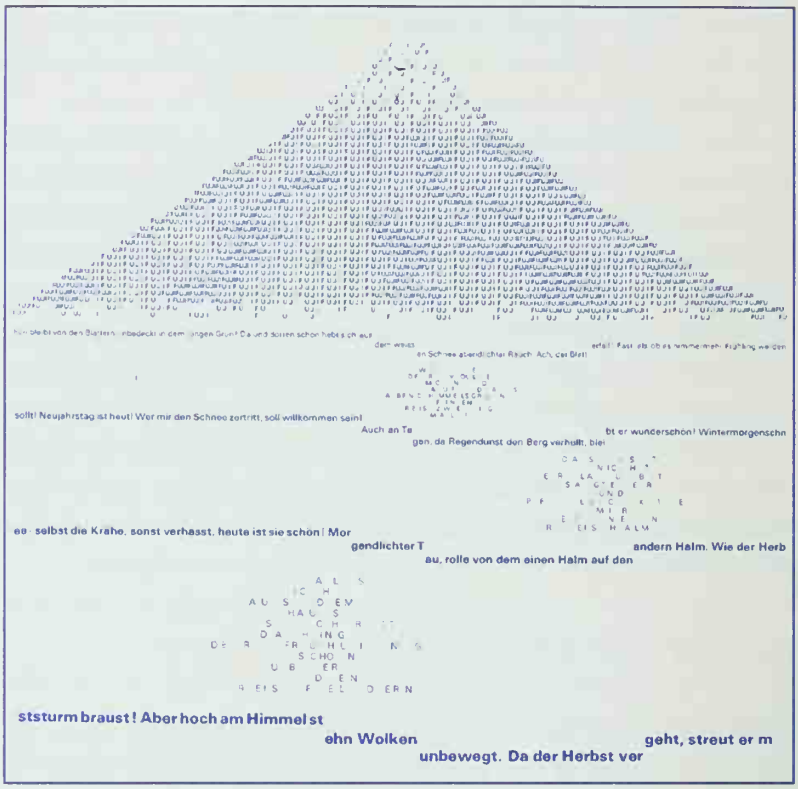
Witness to the fact that lettering styles can be seen as an expression of the spirit of a given period is provided by some of the styles in evidence today in graffiti, on walls and posters, and also on transfer lettering sheets. These are signs that, although broadly based on the alphabetical, find their expression at the very boundaries of legibility. An obvious provocation of traditional reading habits is latent in contemporary scripts such as these.

It is still difficult for us to make an exact judgment of this antireading reaction and its significance. Perhaps something fundamentally new will emerge in the future from a movement that at present is still considered to be decadent.

Boundaries of legibility

e Type image and type picture

On the theme of deviations from basic forms, the foregoing comments have already revealed a tendency for the pictorial artist to become recognizable in the work of the scribe. This tendency is probably motivated by the absolutely abstract nature of alphabetical letters and their purely mechanical use for the recording of thought.



Typographical calligram (Bruno Pfäffli)

In certain well-known cases, lyric poets have repeatedly tried to break through the hard, conventional grid of typesetting by means of the pictorial arrangement of verse. The "calligrams" produced by Apollinaire in France and Morgenstern in Germany and the "Mouse's Tail" poem in *Alice in Wonderland* are examples of this way of turning script back into pictures. The typographic designer is also sometimes tempted to break the strong linear rules of typesetting for once

Hidden dreams

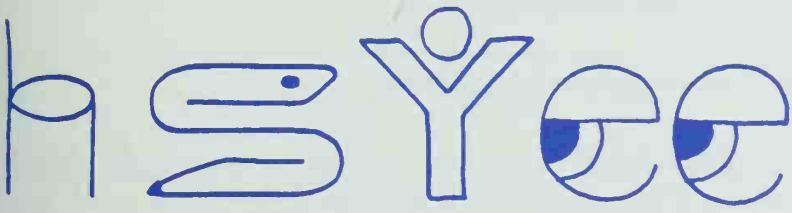
and interpret the content of a text pictorially in two dimensions.

Most of us have tried at one time or another to remove the letter value of a capital O, perhaps in a newspaper headline, and turn it into a face by childishly drawing in eyes, nose and mouth. In this way, a capital Y is easily turned into a champagne glass, simply by adding a wavy line and a few small circles.

Games such as these are played in precisely that borderland where the letter image, which has become a subconscious "substance" to the reader, is lifted into the conscious realm of the pictorial.

The word image can be given this kind of double meaning in a great variety of ways, the simplest and most meaningful of which consists in the disturbance of the normal arrangement of letters within a word. The unusual positioning of a letter at first alienates readers, but on recognizing the nature of the game they appreciate the way in which the word has been changed into an illustration which illuminates the imaginative connection between the normal word image and its meaning.

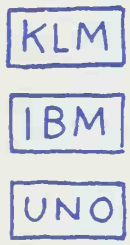
The most direct way of "pictorializing" script signs is simply to turn the letter image or word image into a picture. This produces a very strong conflict between what is "seen" and what is "read." This double effect is much exploited in modern graphics, for example, in order to make a company logotype especially memorable by arousing the reader's interest in the interplay of the abstract alphabetical form with the pictorial message.



The letter returns to the pictorial

3. Monograms

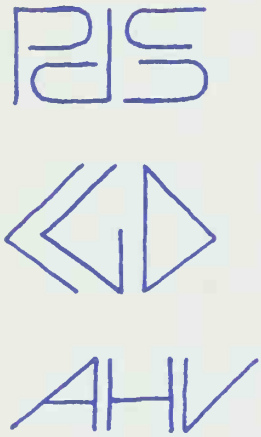
a Abbreviations become acronyms



Abbreviations

A typical typographic phenomenon of today is the use of abbreviations consisting of the initial letters of proper names or other word groupings of all kinds. This tendency to reduction in writing by abbreviation, producing acronyms as additions to the language, is a clear indication of the ever-increasing host of human groupings, from commercial organizations to political, social, or ethical associations. Complex technical terminology also tends to be more and more reduced to its initial letters so that it can be more quickly spoken, written, and read.

This linguistic reduction process has led to completely new units of communication, the comprehension of which is to a greater or lesser extent restricted to the initiated. The name UNESCO may be understood all over the world, but there are many specifically national associations whose acronyms are familiar only to people in the trade or profession concerned.



Recognition effects

Abbreviations of this kind, when given graphic expression, are known as "logos," "trademarks," or "monograms." They are mostly limited to a minimum number of letters, pronounced individually, inviting the graphic artist to produce combinations of signs which do not necessarily follow the rules of written language. The artist's aim is to produce a new, uncommon, and meaningful effect which will be easily memorable and recognizable.

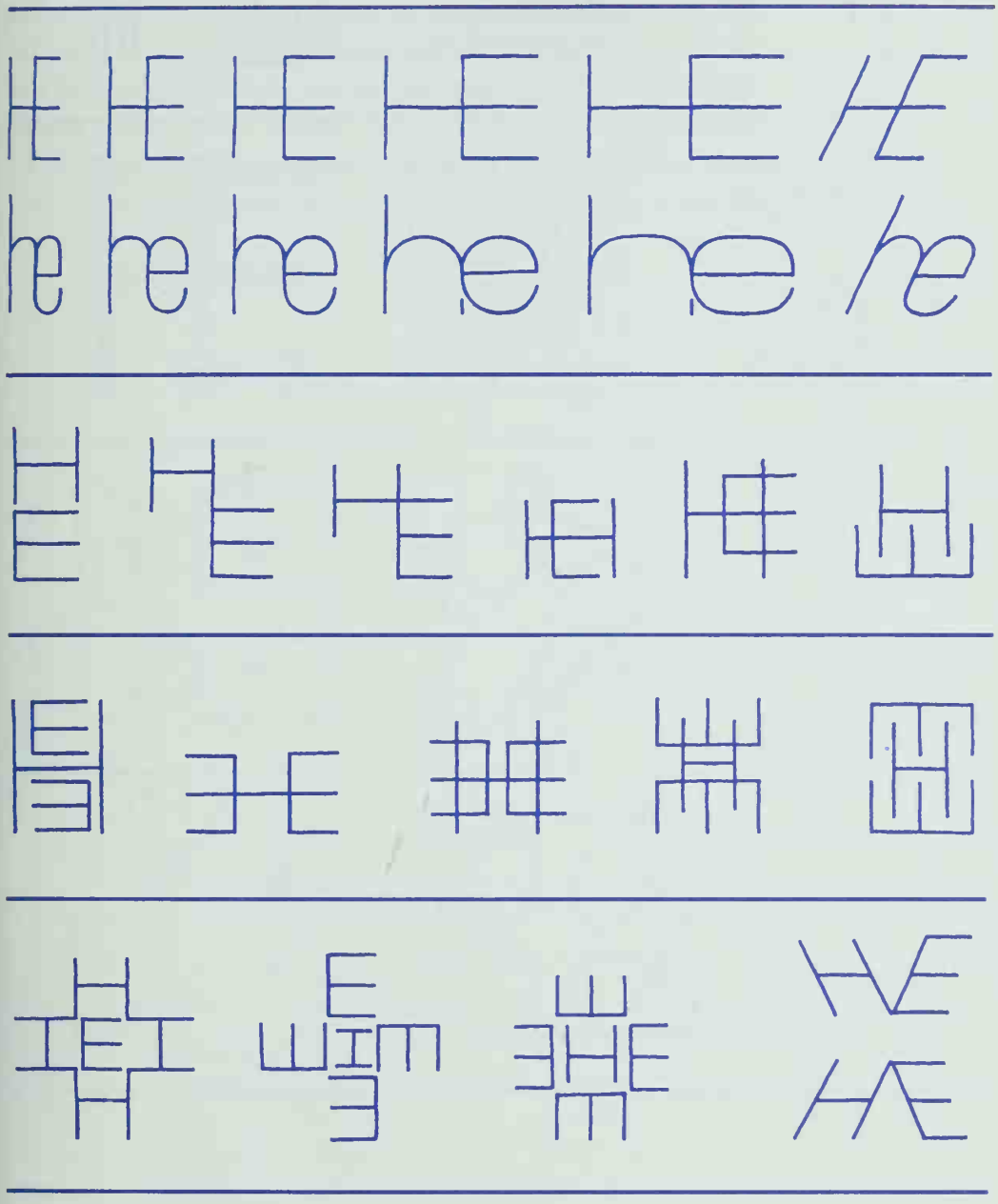
b From ligature to ornament

As a series of examples, our next table once again shows a number of H-E monograms. The signs have deliberately been limited to linear forms, since the introduction of variations such as bold, outlined, shadowed, etc., would lead to a table of excessive length.

The top row of the table recapitulates the purely proportional variations of capital and small letters from

narrow to wide, as already described. The second row shows examples of combining one H with one E, and the remaining examples consist of multiple uses of the letters, leading still further into the realm of the ornamental logotype.

The theme of "logo design" will be taken up in more detail in Part 3, Chapter VIII, "Trademarks."

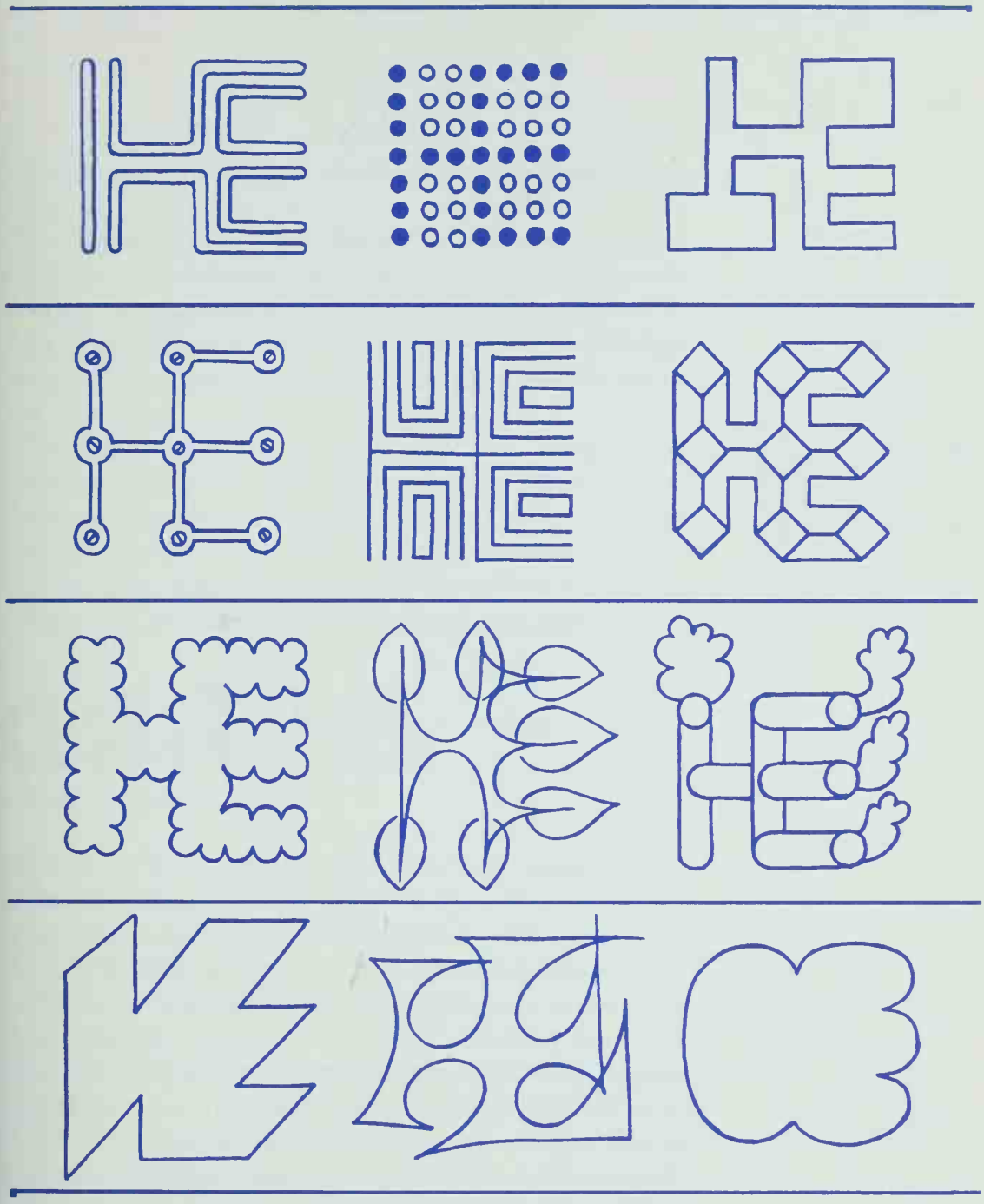


Monograms are designed in accordance with definite rules.

As a visual summary of letters deviating from standard forms, our next table shows some generic examples of styles that may be commonly seen nowadays. The signs are again composed of the elements H and E, giving the same outline as the candlestick sign shown at the end of Part 1, but turned to the right through 45°.

The examples in the first two rows clearly show the influence of the images of modern technology. In the third row, the letters are made to symbolize objects, and the three drawings in the last row have crossed the boundaries of legibility, the letters themselves being only hinted at, so that the sign can be evaluated as more a pure abstraction than a combination of two letters.

Ornamentation of characters for pictorial statements



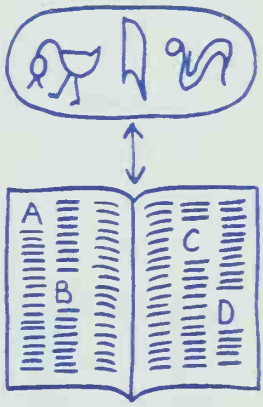
VIII. Text Type and its Legibility

1. Type as a worldwide medium of communication

Two thousand years ago, reading and writing were the privilege of a very small number of people. Today, education is available as a right to whole populations. This progression to the greater spread of knowledge has also involved continual alterations to the forms of our alphabet.

At the beginning of our story, a strong hand scratched pictorial signs into stone, perhaps two or three signs per hour. Today, millions of characters per hour are produced by electronic typesetting machines.

Two facts stand out clearly in the course of this development. First, the ever-increasing demand for text



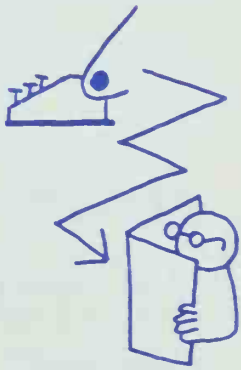
Then and Now

National-international

stimulates the invention of ever-faster methods of typesetting and reproduction. Second, the immensely widespread distribution of the written word leads to a standardization of forms in the design of text typefaces.

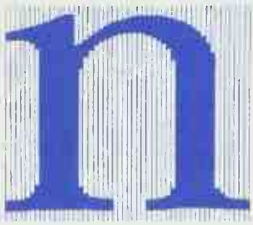
Whereas some centuries ago there were still countless different indigenous styles of lettering in every Western land, today we are witnessing the crystallization of the roman alphabet as an international text face.

This text type has become a "commodity" for which a certain structure conducive to comfortable reading is ever more important, so that it can be taken in by a wide readership with minimum resistance and at maximum speed. An additional factor is that any piece of information is meaningful only when it appears within a given


Closing the gap between event and information

period of time. The path from the event to the reader must be constantly shortened, whether in the newspaper press, in publicity, or in book production. In many cases this factor is also associated with price. The information must be made available at a low price, whether in the daily press, advertising brochures, pocket books, works of technical reference, or any other form.

Those are the reasons why the print production techniques of our century have been characterized by a constantly rising speed of typesetting output. For five hundred years the techniques of setting remained conventional in their use of metal, which was entirely sufficient for the needs of publication. It was only around 1950 that the new techniques of typesetting began to be developed, because the conventional processes of composition could no longer handle the ever-increasing supply of information in the long term. Thus the invention of phototypesetting was no coincidence but a technical necessity in order to keep up with future demand.



Resolution on the cathode ray tube

In the present context it would take up too much space to describe how characters are now brought onto paper from a digital store by means of cathode ray tubes and laser beams. It is sufficient to note, with satisfaction, that the clarity of the type image from modern equipment has reached the level of quality to which readers of the metal-setting generation were accustomed.

abcdefghi

jklmnopq

The alphabet is theory

2. Type forms and legibility

a The reading process

The letters of the alphabet should be evaluated only as the building blocks of language, with which syllables, words, and sentences are formed. As a small child, at the beginning of the process of learning to read and write, one "spells out" the words. At a later stage, the subconscious mind is no longer concerned with single letters but with syllable and word images. Every reader possesses this treasury of images, like a tabular reference plan. The letter associations of the native

ab am

bad bau

bahn

Syllable and word pictures

tongue are very strongly impressed in the mind; those of acquired languages, less so.

A simple experiment will show how precisely these syllable and word outlines are anchored in the reader's mind.

The letter pair "on" is perceived by the reader as a whole, being so to speak photographed *at a glance*. It is then compared with an existing inner reference plan and understood.

The smallest error at a critical point of the o momentarily disturbs the clarity of the statement, creating a doubt between o and c. Furthermore, there is no deeply imprinted combination of letters cn, so it does not help the reader as a bridge to understanding.

The critical point of the n is the upper left stroke ending.

The smallest lengthening of the vertical stroke brings the n into the realm of the letter h, and the idea of h is further strengthened by memory of the very common phonological combination ch.

Coming after these examples of forms that are *not* deeply imprinted in our minds, the correct image of ch in its normal typographical proportions has a relaxing effect, since doubt has been eliminated and the image has returned to the realm of known outlines.

on

Syllable image

cn

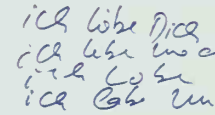
c or o?

cn

n or h?

ch

Standard outline



Handwriting

b Steps in reading motivation

Letterforms, shaped and refined through hundreds of years of use, are today available to us in many different styles as a means of communication. Numerous groups can be defined, including handwritings, functional scripts and typographical text faces.

Readers are certainly capable of understanding a communication in any of these styles, but the extent of their effort to decipher the content depends in the first place on its degree of importance.

Where necessary, we will take a great deal of trouble to decipher the handwriting of an important document, since a single wrongly interpreted letterform can alter the meaning of the statement.

Although a
Squanto wa
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Matrixdrucke
ird in einer
beliebige an

Functional scripts

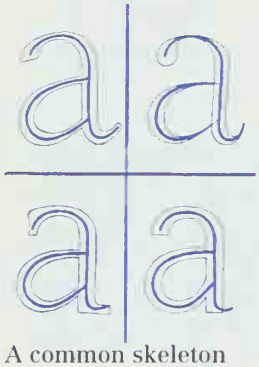
La terre de Fra
par la netteté d
férences de ses
général de cett

Typography

For business letters, memoranda, short reports, etc., handwriting is too individualistic and subject to strong

ly personal interpretations. Typewriting, even if of inferior graphic quality, is appropriate in these cases and is accepted without hesitation by the recipient.

No publishers, however, would take it upon themselves to produce widely read texts, such as novels, periodicals, or newspapers, in a typewriter face. The publicist also knows well that a description of a product must be issued in the best quality type and printing if it is to have a chance of being read by the potential customers, who are not necessarily motivated to study it.


A common skeleton

These considerations point to the fact that the style of lettering most desired by the reader, consciously or unconsciously, is that of high-quality typography. This aesthetic form of word pictures is the one that has established itself most deeply in readers' subconscious, for the simple reason that they have read and internally stored the greater part of their knowledge in this form from books, newspapers, etc., and because the balanced appearance of printing type offers them the greatest degree of reading comfort.

c Formal synthesis of the alphabet

From the foregoing explanations of readability one might conclude that there is only *one* most legible typeface, that a kind of archetype of all text faces might exist, and that the future might bring the danger of a single, uniform prototype as the sole means of communication in print.

"Lettering" may well be a functional commodity, like food, clothing, and shelter, but its attraction will always lie in its variety of style. It can be assumed that readers remember the outlines of syllables and words in a kind of skeletal form and that the details determining the type style are taken in as the "resonance," which does not disturb the reading process so long as the typeface as a whole has been designed in accordance with the basic rules.

The character itself is modeled around the basic,

skeletal strokes of a letter. The artistic element, or what is called its "style," comes into expression within the zone of resonance.

A successful typeface is read by millions of people and influences their idea of the skeleton letters. Where there are excessive innovations of form or designs of poor quality, the typeface encounters a certain resistance in the reader and the reading process is hindered.

To demonstrate this thesis we show some characters from the most widely read typefaces in a series of line screens at different angles. When the eight different styles of the same letter are superimposed, the skeletal form clearly appears in the center of the cross hatching as the darkest part of the drawing.

In the composite diagram of the letter "a," the outline of Garamond appears inside the lower loop. This "old style" typeface is found exceptionally attractive by the reader, but becomes tiring to read in large quantities of text. The same occurrence is found in the upper loop of the "e," where the Garamond form has the highest-placed horizontal bar.

From these two examples of letters with narrow counters, it can be seen how interior forms that were originally small have become standardized to larger openings in modern typefaces, as a consequence of "mass usage." Large counters ensure optimum recognizability and maximum reliability in printing, because of the dangers of filling in through ink smearing.

The composite diagram of "n" shows that the thickness of the serifs, even their presence or absence in a typeface, is *not* decisive for the recognizability of a character, and that legibility is not substantially affected by serifs. All that can be said in favor of serifs is that their presence can help to guide the rapidly reading eye along the line and that they bring the word image together rather more firmly. The objections that could be made to serifs are that they do not constitute a *form-distinguishing* element but a *form-assimilating* one, since all letters carry the same serifs as an addition to

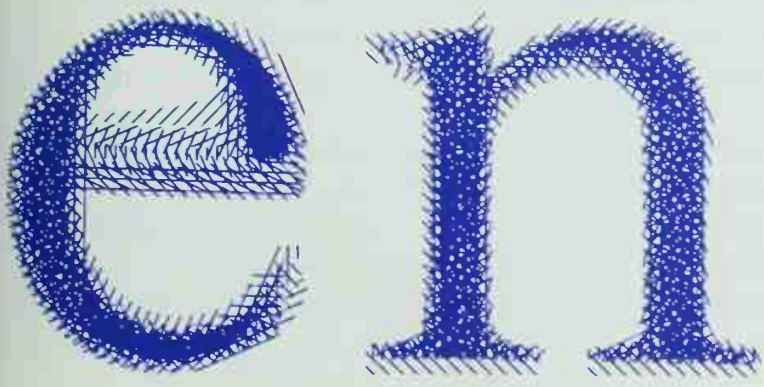
A common basic form of typefaces is visible

Left to right from top:

Garamond
Baskerville
Bodoni
Excelsior
Times
Palatino
Optima
Helvetica/Univers

On studying the diagrams one receives the impression that the pure text face outline corresponds most closely to the one to which the reader has become accustomed through its use in the daily press (Excelsior-Caledonia). The second most widely used outline is that of the sans-serif form of letter (Helvetica, Univers, etc.), which matches the basic form absolutely, deviating only in its constant stroke thickness and the absence of serifs, as already mentioned.

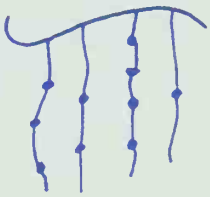
The foundations of legibility are like a crystallization, formed by hundreds of years of use of selected, distinctive typefaces. The usable forms that have stood the test of time are perhaps permanently accepted by humankind as standards conforming to aesthetic laws.



IX. Numerical Signs

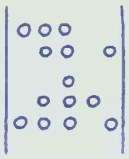
The recording of numbers can certainly be included among the earliest examples of writing. In much the same way as the scores in card games are still recorded today with pencil and paper, the marking of numerical values by scratching or notching was practiced as long ago as in Paleolithic times. Counting systems of this kind have come down to us in the form of notches in bone, horn, and stone; burn marks in skin and hide; and knots in string.

Scratches, notches



Knots

It must be emphasized that records of these kinds are to be understood in a wider sense than merely that of numerical values. For example, they could also be examples of aids to verbal memory, calendrical signs, etc. Here we inevitably come to an analogy with our own times in the form of the binary system of computer language, which is also based on the simple, logical, and rhythmical lining up of a single sign impulse (notch = bit).



Binary impulses

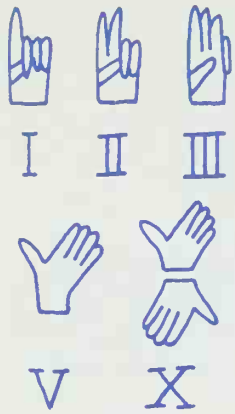
1. Numbering with letters

In parallel with the evolution of script, every civilization has developed its own system of recording numerical values. In many cases, numbers have been expressed with the aid of the ordinary writing signs. The writing systems of classical Greece and Rome provide obvious examples. In ancient Greek, the signs of the alphabet were used in their normal sequence to stand for numbers. Only the addition of an apostrophe indicated that the sign was no longer a phonetic but a numerical symbol.

α' = 1	I = 1
β' = 2	V = 5
γ' = 3	X = 10

Alphabetical number signs

Roman numerals also relied on the signs of the alphabet, with the simple phonetic sign I representing the smallest numerical unit. Perhaps this was due to an analogy with the outstretched finger, an explanation which also covers the use of figures II and III. By this system, an open hand could have served as the model



Pictorial analogy?

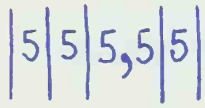
for the number V and two hands for the number X. Such graphic comparisons should not, however, be taken too literally as factual accounts of processes of development, but rather as indications of the initial pictorial motives that underlie all sign systems.

2. Origin and evolution of arabic numerals

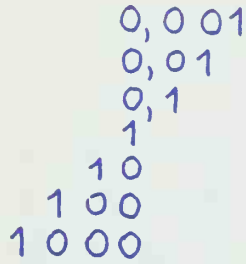
The essential starting point for any consideration of arabic numerals is to recognize the fact that they were fully developed quite separately and in a different culture from our own alphabet, even though both groups of signs, the letters and the figures, have taken on a certain "family likeness" in their modern printed form.

This difference of origin must be the main reason for the worldwide use of arabic numerals and the fact that it has been possible to integrate them, without influencing their forms, into practically every other kind of script.

a The ingenious idea of the zero



System of positional values



Zero geometry

Zero or hole

The reader may perhaps not be aware of the fundamental importance of the invention of the system of positional values in the development of the world economy as a whole. On either side of the central decimal point (or comma in continental usage) there are ranged, at the left, the units in tens, hundreds, etc., and at the right, fractions, in a fixed order that allows the calculator to undertake any arithmetical operation by exact positioning of the figures. The possibility of such a system is based on the ingenious invention of a sign for "nothing," the zero, which occupies any position in the row for which no unitary value is present in the number concerned.

In other words, the signs 123456789 could be described as concrete values, while the zero is an abstract concept, functioning as a component of a number only in association with the position that it occupies in the row. It is interesting to note that the circular shape of the zero carries the double meaning of positive *and* negative, since it is both object *and* hole at the same time (see also Part 1, Chapter II, on "The circle").

b Origins and development of form

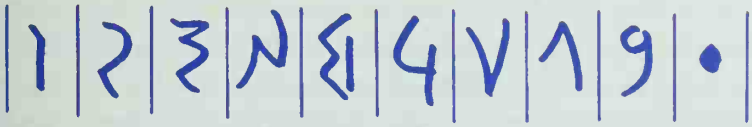
The numerals known as "arabic" actually had their origin in ancient India. Records dating back as far as the 2nd century B.C. have been discovered, containing concepts of quantity expressed with signs that begin to show the way to the decimal system.

1 2 3 6 7 9 10 20 100 200

The row of multiples of ten was gradually developed in northern India during the course of the 1st millenium A.D. The forms of these first numerals were taken, as in Greek and Roman usage, from the shapes of letters; but not the sign for zero, which from the start was written as a small circle, later reduced to a large dot. Unequivocal individual signs for each of the ten values of the decimal system are to be found in Sanskrit documents from the 9th and 10th centuries A.D.

1 2 3 4 5 6 7 8 9 0

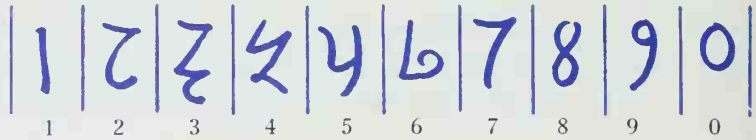
Persian scholars, who at this stage of development were familiar with Indian mathematics, took over the system, and the typical series of figures of eastern Arabic also first appeared in the 10th century, in a version containing most of the numeral signs that have come down to us and are still used in Arabic writing.



1 2 3 4 5 6 7 8 9 0

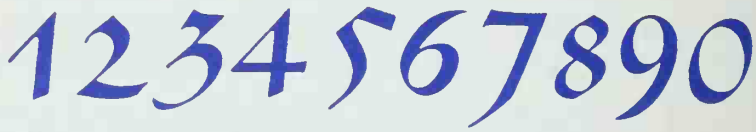
Arabic numerals began to enter the Western world at the end of the 10th century. For obvious ethnological reasons they first emerged in Spain, whence the new numbering system spread throughout Europe. An early Spanish set of decimal figures already has forms

that, with some exceptions like the 5 and the upside-down 2, may be regarded as the forerunners of our present-day numeral forms.



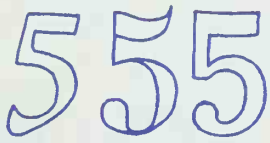
We hardly need to emphasize the fact that these new numerals, and above all the associated new method of calculating, were of decisive importance for the entire course of development of European culture and economy.

As soon as these numbers were introduced it became necessary to fix their forms definitively, both for the purposes of exact science and for commercial and cultural exchanges between different countries.



Calligraphic numerals

The calligraphic styles of the Middle Ages and the printing techniques of the post-Renaissance period were evidently not without influence on the outward appearance, as it were the "dress," of the numerals but could not fundamentally impair the basic forms. The calligrapher's quill pen determined the positions of swelling and thinning of the strokes right from the start. At later stages, letterpress printers, copperplate engravers, and lithographers incorporated the figures into the stylistic presentation of their alphabets. Thus the figures of the 18th century have the typical hairlines and droplet endings of the "Modern" or Didonic style, while the subsequent period created slab-serif and sans-serif typefaces in which the figures were assimilated into the style of lettering.



Printing techniques and numeral forms

The 20th century has seen the removal of decorative elements from the figure signs for the benefit of optimum readability in all fields of reference, from stock ex-

1 2 3 4 5 6 7 8 9 0

The standard

change listings to telephone directories. The width of all ten figures has been made uniform in order to allow tabulated setting in columns and, for this reason, the figure 1 is often equipped with serifs in order to fill in some of the space at the sides. (Figures are never otherwise given serifs.)

3. Some analytical comments

a Speech and numbers

The written or printed recording of numbers has a completely different basis from that of words. The figure is an ideogram denoting a quantity, while the letter is a purely phonetic sign representing a phoneme or unit of significant sound. Thus it is possible, for example, to represent a numerical value either with a figure sign (7) or with letters (seven).

It is interesting to note, in connection with the written and the spoken word, that in most western languages the names of the numbers 1 to 12 are nearly all monosyllabic, which clearly suggests a century-long reduction of both the spoken and the written forms. This observation leads us almost inevitably to a comparison between the words and the movements of the writing hand.

eins	un	one
zwei	deux	two
drei	trois	three

One number = one syllable

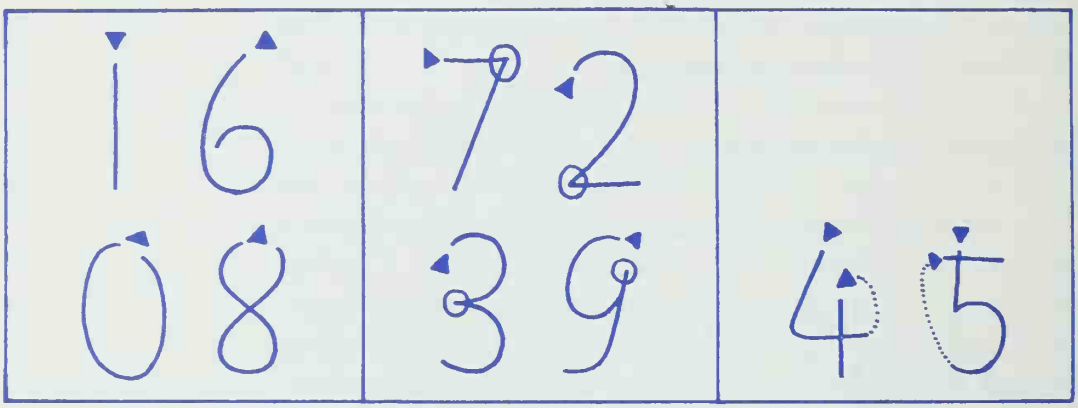
b Number-writing movements

In every act of handwriting, two contradictory requirements come into play: the speed of writing, as opposed to the legibility of the matter being written. The writer instinctively seeks the briefest forms of signs so that the writing hand can to some extent keep up with the much faster flow of thoughts. If this recording process takes place with a conscious effort to make the writing legi-

Impossible writing style

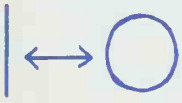
ble to third parties, the writer enters the borderland of sign simplification where the signs still remain "decipherable."

In this connection we find that the writing of numbers follows completely different laws from those applying to the writing of text. For example, it would appear to be completely impossible to write numbers down in a joined-up style. This fact alone suggests that, unlike words, numbers are not read by groups but deciphered one by one.



Single movement | Double movement | Lift and replace

We also find that, as an essential rule, the difficulty of the hand movements made in writing numbers has been reduced to a minimum, so that the same simplicity is in evidence as in the monosyllabic names of the figures, as already noted. Four figures are written with a single continuous movement (1, 6, 8, 0) and four more can be analyzed as requiring a dual movement, divided by a separating or braking change of direction in the form of an angle (7, 2, 3, 9). Only two figures require a lifting of the writing instrument from the material (4, 5), and only in the figure 5 is the second starting point topographically established, namely at the upper left exit point. (The figure 5 is often written with only *one* stroke, but with the danger of being read as capital S or even figure 8 in some cases.)



Between one and zero

Figure writing could therefore be described as "monogestural" in the same sense that the pronunciation of the names of most figures is "monosyllabic."

c Division into basic elements

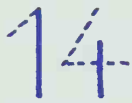
The most used figures are 1 and 0, two signs that have highly differentiated forms: the straight line and the circle. Once again we come across the binary principle: 1 = notch, cut, hardness (two visible stroke endings); 0 = emptiness, readiness (no beginning or ending).

Between these two extremes the other eight figures are arranged with the greatest possible contrast of forms. Unlike in the alphabet, there are very few vertical strokes among the figures, certainly by reason of the dominance of the figure 1, which must stand out among all the others. The only approach to another vertical is found, somewhat stunted and crossed, as though for safety's sake, with a horizontal bar, in the figure 4.

Horizontals, on the other hand, appear more frequently, but for the sake of the clearest possible distinction they are situated at different levels: in 2 at the foot, in 4 centrally, and in 5 and 7 at the top.

Three figures have marked oblique strokes: 2, 4, and 7. Note that all these oblique strokes run from upper right to lower left, the reason being that this direction is the easiest to follow when writing with the right hand.

In the entire set of figures there are only two cross strokes, in 4 and 8. Furthermore, these two crosses are clearly distinguishable from each other by being horizontal-vertical in one case and diagonal in the other. (In comparing the forms of figures with letters we find that in all typefaces, of whatever style, crossings are also very few in number, being found only in f and t, x and X.)



Only two verticals

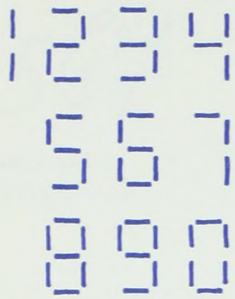
Four horizontals

Three oblique strokes

Two crossings

d The future of numeral forms

From the preceding analytical comments it can be seen how strongly the formal anatomy of figure signs is directed toward a highly developed process of recognition in the reader. The smallest deviation leads to incorrect information – and in the field of figures, ambigu-



A second set of forms

ities cannot be overcome by any factors of context, as is the case with written text.

Today it is more important than ever before to be aware of this need for clarity, since the design of numeral forms is in a state of upheaval with the present emergence of electronically controlled digital displays. For example, the style of figures displayed by pocket calculators, reduced to seven bars, has become rapidly accepted as a standard of recognition, establishing itself as a second set of numeral forms in parallel with traditional figures.

Developments in this field ought to be followed with close attention, since this is not merely a question of technical progress but of fundamental opposition between human sensitivity and technical economy.

X. Punctuation Signs

Our alphabet consists of a fixed series of signs for minimum units of significant sound (phonemes), from which the written language can be assembled. The letters of the alphabet could also be described as literary *construction material*. However, this material alone is not sufficient to formulate writing in a comprehensible form. The separation of words and their arrangement into sentences are made possible only by a logical use of spaces and punctuation marks. These essential, unspoken elements could be characterized as *boundary instruments* with which the basic material of the alphabet can be handled, i.e., related and separated.

reisen
eisern
riesen
serien

Letters are word-building materials

1. Word space

Hand compositors know from the layout of their case that the item lying next to their hand in the lowest compartment and in large quantities is a "blind" piece of type metal, namely the word space. Here again, we come across the elementary importance of an *absence* of signs. It is only through the logical interposition of these empty spaces that a row of signs becomes comprehensible, legible typesetting.

aneinandermal
aneinander mal
an ein andermal
an ein an der mal

Spacing governs comprehension

The historical commencement of a consistent use of spaces to separate words cannot be given a precise date. Early Greek and Roman inscriptions and manuscripts in capital letters have no spaces between the words. In later Roman records, centralized points are used to indicate proper names, then used between ordinary words and at the end of sentences.

Development of a systematic separation of words through a deliberately applied system of spacing did not, however, take place either in monumental inscrip-

DASWORTISTEINBILD
WELCHESVOMLESER
ALSGESAMTHEITER
FASSTUNDAUFGE
NOMMENWIRD

Das Wort ist ein Bild, welches vom Leser als Gesamtheit erfasst und aufgenommen wird.

From inscription to text type

tions or in early calligraphic book script. It is rather to be found in the more ephemeral and rapidly written forms of handwriting, where a clear new start for each word had become a necessity for legibility. During the same era, roughly between the 4th and 9th centuries A.D., the change from capitals to minuscules took place in book scripts. The actual process of *word formation* occurred with these two developments. The early, widely spaced capital scripts were deciphered letter by letter, whereas the procedure for reading the narrower minuscule made it possible mentally to "photograph" the separate word outline. In this way the word space became a logical component of writing.

2. The punctuation marks

A detailed historical or literary treatment of the origin and use of punctuation marks would go beyond the purely graphic field of the present work. Nevertheless it is appropriate to mention them at this point with regard to their modern design as aids to speech fixing. Every newly designed typeface includes a given number of signs of punctuation, drawn in the same style, and these can be subdivided into several groups in accordance with their various functions.

a Sentence-structuring signs

End of sentence

Division of sentence

The name sentence-structuring signs could be given to the basic punctuation marks that regulate the construction of a process of thought within the linear flow of text. On "boarding" a page of text, the reader seeks an orientation concerning the beginnings and ends of sentences, therefore looking out for the *full-stop* or *full-point* sign. (The capital letters at the beginnings of sentences are also very helpful in this respect.)

The *comma* and *semicolon* are the signs with which a sentence is divided, the former having a weaker and the latter a stronger separation capacity.

These signs are sometimes wrongly seen as "breathing spaces" in reading. Any actor will confirm that logical punctuation cannot coincide with rhetorical rhythm.

This marginal comment is made in order to differentiate between two basically different procedures: spoken and unspoken reading.

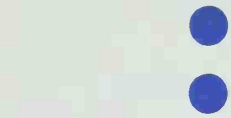
The *colon*, as its appearance shows, is a stop with a double use, marking the ending of one sentence and the beginning of another, which is related to the first one. It is most often used to introduce a quotation, but may also precede an analysis of the foregoing sentence or a list of examples.

Parentheses or *brackets*, round or square, and also the more recently introduced *dash* are signs used to isolate inserted matter of the most varied kinds (explanatory, additional, affirmative, etc.). The dash also has other uses depending on house style and language style, for example, to introduce an important statement or to show a change of speaker in the setting of dialogue.

The *hyphen* has two opposite uses: to join words together in order to express a new concept and to break a word into two at the end of a line within a column. The *oblique stroke* or *shilling stroke* has a similar function in joining two words together, but more in the sense of expressing one as a function of the other (e.g., feet/minute).

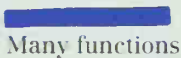
Looking back at the source of these simple punctuation marks, the date of their definitive establishment may be given as the end of the Middle Ages, i.e., the period of the invention of printing. There must have been rules of writing among the medieval calligraphers, but an individual expression and a personal interpretation were given to the signs of punctuation in every region, in every monastery, and in some cases by individual scribes.

Medieval scribes used punctuation primarily for the abbreviation of very long Latin word endings, particularly in connection with the use of increasingly narrow columns, which by this means were able to show an amazingly well justified right-hand margin. The full point was the mark mainly used as a sign of *abbreviation*, a use to which it is still put today. In the same way, the *apostrophe* is still used as a sign of elision (don't, isn't).



Introduction

Insertion



Many functions

Hyphen: joining or breaking

Joining sign relating to function

Abbreviation

Apostrophe, elision

Because of the wealth of conjunctions in the Latin language joining one part of a sentence to another with unequivocal meaning, there was little need for punctuation marks like the comma and semicolon in most medieval manuscripts. Even the use of the full point was not always essential because of the frequent use of large, often decorated initials at the beginnings of sentences.

Printing from the office of the Venetian Aldus Manutius, one of the most notable type founders and printers of the Renaissance, can be regarded as authoritative for the elementary use of punctuation. His books show an astonishing unity and clarity of house style. They give the full point, comma, and colon their definitive functions and also make use of parentheses and the question mark. It is also noteworthy that they do not include any abbreviations within the texts.

!

Affirmation, exclamation

?

Question, doubt

« »

“ ”

Spoken, quoted

b Expression signs

The remaining commonly used marks of punctuation have, in addition to their purely structuring function, qualities that can give a specific expression to the texts concerned. Thus the *exclamation mark* and the *question mark* express, respectively, emphasis and uncertainty concerning the preceding word or sentence. It is important to note that these two signs consist of full points to which extensions have been added. They are therefore the only ones that can take the place of the full point at the end of a sentence.

Quotation marks or *inverted commas* are primarily used to enclose those parts of a text that are to be marked out as verbatim quotations of direct speech. They also have other uses, for example, the separation of unusual turns of phrase or specialized expressions from the main body of the author's text. The first uses of these "guillemets," as they are called in French, are to be found in manuscripts of the early Middle Ages in the form of sideways-lying lambda signs from the Greek alphabet: < > . The inventor of this practice is said to have been called Guillaume. The writer has a further possible means of expression in the repetition

or combination of two or more marks of punctuation. This practice can be used to suggest much that is unwritten. Combinations of signs like !! !? (??) ... (...) are common notations that can say a great deal in a little space.

The expressive punctuation marks do not stem from the medieval writing of Latin but from the post-Renaissance period, when the printing styles of modern European languages were established. That is the reason why the form and usage of these signs have developed somewhat differently from one country to another. There is a difference, for example, between French and English quotation marks, while in Spanish the exclamation and question marks are placed at the beginning of the sentence (upside-down) as well as at the end.

» German «

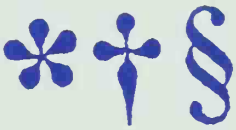
« French »

“ English ”

¡ Spanish !

Different usage by language

c Reference signs



Notes, references

Outside the field of sentence-building punctuation marks, the compositor has access to a number of signs that are used within the text to guide the reader to explanatory texts with which the author does not wish to burden the smooth flow of the main text, preferring to relegate them to footnotes or listed notes at the end of the book or chapter. As a reference or indication of a note, the most commonly used sign is the star-shaped *asterisk*. English-language usage allows the insertion of the *dagger* sign for the same purpose.

The *paragraph* sign may also be included in this section, as it also finds use as a reference mark.

3. The ampersand

The ampersand is neither a letter of the alphabet nor a punctuation mark. It is a separate ideogram, derived from a ligature of the very commonly written Latin con-

Ampersands are not tied to one language

£ $ ¢
¥ ℓ ƒ
Currencies

junction et (and) and subsequently used for many hundreds of years. The sign is no longer linked to speech but is used, like its mathematical relative + for the idea of addition, most often to indicate an association in a company name. Stylistically, the ampersand has been matched to the appearance of the alphabets with which it appears, in a suitable form for every period and every technique of composition. Its independence from direct verbal readability permits the typeface designer to satisfy a taste for inventing forms.

4. Currency and other signs

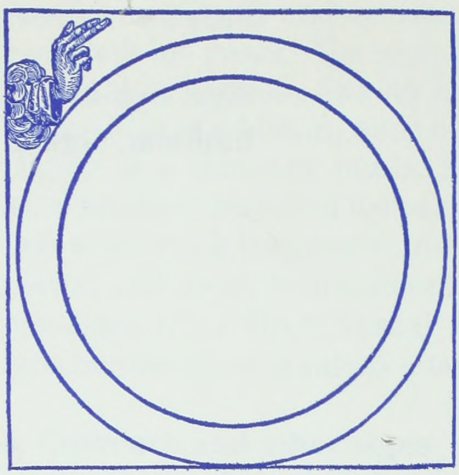
The final category of signs that are usually designed to match a specific type style and therefore belong to an alphabetical font, are *currency* signs. Many of them are formed from the initial letter of the name of the currency unit in the country concerned. In order to distinguish them clearly from the alphabetical signs, these initials are usually crossed through with one stroke or two.

The illustration of these signs completes the series of "style-bearing" characters belonging to a font of printing type. The complete range of technical, economic, and journalistic writings naturally needs more signs, but these have nothing to do with the question of speech-fixing script, being pure symbols or ideograms, and form the subject of Part 3 of this work.

+ @ = % ×

Part 3

Sign, Symbol, Emblem, Signal



"The Creation of the World"
Woodcut from an incunabulum,
printed in Nürnberg, 1493

PART 3: SIGN, SYMBOL, EMBLEM, SIGNAL

Introduction

One of the most important aspects of human life and a basic condition for survival has always been the means of expression for mutual understanding between members of a tribal or social group. This need for communication and its constant improvement and development can be seen as a major factor in the growth of human civilization.

In the course of mental development, comprehension between individuals and individual has increasingly concentrated on *verbal* communication. During the millennia of historical times, the verbal message has also been visibly fixed by means of scripts, among which the development of the Roman alphabet can be evaluated as the high point of an abstract, rationalized method of expression.

Nonalphabetical signs

It must be borne in mind, however, that speech made visible, that is, reading and writing, was reserved as the privilege of a clerical elite until a few hundred years ago, or to be more precise, until Gutenberg's invention of the mass production of texts.

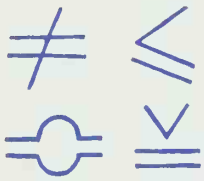
In the days before printing, the "illiterate" population not only possessed an important oral tradition but also had other ways of fixing and communicating that which was thought or spoken, with pictures, symbols, signs, and signals forming a kind of "tribal handwrit-

Examples of representative and encoded signs

ing" that was in daily use as an aid to thought, a means of comprehension, and a method of bearing witness or authentication. Pictures and signs either were clearly understandable or, on the contrary, had an occult and encoded meaning. The spread of script through all levels of society and the growth of a rational approach to intellectual life as a whole over the past 500 years have almost entirely wiped out both the use and the understanding of this original fund of pictures and signs.

New signs for science

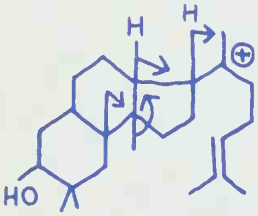
Every nation has its language and most languages have their script. Beyond national and linguistic boundaries there are more and more people who meet in the interests of science and can understand one another in a general way. It is evident that the speech signs of normal language are now too imprecise and quite inadequate for scientific communication, and it has become impossible to cope with the precision of scientific work with purely verbal signs. From this perfectly natural need for an absolutely clear and unequivocal way of recording exact values, functions, schemata, and so on, new sets of signs have come into existence and been kept in continuous development.



Exact statements without language

A mathematical, chemical, or physical formula may well still be based on the alphanumeric repertoire, but countless other signs have been added, partly from the treasury of the past and partly by new invention.

The extent of the gap between the recording of scientific concepts and the fixing of purely verbal speech can be appreciated when one considers the fact that mathematical, chemical, and other formulas have departed from the linear basis of left-to-right-reading text records and make free use of all directions of the writing surface for their expression.



Formulae spread out freely in two dimensions

The game of chess provides a comparable approach to that of the abbreviated sign language of science. As in a formula, so on the chessboard, all the values and positions are present to the imagination without being written down. All the pieces are positioned on the

checkered grid of the board, and the game proceeds to its conclusion, in accordance with established rules, in the minds of the players.

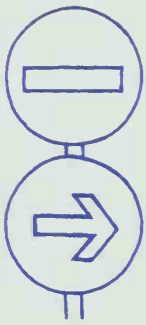
Pictorial signs for industry

The economic laws of a constantly growing and ever more insistent supply of goods, stimulating an ever increasing field of demand, have also produced new pictorial conventions and sign languages. In technical terms, reference is also made to "brand images" and "corporate identity programs." Publicists have the task of giving new companies and new products a new image, so that in the field of commercial graphics a multitude of new trademarks and company logotypes have been designed in recent decades. Most of these modern industrial pictograms are based on the principles of the strongest possible graphic effects and contrasts. It is amazing to see how often similarities now occur in the appearance of these signs, a fact that can in many cases be attributed to the one-sided orientation of the training provided for designers but may also be blamed on the loss of knowledge of the wealth of past sign cultures, from which new ideas could be derived.

The danger of similarity

Directional signs

Streets and roads in town and country, and even passages within buildings, are now so densely constructed that a natural sense of direction is no longer sufficient for reaching a required destination from a given point of departure. Any such movement has become almost unthinkable without directional signs and inscriptions; and since new places and routes are constantly coming into existence and new means of transport into use, with a continuous need for modernization and automation, there is a corresponding need for the invention of new instructional signs conveying the understanding of an unequivocal practical message.



Direction signs are becoming essential

A surfeit of pictures?

Technology has now made it possible to distribute realistic information almost instantaneously over the entire globe, not only in verbal form through telephone and radio but also by the transmission of pictures on film and television.

An important aspect of this development is the clear tendency among the receiving public to prefer the pictorial message, in its televisual form, to purely verbal means of communication. It is felt to be less trouble to look at a picture than to attend to and understand a spoken message.

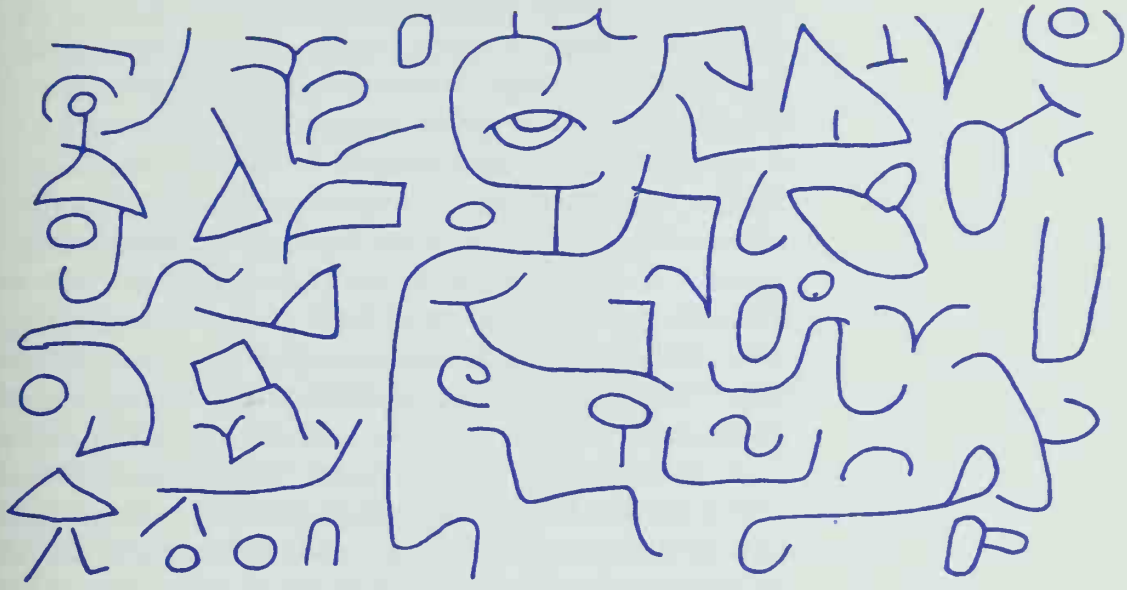
The massive diffusion of pictures, also in printed form, is in the process of making a major change to the general psyche of the present generation. The broadcast picture is globally received as it were in glances, not continuously followed, in contrast to speech, which proceeds through time in linear fashion and, in order to be understood, must be attended to and taken in *without interruption*. Moreover, the picture shows the message at once in its entirety and in an *encapsulated* form. Viewers no longer have to create their own images, as is the case with readers or listeners. The picture is a finished product that rules out the act of imagination and causes a far-reaching impoverishment of the human faculty of the "mind's eye." In addition to this, pictorial communication brings in to effect what might be called a process of demystification, since everything now happening in the world can be seen by everybody at the same time. This abundance of "photographic" information leads to a certain pictorial surfeit.

The flood of illustrations that are daily taken in by humankind on television and in print can never satisfy human curiosity, and the human capacity for imagination is not strengthened by this multitude of presentations but schematized or organized.

On the other hand, printed text, which also has its effect on the reader in unlimited quantities, is undergoing certain restrictions, in that the alphabetical letter has lost some of its power of attraction and has

become a necessary and almost banal functional object.

The demand for a new "stylization" of pictures, for drawings and signs that are accessible to understanding by means of a detailed process of observation, search, and meditation, is to be seen, for example, in the whole development of contemporary art. A newly awakening, lively interest in the meaning of signs with a symbolic content can be observed everywhere nowadays.



Freely copied from a painting by Paul Klee

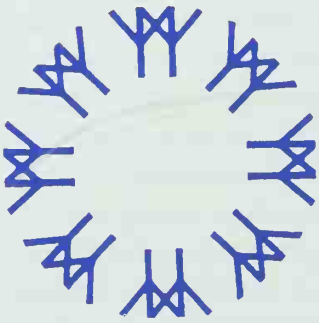
Back to pictograms?

Every blink of the eye brings a picture to the human mind. Our thoughts and concepts, memories and dreams, our whole experience is played out in pictures. This is not a reference to photographic reproductions but to mental pictures, which are not of well-defined objects but rather of archetypes of things that we have seen and experienced, once or many times, and through the piling up of impressions something in the nature of stylized drawings has remained behind, without any sharp outlines, for these pictures, as in dreams, have become somewhat schematic, something that approaches the nature of a sign.

It is therefore by no means surprising that a need for a renewal of signs and symbols is becoming clearly apparent. Attempts to satisfy this need and the search for profounder possibilities of expression and communication are to be found in the form of graffiti on house walls, in the works of successful painters of our generation, and even on the printed T-shirts of young people.

The collection of symbols and signs in the present volume represents an attempt to open up the lost realm of these "pictograms" to the world of the reader's imagination in an organized manner. The book is not, however, intended to be a complete reference manual but more an incentive to observation and perhaps also a source of new forms of expression.

One might well ask whether we are not thereby on the way back to the origin of the recording of thought, to the pictorial scripts of our forebears? How strangely clear it seems that the modern need for symbols closes a circle that takes us back to the rock paintings mentioned right at the beginning of this study as the precursors of speech fixing, the first of all indications of human culture. But we have also shown that this way back cannot take place without an impoverishment and a schematization of speech itself, for the precise function of the pictorial sign in an infinitely complex world is to provide organized signals in places where speech would be excessive. So we can provisionally answer the question at the head of this paragraph as follows: pictorial signs are becoming ever more indispensable for human communication, not exclusively but in the right places.



Logotype of the Montreal World Exhibition, 1967. The medieval sign for friendship (see Chapter III, section 4a., no. 12) is repeated to represent a community in the form of a circle (the world).

I. From Illustration to Symbol

1. The picture

Like all printed books, the present volume is based on the principle of the two-dimensional printing process. The use of color and of halftones, i.e., the reproduction of full-color pictures with a three-dimensional effect, has been deliberately excluded. Since this book is a treatise on *signs*, this limitation should rather be seen as making a positive contribution to the formation of a unity of expression among all the figures of the book, so that they stand in a closer relationship with one another and can be more effectively compared.

What is generally meant by the term "picture" is a record, as true to life as possible, of that which the human eye sees or is believed to see. The pictorial arts of the 19th century, for example, strove to capture as faithfully as possible the perceptions of the human eye.

With the invention of photography, the naturalistic art of "image recording" lost its original meaning and value, so that it is no coincidence that the departure from realistic representation in painting runs parallel with the emergence of photographic techniques. This kind of pictorial reproduction now makes it possible to affect humankind with a mass of pictorial material in ever-increasing quantities, whether in the form of printing or of television.

In earlier times, a picture was experienced as what one might call a concentrated medium, a self-enclosed message, in many ways in the sense of an object of contemplation. Today the flood of pictorial information and moving pictures has developed into a real pictorial *language*. For the viewer, or "reader" of the pictures, the accompanying verbal expression now plays only a secondary role in the understanding of the meaning of a communication. As an earlier typical example of this trend we may mention the silent movie, the art of which

Picture reading

lay precisely in the communication of the action without the use of speech.

Members of the younger generation are growing into a practice of real "picture reading," flipping through comic books without consciously studying the words in the speech bubbles. The comic and other kinds of pictorial strip are forming a new mentality in the world of visual communication.

In the field of pictorial information it can be seen that levels of picture quality are clearly divided into two groups. On the one hand we have the brief and superficial type of information, as, for example, in the daily press or the filmed news report. In this sector, the quality of reproduction does not play an essential role and the pictures are regarded only as "sketches," where the coarse screen dot of newsprint or the poor contrast of the TV screen is subordinate to the viewer's powers of imagination. On the other hand, there is also a demand for a quality of graphic reproduction approaching ever closer to reality, for example, in the field of publicity, where the faithfully reproduced color of the item being promoted is of the greatest importance.

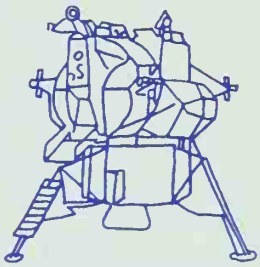
Two basic media are available in the first instance to the techniques of communication: verbal language and pictorial language. In both sectors, the diversity of the vocabulary is coming more and more into evidence, with an increasing recognition of lapses such as the hackneyed phrase or empty cliché. In the field of speech we are now experiencing an extension of the vocabulary into a kind of "polymathy," where the diversity and multiple meanings of expressions and figures of speech call for a constant learning process if they are to be understood. The picture, for its part, is branching out into the micro- and macroscopic fields, where it is no longer to be judged as absolutely true to nature since it may not be visible or comprehensible to the naked eye. Consideration of these kinds of picture naturally leads us into the field of the diagram or schematized illustration, which it is important to examine more closely in the present context of the progression from picture to sign.

2. The diagram

The essential purpose of a diagram is to analyze or break down an object or event into its parts, rather than merely describing it verbally or representing it photographically. The complete picture is therefore either stylized, cut up, or dissected, so that a construction, a mechanism, or a function can be explained. In addition to the representation of objects, other kinds of diagram can employ graphics in order to represent tables listing abstract concepts that illustrate technical or economic facts.

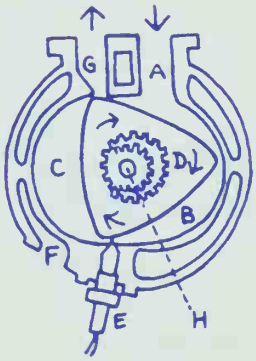
a Stages of schematization

Our examples show four of the main stages of schematization, technically known as degrees of iconization. The first illustration consists of a drawing recognizable to almost everyone as the moon landing craft LEM. This is an example of extreme simplification: an outline drawing showing only the most essential outward forms and renouncing any treatment of surfaces by means of colors, halftones, shadows, or structural information about the material. In this sense the illustration may be regarded as representing the first level of schematization, since the departure from reality is already considerable and the sketch relies to a great extent on the viewer's own memory image of the object.



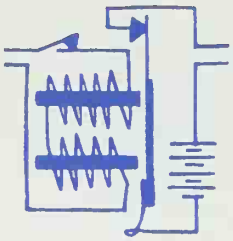
Simplified illustration

The second example is of a diagram that makes greater demands on the viewer's intelligence. It is a *cross section* of a motor. The picture has become divorced from reality as the object will never really be seen in the form illustrated, but the cross-cut representation is absolutely necessary for the clarification of explanations about the functioning principle of the motor.



Cross section

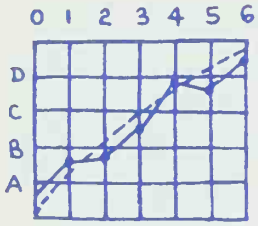
A third and even more abstract form of schematization is shown in the form of a *wiring diagram*. The outward form of the object has now completely disappeared and only a part of the function of the equipment is explained, namely the electrical. Within the wiring diagram there are certain signs whose meaning cannot



Electrical wiring diagram

be immediately recognized, since they belong to the category of scientific signs and as such must be learned by the technician.

The reader will have noticed that in the progressive course of schematization, verbal explanation becomes essential as soon as the second stage has been reached. The stronger the schematization becomes with increasing distancing from straightforward representation of the object, the more dependent it becomes upon explanatory language. In the final example this fact becomes even more clearly apparent. The illustration is of a *table* with a basic grid dividing up specific values. The two-dimensional arrangement of these lines of value with a horizontal and a vertical coordinate allows given relationships to be visually fixed at all the crossing points. The connecting lines between the individual points produce the *curve*, which makes situations and trends instantly comprehensible to the viewer with spontaneous clarity.



Graph

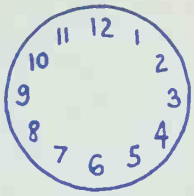
Within the four degrees of schematization shown, there is a whole range of other possibilities of graphic representation to support the verbal explanation of things that cannot be fully or clearly described in words alone.

b Computer aids to schematization

Theoretical views "calculated" by computer

The need for representation of third and fourth dimensions gives the technician the occasion to make use of new sources of schematization, for example that of digital recording on a computer-controlled screen, the main advantage of which is to allow the precise regulation of the timing of a course of action. For example, the planning of the construction of a motorway is dependent upon so many determining factors that consultation on the cathode ray tube has become an indispensable aid. The coordination points of the terrain are stored in the computer memory, together with specifications of the basic principles of construction of the theoretical roadway. A preset line is fed into the computer as impulse (input), and the result appears on the screen in the form of perspective views of the

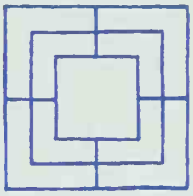
location of the road in the preselected portion of the terrain. The progression from picture to picture makes it possible to identify and correct faulty decisions that could not have been foreseen by the human brain.



Plan for division of time

3. The ground plan

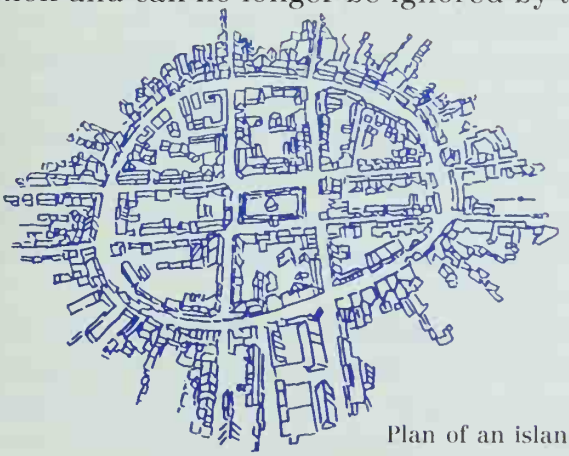
The term *ground plan* in the present context is taken to mean the visibly indicated division of a space or a visual arrangement of a lapse of time. Such divisions and arrangements are the schematic bases on which something is organized or happens. A clock face, for example, can be regarded as a ground plan on which time becomes measurable through the movement of the hands. The same applies to the checkerboard as the ground plan for a game, providing a grid on which the pieces are moved in accordance with the rules and the game is played out.



Game plan

The choreographer also draws a ground plan on the stage to determine the movements of the ballet, and the general superimposes two ground plans by drawing in a battle plan on the geographical ground plan, i.e., the map.

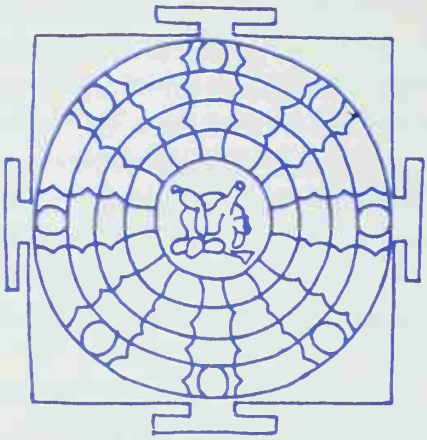
Without a ground plan of the streets in a street map, visitors to a town would become lost in the maze of houses, and even the native of the town must make frequent reference to the plan of the transport network. The orientation plan is a schematic and graphic representation with a greater or lesser degree of realistic illustration and can no longer be ignored by travelers



Plan of an island village has symbolic quality

today, from the points of view of both space and time.

The modern phenomenon of expansion has outstripped the human capacity for understanding in practically all fields, so that the individual now has to rely on *schematic* images of transport networks, business results, scientific achievements, and so on.



Indian Tantra image: a plan for meditation

In contrast to all these movements into the incomprehensible, our bird's-eye view of an island settlement in the Pacific Ocean produces a ground plan which is fascinating in its simplicity. The streets are laid out like a sign, consisting of cross and circle, with a strong emphasis on the center. The town plan has here become a symbol sign which all inhabitants carry in their memory and in relation to which they can identify themselves.

As a final example from the multitude of different kinds of ground plan, we take an image from Tantric Buddhism. It is to be seen as a contemplative plan, before which believers follow their life's course in meditation. The path leads from the circumference, around the decreasing concentric circles to the center, which is Nirvana.

With these examples we have already departed considerably from scientific or everyday diagrams and ground plans into the realm of the symbol, which will be the subject of the greater part of our observations.

4. The allegory

The only reason why we have included an account of the allegory at this point in our considerations is that it is too often confused with the symbol.

The allegory consists of a purely figurative representation, usually a personification of an abstract concept, with the objective of providing a naturalistic illustration of some extraordinary deed, exceptional situation, or outstanding quality. Most of the allegorical figures of Western culture are derived from the mythology of Greece and Rome and given *attributes* in a manner that generally dates back to the Middle Ages or the Renaissance. The combination of the historical figure with the symbol-laden object produces an abstract statement that is, in fact, allegorical. Thus, for example, the winged female form is the generally understood representation of victory and peace, and the horn filled with fruit is the allegory for wealth and abundance. The figure of justice, a female form with bandaged eyes, holding a sword in one hand and a pair of scales in the other, is no longer merely a symbol or connection between a visible and an invisible world but an allegorical picture of a real phenomenon.

The figure of justice is a typical representation of allegorical forms from mythology or religion. Other examples, too numerous to mention, range from the Centaur to the Sirens and the Statue of Liberty.

In the 20th century, the tendency to use figures from antiquity to form allegorical images has almost completely died out. Today, new forms are coming into the foreground. Figures of supermen of all kinds, conquerors of outer space surrounded by robot slaves, etc., will probably form the new models for the allegorical expressions of the future.

Figure of Justice, a typical allegorical image

5. The images of superstition

Superstition is defined as "misdirected reverence." It is based as a whole on a primitive fear of the future, of the malign. Humankind has always tried to protect itself from ill fortune. Many superstitious acts have a

thoroughly reasonable core of sense. To walk under a ladder increases the risk of being hit by a falling object. In the days when salt was precious, to spill it could signify real misfortune.

Amulets are a product of superstition. These objects, usually worn or carried about the person, are supposed to have a protective influence by providing a guarantee against misfortune. Such amulets are also known in the form of pictures, and it will be sufficient to mention only a few typical examples. Apart from the number 13, most of them are bringers of good luck: chimney sweeps on New Year's Day, the lucky pig, the ladybug, the money spider, etc.

Closer to the symbolic sign of good luck is, for example, the four-leafed clover, which as a biological "sport" gave the farmer an important indication of the good quality of the land, since it is only found on certain kinds of soil. The horseshoe is another sign of fertility with a reasonable basis, since its discovery provides evidence of long cultivation. It is also an object of respect, sometimes associated with use by distant ancestors.

Good-luck signs

II. The Symbol

1. What is symbolic?

In looking at pictures, sculptures, architecture, and all kinds of ornamentation, including ornaments on objects of daily use, from whatever period, ranging from Stone Age discoveries to modern paintings, we are constantly faced with the question, What does it mean? What is hidden in this thing? Pictures and ornamentation are, in fact, seldom unequivocal in their statements or easily "readable." The viewer infers an underlying meaning and looks for an interpretation. This often undefinable capacity of a representation to make a statement is also denoted by the term "symbolic content."

This symbolic element in pictures is an implied value, a mediator between recognizable reality and the mystical, invisible realm of religion, philosophy, and

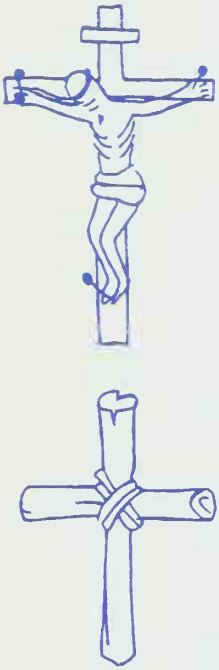
Painting on an Egyptian coffin

Yugoslavian icon of the 12th century

magic, extending from the consciously understandable into the field of the unconscious. To this extent one can say that the artist or craftsman is in reality a mediator between two worlds, visible and invisible. In former times, craftsmanship in itself was regarded as something "miraculous." The more completely the work brought its content to expression through its aesthetic perfection, the greater its symbolic value became and the more worthy of worship it was. A typical example of this effect is the icon, whose beauty, greatly enhanced by a certain stylization, is entirely concerned with the revelation of the object's symbolic content and the enlightenment of the viewer.

2. From symbol picture to symbol sign

In contrast to this elevation of the symbolic picture to perfect beauty, we also find the tendency to simplification, where the pictorial is reduced to the signlike through the representation of the object in a basic form. An example of this is provided by the symbol picture of the crucified Christ, which cannot be regarded by anybody in the Western world as an anecdotal illustration but only as an absolute object of worship, i.e., a symbol of the Christian faith.



Maximum formal reduction from symbolic image to symbolic sign

In contrast to this pictorial absolute one may find, in a mountain hut or a nomad's tent, two pieces of wood tied together to represent the same cross and thereby signifying the same symbolic content for the believer, even in the absence of any figurative representation or even any aesthetic value. Although the picture has been reduced to a simple sign, its symbolic content remains absolutely identical.

The reduction from picture to sign is a different process from the development of script, which as we have seen was the result of a reduction of hand movements by the scribe. The symbol sign arises from the believers' need to possess a version of the original, genuine image so that they can participate, as it were, in its radiation; in just the same way as superstitious persons wearing amulets want to transfer some kind of higher power to themselves.

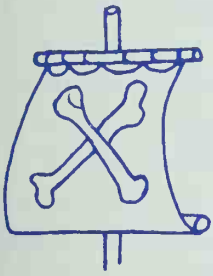
The stages of symbolic value are therefore not dependent on any perfection of outward form but on the readiness of the viewers to attach their conviction, their faith, to an object of meditation, i.e., a symbol.

3. Ambiguous use of the word "symbol"

The term "symbol" is often incorrectly used today, for example, to describe newly invented signs that are different from the normal alphabet and numerals. Admittedly, it may well be difficult to alter this practice in the future. A scientist will always wish to make use of a new sign unit for a newly discovered formula, by finding or inventing a so-called new symbol, which fundamentally belongs to the category of purely scientific signs and in no way justifies the use of the name of "symbol."

On the other hand, it is difficult to achieve any certainty about the symbolic expression content of any given figure in the class of nonalphabetical graphic expression in our environment.

A significant example of this difficulty is the sign of the crossbones. On the warrior's banner or the pirate ship's sail it appears as the heraldic signature of a fellowship. On the medicine bottle it is the signal for "poisonous," and on the motorcyclist's leather jacket it is a symbol sign for daring or acceptance of risks.



Emblem (logo)

Signal

Symbol

III. The Graphic Wealth of Figurative Symbols

The selection and arrangement of signs in the tables in this chapter do not follow any system of geographical, historical, philosophical, or metaphysical interpretation. The basis of selection and juxtaposition is similar to that of the tabulations in the previous studies in Parts 1 and 2, namely, to seek an understanding of the elements of the signs from the point of view of graphic expression. Our main interest lies in showing how figurative representations are altered or simplified by the manual techniques applied in association with the material used. At the same time, we believe that the juxtaposition of similar kinds of signs from different periods and cultures makes the original intention of a sign form more clearly recognizable and therefore more understandable for the reader.

The series of tables follows a logical sequence in that the concrete pictorial signs are gradually changed into abstract signs in a manner that is similar to the transition from pictographic to ideographic and alphabetical script. It may well be that this arrangement follows a certain historical sequence of development, since it can be clearly seen that an increasing tendency to abstraction has gone side by side with humankind's growing mental activity from the earliest times.

There is also the consideration that a symbol with reduced form is more memorable than an ordinary picture and that the coded secret within a nonfigurative sign is precisely that which offers more incentive to meditation and also a closer association with the occult.

We have deliberately left out the purely figurative type of image, that is, the one that is more or less true to nature, even though the illustrative form as such occupies an important position in the symbolic tradition. In this connection we have to follow our particu-

Siren: a symbolic pictorial drawing from the 15th century. How far removed from a sign!

lar line, namely the theme of *"Sign, Symbol, Emblem, Signal,"* as faithfully as possible, by keeping the emphasis on all that is really *signlike* among human records.

1. How pictures become symbol signs

a The process of stylization

The starting point for our examination of the visible formulation of an image is the physical substrate, the object that carries the picture, sign, or ornamentation. The object denoted, or designed, is also of essential importance for the interpretation of the symbolic drawing. There is no doubt that one and the same sign shown on different objects, such as a food container, an altar, a piece of clothing, or a tomb, cannot signify a single, uniform concept.

From the very earliest stages of human development there has been an association between humans and the objects they use. It was the stick that lengthened the arm to strike more firmly and the stone that turned the hand into a hard weapon. From the weapon to the tool, from clothing to housing, the number of such objects grew, and through constant use they become indispensable companions.

Purely practical evaluation with regard to the degree of usefulness of an object was followed by a more emotional scale of values, in that the object became a treasured possession. What could be more appropriate to this affectionate feeling than to "sign" the object by providing it with a distinguishing mark? This process of adoption, accompanied by an awakening aesthetic

1 to 3: Strongly figurative representations, where the positioning of the limbs is adapted to the circular form of the object. Celtic coins. 4: Adaptation of heraldic images to the shape of the shield led to countless varieties of stylization during the Middle Ages. 5: Human figure compressed into the circular shape of a spindle disk. Even the central hole is included in the composition as a shield. Baked clay, Ancient Mexico. 6: Japanese family device. The sign acquires a supernatural air through the total integration of the birdfigure into a circle. Embroidery. 7: Distortion of naturalistic figures to ornament given spaces was mainly practiced in the field of heraldry. This typical example is a saddlecloth, on the surface of which the lion figure is distorted to the extreme. Embroidery, England. 8: Porcelain painting showing an interesting example of adaptation of forms in the well adapted to fill the side of a stone sarcophagus and strongly stylized. Stone carving, Scandinavia. 10: Snake scratched in a piece of timber and completely integrated with its shape, Dahomey.

Adaptation of forms to the object decorated

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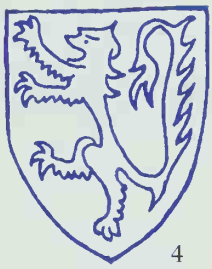

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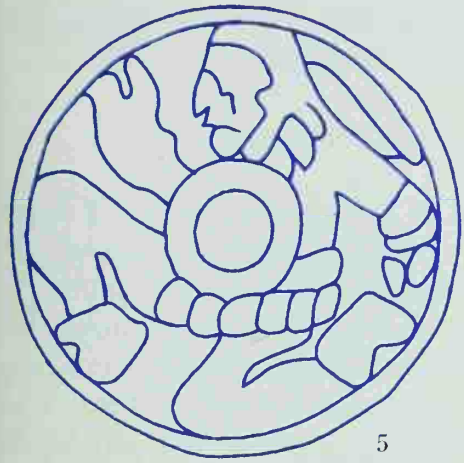

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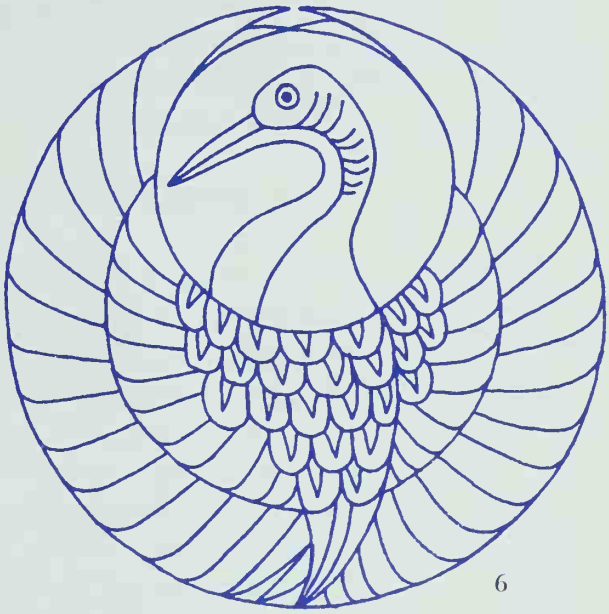

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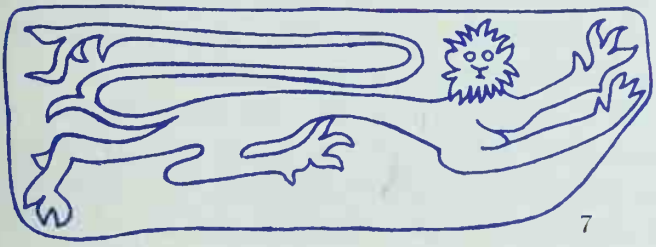

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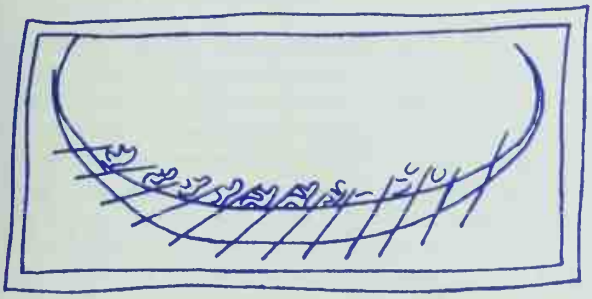


9

10

sensitivity, led to ornamentation. At the same time, mythical beliefs in superhuman powers led to emblematic drawings that gave the weapon more accuracy, the tools more effective uses, in order to protect the lodging from harm and the owner's body from sickness and death.

In the beginning, then, was the object, not the sign! The sign has been determined by the form and material of the object. This process of adjustment is nowadays known as "stylization." The drawing is adapted to the material and the form to the object, thereby heightening the signlike nature of the expression. This tendency toward sign making also draws the image further into the field of symbolic expression.

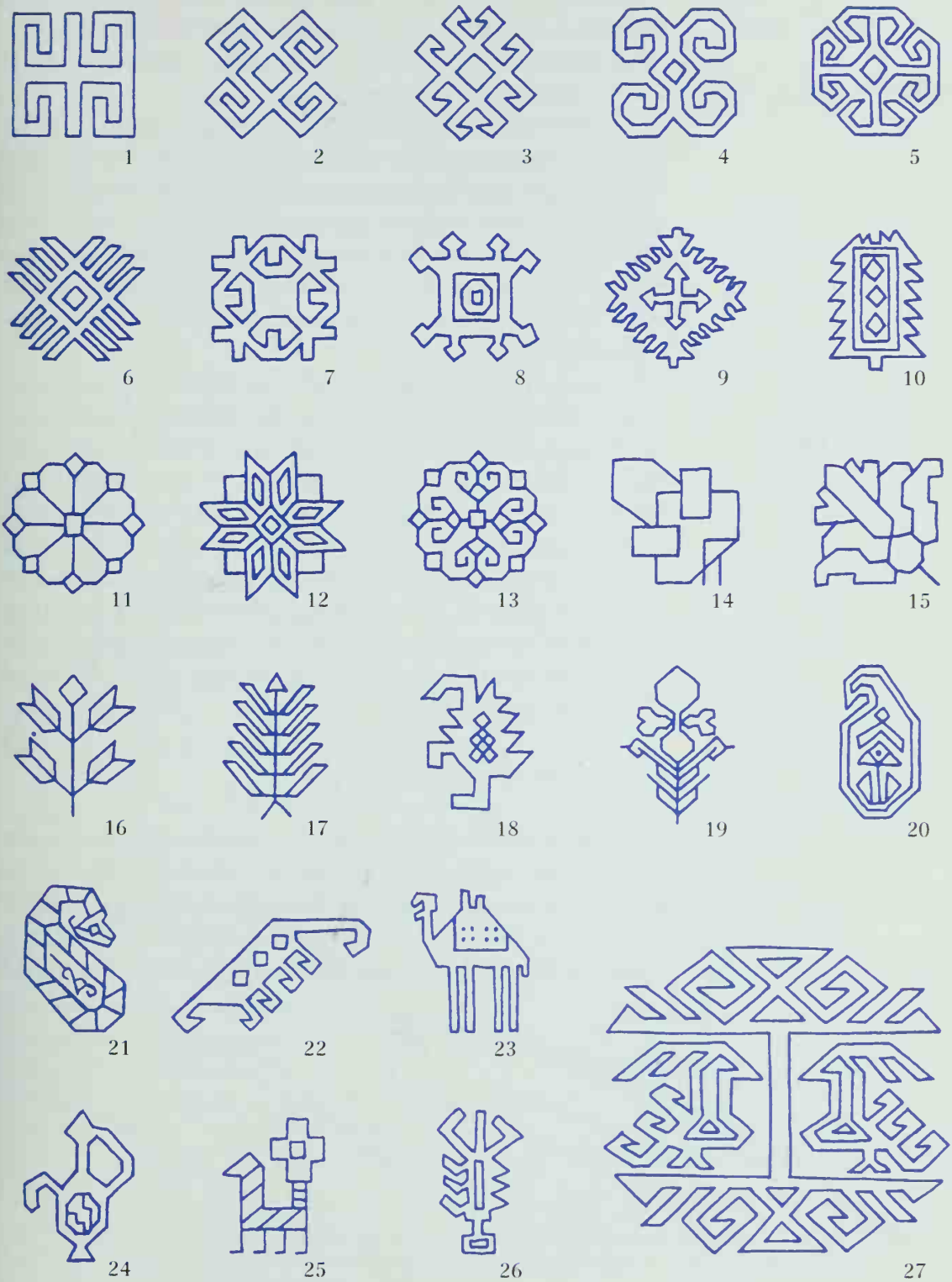
b Simplification through material and tools

A proper appreciation of the graphic effect of signs would not be possible without a knowledge of the substrate, which determines the structure, and the characteristics of the tools employed. Inscriptions can be scratched or carved into stone, burned or cut into wood, and woven or embroidered into textiles. The formal "typification" of sign production of many kinds developed in this way, from the relationship between material and tool (see Part 1, Chapter VIII, "The Diversity of Appearance"). For this reason, the captions to the illustrations in Part 3 give information about the techniques employed, wherever possible.

In order to illustrate a single field of expression we have assembled a table of the most typical pattern elements of Oriental carpet weaving. The symbolic meaning of the individual figures can no longer be

1 to 10: Selection of the most widely used carpet-knotting patterns. Most of these signs are centrally symmetrical. The varied treatment of the endings is a point of interest. In 1 and 2 there is the beginning of a meander; in 4 and 5 the curving-in is tendril-like, unlike in 6, where the endings have a very bare effect (unusual). 9: Crosses are found only in the northern regions (Caucasus). The zigzag border is called "running dog." In patterns 11 to 19, flower and plant motifs are recognizable: 14 shows a cotton-plant blossom, 15 a carnation, 17 a wheat ear and 18 an oak leaf. 20 and 21 are examples of the famous "Boteh" signs, the origin of which is still a matter of dispute among experts: almond, water drop, fig, etc. These are typical of ornamental elements with a symbolic content that can no longer be interpreted. The remaining signs of the table are figurative and therefore come from northern regions. 22: Dragon; 23: Camel; 24: Can; 25: Dog with cross on tail; 26: Crab. 27: A rich weaving pattern from a Swedish carpet, showing the tree of life with fantastic animal figures.

Pattern signs of weaving techniques



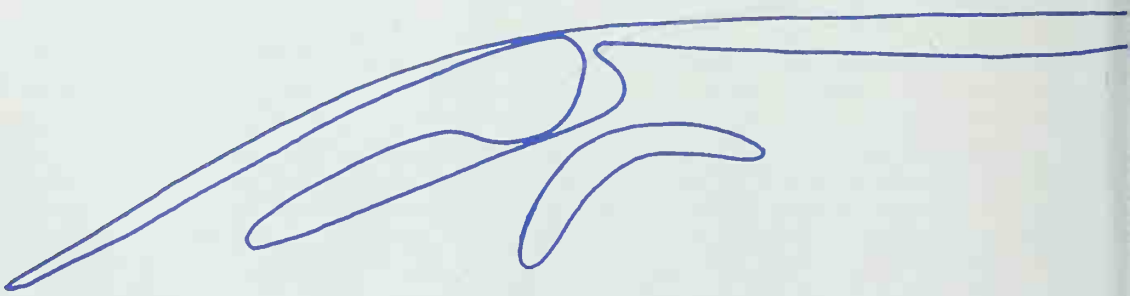
interpreted with certainty in this field. The deeper meaning of the pictures and signs on which the ornaments are based lies far in the past and has been largely forgotten, because of constantly repeated use and the very prominent tendency toward the strongest possible ornamental effect.

At the same time it should be borne in mind that the techniques of carpet weaving and knotting have found their widest use in the lands of the Mohammedan faith, which actually forbids the representation of human and animal figures, and even of nonstylized plants, for ornamental purposes. This is certainly a further reason why the objects in question have become largely unrecognizable.

The wealth of ornamentation in Oriental carpets can probably also be attributed to the climatic conditions of the infertile regions of their use. When nomads in the desert unroll their prayer rugs in the direction of Mecca, they surround themselves with an imaginary magic garden. By contrast, the patterns of carpets made in northern lands are much more subtle, being mostly limited to geometrical patterns in the ordinary surface of the textile, and the decorative elements have remained recognizable figures (see also table of animal and plant symbols).

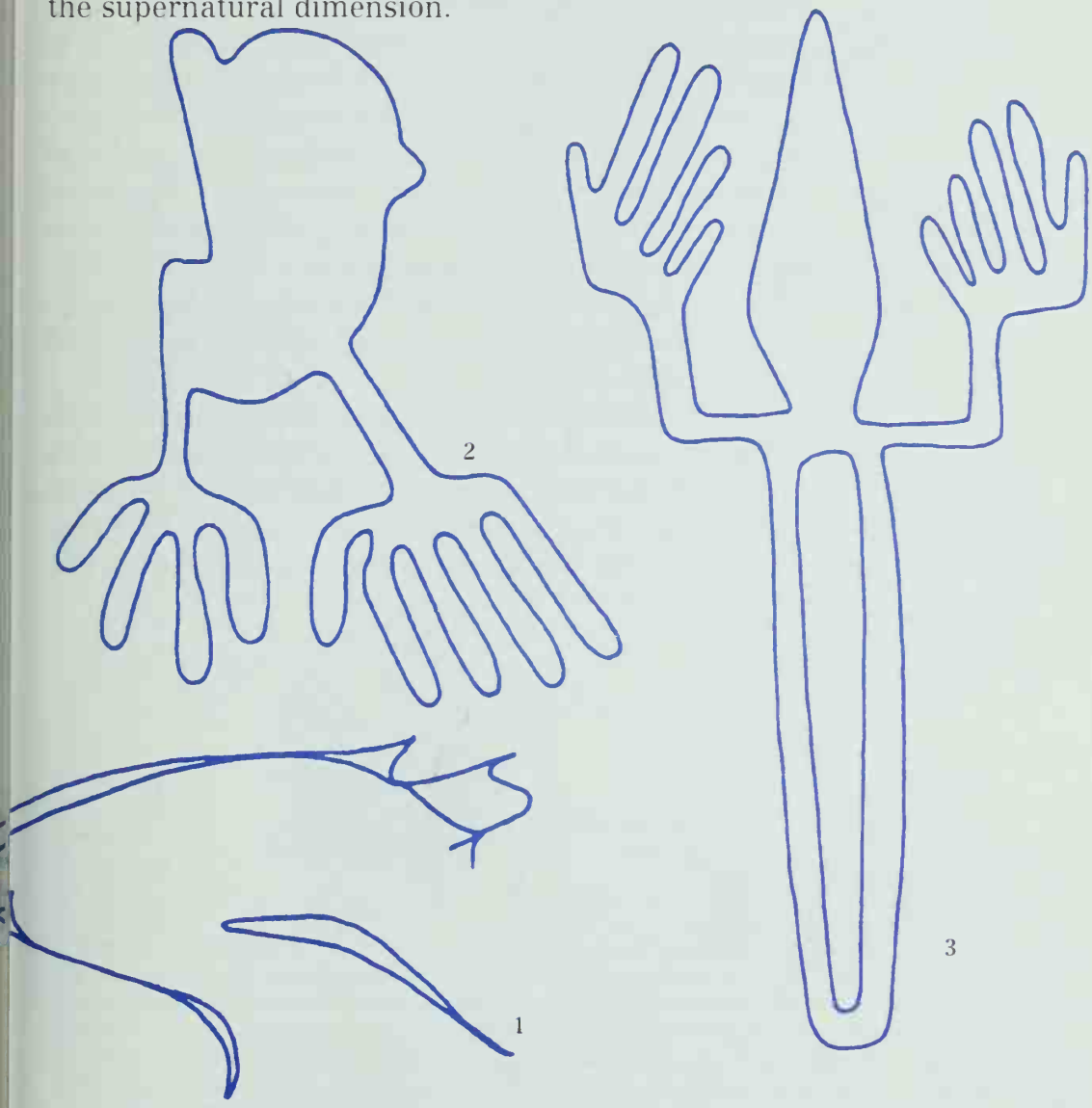
c Gigantic symbol signs

Gigantic symbol signs, which in many cases have been discovered only through aerial photography, have remained an unexplained mystery to this day. What were the motives of the people who drew giant signs, whether figurative or abstract, on the natural ground



surfaces of southern England, the Peruvian pampas, or the Atacama Desert of Chile? These figures have such colossal dimensions that their entire forms can hardly be taken in at ground level. It can be assumed that the production of such signs, the creative act itself, took place in the course of a religious ceremony.

These gigantic proportions also probably bear witness to a certain reaction, or counteraction, to the mighty mysteries of gods and demons. The huge extension of the pictures provided a means of encountering the supernatural dimension.



1: The White Horse of Uffington, England (10 m long), carved into a grass-covered chalk hill. 2: "Nozca," a monkey figure (according to Maria Reich), carved into the Peruvian pampa, 50 m long. 3: "Nizca," a gigantic reptile carved into the stone of the Peruvian pampa plain.

The attribute of wings

2. Fauna symbols

a From multiplicity to simplicity
Bird figures

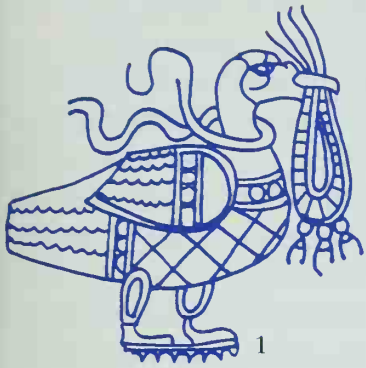
For earth-bound humankind, birds with their ability to cavort in the air must always have seemed gifted creatures with more than earthly faculties. The fact that birds are associated with the "heavenly" as well as the earthly, that is to say with something beyond mortal life from the primitive viewpoint, offers what might be called an embodiment of the symbolic. It is therefore not surprising that all flying creatures have been very strong objects of attraction for symbolic and mystical beliefs and are to be found represented by all cultures, including that of the Stone Age. A point of special interest is that the faculty of *flight* was also bestowed on other creatures by giving them the attribute of *wings*. Thus the winged serpent became the all-powerful dragon and the winged human represented the heavenly angel.

An exception to the association of feathers with flying is provided by the peacock, which still possesses an equally marked feather symbol, which when fanned out is interpreted in mythology as a symbol of the sun, an image of the firmament of stars, the eye of God, etc.

Byzantine painting
1100 A.D.

1: Stylized but realistic bird figure with unexplained attributes. Pre-Christian fresco painting, Turkestan. 2: Charlemagne's symbol, woven in silk on his cloak. Note the figure's wealth of symbols: sun, lily, scales, tears, and not least the halo. 3: Unusual figure of a peacock with closed fan. Mosaic, Ravello. 4: Gothic eagle, strongly stylized. Metal holder with inset stones. Jeweled ornament, Spain. 5: Double bird on ancient Mexican ceramic seal. 6 and 7: Flying birds, ceramic paintings from Greece and China. 8: Typical bird sign from Easter Island, formed only of curves. Wood carving. 9: Dream bird, "the bringer of sleep." Burned into bark, Scandinavia. 10: Textile painting, Ivory Coast. 11, 14, and 15: Highly stylized bird signs of the Hopi Indians, Arizona. 12 and 13: Bird motifs, highly stylized by weaving techniques, Perusa and Scandinavia. 16: Four birds joined ornamentally and made abstract to the utmost degree. North American Indian art on leather.

Symbolic forms between heaven and earth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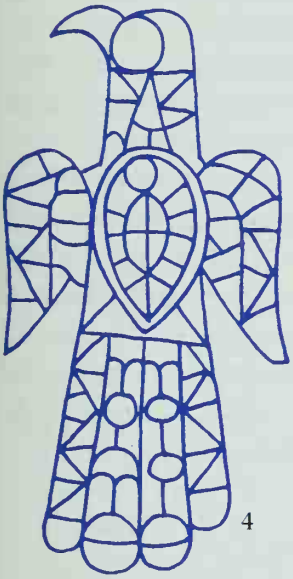
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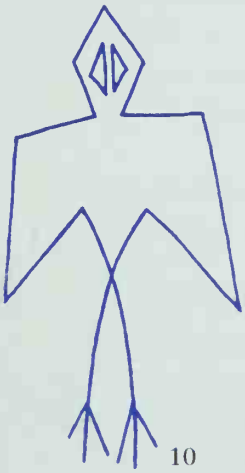
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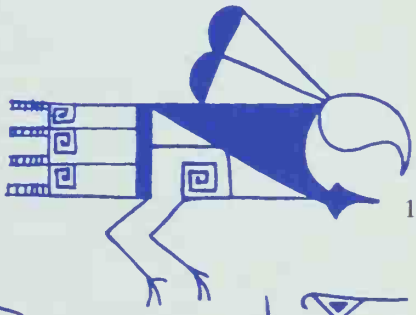
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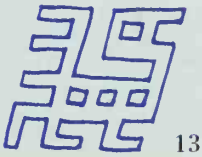
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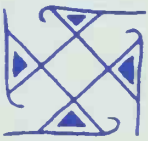
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Our selection of figures for the tables of illustrations has been made with the intention of showing a cross section of the variety of formulations visibly associated with the materials and tools employed. The majestic frontal view (a widely used way of showing the bird both standing *and* flying at the same time) of the fine embroidery on Charlemagne's cloak endeavors to express pictorial perfection, with every detail included in the finest needlework. The sign is by no means intended to be a realistic representation of the bird but rather a "superbird," richly decorated with symbolic motifs.

At the opposite pole there are the extremely simplified bird outlines at the bottom left of the page, produced with the crisscross lines that are within the scope of traditional country weaving.

Still more significant in their simplification are the bird motifs of North American Indians. These figures have, in fact, been simplified not only for purely technical reasons, since painting, scratching and burning-in allow for a more complex style of drawing, but because of an inward-looking tendency to simplification, which they express in a quite remarkable manner – perhaps with the intention of reducing the image to an absolute sign. These designs bear witness to a spiritual activity, without any verbal expression, consciously transforming the picture into a symbol.

b Of life and death
The serpent symbol

The snake or serpent is the easiest form of life to draw. A crooked line alone, perhaps with a thickening at the end for the head, is enough to represent the creature. This "lack of body" must have been one of the attractions that have caused its extremely simplified form to appear at all times as one of the most mysterious of all graphic representations.

Naturally there are also many deeper reasons for the prominence of the serpent symbol than mere mechanical ease of drawing. The serpent figure can be seen as a symbolic archetype, incontrovertibly present

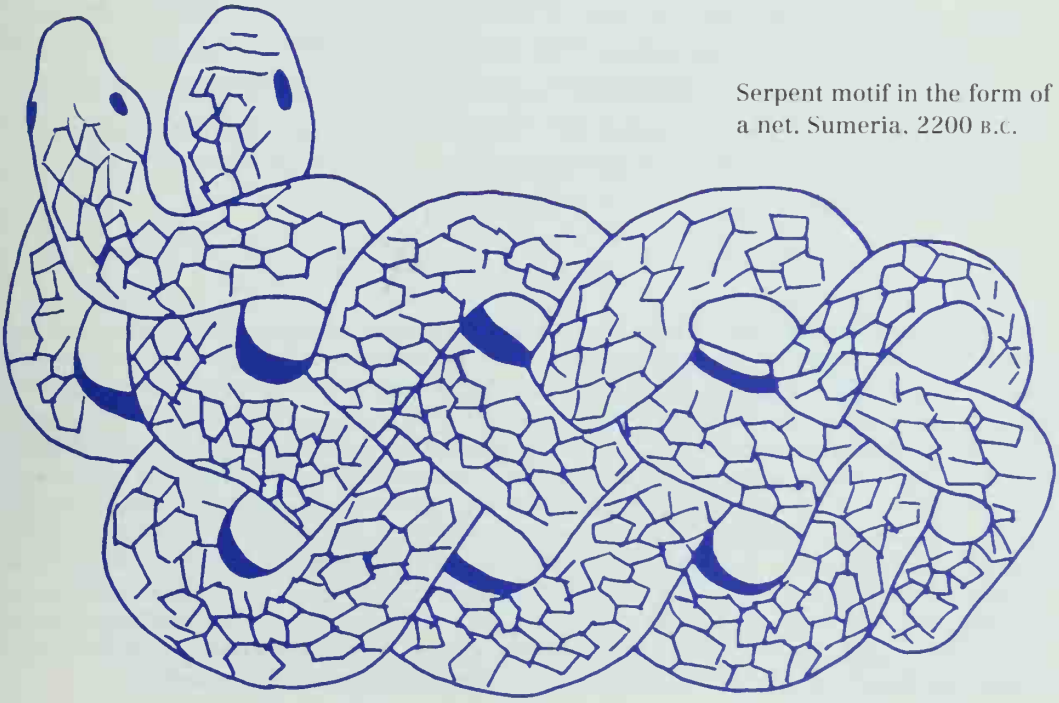
seen as a symbolic archetype, incontrovertibly present in the human subconscious. The most important association is probably fear of its deadly bite: fear of a being that can bring death, hidden in the earth, in grass, in foliage, and in piles of rocks.

Confronting humankind with this primitive fear, the serpent has been given a leading place in the symbolization of matters of life and death in many different cultures.

The more figurative association of the serpent with the phallus, together with the idea of the rootlike, half-hidden source of life arising from underground, places the creature in an absolutely ambivalent light: bringing death and producing life.

A still more subtle significance must have been provided by the phenomenon of the snake's shedding its skin, in association with the deep-seated inner concern of humankind with rebirth and immortality.

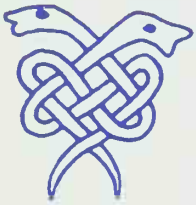
The symbol sign of the circular serpent, which by swallowing its own tail appears to eat itself, that is, to nourish *or* annihilate itself through its own death, is a clear symbol of an eternal recurrence. The thought of a re-birth goes together with the representation of the secret of eternity.



Serpent motif in the form of a net. Sumeria. 2200 B.C.

The moon over the sun leads to the serpent form

Crescent moon and serpent have associated forms



Knotted serpents from Mesopotamia

In Western usage, the serpent therefore became not only a symbol but also the mark of a profession, as the emblem of medical science. It winds around the staff of Aesculapius as an attribute of the Greek god of medicine, and we later find it in doubled form around the winged staff of Mercury. These symbols are still used today to identify the physician or the apothecary.

An interesting theory concerning the origin of the staff of Hermes is that the serpent form is derived from an ancient Greek sign consisting of the moon placed over the sun. This involves the assumption that the similarity of form between the crescent moon and the serpent led to associations of thought and interpretation, since the moon, too, was a symbol of fruitfulness, pregnancy, and eternal disappearance and reappearance, because of its constant growth and decline.

A further association is provided by the serpent and the egg. The spiral loops of the serpent's body surrounding the egg symbolize the cosmic embrace of the earth in a dominance of all life.

The form of the drawn-out, tapelike serpent's body, its surface decorated with rhythmical patterns of patches, lines, and colors, provides an ideal theme for ornamentation. As will be noted in a later chapter, spirals, loops, knots, etc., are powerfully symbolic abstractions. The serpent's body in its linear form allows the artist to associate the figurative most closely with the abstract. In both linear and area ornamentation, the serpentine line plays an important part.

1: The staff of Aesculapius, wound round by sacred serpent, was the mark of the Greek god of medicine and has remained the sign of the physician to this day. 2: The double serpent has been used for thousands of years as carrier of deep symbolic concepts, the most common form being the staff of Mercury (Hermes) with two entwined serpents. 3: The serpent wound around the cosmic egg is the Greek symbol of godlike prescience. 4: Another form of serpent figure with strongly symbolic content is the "serpent ring," where the creature is consuming its own body, holding tail in mouth. Already present in ancient Egyptian mythology, this figure is also found in both Oriental and Western cultures. The illustration is of an African version modeled in clay, from Dahomey. 5: This swastika sign with serpents' heads at the terminals is from an Indian coin and is probably a sun sign representing the scorching heat of the tropical sunbeams. 6: Serpent as cloud carrier, North American Indian drawing. 7: The patriarch fertilizes the seven sacred eggs, drawing from Australia. 8: Double serpent motif in carpet weave, Turkestan. 9: The Egyptian god Tum appears in a serpent's form, typically showing markedly humanoid body. 10: An impressive double serpent with unusually thick body and no tail, South African rock drawing. 11: Serpentine ornament made by sand-dusting process on a floor, central India. 12, 13, 14: Serpent forms on ancient Mexican ceramic seals.

The tapelike linear serpent form is in itself a sign

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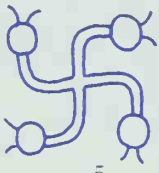
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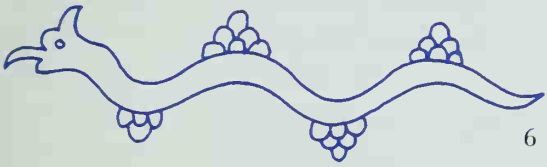
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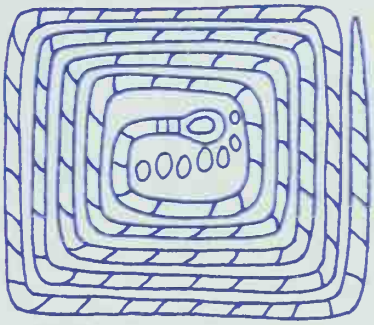
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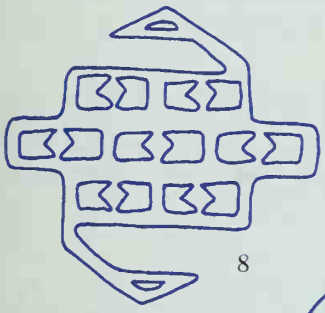
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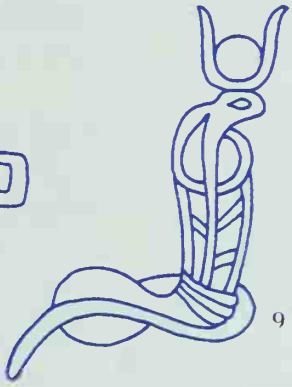
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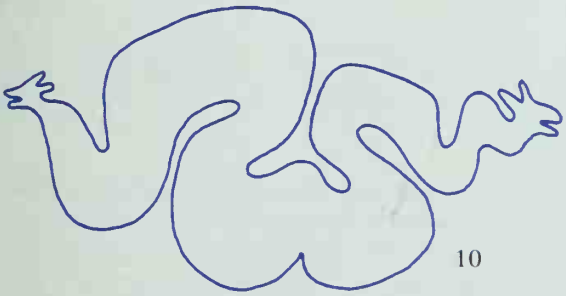
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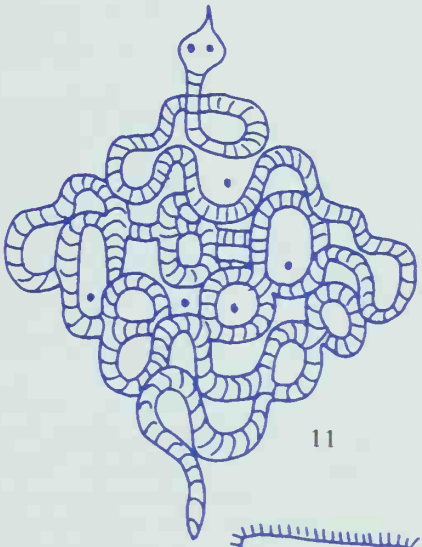
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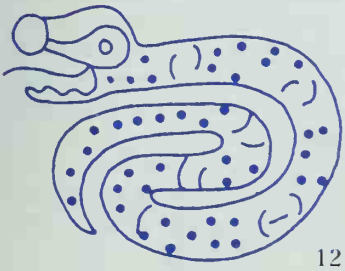
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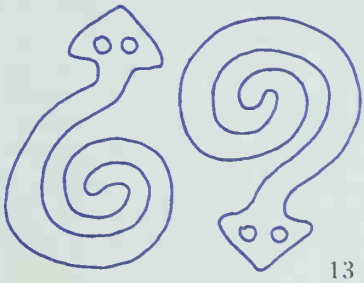
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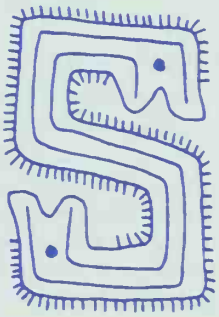
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The Egyptian god Hathor

The Holy Ghost

c Other fauna symbols
Archetypes of the subconscious

Since the earliest times there have been relations between human and beast, which must be deeply rooted in the human psyche. In the human subconscious, beasts have always played a role as the essential archetypes of all that is instinctive, as symbols of the principles of material, spiritual, and even cosmic powers.

There is no shortage of examples to illustrate these facts. The gods of many early cultures are embodied in animal figures: all Egyptian gods had animal heads. The same applies to the Assyrian god Nisroch with its eagle's head, and one of the principal gods of the Hindus is still Ganesha, the elephant. The godhead of the Aztecs was the green plumed serpent Quetzalcoatl and the Hebrew god El was embodied in the figure of a bull, a figure which appears later in the Old Testament as the golden calf.

Nearer to us are the animal symbols of the evangelists; Christ was described as the Lamb of God, and the Holy Ghost was made visible in the form of a downward-flying dove.

John = Eagle

Matthew = Angel

Luke = Bull

Mark = Lion

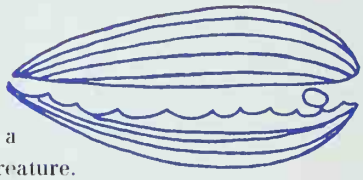
1: The fish sign was a Hebrew symbol for the Redeemer, later used by the early Christians in Rome, during the persecutions, as a secret sign and scratched on the walls of the catacombs. 2: Double fish, a Chinese symbol from a painting on porcelain. 3: Triple fish with common head, clearly showing the symbolism of the Trinity in a manuscript painting from Spain. The same sign is produced in India by the sand-dusting technique. 4: Spider, the archetype of a fauna symbol, found in many parts of the world, often in connection with a spider's web. 5: Snail shell, relating to the spiral, but also to concepts of housing, protection, caution. An old rustic symbol from northern Europe. 6: Greek nautilus or mussel sign, symbolizing the secrets of the sea. 7: Wolf-horse, the terrifying ghostly beast, engraved on an axe from the Caucasus. 8: Double crocodile on a seal, Ghana. 9: Dog, scratched figure from Ghana. 10: Cuttlefish, a frequently used animal sign, symbolizing the mystery, depth, and perils of the sea, painted on a Cretan vase. 11: Dragon embroidered on a Chinese coat of arms. 12: Lizard or crocodile (two completely different basic symbols), ceramic seal from ancient Mexico. 13: Catfish, ivory carving from Nigeria. 14: Bull's head crowned with double axe, a combination of two symbols for power, victory, and judgment, tomb in Crete. 15: Horse-spider, a horrific beast, as No 7, Caucasus. 16: African stone weight in the form of a frog, a widespread symbol of the amphibian principle. 17: Ibex with circular horns enclosing mythical flying sun birds, ceramic painting from Mesopotamia, 3500 B.C.

Examples of the unlimited wealth of fauna symbols

Human characteristics are still projected onto animals today, in a manner that finds expression in commonly used similes and metaphors. Thus we speak of someone's being "cunning as a fox," or "strong as a horse," or describe a person as "a dumb ox" or simply "a snake."

Some psychoanalysts make willing use of this tendency by claiming to find the solution of conflicts and traumas in the interpretation of dreams, in which animals so often occur.

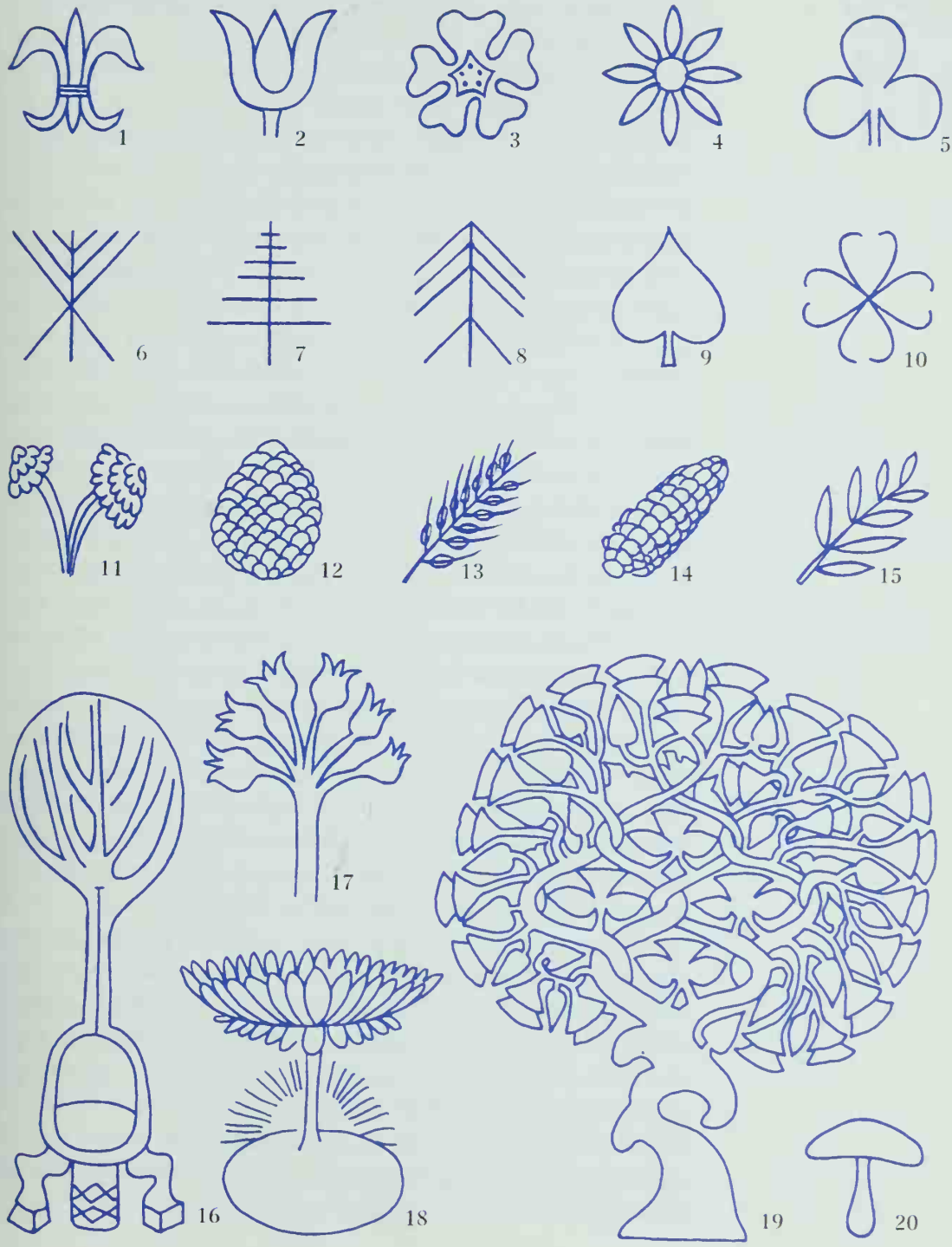
The wealth of graphic representation of fauna symbols is so immense that it would take up far too much space to show all the relevant illustrative material. In this field, once again, we wish to emphasize the development from naturalistic picture to sign as our principal concern. The examples chosen are therefore close to the limit of the recognizable image. Stylization from picture to sign is, in our view, evidence of the fact that these examples were intended not so much as ornaments or decoration but much more as drawings with a symbolic content.



The cowrie shell of Indonesia is a typical example of a symbolic creature. Analogy with the vulva, which can hide a pearl (good luck sign).

1: Lily sign has a double symbolism, representing purity and innocence but also regarded as a sign of procreation (phallus in vulva). The sign acquired its great importance in heraldry as a royal symbol, the number of cross strokes denoting the rank. 2: Tulip, a sign of fertility. 3: Rose. All rose motifs are a symbolic expression of love. 4: Daisy, also a love symbol. Western folk art. 5: Cloverleaf. The sign of the normal three-leafed clover (as opposed to the four-leafed variety (No. 10), is an expression of well-being. 6: Tree of life. 7: May tree or tree of life, sign of joy. 8: Tree of Death, an oath-taking sign (6, 7, and 8 are old runic signs). 9: Lime-tree leaf, symbolizing death. (a) In the Siegfried saga, a lime-tree leaf fell between the shoulders of the invulnerable. (b) The sign also represents a reversed heart, pierced by a weapon. (c) The point of a lance has a similar shape to a lime-tree leaf. 10: The open four-leaf is drawn by superimposing a left-handed and a right-handed swastika. The four-leafed clover is an exception in nature, mostly used as a good-luck sign, but like all unusual appearances it can be interpreted in the opposite sense. 11: Heliotrope, or "sunflower," which always turns toward the sun throughout the day, used in Greece as a symbol of constancy in love. 12: Pinecone, an old Semitic symbol of fertility. 13: Wheat ear, a worldwide symbol of harvest, signifying abundance, gratitude, hope. 14: Maize cob, a fertility symbol of great importance in pre-Columbian America. 15: Branch of peace, a Western symbol associated with the story of Noah. 16: Tree of Buddha, also the shape of the heavenly throne. 17: Plant of immortality from the Gilgamesh legend. 18: Lotus blossom, a branching symbol of the flower that floats on water, deified by the ancient Egyptians. Our illustration shows the lotus blossom rising from the cosmic egg in an Indian painting. 19: Chinese tree of life, with each double twig producing a blossom, in accordance with the duality principle of yin and yang. 20: Mushroom, another sign with a double meaning, being both "lucky mushroom" and warning of poison.

The sense of beauty in the realm of plant life



Capital of an Egyptian column, representing a closed lotus blossom

3. Plant symbols

Humankind is surrounded by the wealth of the vegetable kingdom, which in earlier times covered most of the earth's surface. The forest offered shelter. Plants, fruits, and roots still form an important part of our diet. It is therefore not surprising that all kinds of plants, as well as fauna, have become symbols.

All civilizations have made use of plant symbols as fundamental expressions of life, growth, fertility, procreation, and so on. A connection between the primitive life of plants and the higher forms of life in fauna and humankind is often shown. An example is the sacred lotus blossom, which is seen as the embodiment of all life, arising from the depths of the water as though from the void. All the higher, cosmic powers are seen as growing in their turn from the flower.

One of humankind's most important symbols is the tree. Its roots grasp deeply into the mysterious earth, its trunk was often used as the main pillar of primitive dwellings (and was therefore commonly thought of as the axis of the world), and its branches sway, like the birds, in the realm of the air, the sky, the celestial. Thus the form of the tree is the image of a connection between heaven and earth, and its structure has a marked symbolic content. The manifold dependence of humankind on the tree for firewood, building materials, tools, and other products led directly to the concept of the "tree of life." The life span of a tree is much longer than that of a human, leading to a feeling of reverence, as toward an ancestor. There is also the legend of the tree of knowledge. The oak tree was sacred to the Celtic peoples, if not itself regarded as a god.

Blossoms and leaves were used as materials for decoration, and a growing sense of beauty brought the attribution of symbolic content to the world of plants, with its splendor of color and wealth of form, as is shown by names like edelweiss (noble white) or herb of grace, and descriptive phrases like "pure as a lily." Parts of plants such as thorns and buds also have a clear symbolic meaning, and the palm branch is still known as a sign of peace.

We will return to the subject of the representation of plants in the section on heraldry (Chapter VII), although not so much in the sense of the plant as symbol but more as identifying mark or emblem.

4. The human form as symbol

a The complete figure of the human body

A mere naturalistic representation of the naked human body with the intention of making a symbolic statement would be a contradiction, strictly speaking, since there is nothing about the complete human figure to indicate a symbolic content. It is therefore axiomatic that the form of the human body, on its own, cannot convey any symbolic statement whatever. The expression of the symbolic only comes to it in connection with a given object or creature, or if it is clothed in a certain kind of costume, or equipped with some particular attribute.

Water carrier, a weaving pattern from Nigeria

Even such representations of the human form with symbolic attributes are irrelevant to our inquiry into the question of "signs." On the contrary, what we are here concerned with in the context of this work is to examine those signs in which the human form is included as a stylized outline, often much altered.

We have already referred to the fact that the forms of the cross, the fork, and the Egyptian life sign have their origin in the human form. A very lively example of this transformation of the body into a sign is provided by the series of medieval signs collected by Rudolf Koch and published in *Das Leben in der Familie* (Life in the Family). The examples given are probably of stonemasons' signs, which contain some kind of statement in nonverbal form.

The history of mythology, of art, and of design in general shows that artists have always taken the human body to be the most perfect in the hierarchy of creatures.

Drawings of the human body have therefore found constant use as a yardstick for standards in the construction of mythological, religious, and philosophical world pictures and explanations of the cosmos. Thus

Symbolic human figures: abstract, stylized, and concrete

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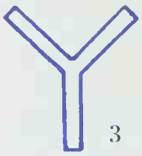
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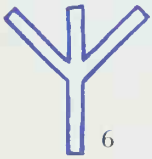
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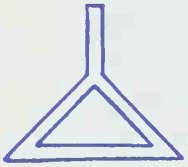
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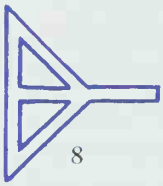
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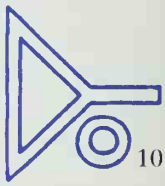
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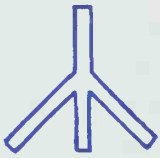
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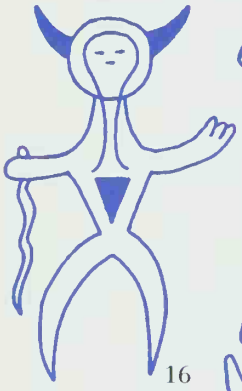
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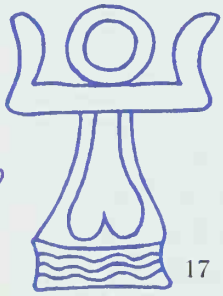
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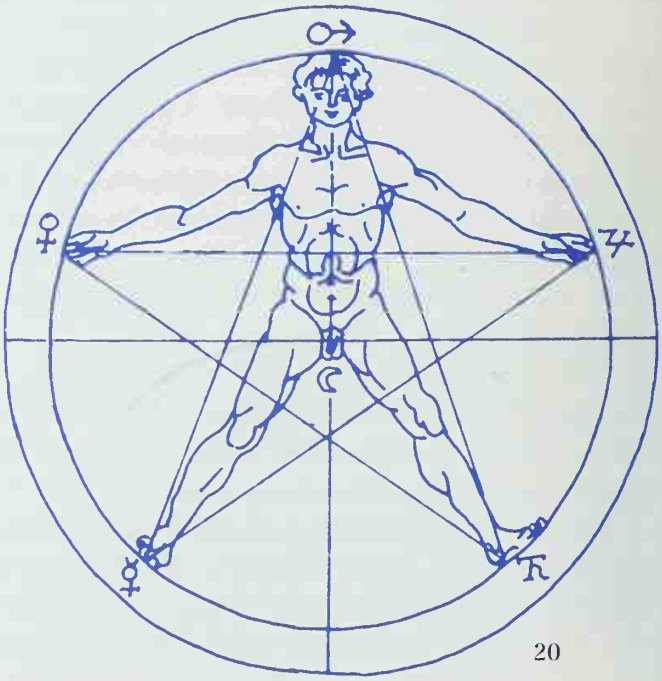
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we find, in India, representations of the human figure divided into zones of metaphysical powers and actions; in ancient Greece, gods and goddesses with human forms; and in Western culture, pseudoscientific schemata for magical, mystical, or philosophical worldviews based on the figure of the human body. Our table of symbolic human figures includes a drawing of this kind, showing the figure of a man inside a cosmic circle.

In contrast to this theme it is interesting to note that in the mythology of Islam there is no figurative illustration. That is the reason why Arabic script has developed such a rich and decorative diversity, with the holy words of the Koran in written form constantly serving as the basis of the kind of ornamentation known as arabesque.

b Parts of the human body

It can be assumed that the earliest illustrations in human history were footprints in clay and the prints of hands smeared with coloring matter on rock walls. The ability to produce an illustration without the movements of drawing may well have fascinated early human. The technique of making handprints on textiles is still in use among some African tribes.

Handprint, perhaps the first rock drawing

The footprint of Buddha has great importance in Buddhist mythology, leading to the production of some astonishingly beautiful symbol signs. In the imagined scale of the divine, superhuman form it is the soles of the feet that come closest to the earth. Foot symbols have been derived from this idea because they are the only traces remaining of the godhead's former sojourn on earth. The same myth has remained alive in Hinduism, accounting for the frequent occurrence of the outline of the foot in north Indian painting. As an example we show a picture of a footprint of the Indian god Vishnu with a mass of symbols on its sole.

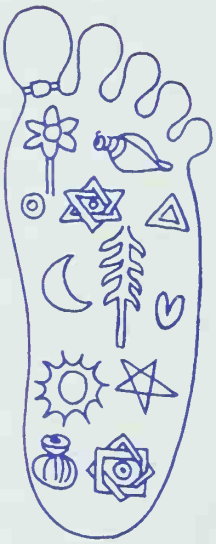
1 to 15: Abstract signs in which a strong association with the outline of the human body is recognizable. 1: Christian cross. 2: Egyptian cross (see table of cross signs). 3: Fork-sign (see Part 1 on duality). 4: Double fork or support. Sign of gathering, firmness, readiness. 5: Light carrier. Sign of worship. 6 to 15: Family life. 6: Man. 7: Woman. 8: Man and woman joined in the act of love. 9: Pregnant woman. 10: Birth. 11: Family. 12: Two friends. 13: Conflict. 14: Dead man. 15: Widow with two children. 16: Moon goddess (Maya). 17: Goddess (Ancient Punic). 18: Figure of a god (Ancient China). 19: Galley oarsmen, ornament on a pot (African). 20: Microcosmic symbol, related to the human form.

The hand of Fatima

The hand may be regarded as the part of the body that appears most frequently in the field of human vision. Its representation is correspondingly frequent, and not only for purposes of direction giving and warning.

An example of a typical hand symbol is the hand of Fatima, daughter of Mohammed and born in Mecca. Its special characteristic is a thumb on each side. There are many possible ways of explaining this formation of the hand. The symbol may represent the two hands overlaid in greeting but has in many cases simply been formed into a symmetrical sign through constant repetition as a talisman, whether drawn, engraved, or carved. It is also possible that the comparable flower shapes such as those of the lily and tulip have played a part in the development of this sign.

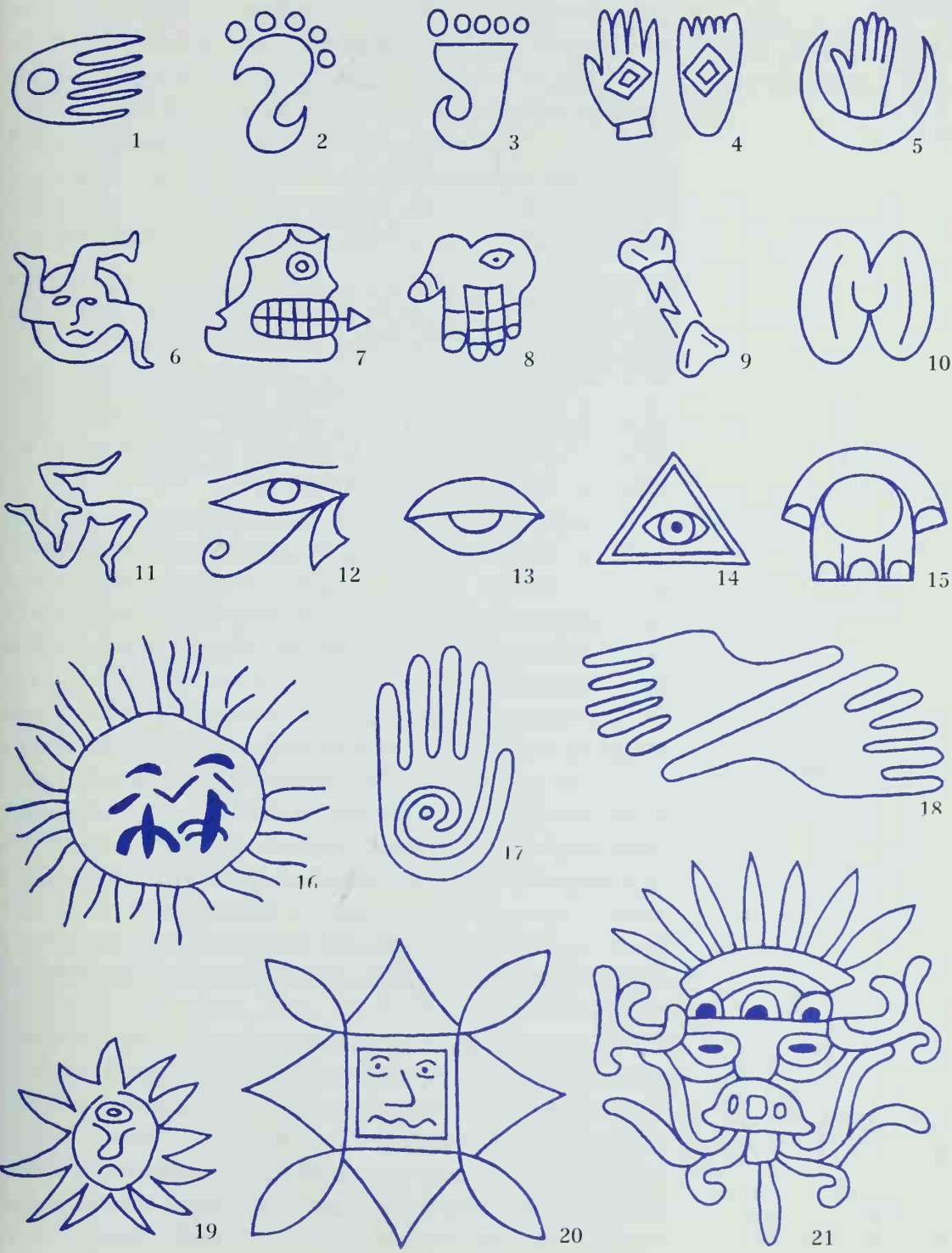
In the Christian faith, the wounded hand of the crucified Christ has become a symbol of major importance.



Footprint of the Indian god Vishnu. Painting from Nepal

1: Handprint from the Stone Age, on a cave wall in Anatolia. 2 and 3: Buddha's footprints, Indian drawings. 4: Ex-voto signs at shrines, India. 5: Mohammedan sign of blessing, combining the hand of Fatima with the crescent moon. 6: Three-legged triskelion, face and circle combined to make a potent symbol, meaning uncertain, on a Greek coin. 7, 8, and 9: Representative parts of the body from North American Indian paintings. 10: Vulva as a Tantric symbol, Indian drawing. 11: Triskelion, or three-legged sign, symbolizing victory and progress (cf. swastika), ceramic painting on a Greek vase. 12: Utchat, the holy eye, Egyptian hieroglyph carved in stone. 13: Giant eye of Buddha, painted on the front wall of a stupa temple, Katmandu. An interesting aspect of all images of Buddha's eye is the two-thirds covered iris, increasing the expression of meditation. 14: Eye of God, Christian symbol of the Trinity, painted on many church walls. 15: Hand symbol carved in wood, Congo. 16: Human pair in the sun, rock drawing, Spain. 17, 18: Hand symbols, ancient Mexican seals. 19: Eye of Cyclops, baked earth, Babylon. 20: World with the face of God, Ethiopian drawing. 21: The rain god Tlaloc, stone carving, ancient Mexico.

Parts of the human body with deep symbolic content



Mudras, the sacred gestures of Buddha

1 Meditation
2 Reasons
3 Doctrine
4 Protection and request
5 Enlightenment
6 Unification of matter and spirit

Hand signs and foot signs are to be found at all cult centers and places of pilgrimage as ex-voto tributes in gratitude for favors received.

The sign of the hand raised in blessing is to be found in the iconography of most religions. In Buddhist theology there is a whole language of gestures in the different positions of Buddha's hand.

The devil's hand

In opposition to the grace-giving hand there are also gestures of conspiracy and malignity, such as the well-known "devil's hand," which symbolizes the horned figure and is also intended to ward off the evil eye. In India, the right hand is regarded as good and the left as the bad hand.

The mask, a new face

The human face plays an important role in all cultures in its use for symbolization of the most varied kinds. In most cases the facial features shown have been stiffened into masks, an effect that predominantly gives a terrifying aspect to the countenance. Although the graphic reduction of the face to a sign in itself is comparatively rare, its individual features appear more often in stylized form, the most commonly used organ being the eye, most often representing the eye of God.

Heart sign, love

From the time of the first rock drawings onward, the sexual organs have appeared as the original symbols for life, power, fertility, etc. In the Christian world, the suppression of nakedness has led to the complete disappearance of such symbol signs, while in other religions, for example, Hinduism, they have been elevated even into becoming signs of deification.

In the present context there is not enough space to cover all the different parts of the body having a symbolic content, but a final comment on the use of the interior organs may be added. Here the formal representation relies on pure imagination rather than observation. The most striking example of this is the heart shape, an outline that is probably one of the most widely used symbol signs but has no connection with the actual appearance of the living organ.

Skeleton, death

Another special theme is the representation of death, in connection with the immortality of the soul. The concept of death is closely associated with the image of the skeleton.

In earlier representations, the ascending soul was shown as a physical organ, leaving the dead body in the forms of many abstract symbols. In some medieval pictures the soul even takes on the complete form of the human figure, bursting forth through the mouth with the last breath of the dying body.

5. Objects, landscapes, elements of nature

Everyday objects seldom have an independent symbolic content. Tools, crockery, clothing, and housing are too close to humans' daily life to be charged with any mythological content, but in association with other objects or creatures they can give the whole image a new symbolic expression, as attributes.

In this way, the ordinary tools of carpentry take on an unusual significance by becoming symbols of martyrdom, when shown in association with the Cross of Christ.

The only self-sufficient object symbols are provided by items connected with outstanding events of life such as birth, marriage, and death. Signs representing weapons are also symbolic in this way, being connected in one way or another with the act of death. We find the basic symbol of the arrow even in prehistoric rock drawings (see Part 1). The axe is found in practically all the world's cultures as a symbol of thunder and lightning. Another symbolic value of the axe is that of a sacred instrument of sacrifice; as a symbol of pene-

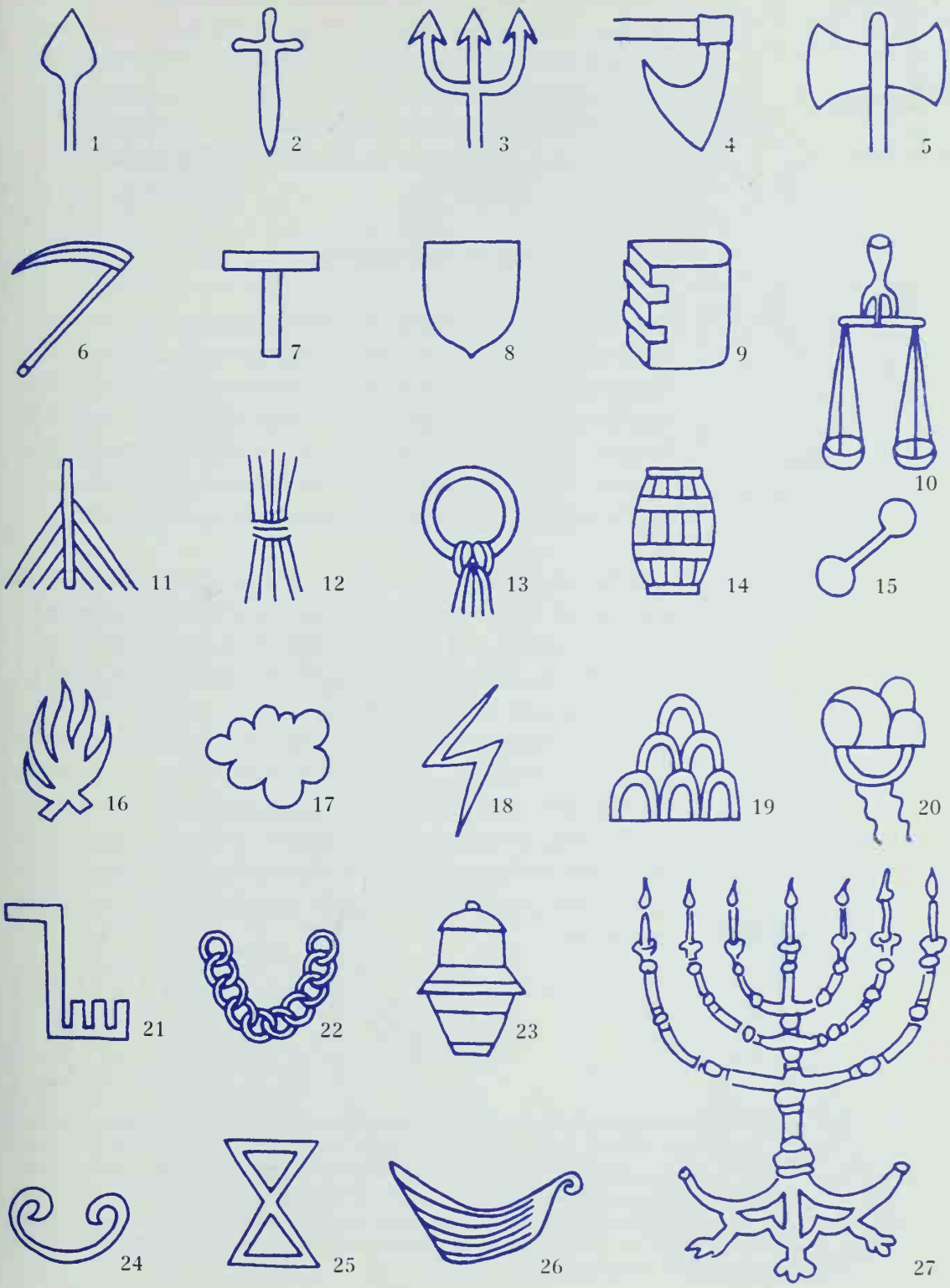
tration into wood and earth it became a symbol of life-destroying and life-begetting power in many regions. The double-headed axe symbolizes this duality even more strongly, and when placed on the head of a bull it is elevated into a divine image.

In an extended sense of the meaning of "objects," representations of landscapes and all aspects of nature and the elements may be added. People living on broad plains or vales are inclined to see the hill or mountain, rising from the bare horizon, as a central point of their environment, raising it to the status of a cult location. The principle of construction of the domed Buddhist shrine known as a *stupa* is fundamentally none other than that of an artificial hill in the plain, since the building itself has no interior.

The valley through which life-bringing water runs, having sprung from a hidden source; the clouds, bringing the welcome rain but also thunder and storms; and not least the warming but also destructive element of fire: all these phenomena must at first have appeared

1,2,3: Weapon signs, showing points and barbs to symbolize aggression, injury, death, but also power and domination. 1: Spear (cf. lime-tree leaf). 2: Sword (cf. sword cross). 3: Trident, weapon of the sea, symbol of the Indian goddess Shiva, the Greek god Neptune, and the Mexican goddess Chalchiutlicue. A worldwide symbol of divine superiority. 4, 5, 6: Cutting tools. 4: Axe, a much-used symbol of destruction, also symbolizing thunder and lightning. 5: Double-headed axe, a symbol occurring in almost all cultures, signifying not only destruction but also both life and death in a dualistic sense. The double-headed axe "Labrys," from which the name of the Labyrinth sanctuary is derived, has been found as a sacred symbol in the palace of Knossos. 6: Scythe, the tool of death. 7: Thor's hammer, the sign of judgment. The Roman T-cross was the one actually used for executions. In heraldry, the sign is called the ruler. 8: Shield or scutcheon, sign of protection, also of honor and duty, which became the main image carrier of heraldry. The expression "a blot on the scutcheon" is still current. 9: The sealed book (word) of God. 10: Scales of justice. 11: Witch's besom, of runic origin, also used as a sign meaning "to remain fixed in the earth". Note similarity to the tree of death. Also used as an oath-taking sign. 12: Rod, symbol of male procreative power, originally representing an erect phallus. Often found in heraldry as a sign of knightly power of punishment. 13: Ring with tassel, an old rural symbol for sexual intercourse, with the ring as vulva and the tassel as the traditional sign of the male member. 14: Barrel, sign of abundance, wealth, and joy. 15: Dumbbell, sign of contraries such as life-death, joy-sorrow, summer-winter, much used in alchemy and astrology. 16: Fire. 17: Cloud, water, wind. 18: Lightning. 19: Primitive representation of mountains. 20: Spring, Spanish rural painting. 21: Key, a deeply rooted symbol opening up the invisible and mysterious, a sign of power for the owner of the key. Spanish manuscript painting. 22: Chain, a general symbol for binding, fettering, also mysterious chain effects and propagation. When closed into a circle it becomes a symbol of eternal recurrence and is related to the rosary. 23: Urn, final housing, seclusion, secrecy. An Etruscan example. 24: Cradle sign, expressing duality of birth (left-hand spiral) and life (right-hand spiral), with curve of life in between. Resembles astrological sign of the Ram (Aries). Example from a coat of arms. 25: Stylized sign of an hourglass, symbolizing the passage of time, later used by alchemists as hour sign. 26: Funeral boat from Viking times, but used in almost all mythologies as sign of passage from life to death. 27: Seven-branched candelabra, symbol of Jewish faith with variety of meanings, e.g., light, tree of life, six planets, and the sun. A miniature from Alsace.

Everyday objects elevated to symbols



On an African wooden box

to humankind's awakening intelligence as fateful and divine powers. We find graphic records of natural phenomena and the elements in the early pictographic scripts, at the stage where the pictograms have already become signs, whose origin is lost in primitive times but that most probably came into existence for their earliest uses as symbolic representations (see Part 2, Chapter III, "The Graphic Wealth of Pictograms").

Symmetry through duplication (Assyrian seal cylinder)

6. The symbol of the center

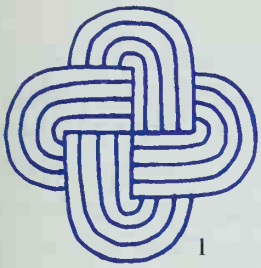
Out of the whole range of abstract symbol signs, there are only a few that are not symmetrically constructed. Even concrete image symbols tend to be symmetrical, whether in the frontal representation of a bird with the central point of the heart drawn in or in the technique of double ornamentation, where plants or animals are duplicated to form a harmoniously symmetrical picture.

The more or less hidden principle of the center seems to have been, in all kinds of signs, the expression of the desired perfection. This tendency appears repeatedly in the most important symbol signs such as the cross and the swastika.

Two kinds of symbol formation, the knot and the labyrinth or maze, provide the basis of inducement to meditation and symbolize the hardship of the way to perfection, as well as the medieval Christian imposition of penances. Knot signs are often interweavings of several signs, requiring a certain mental activity for their decoding.

1: Gordian knot, Romanesque ornament carved or painted in stone. 2: Knot symbol engraved on a powder horn, Norway. 3: Labyrinth pattern on an old coin, Crete. 4: Sign of the center drawn on the ground in white sand, India. 5: Labyrinth of white and black stones in the floor of a cathedral, followed to its center by pilgrims on their knees. 6: Tantra diagram of Nirvana (heaven), showing the way from the earthly rectangle to the heavenly circle, with sexuality (triangles) as the universal act of creation. An image for meditation, known as a Mandala, with its main point in the center. Indian painting. 7: "Jaina" diagram representing the various levels of the universe and the doctrine of passing through them. Indian painting.

The center designated as an image for meditation



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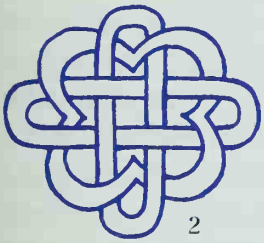

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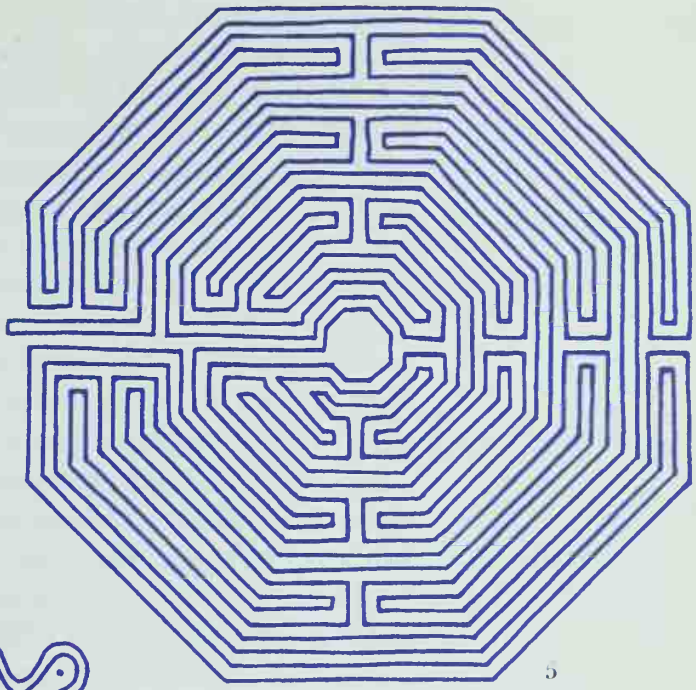

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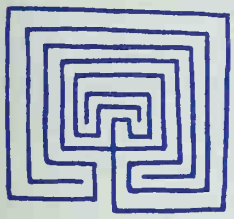

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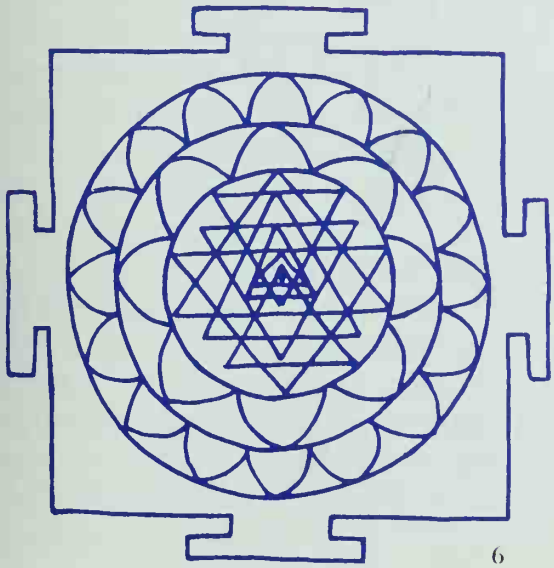

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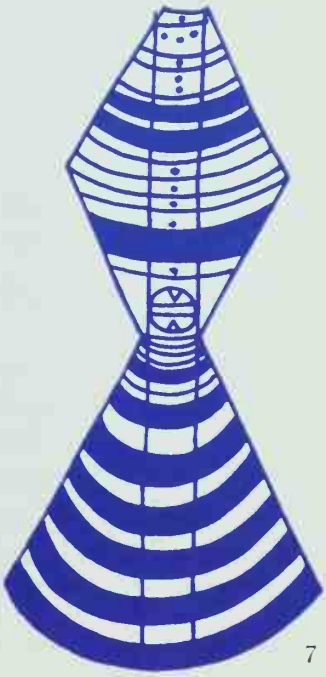

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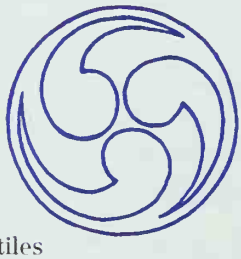
A significant example is the image of the Gordian knot, believed to represent the "Key to the East." According to tradition, Alexander the Great cut through the knot with his sword, thus symbolizing the shortening of a difficult route, before entering upon his campaign in the East.

Knot signs may be compared in certain ways with the Mandala signs of the Hindu and Buddhist religions, designed for meditations on wisdom and with a deeper signification of the various earthly and cosmic spaces or life circles that humans must experience and pass through in order to reach the center, or Nirvana.

This spiritual movement comes very close to the meaning of Western representations of labyrinths. On the island of Crete, with its mysterious customs, a typical labyrinth sign was stamped on a pre-Christian coin and supposedly represents the hiding place of the Minotaur. In a much later period, the Christian Middle Ages, labyrinths of black and white stone were built into the floors of cathedrals. Pilgrims at the end of their journey went through the labyrinth on their knees as the culmination of the pilgrimage and a final act of contrition, often lasting hours, until they reached the fulfillment of their wish for forgiveness at the center.



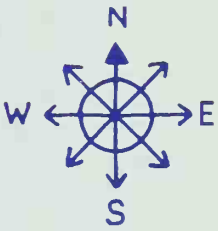
The omphalos, or Buddha's navel, center of all life. Sign modeled in the frontal roof tiles of a Japanese monastery.

IV. Abstract Symbols

1. Space and its center

How else could humans comprehend the space around them than by perceiving themselves as located in its center? They endeavored to orientate themselves between the earth's surface and the vault of the sky by dividing space into parts. The concept of the points of the compass arose from observation of the stars and the daily course of the sun in relation to the horizontal.

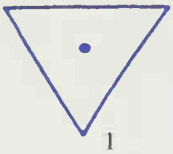
In contrast to this circular movement was the feeling of the fixed vertical axis, anchored in the Pole Star of the North. This experience and recognition of space led to its conscious division, visibly expressed by means of the cross sign, which came to provide humankind with an elementary aid to orientation, enabling them to distinguish up, down, left, and right. From this recognition came their entire understanding of space, which became the basis of all thought processes.



The various adaptations of this elementary cross sign bear witness of this primary diagram, in which most subsequent perceptions and ideas are incorporated. Thus, for example, changes of direction in the wind are divided by means of the primary axis cross into the halfway directions of NW, SE, and so on. The compass became the instrument for fixing the points of reference and the compass rose is still called "windrose" in German.

Mythological and speculative notions about the origin of the world came into existence in all the awakening civilizations. There is therefore no shortage of creation myths, and every people has developed expressive symbolic images, often explanatory and instructional but more often meditative in character, showing its belief in a source of all life in accordance with its own particular ideas.

Images of the center of the world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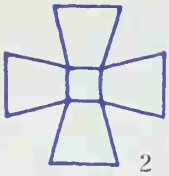
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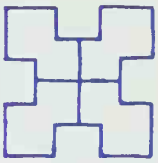
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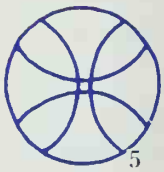
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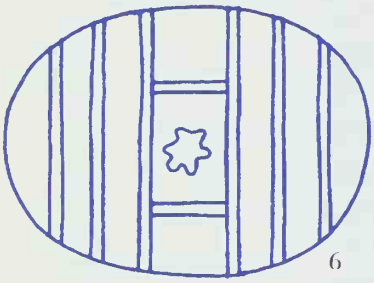
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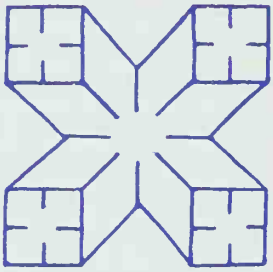
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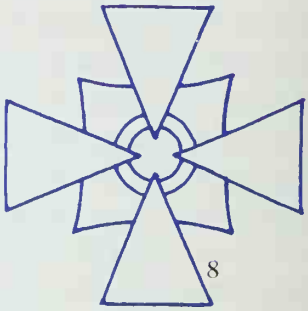
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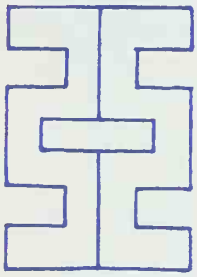
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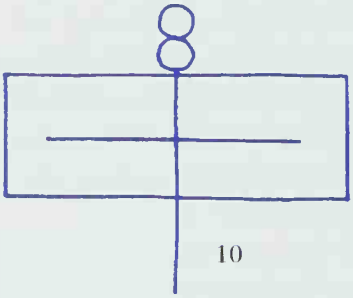
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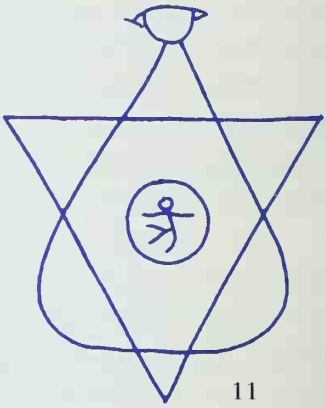
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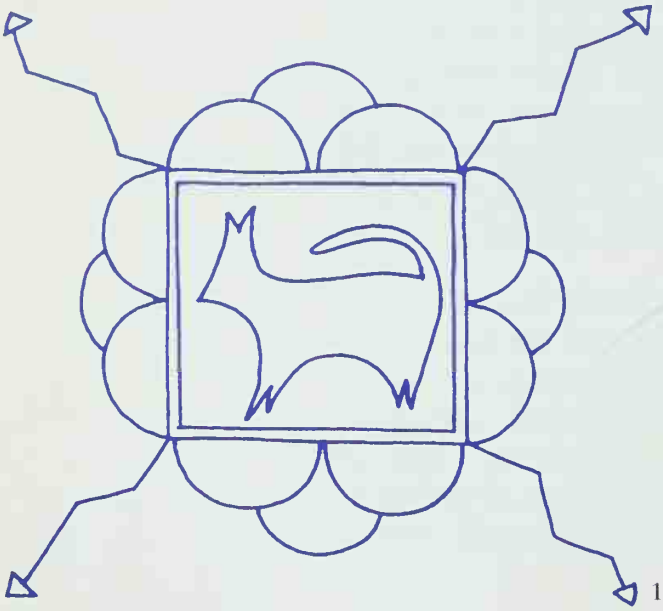
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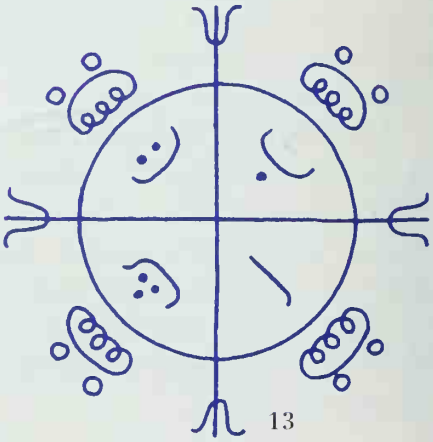
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Captions to page 270

1: Indian Tantra symbol of the vulva, center and source of all life. 2: Aztec sign representing the four quarters of the world. 3: The four corners of the world, pressure stamp, Ghana. 4: Symbol of a central force, embossed in gold on a belt buckle, Turkmenia 2000 B.C.. 5: Typical symbol of a central concept of life and eternity, as found in many variations on pre-Christian Nordic rune stones. 6: The cosmic egg, fertilized and divided into zones of energy, painting on paper, Rajastan, India. 7: Russian embroidery pattern expressly emphasizing the center. 8: Rune stone sign from the Christian era with superimposed center symbols overlaid by a cross. 9: Ancient Chinese symbol of the sacred axes of the world. 10: Alchemical symbol of the spirit of the world, with sun and moon standing over the rectangle of the world, in which the horizontal of the bodily is crossed by the vertical of the spiritual. 11: Indian symbol of life, where both the droplet shape and the triangle (cf. 1) are stylized representations of the Yoni, the vulva. In the center is the sacred letter "Om," pronounced in all prayers as the all-embracing sound of eternity. A comparison may be made with the Western use of "Amen." 12: North American Indian representation of the creation of the world, where the earthly rectangle with the ox, the clouds of Heaven, and the four arrows of lightning, pointing to infinity, are easy to interpret. 13: The magic circle, Mohammedan diagram of the world with significant Arabic letters, from north India.

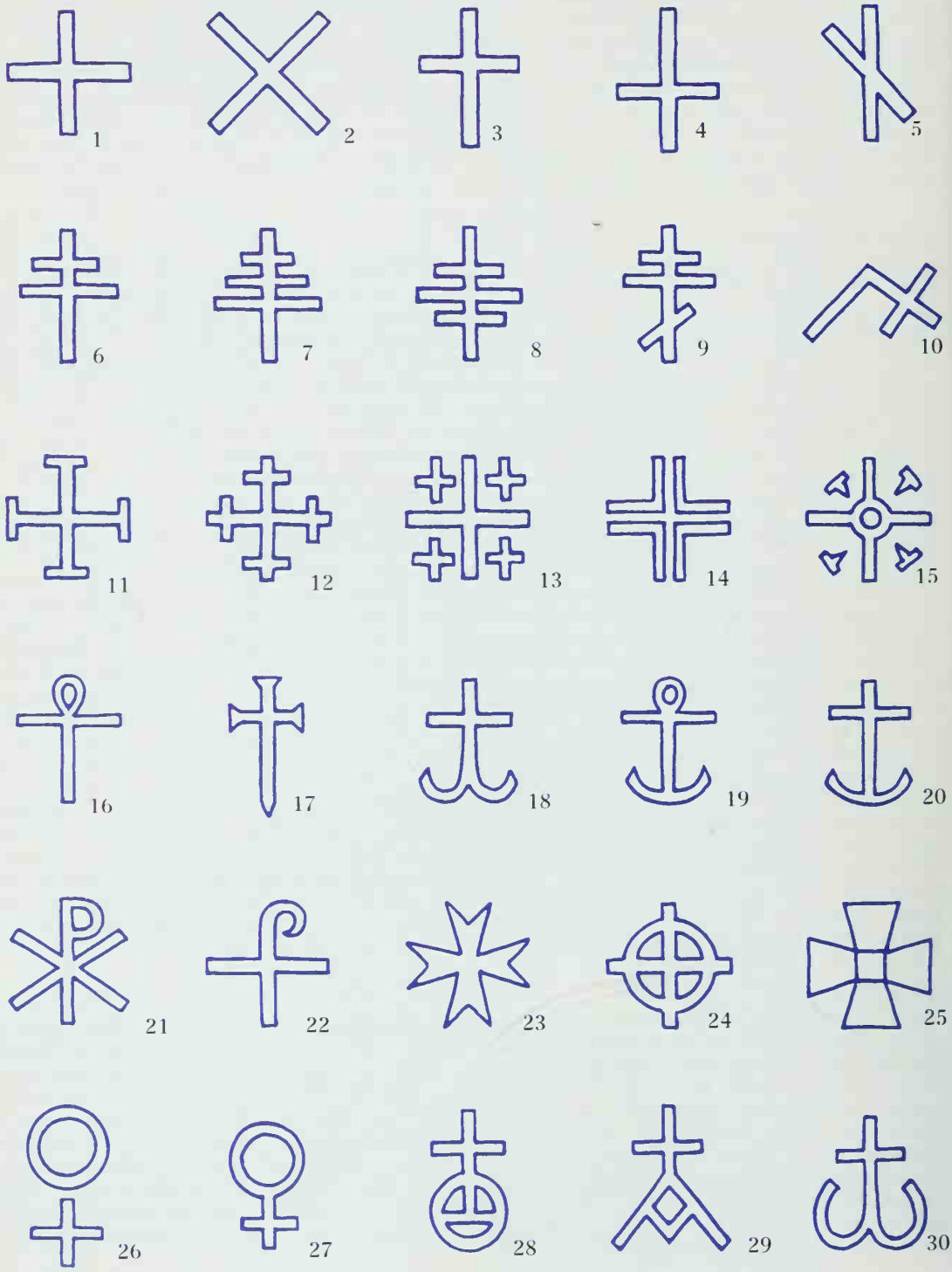
Captions to page 272

1: Quadratic or Greek cross, cross of execution, plus sign. 2: Oblique cross, marking intermediate wind directions, cross of protection or closure, St Andrew's cross. The two equal oblique strokes do not convey any dualistic statement and the pictorial expression is closer to the purely ornamental. The Greek letter X (chi) is the initial of Christ. Cross of life, Latin cross, Cross of Christ, already used as a symbol for godhead before the Christian era (Greece, Egypt, China). 4: Reversed cross, St Peter's cross. In contrast to the cross of life, this sign suggests something negative. St Peter is believed to have been crucified head downward. 5: Robber's cross. This sign is the negation of the cross, the vertical being crossed through with an oblique down stroke. Sign of distress, fate, restless life. 6: Double cross, cardinal's cross, or Cross of Lorraine. The doubling of the horizontal makes this sign a higher-ranking cross. The upper stroke is also interpreted as a panel for inscriptions (INRI). Greek origin. 7: Triple cross, Papal cross, the three horizontals indicating power; the sign also comprises the outline of the Tree of Life. 8: Triple cross, Orthodox cross. Central repetition of the horizontals is not taken as an indication of power (as 7) but an attestation of deeply held faith. 9: Orthodox cross with oblique lower stroke, serving as support for the feet or (cf. 5) indicating the death of Christ. 10: Cross of suffering, broken cross, chevron cross, referring to the stations of the cross and the death of Christ. 11: Tau (T) cross, cross of Jerusalem, crutch cross, hammer cross, a sign appearing as early as the time of the Vikings. Used as a sign of authority on coins, coats of arms, trademarks, etc. 12: Germanic cross, cross of consecration. The fourfold repetition of the cross sign increases its sacral expression. 13: Sign of the Crusades, from which the term Jerusalem cross is derived. 14: Gamma cross, so called because constructed from the Greek letter gamma (Γ) four times rotated. Originally an alchemical sign for the four corners of the earth. 15: Coptic cross, with nails representing martyrdom of the crucified. 16: Egyptian cross, key to the Nile, symbol of life and of divinity on the forehead of the Pharaohs. 17: Sword cross. 18: Anchor cross, an association producing a symbol of firmness in faith. 19: Anchor sign. The cross is barely recognizable and it seems improbable that there is any association with the Egyptian cross, the loop being rather the sign of the first link in a chain. 20: Anchor cross, said to symbolize the birth of Christ (cross) from the body of Mary (crescent moon). 21: Monogram of Christ, consisting of the two Greek initials X (chi) and P (rho). 22: Cross with hooked ending, identical with 21 but the hook could also represent a bishop's crook. 23: Maltese cross, knight's cross, a medieval sign of the orders of chivalry of St John, Malta, and the Temple. 24: Celtic cross and sun sign, relating to the centuries of association of Christianity with the Celtic cult. 25: Aztec cross indicating the four points of the compass. 26: Cross and circle, an Oriental sun symbol, combining the same elementary signs as in the Western version (24): circle for sun, cross for earth. 27: Mirror of Venus, clearly related to 26. 28: Imperial orb, symbol of earthly dominance. 29, 30 : Crosses over the letters alpha and omega, beginning and ending, a Christian double symbol.

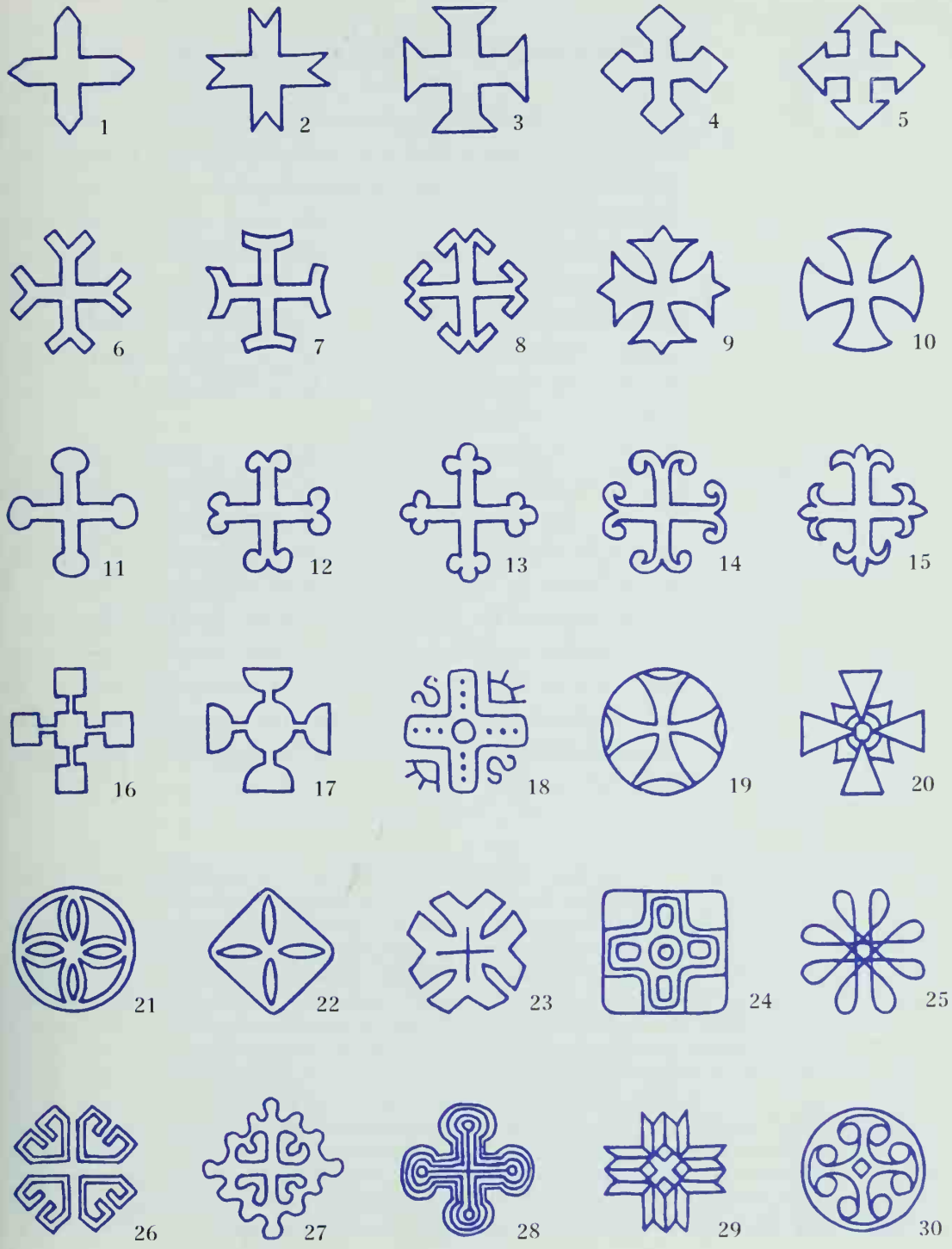
Captions to page 273

1 to 5: Transformation of the basic form of the cross to make patterns for embroidery and weaving, involving the oblique strokes typical of these techniques (northern Europe). 6 to 15: Heraldry also led to the development of numerous individual variations. 6: Forked cross, dating back to Troy. 7: Crutch cross, a bowed Tau cross. 8: Double-hook cross, also rounded off to make an anchor cross. 9: Paw cross, becoming "Iron Cross" when points are removed. 10: Disk cross. 11: Ball cross, mace cross. 12: Heart cross, apple cross. 13: Cloverleaf cross. 14: Leaf cross, tendril cross. 15: Lily cross. 16 and 17: From Irish book illuminations. 18: On Mexican pottery. 19 and 20: On Scandinavian rune stones. 21 to 25: Coptic art of early Christian times brought in an astonishingly rich range of ornamentation, with the cross as the principal basic element. The examples are from stone friezes in Ethiopian monasteries and churches, 8th to 10th century A.D. 26: Fire cross, weaving pattern from the Caucasus. 27: Orthodox cross cut in metal, Russia. 28: Cross ornament carved on an African chest. 29: Embroidery pattern of double cross, Russia. 30: Embossed metal ornament, Ireland.

The cross as symbol of the Christian faith



Symmetry of the cross allows for many styles of ornamentation



In our limited space we can show only a small selection from the multitude of signs, diagrams and images expressing concepts of the earth and space, in association with the idea of a primary act of creation.

2. The cross sign and its ornamentation

Following from the representation of the fundamental concept of space and the cosmos by the horizontal-vertical principle, as already explained, the cross is certainly the most commonly used elementary sign throughout the world, uniting the active and passive principles in dualistic connection. It has become a symbol in a wide variety of mythologies to indicate a central point (cf. Part 1, Chapter V). The reason for the worldwide use of the sign is undoubtedly the extreme simplicity of its formation.

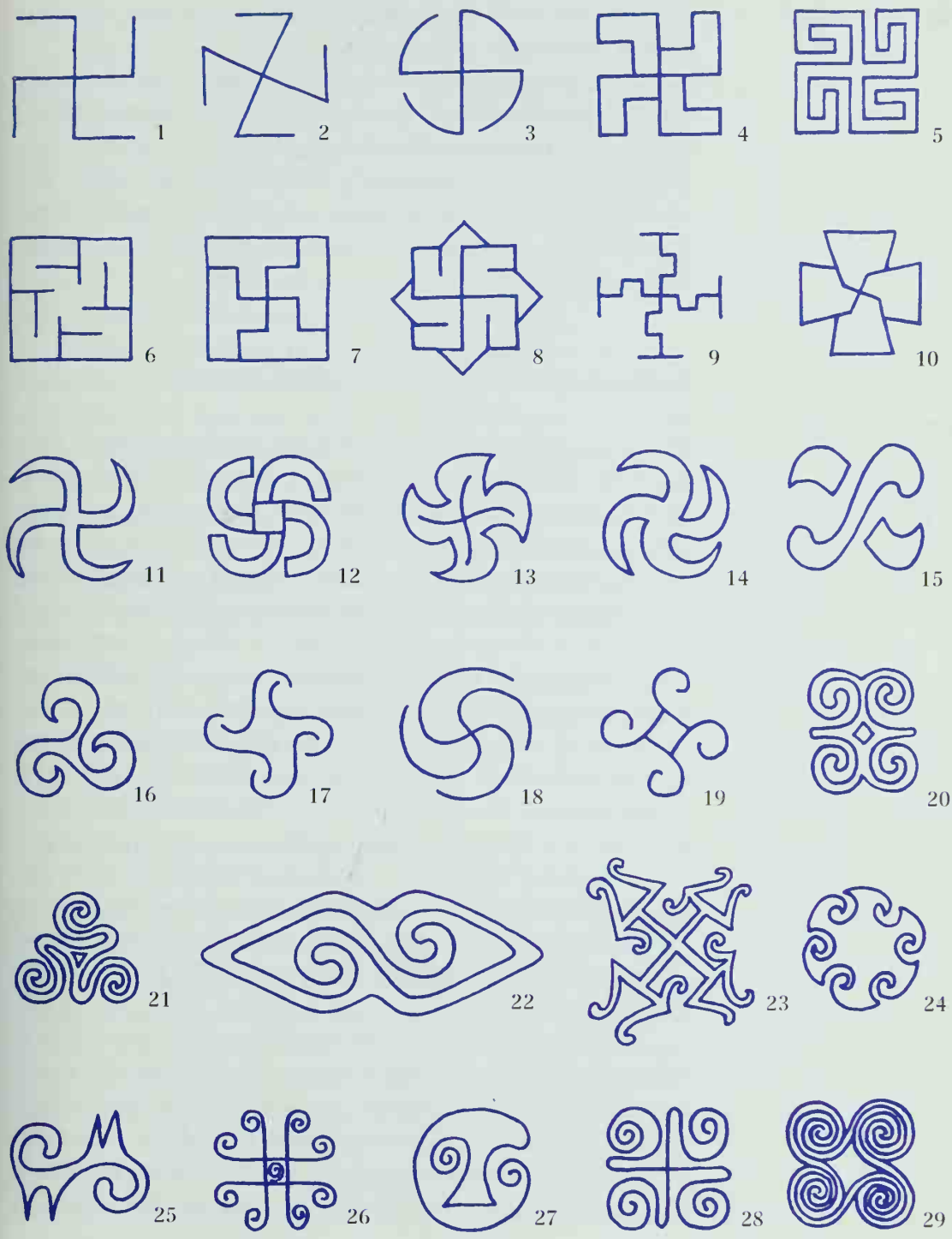
Graphic association with the cross of execution and the similarity of its outline to the human form have made it the symbol of the Christian faith.

General observations on the cross sign are given in some detail in Part 1, Chapter II, Section 5.

Because of its symmetrical form and four freestanding stroke endings, the cross sign provides a strong stimulus to ornamentation. The abruptly broken-off line ending calls for a terminal, a conclusion of the straight lines reaching out to infinity (cf. Part 1, Chapter VIII, 1*b*).

1: Simple swastika, gamma cross, or hooked cross, a symbol used in the Far East before the Christian era. 2: Oblique swastika comprising a pair of crossed runic signs: two strokes of lightning giving light, or two sticks rubbed together to make fire. 3: In the rounded version of the sign, symbolization of the sun is clearly expressed. 4, 5: Variations of the swastika on Indian seals. 6, 7: Area design, Irish book illuminations. 8: Swastika and star combined in one sign, Rhodesian ceramics. 9: Combination of tau cross and swastika, Irish book illumination. 10: Viking sign of blessing on a rune stone. 11: Hooked cross formed by two double hooks (cf. 2). 12: Swastika formed from four semicircles, African embroidery. 13: Flame cross, ceramic seal, ancient Mexico. 14: Sign believed to represent a stylized coiffure meaning strength and unity, pressure stamp from Ghana. 15: The "Chimi" sign denotes death, ancient Mexican seal. 16, 17, 24: Typical Mediterranean signs consisting of wave shapes, embossed in metal, Crete. 18: Completely rounded swastika with maximum effect of movement, Irish gravestone. 19: The four feet of paradise, Indian coin. 20: Symmetrically rolled-up sign in which the turning movement of the swastika disappears, seal from Ghana. 21: Celtic symbol of life. 22: "Tecpatl" meaning fire stone, also interpreted as a sacrificial knife, ceramic seal, ancient Mexico. 23: Magical sign painted on the resonance board of a harp, Moorish nomads. 25: Seal, Ghana. 26: Engraved on an African metal mask. 27, 28: Tightly clustered decorations on ornaments, Crete. 29: The tendril rolls up into a spiral on a sign of the sun cult found on Scandinavian rune stones.

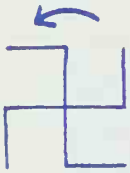
Bending of terminals, from hook to spiral



The greatest abundance of ornamented crosses is to be found within the Christian culture of the West. Since the Middle Ages, the significance of the cross has been completely taken over and determined by Christianity, making it the basic element in all fields of application such as decoration, heraldry, and identification marking.

The three lower rows of our table show a very limited selection from the multitude of signs and ornaments that may be defined as being based on the cross. Nevertheless, they are taken from cultures outside the Christian religion, temporally as well as geographically, since the cross was already in existence in periods long before Christ.

3. Signs symbolizing movement



Good luck

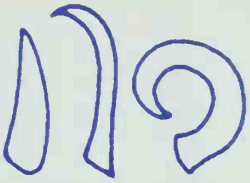
Bad luck

While the straight cross sign is an expression of all that is static and firmly anchored, the cross with broken line endings expresses movement in the sense of rotation. In its basic linear form, the swastika may be numbered among humankind's oldest symbols. It has been discovered in drawings dating back to prehistoric times. It is easier to substantiate a magical and symbolic content for this sign than for the cross, which has been used principally as a mark and an aid to memory, because of the simplicity of the hand movements required to draw it, whereas the swastika sign calls for a differentiated mental capacity to visualize and inscribe (cf. Part 1, Chapter I, Section 3).

The name "swastika" is derived from the Sanskrit word meaning "well-being." In China it was the sign for "highest perfection" and in Japan, where it was called "manji," it signified both the number 10,000 and the concept of "infinite."

The positioning of the hooks gives the sign a direction of rotation, which may be to the left or right, varying from one example to another. An interesting interpretation from ancient China is that the sign with leftward-pointing terminals means "good luck," while the opposite direction of rotation means "bad luck."

When the four hooks are curved instead of straight, the generally recognized interpretation of the swastika as a sun sign comes even more clearly into evidence.



Bull, chamois, ram

Examples of the sign from more recent times are such as to associate the simulation of rotary movement with a wheel, a millstone, etc.

From a certain degree of curving of the stroke onward, the aggressiveness of the hooks disappears and the sign rolls up into a loop, finally appearing as a spiral from the point at which the inner stroke meets the outer one to initiate a second, tapering, circular form. To illustrate this point, a comparison may be made with the bending of animal horns, from the pointed horn of the bull to the curved horn of the mountain goat and the rolled-up horn of the ram.

Bending, curving-in, and rolling-up also produce three totally different images. In the first, the association with the aggressive point of a straight arrow or weapon is retained, and there is also a suggestion of a flame or a tongue. Curving-in eliminates this aggressive character and produces images of tendrils (growth), waves (water), ringlets (beauty), etc. In the spiral form, the center stands out strongly, like an eye, and the parallel circles produce a certain rotation and agitation.

The spiral is a very ancient sign of the sun and life, its constant rotation symbolizing the pulsation and periodicity of all life.

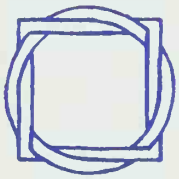
4. Plaiting, interweaving, knotting

All materials used for manufacturing or forming objects have a greater or lesser degree of elasticity or suppleness, depending on their structure. A stone, which might be said to stand at the bottom of the suppleness scale, is not bent but trimmed. A piece of timber, on the other hand; a willow twig; and especially a fiber or hair can be changed into a new form, literally transformed, without trimming, cutting, or breaking.

The nature of the spun thread or the turned cord comprises both the mystery of infinite length and the

The endlessly long spun and rolled-up thread

Pretzel, cradle



Material world, spiritual world

Infinite and always bound together

possibility of being rolled up in a limited space on the spindle, with overtones of the spiral, perpetual circular motion, the "unrolling" of life, etc.

The further processing that turns the spun thread into woven, knotted, or plaited fabric, wherein the infinite length of the thread is still present, gives all such materials something peculiarly attractive. (This feeling has largely been lost in modern textiles.)

The supple, long, drawn-out object invites hand and mind to activity and the result is always in some way beautiful, ornamental, or, on the contrary, mysteriously knotted and entangled, suggesting a comparison with the mythological serpent and its symbolism.

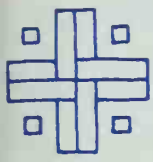
Women have the manual skill of braiding their own hair, as well as the dough of a pastry or a string of onions for the winter, in artistic plaits. The shape of a pretzel is a lively example of an everyday elementary but well-balanced ornament in which a deeper symbol may be found, namely that of the cradle, of birth, and of the desire for propagation.

The interlaced or interwoven form occupies an important place in symbolic representation. A number of simple geometrical signs can be plaited together, always producing a strong effect of binding, which can certainly be attributed to a symbolic content.

Proceeding from the same delight in fabrication as the activities of embroidery and lace making, which create hundreds of patterns from the simple line of thread, are the graphic "embroideries" that are found all over the world in all fields of culture, enhanced by the artist's imagination to the level of the "insoluble," where the basic sign may become almost unrecogniza-

1: Romanesque cross with typical plaiting effect of this style. 2,3,11,13,15,18: In the early Christian fresco painting and stone carving of friezes in Ethiopia, the art of ornamentation was taken to the utmost possibilities of interlacing and plaiting effects, while elementary signs with symbolic content remain recognizable in each ornament. 4,12,16: Irish and Anglo-Saxon book illumination of the early Middle Ages also shows an almost inexhaustible wealth of ornamentation through plaiting and knotting effects. 6: On an Indian seal. 7: Knot ornament engraved in metal, Crete. 8: Mosaic pattern, Ravenna. 9: A sign similar to the Oriental Gordian knot, on an ancient Mexican ceramic seal. 10: Embossed in metal on an ornament, Crete. 14: Engraved in ivory, Nigeria. 17: Indian sand-dusting drawing. This is a method of drawing on flat ground for ceremonial purposes. At first a "grid" is marked out, then the lines are drawn on white sand, by letting it flow between the fingers. The peculiarity of this kind of ornament consists in the absence of any line endings or beginnings, the lines being almost invariably drawn on the principle of the "eternal recurrence."

Stroke endings lost in interlacing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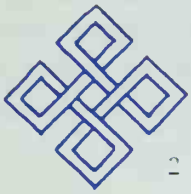
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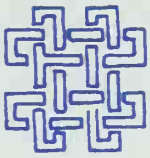
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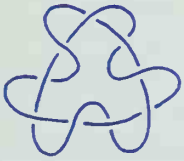
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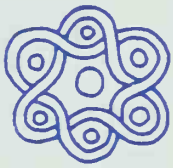
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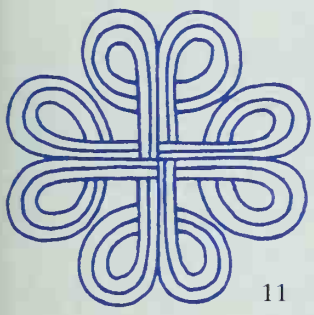
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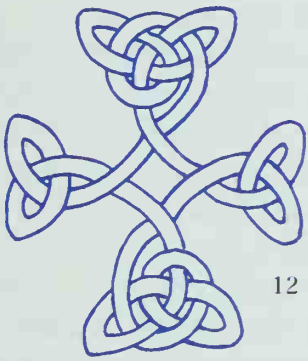
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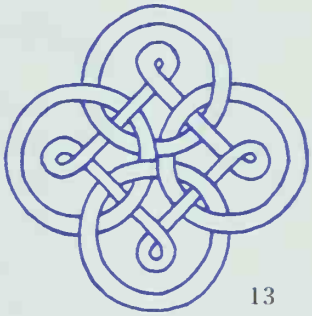
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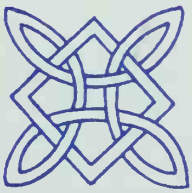
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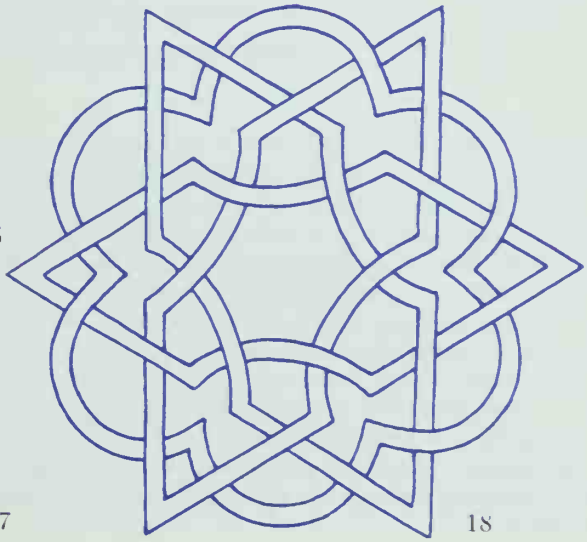
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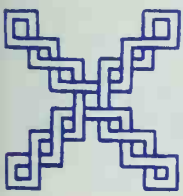
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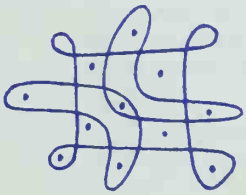
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ble. This possibility of simulating volume (cf. Part 1, Chapter VII) has probably been most widely exercised with cross signs. The two bars meeting in the middle at right angles, the four "naked" stroke endings, and the four symmetrically arranged interior angles form an ideal point of departure for sheer sport with loops, plaits, and knots. Not all the examples shown in our table need necessarily have a symbolic motive for their production.

5. Sun signs

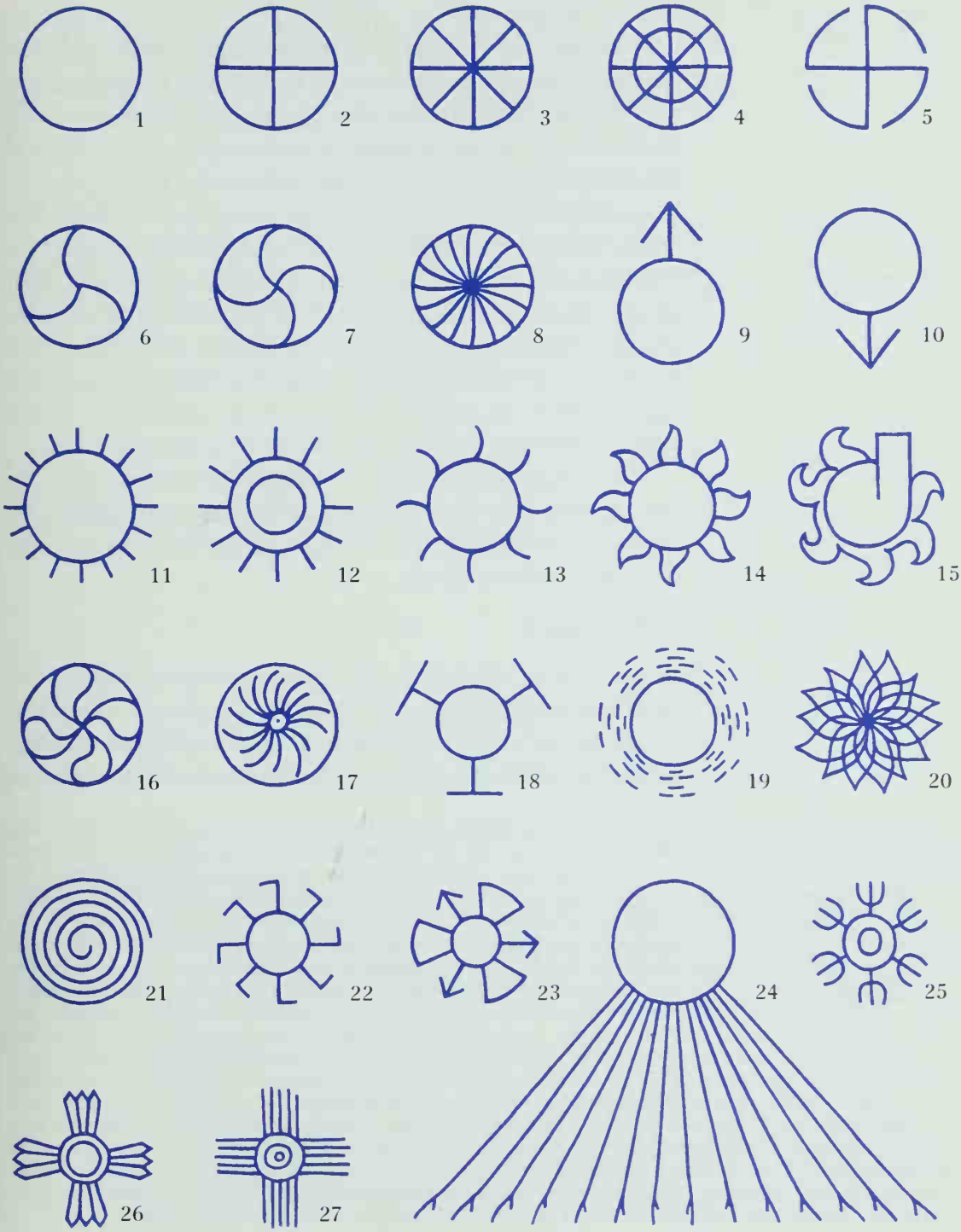
The signs for the stars occupy an intermediate position between the concrete and the abstract symbols of our dichotomy. Although the representation of the sun and stars may be judged as figurative, they are nevertheless closer to abstraction in their symmetrical and basically simple formal construction.

Without going into deep commentaries and reasonings, one may consider the cult of the sun to be the most widespread and ancient of all forms of worship. The fact that the circle or disk-shape has a prominent position as an archetype in the subconscious can be attributed to the image of the sun as a life-giving force. (An attempt is made to analyze the basic form of the circle in some depth in Part 1, Chapter II.)

The sun sign almost always comprises two basic elements: the circular or disk-shaped form of the body and the more abstract representation of the rays. These

1: The basic symbol for the sun, the universe, eternal recurrence, found in almost all the world's cultures. 2: Primitive sun symbol with the four directions of the compass or Christian wheel cross (the cross in the world). 3: Sun wheel with internal radiation (warmth), also a Christian sign with the Greek letter X (chi) as the initial of Christ. 4: The sun (inner circle) shining on the earth (outer circle). 5: The wheel cross opened out to make a circular swastika, basic element of numerous symbols of the sun and life. 6, 7, 8: The curved divisions no longer represent rays but refer to rotation and movement of the sun in the sky. 6 also denotes the Trinity. 7: Sun wheel, also wind wheel, with movement from the four points of the compass. 9, 10: Rising and setting sun, forming the basis of later pseudoscientific signs. 11: A traditional representation of the sun with rays, also interpreted as life-giving womb. 12: On an Indian coin. 13: Embossed in metal, Crete. 14: Sun with flaming beams. 15: Indian sign painted on leather. The meaning of the chimney-shaped exit has not been discovered. 16: Sun wheel, rural painting, Alps. 17: On a Roman tomb. 18: Sun in a closed world, Knossos. 19: Ancient Chinese symbol of forces of nature. 20: Indian sand-dusting sign. 21: Typical Celtic symbol of the sun cult. 22: Trojan footed sun. 23,25: On Indian coins, the rays ending in aggressive weapons. 24: Egyptian hieroglyph for "lucky day." 26: On Hopi pottery, Arizona. 27: Assyria, scratched in clay.

The day star in symbolic representation from many cultures



two basic elements are often supported by an indication of rotary movement, probably in connection with the sun's daily course. Also of importance is the symbolization of the growth and decline of warmth during the day or the season, finding its best expression in the form of a spiral.

The sun's rays can be drawn either inside the disk (figures 1 to 8) or outside it (11 to 15), and their meeting with the earth's surface also comes into expression (22 to 25). An interesting point to note in this connection is the influence of geographical latitude on the appreciation of the presence of the sun as not only beneficial but also burning or scorching, as, for example, in the two illustrations from India, where the rays are tipped with weapons such as arrows or tridents. In Nordic languages the sun is usually a feminine object, whereas in the Romance languages of the south it is given the masculine gender. In Arabic, the moon is masculine, being seen by the nomads as the "leader in the night."

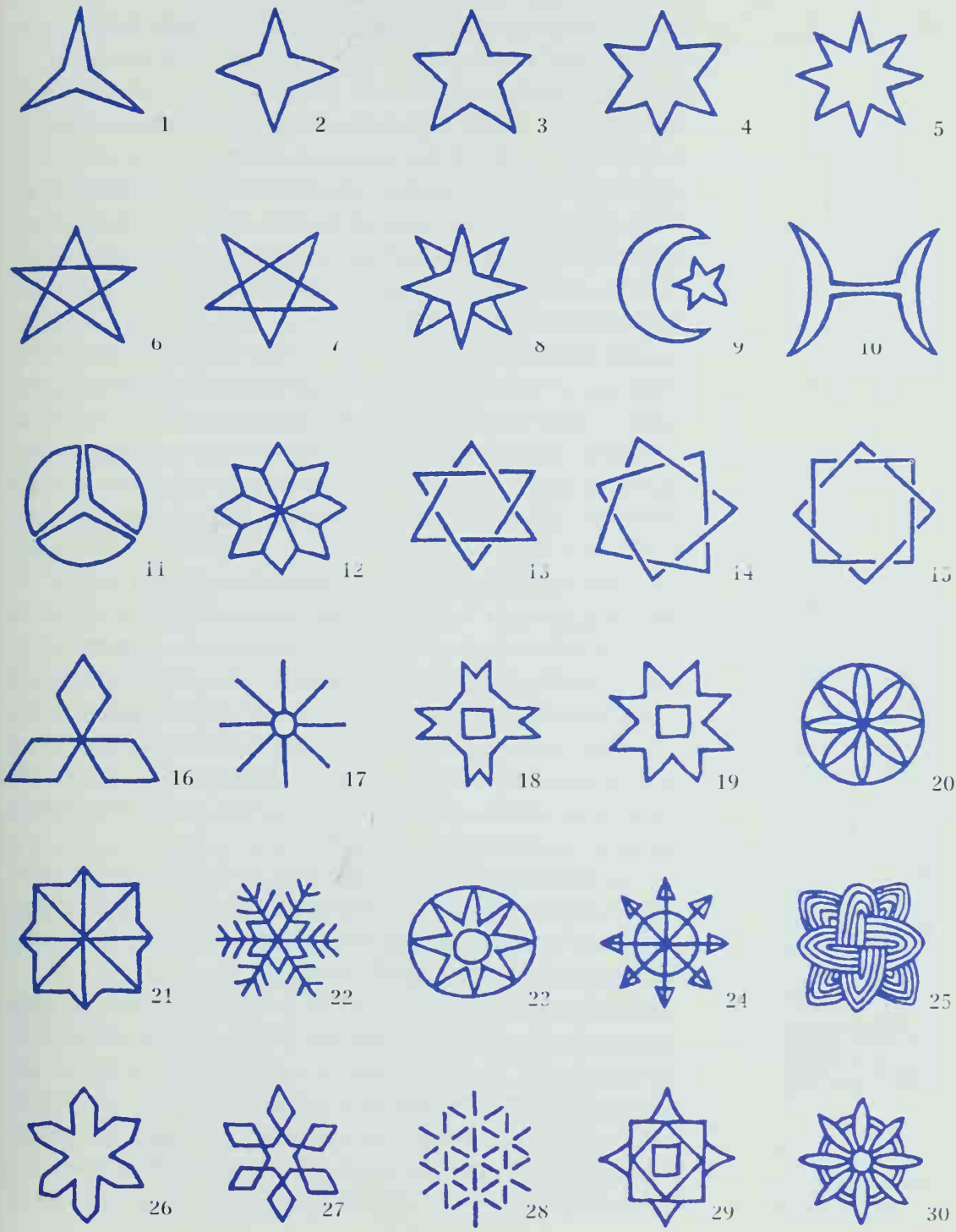
Most sun symbols clearly emphasize the concept of the "center" as a confirmation of the central significance of the sun for all life, a feeling that goes back to the very earliest times.

6. The stars

At the end of each day, the blue sky dominated by the sun changes to darkness, from the depths of which the stars appear, giving a sense of the infinity of the universe. Until a few hundred years ago, however, the

1,2,3,4,5: Traditional star shapes in outline drawing, with the points of the beams touching an invisible circle and their radiation disappearing into the universe. The greater the number of points, the stronger is the impression of the star's twinkling. 6: Pentagram or five-pointed star. The number five is closely associated with humans (5 fingers, 5 senses). A much used, very mysterious sign known in all cultures, including modern graffiti. It may be drawn "in one go" with the right sequence of hand movements. 7: Reversed pentagram, a medieval magic sign for "the black hand." 8: Compass rose consisting of two superimposed four-pointed stars. 9: Symbol of the Mohammedan faith. Its basic symbolic meaning is God of the Night. Just as the sun brings the division of days and year, the moon governs the months and the different course of each year. 10: Passage of time between waxing and waning moon, medieval symbol of life. 11: The three-pointed star in a circle comes from a medieval symbol of the Trinity. 12: Closed eight-pointed star, also called flower star, symbol of fertility in folklore. 13: Star of David, also Solomon's seal, a combination of two three-pointed duality signs. 14: Heptagram, with meaning similar to the pentagram (6). Applied to houses as a protective sign, seven being the magic number of good fortune. 15: Eight-pointed star formed of two squares, mosaic in Ravenna. This symbol was also drawn as a stylized crown of thorns in the Middle Ages. 16: A well-known form of triple star, used as a Nordic symbol of divine omnipotence; also an ancient Japanese family sign. 17: Spider star, Russian symbol. 18,19: Woven stars, Caucasus. 20: Leaf or flower star, folk art. 21: Viking cross, carved in stone memorials in northern lands. 22: Snow star. 23: Textile motif, Ghana. 24: On Indian coins. 25: Indian sand-dusted drawing. 26: Crystal star. 27: Star pattern of Oriental carpet weaving. 28: Embroidered star pattern. 29: Stone carving, Ethiopia. 30: Flower star or love star (daisy), Spanish book illumination.

Star signs, mysterious mediators from distant worlds



mind of humans could not grasp the idea of the inconceivably vast distances of an empty universe. In earlier times, humans saw the vault of the heavens as a fixed material dome on which the stars were hung or existed as openings. That is probably the reason why sun, moon, and stars are shown in bodily form in practically all pictorial representations, with the courses of these heavenly bodies expressed as "paths" or "ways." One has only to think of Apollo, god of the sun, passing across the vault of the heavens every day in his fiery chariot. The moon is represented in its main phases of crescent, semicircle, and disk. The waxing and waning of the moon and the annual movements of the constellations became fixed points of reference for humankind's divisions of time.

We must also be aware of the fact that primitive humans could not grasp the concept of the universal course of time but lived from one privileged moment to another in the constant expectation of a renewal of the customary seasons. The course of the year was punctuated by ritual actions, such as the Shrovetide carnival to drive out the winter. For Nordic peoples, the midsummer night festival is a celebration of well-being on the longest day, but in earlier times it must also have been a celebration of the hope that a new annual cycle would begin despite the coming shortening of the days. This hope was expressed through sacrifices and conjurations. Cults of the sun and moon, leading to the existence of a multitude of symbolic representations of heavenly bodies, are easier to explain when this point of view is taken into account.

Comparisons of form, like that of the crescent moon with cattle horns, water waves, roots, the serpent, and the phallus, have led to the creation of eloquent basic symbols pertaining to life on earth.

While the circle and disk form the bases of sun signs, most star signs do not have any pronounced round form. The expression of radiance is given by symmetrical arrangements of straight lines, tapering out to a point, which convey the impression of beams disappearing into the void. These signs therefore almost always consist solely of straight lines, unless a

resemblance to something figurative such as a flower or a spider is sought.

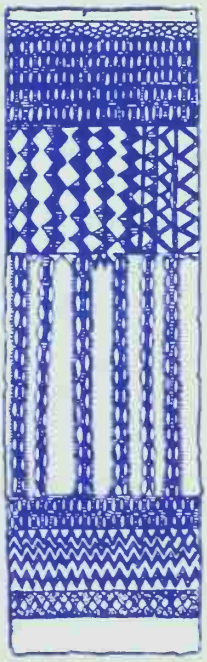
We find star signs in all fields of sign making, from the symbolic Star of David through the trademarks of industry to the asterisk in our books, as examples of one of the basic figures with a very strong graphic identity.

7. The symbol in ornamentation

Prehistoric artifacts have been found bearing scratched or scored rows of signs, whose meaning or statement cannot be scientifically determined with any certainty. It can be assumed that the earliest ornamentations were in some cases merely playful decorations and in other cases deliberate markings for identification of ownership or for purposes of magic. The appearance of such ornaments must have been a subject of admiration in earlier times when all artistic productions were felt to be supernatural. It is possible that the ornamental sign received its symbolic value for this reason.

Ornamentation of a sculpture, fertility, seated figure. Ukraine, end of Ice Age.

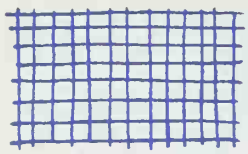
The limitations imposed by the use of primitive tools and actions such as cutting, pricking, and burning-in reduced the expression of form to geometrical, mostly linear motifs, but the meaning of such strip forms has been handed down to maintain traditions to this day, for example, in the fabrics of the Sahara nomads, where every strip of the pattern carries a recognizable symbol. As a typical example of symbolic ornamentation we reproduce a decorated magical bamboo pole from the Malayan peninsula with demonstrable meanings, according to which the successive strips originally held the following information.



Symbolic ornamentation of a Malayan bamboo pole.

The lowest strip, No. 7, means "river," and a line of hills is recognizable in the next, No. 6. Between the identical strips 5 and 2, whose meaning is uncertain, we find plant stems, leaves, and branches. The topmost strip has not been identified but could be interpreted as clouds or sky. It is an obvious conclusion that this apparently decorative strip pattern adds up to a symbolic expression of "life."

Rows of symbols: ornaments for meditation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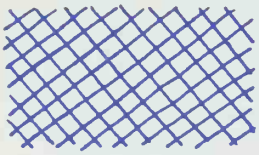
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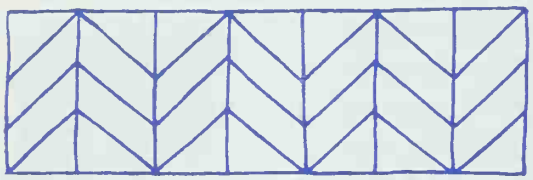
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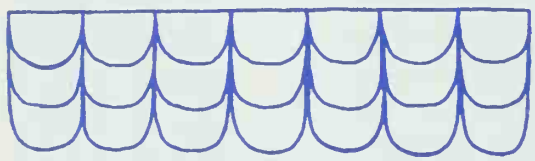
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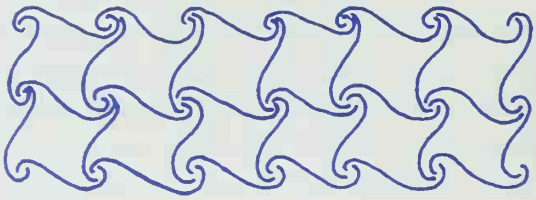
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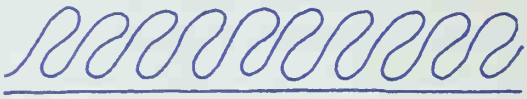
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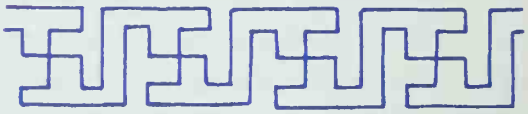
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The next illustration shows a highly ornamental ceramic bowl from the early period of Sumeria, circa 3000 B.C. The painting certainly has a symbolic, even perhaps a magical meaning. The pattern around the edge has been interpreted as a rain motif, representing the sky; the central checkered circle as the sun, and the wavy areas as the sea. It is possible that mythical birds are shown flying around the sun and that the broad rays represent the magical strength of a supernatural power.

Symbolic ornamentation of a Sumerian bowl

Our table shows a small collection of ornamental friezes and strips, which certainly include specific signs and symbols for purposes of ornamentation *and* meditation.

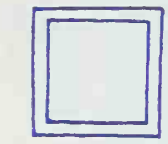
8. Geometry and symbol

The *visible* part of a geometrical sign consists of a more or less complex assembly of straight and curved lines, whereas the *invisible* part consists of the mathematical laws under which the lines are oriented, extended, and turned. Among such underlying factors determining the form of a sign are the four identical sides of the square, the constant radius and invisible center of the circle, and the sum of the angles of a triangle.

The projection of any kind of symbolic meaning comes from this aspect of the sign, which we might call its metaphysical content. The meaning of each sign cannot, however, be simply "called up," since many signs disclose their conventionally accepted meaning only to the initiated.

1, 2: It is not always relevant to look for symbols in the simple grid pattern of crossed lines, but we know that on prehistoric artifacts and also in association with early pictographic scripts, these hatchings make a specific statement, usually referring to the tilled field, that is, to fertility. 3, 4: The chevron motif and the row of triangles are stylized representations of grain and of the tree of life and can therefore be seen as fertility symbols. 5, 6: The symmetrically aligned patterns carry a sense of duality or complementarity and may be interpreted as meaning fertilization. 7, 8: Fishbone and scale patterns probably appear most often for purely ornamental purposes, but one may also read into them the meaning of protection from without (scales, tiles, etc.). 9, 10, 11: Typical wave friezes from the Mediterranean region, all found on Greek vases. 12: Wave pattern based on extension over an area rather than linear development. Ceramic painting, Crete. 13: The so-called Greek meander pattern is a straight-line adaptation of the wave pattern and has many applications. 14: Wave pattern without stroke endings, Chinese embroidery. 15: Wave and leaf pattern on a Scandinavian fresco. 16: A peculiar wave ornament with plantlike features scratched on a wooden container, Ghana. 17: Swastika meander pattern, a widely used and favorite ornament with strongly symbolic character, fresco painting, Ravenna. 18: Meander type of textile pattern with angle and circle signs, undoubtedly based on the serpent motif. On Sumerian clay tablet. 19: Twisted skein pattern. 20: Typical Roman, later Romanesque, plaited pattern. Mosaic at Nîmes.

Geometrical figures often have a coded symbolism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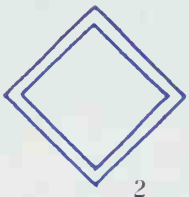
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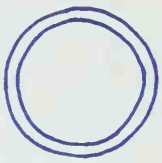
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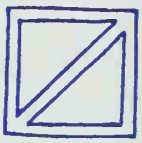
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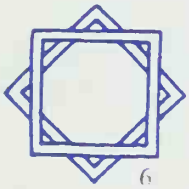
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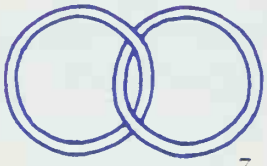
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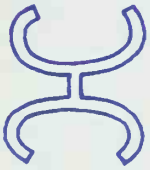
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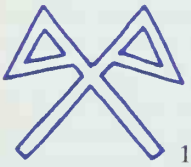
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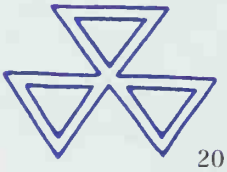
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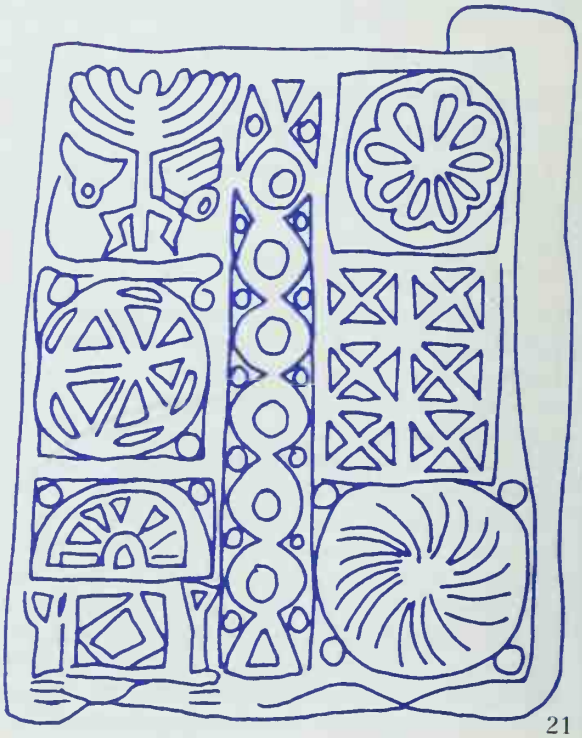
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In the final table of this chapter we show a small selection of symbol signs from a wide variety of sources. Attempts to interpret the individual figures must remain subjective, since in most cases no explanations have been handed down with the surviving examples of their use.

The table includes some signs taken from the partly esoteric cryptography of medieval philosophies, bringing us into the field of pseudoscientific signs, which form the subject of the next chapter.

1, 3, 4: The three elementary, basic signs, known in all parts of the world. The square denotes the four regions, the four seasons, etc., in contrast to the circle, which comprises everything spiritual in the circular course of eternal recurrence. The triangle, on the other hand, incorporates the creative intellect, the faculties, and the active principle (see explanations in Part 1, Chapter I). 5: The diagonal is the concept of the irrational, as its mathematical length has no simple relationship to the sides. The Greeks concluded from this fact that the diagonal belongs to the incomprehensible world of the occult. 6, 7, 8, 9: When signs are joined together, new symbolic meanings are found. Four different kinds of association are shown in this row. In 6, the squares 1 and 2 are superimposed, producing an eight-pointed star. In 7, two circles are interlaced, denoting community. In 8, three triangles are put together, all on the same level without superposition or interlacing. This sign, already to be found in Viking times, denotes the secret number 9, made of 3 x 3, which certainly had a symbolic meaning. In figure 9 the two superimposed triangles are separated by color, the solid strokes of the downward-pointing triangle making it dominant. 10 to 14: The third row contains curved signs with visible stroke endings. 10: The doorway arch, vault, or protective cave. 11: The bowl, reception, sacrifice. 12: The double hook or stork sign from folk art, signifying protection and blessing. 13: The loop or womb, also a variant of the serpent sign, regarded as a sign of fate. 14: A modification of the omega sign, symbolizing becoming, being, and passing. 15: Between birth and death is life. The ships of life and death are joined by the stroke of life. 16: Trinity, a life sign drawn with one continuous stroke, traditional rural sign. 17: The X-cross with two flags, horses' heads, or keys. Protective sign on farmhouses. 18: Triple foot, another Trinity sign, very often used for magical purposes and also known as witch's foot when reversed. 19: A typical negative sign, characterized by the six stroke endings and three crossings. 20: A Trinity sign with similar meaning to 8 and drawn with continuous stroke, the star sign being central. 21: Both the Jewish and the Mohammedan religions forbade any figurative representation of life forms, in order to forestall all risk of idolatry. Both cultures therefore made much use of abstract symbols for purposes of ornamentation. The sepulcher door of Kefer-Yesef in Palestine serves as a striking example. It dates from the Roman period. Its symbolic ornaments have given rise to a variety of interpretations. According to M. Rutten, the vertical central strip shows a belt adorned with six circles and two triangles. (This kind of belt forms part of the costume worn for the Easter fertility festival.) The two circles at the right form a double symbol, representing the sun (Apollo) above and the moon (Artemis) below. Between these, there are six magic squares as symbols of the world, i.e., the six days of creation of Genesis. The left-hand side of the door shows (above) the nine-branched candelabra, in the center the earthly cycle of the four seasons in the hexagon, surrounded by the circle of eternity. At lower left is a stylized altar or chest enclosing the book of the law in the form of a rhombus. Above it floats the mussel shell of fertility with the triangle of creation in the middle.

V. Signs of Pseudoscience and Magic

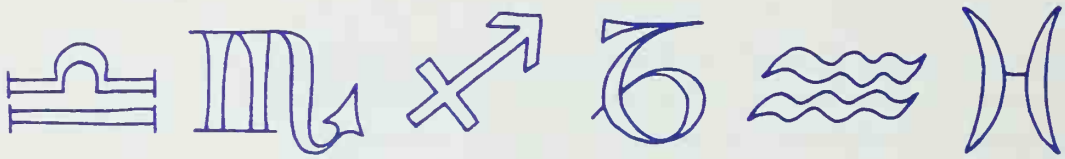
It is extremely difficult to draw a clear boundary between the concept of a "symbol sign" and that of a straightforward communication sign. As we emphasized at the beginning of the present study, the objects and creatures that are elevated to the status of symbols must be regarded essentially as *mediators* between the fields of the objective, which is comprehensible and visible, and the mystical, which is supernatural and invisible.

On the other hand, an illustration or sign that is used only to designate or describe a quite specific thing, condition, or event can no longer be called a symbol.

It is also evident that any object or creature, or its abstraction in the form of a sign, can either be elevated to a symbol or treated purely as a designation. In order to clarify this phenomenon of the diverse uses of one and the same thing, we have assembled a table at the end of this volume to show the various stages of characteristic forms of expression, using two figures and two signs as examples. The first examples given in the present chapter illustrate both the ambiguity of the terms "sign" and "symbol" and the nature of the boundary between them. The signs of the zodiac are designations of the twelve constellations in which the sun appears – from a terrestrial viewpoint – during the course of a year. This annual course was observed long before our era, in China, Egypt, and Babylon, and divided into twelve sectors, from which today's customary division into months is derived. Each constellation was given a mythological character, symbolized either figuratively, for example, in the image of a maiden for the constellation of Virgo, or in an abstract way by means of the condensed forms of the zodiacal signs.

These signs, when isolated from any interrelationship or association with people's dates of birth, are to

Aries, ram (March) | Taurus, bull (April) | Gemini, twins (May) | Cancer, crab (June) | Leo, lion (July) | Virgo, maiden (August)



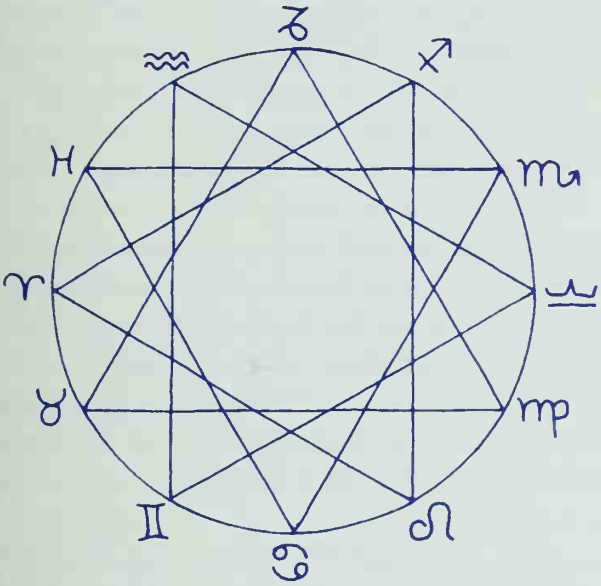
Libra, scales (September) | Scorpio, scorpion (October) | Sagittarius, archer (November) | Capricorn, goat (December) | Aquarius, water-carrier (January) | Pisces, fish (February)

be regarded as pure *signs* for the corresponding solar position in the constellation for a given date.

On the other hand, when used for magical purposes such as foretelling the future or choosing a spouse, the signs of the zodiac are elevated to the status of symbols through being considered in relation to a theory. As an example, our second illustration shows the twelve signs located on the circle of the sun's path, symbolizing the course of the year. In accordance with their ancient astrological relationship, the signs are linked by four triangles crossing one another to produce the following magical associations: the triad of fire, consisting of Aries (the ram), Sagittarius (the archer), and Leo (the lion); the triad of water, Pisces (fish), Scorpio (scorpion), Cancer (crab); the triad of air, Aquarius (water carrier), Libra (scales), Gemini (twins); and the triad of earth, Taurus (bull), Capricorn (goat), Virgo (maiden).

This illustration clearly shows how signs are assembled to express a process of thought, thereby making a symbolic statement. In addition to the signs of the zodiac there are other symbol signs in the illustration: the circle itself as a symbol of the constantly recurring course of the year, the star as expression of the complexity of life in all its diversity, and not least the star surrounded by a circle, a sign that we find again in symbols of the sun cult and also in the meditation images of Indian Mandalas.

We have chosen the example of the zodiacal signs in order to illustrate the borderland between sign and symbol more clearly than can be done with words alone. At this point we leave the field of the symbol, all subsequent illustrations being presented as unrelated individual signs, even though they have been used as symobls in the pseudosciences of astrology and alchemy and the cryptic drawings of freemasons and cabalists for mystical and obscure purposes of magical formulation.

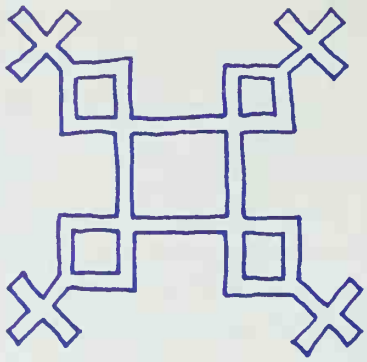


Cosmic representation of the signs of the zodiac.
The twelve signs are placed around the circular path of the sun. They are also divided into four groups by means of four triangles. The dual association of the signs with circle and triangle gave rise to a large number of interpretations.

1. The elements

With the awakening of human intelligence there arose a need to understand the nature of things and of life on this earth, leading to primitive but realistic recognition of the qualities of elementary substances: earth, as that which is fixed; water as fluid; fire as heat; and air as coolness (air being recognizable only in its movement as wind).

The most ancient examples of wisdom that have come down to us are based on this division of the world into its basic elements. In an earlier chapter of this work (Part 2, Chapter III) we have already considered an ancient world view of this kind, based on eight elements formed from the signs for yin and yang.



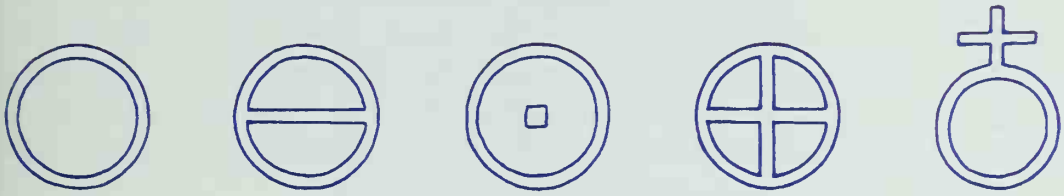
Medieval Christian sign of the world, consisting of the four elements

Most philosophical worldviews, especially those of ancient Greece, are based on the fourfold or quadratic nature of the aforementioned elements of earth, water, fire, and air, in that they trace everything generative, formative, living, and passing away, back to them: cold and dampness producing water; dampness and warmth, air; warmth and dryness, fire; dryness and cold, earth. Nature appears to be firmly based on this quadratic principle, as is also repeatedly shown by the symbolic interpretations of the square: spring, summer, autumn, winter; morning, noon, evening, night. We have also encountered the four elements in the first section of the present chapter, in the form of the four astrological triangles of the zodiacal circle.

Fire Water Air Earth The World

During the Middle Ages, nonalphabetical signs were increasingly used in the secretive pursuit of obscure sciences. The signs shown here, characterizing the four elements, are of medieval origin, and there is absolutely no reason to seek any tendency to figurative representation in their use. They are to be understood as purely abstract signs, since an extended interpretation was added to their significance in mystical practice. The fire sign was also taken to mean "choleric" or prone to anger, the water sign "phlegmatic" or unemotional, the air sign "sanguine" or cheerfully dis-

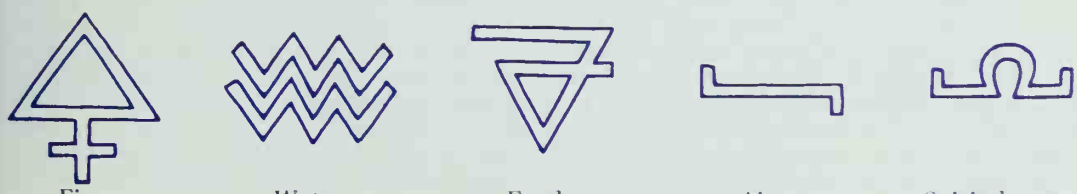
posed, and the earth sign "melancholic." In these extended meanings, the esoteric nature of occult science and a close association with astrology and its use for soothsaying are clearly apparent. A noteworthy feature is the fifth sign, expressing the combination of all four elements. This sign, the Star of David, has already been described in the chapter on dualism (Part 1, Chapter V).



Fire Water Air Earth (matter) Earth (world)

We find the same four elements represented in circular signs. These provide more reason for comparison with figures. We recognize the sign for the sun in the one for fire; the surface of the water becomes an almost tangible element in the water sign; the central point in the air sign can be taken as a nonfigurative representation of the invisible air in space; and the earth sign once again contains the quadratic character of the four points of the compass, or the four seasons, together with the four corners of the earth and the cross sign with its many meanings.

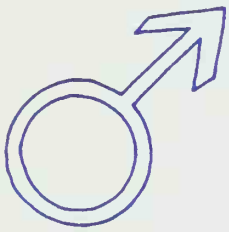
In the signs of alchemy the elements were given further signs of various forms, of which the ones shown here are typical. They include the sign for the spiritual, which completes the series by representing the opposite pole to the material.



Fire Water Earth Air Spirit, heaven

2. The signs of astrology

Without exception, the cultures of the past were based on the acknowledgment of the existence of supernatural powers, entailing beliefs in gods and supernatural realms such as heaven, hell, and Nirvana. In this connection it should be noted that religious believers *submit passively* to supernatural governance, believing in a preordained, fateful determinism. Nonreligious persons, on the other hand, feel more drawn to the field of magic, where they believe they can *actively determine* their *own* destiny through spiritual acts of conjuration, with the aid of certain manipulations and occult signs for magic formulas.



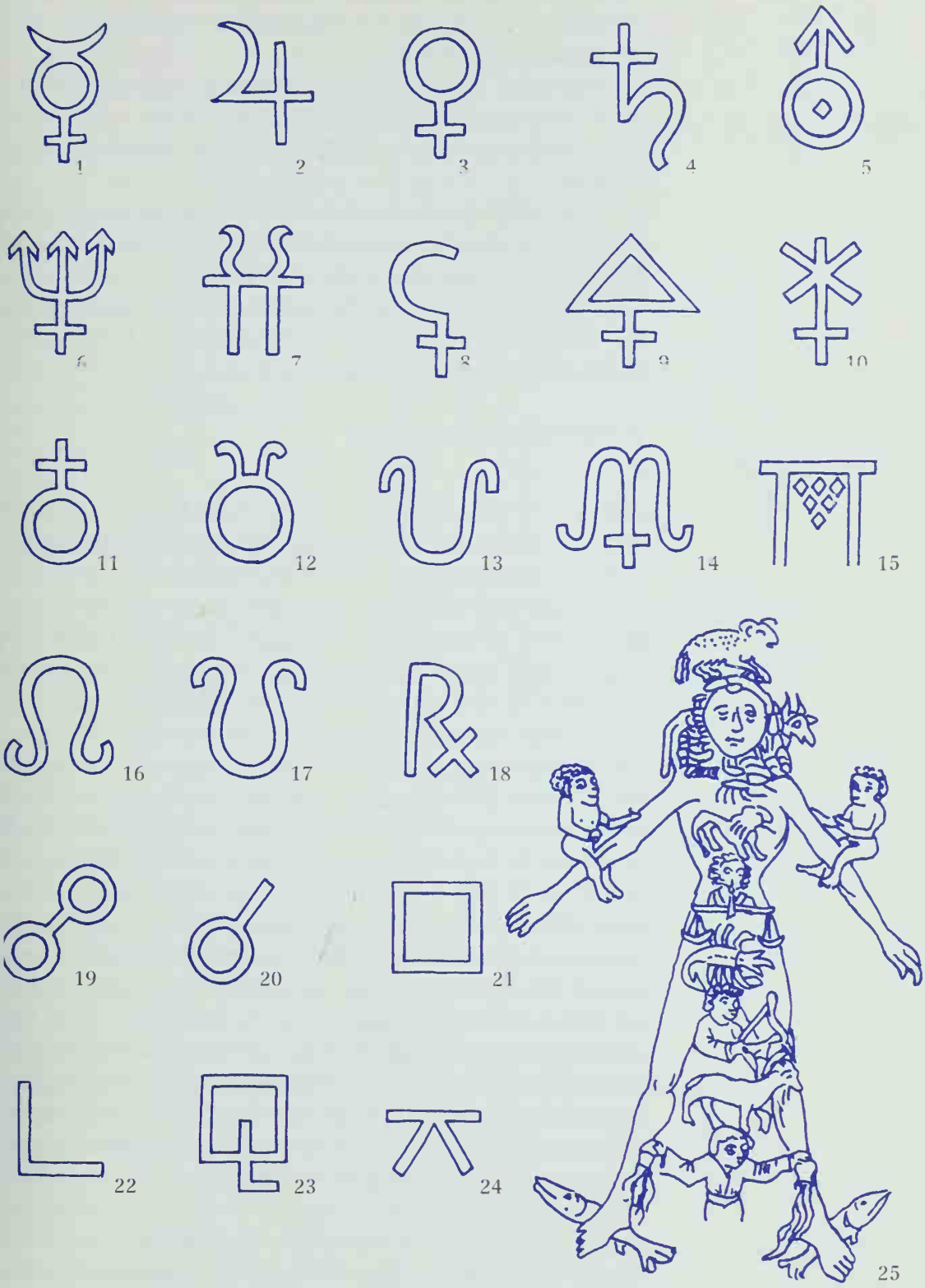
Mars, iron, Tuesday, masculine

Here again there is a distinction between sign and symbol. Believers raised a being, a thing, or its image to the status of mediator between the almighty being that passes all understanding and their own inadequacy, by creating for themselves a *symbolic representative* as object of worship. Atheistical persons, attracted by science, attempted to interpret and understand the cosmos, creating for themselves *signs* of the macrocosm of the universe and of the microcosm of earthly materials, for purposes of manipulation.

The reader should bear in mind that astrology was not a true *science* of star lore, nor was alchemy a proper form of chemistry or physics with any exact scientific foundation. For this reason we have called them pseudosciences. Astrology and alchemy were usually a combined study, so it is not surprising that the meaning of a number of signs recurs in different branches of learning. Thus we find, for example, that the astrological sign for Mars is also used as the

1 to 10: Planet signs (the signs for sun, moon, and Mars, already shown, have the following additional meanings. sun: alchemy, gold, calendar sign for Sunday. moon: silver, Monday. Mars: iron, Tuesday). 1: Mercury: quicksilver, Wednesday. In botany, a hybrid. 2: Jupiter: tin, Thursday. 3: Venus: copper, Friday. In botany, female. 4: Saturn: lead, Saturday. 5: Uranus. 6: Neptune. 7: Vesta. 8: Ceres. 9: Pallas: sulfur. 10: Juno. 11: Earth: antimony. 12 to 15: The four seasons. 12: Spring. 13: Summer. 14: Autumn. 15: Winter. 16 and 17: Signs for nodes, i.e., points of intersection of planetary orbits and the sun's astronomical path. 16: Ascending. 17: Descending. 18: Designation of a returning constellation. 19 and 20: Positional signs of the planets in relation to one another. 19: Direct opposition of 180°. 20: Superposed or conjunction 0°. 21 to 24: More positional signs. 21: Quadrature or 90°. 22: Semi-quadrature or 45°. 23: One-and-a-half quadrature or 135°. 24: Quincunx or 150°. 25: From a 15th century engraving representing the signs of the zodiac in connection with the human body. One of the purposes of such figures was to determine the most auspicious dates for the healing of sickness in different parts of the body. Known as "blood-letting figures," these were still in use in the 19th century.

Signs expressing a secret world order



alchemical sign for iron and the calendar sign for Tuesday (in Latin *dies Martis* or day of Mars); it has remained in current use in modern science with the meaning of "masculine."

Our next full-page table shows a selection of the most widely used astrological signs, among which the signs of the zodiac, as already shown, should also be counted.

The category also includes the signs for the sun and moon, already shown as symbols. It should be understood that in astrology the sun and moon were considered planets, since the earth was believed to be the center of the universe. Consequently, the sign for earth was not used in astrology.

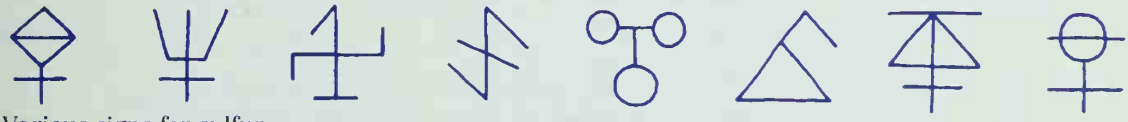
3. The signs of alchemy

The art of transmuting materials, making hard substances liquefy by fire or evaporate through the application of liquid acids, seemed like magic to the uninitiated people of the Middle Ages, who were almost entirely ignorant of the natural sciences. They were unable to understand such processes because they could not be observed in the natural course of existence.

For this reason, the privileged group of learned people occasionally produced individuals, such as Cagliostro in the 18th century, whose knowledge enabled them to turn to the field of metaphysics, cloaking their activities in occultism and sorcery so that they appeared to their fellow-people as beings endowed with supernatural powers. The principal activity of the alchemists was the search for the "philospher's stone" and, above all, the mystical production of gold by artificial means. Gold meant power, even deification and immortality in the case of certain oriental cults such as that of the golden calf. It would take up too much space to go through the principles of alchemy in detail, but the following brief account may serve as a guide. Alchemists generally considered their science to be on a level with cosmology, making the two phases of their operations, coagulation and solution, analogous with the dualistic, universal rhythm of life, which consists of breath-

ing in and out. A comparison with sexuality was also available to them, namely when gold, known as the "new Adam" or androgynous being, appears to be born or sublimated from bronze in the crucible, which can be regarded as the womb, through the admixture of sulfur and quicksilver. The basic elements of alchemy are sulfur and quicksilver, fire and water, which may be compared with the active and passive principles of heavenly and earthly powers. In the equilibrium of the two principles there is salt: not the natural substance of sodium chloride but a mysterious substance with all-embracing effects, such as is spoken of in the Bible as "the salt of the earth." The epitome of this principle of trinity (sulfur-quicksilver-salt) also finds expression in a variety of forms of signs.

Various signs for quicksilver (mercury)



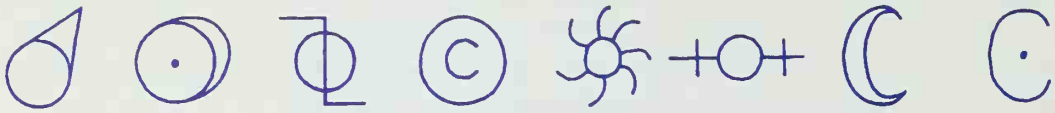
Various signs for sulfur

Four signs for spiritual salt

In the metaphysical sense, the alchemical view distinguishes between two essential stages of progress, that of the white principle, also known as the "lesser mystery," and that of the red principle, also called the "greater mystery," the former corresponding to the desire for perfection (good fortune, Paradise) and entry *into* the center of the world, the latter based on the thought of rising *beyond* the cosmos to reach the superhuman, the divine, through the use of the philosopher's stone.

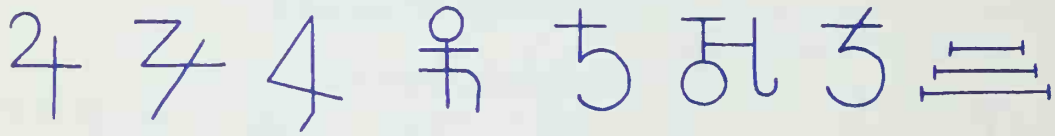
Seen from another viewpoint, alchemy appeared to make it possible for humans to pass beyond the mate-

rial to the spiritual, just as gold (the spirit) is sublimated from raw materials such as base metals (matter).



Four signs for gold (Sun) Four signs for silver (Moon)

Four signs for iron (Mars) Four signs for copper (Venus)

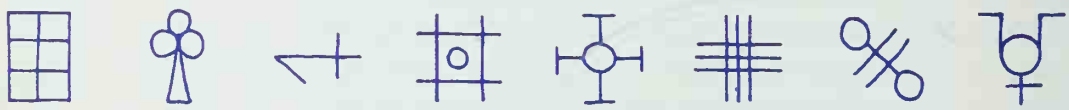


Four signs for tin (Jupiter) Four signs for lead (Saturn)

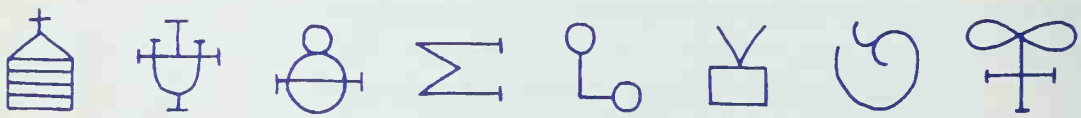
Four signs for antimony (Earth) Steel Cobalt Zinc Arsenic

This condensed account of the ideas of alchemy is sufficient for the purposes of our present study and may be summarized by pointing out that alchemists were concerned with crossing the threshold between pure science and faith so as to find both knowledge and salvation through their experiments.

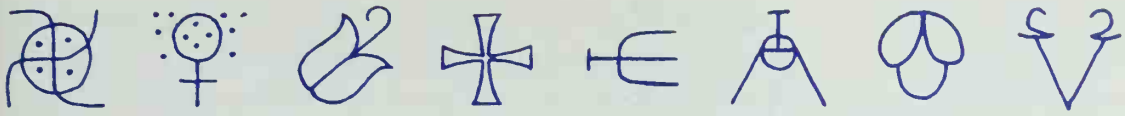
In addition to the principal signs for metals, shown above, a great quantity of other signs for materials could be listed. We confine ourselves here to a small selection:



Water Wood Wax Urine Olive oil Acid Copper, saffron Minimum



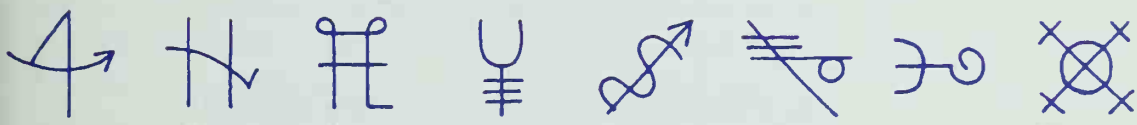
Cooking salt Vinegar Cinnabar Sugar Borax Alum Eggshell Glass



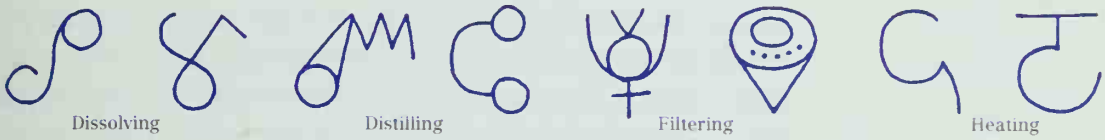
Verdigris Copper fragment Nitrate blossom Welding Ash Crystal Heated stone Hartshorn

Iron rust Tartar Spirits of wine Ammonia Vitriol Arsenic Chalk Dung

The formulae of alchemy also include signs for chemical processes and procedures:



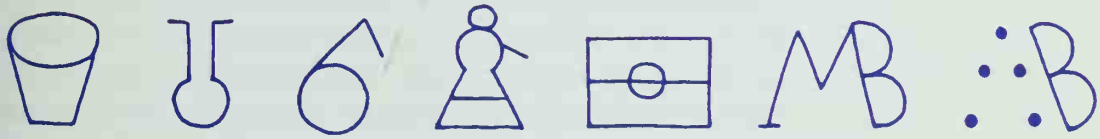
Breaking Pulverizing Mixing Amalgam Cleaning Boiling Combining Annealing



Dissolving Distilling Filtering Heating

Sublimating Precipitation Rotting Fixing Warming Cleaning

Some signs for utensils and containers are also of interest:



Crucible Mace Retort Still Oven Water bath Sand bath

The time spans of particular importance to the chemical processes involved were also given signs:

Hour Day Night Day and night Week Month Year

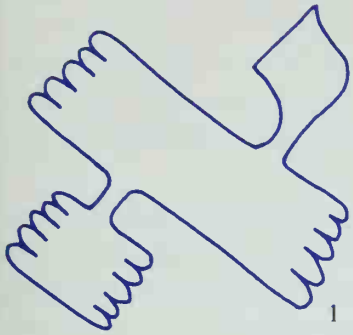
It remains to be emphasized that it is not possible to ascribe a universally unequivocal meaning to the signs of alchemy, since completely different kinds of signs can be found from one country to another because of geographical, linguistic, and individual differences between groups of practitioners. The signs illustrated here form only a small selection of the multitude on record.

Annealing

4. Cabalistic and magical signs, talismans

Although the signs of magic do not really belong to the preceding group of pseudoscientific signs, we conclude this chapter with a few indicative comments about this special category, mainly because it stands in a certain relationship with the pseudoscientific in the great diversity of sign records dating from the Middle Ages.

The term "cabalistic" has now come into general use as an adjective describing magical signs of all kinds, but the true signs of the Cabala relate to a quite specific occult philosophy of Jewish scholars, based upon the ten schemata known as the Sephiroth. Their condensation into signs leads beyond the verbal scriptures of the Torah (Mosaic law) to allow the recording of occult spiritual speculations. This graphic expression consists mainly in the use of letters of the Hebrew alphabet as magical numerical values, assembled into mystical diagrams. Our illustrations show three typical cabbalistic signs: (1) the first letter of the alphabet, aleph, spiritual root of all harmony and starting point for the other schemata of the Sephiroth; (2) a diagram of the world, formed from the initial letters of any given Sephiroth schema by boxing-in; (3) a series of Sephiroth initials grouped into a representation of the tree of life.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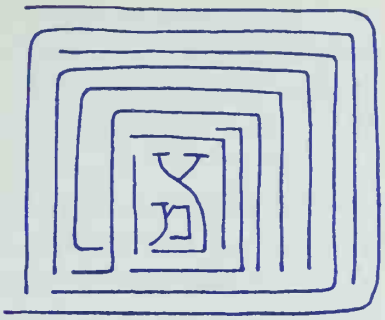
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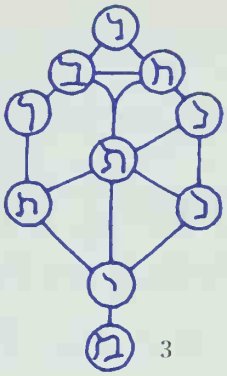
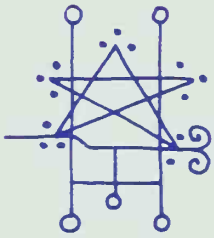

3

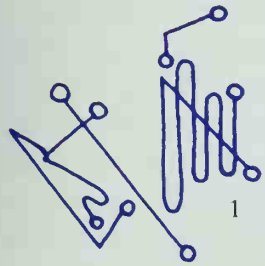
According to legend, the wisdom of the Cabala (a Hebrew word for "tradition") was introduced to the realm of the Jews by Moses himself on the basis of wisdom acquired in Egypt. A scroll discovered near the Dead Sea, bearing texts of a Jewish sect of the 1st century A.D., contains diagramlike signs that are very similar to the signs of medieval magic used some 1400 years later. The example shown here includes a clearly recognizable pentagram, a figure that appears repeatedly in the Middle Ages as a magical sign and amulet.


On a Jewish scroll, first century A.D.

We give here some examples of medieval signs from occult sciences and amulets with magical properties. 1 is from the "Occulta Philosophia" of the humanist scholar Agrippa; 2 is a magical sign from a book entitled "Arbatel de magia reterum"; 3 is a talisman sign believed to endow the wearer with beauty; 4 is from a book of magic entitled "Vincula Salomis" and contains the initials AGLA, much used in talisman signs and standing for the Hebrew words meaning "Almighty art thou, Lord, in eternity."

Pentagram

As a graphic peculiarity, many magical signs of the most varied origin and from widely separated periods of time have all their stroke endings strengthened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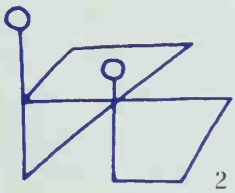
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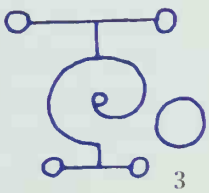
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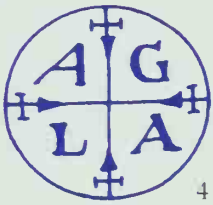

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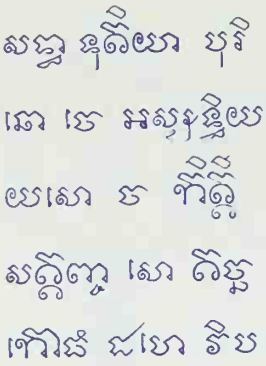
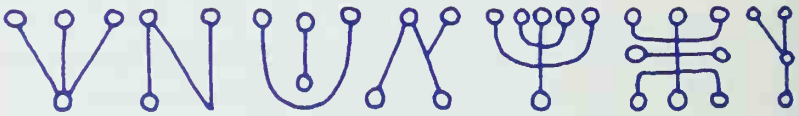


Script currently used in Cambodia

either by dots or by small circles. The same characteristic is present in the secret alphabets of the Cabala. Strangely enough, a comparison is provided by Asiatic scripts from Burma, Thailand, Cambodia, etc., in which the stroke endings are adorned with similar roundings-off.

The presence of the terminal circle has the effect of eliminating not only the stroke endings but also some of the points of crossing and "stroke welding." This produces a graphic impression that separates these figures from all conventional signs as customarily written or drawn, leading to the markedly cryptic and mystical effect of such writings.

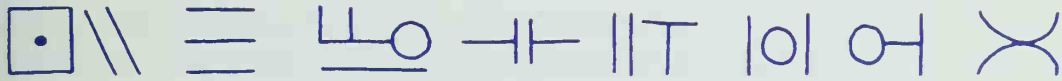


Cabalistic script

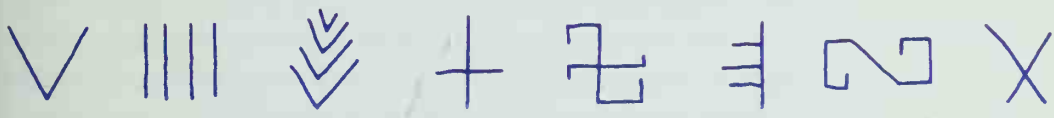
VI. Signature Signs

It is scarcely imaginable today that there were once people who had no names of their own and could not be characterized as distinct individuals. (The only such cases in historical times would be those of groups of people who became "nameless" through forced separation from their origins by enslavement or captivity.)

The giving of names to individuals has its roots in prehistoric times, long before any form of writing had been developed. The visual representation of the individual – not just the drawing of a human figure but the individual expression of a specific person, in other words the signature – must have come into existence at a very early stage, for example, among nomadic tribes for the identification of ownership of cattle and objects of use. Property signs of this kind have been discovered, scratched in cattle horn and pottery, in Stone Age excavations.



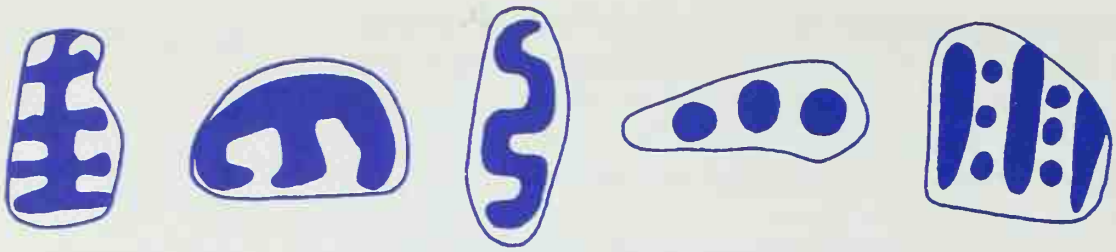
Ancient nomadic cattle-branding marks



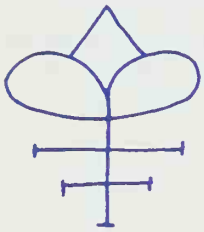
Marks on vessels of the late Stone Age

The much-disputed pebbles from the Mas d'Azil cave in France, dating from the Paleolithic period, around 12,000 B.C., are certainly not forerunners of our script signs, as is often assumed, but are much more likely to have been objects denoting a person or tribe.

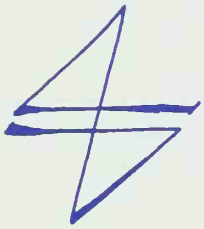
Development of the written fixing of language did not in any way drive out the use of individual signature



Painted pebbles from Mas d'Azil, middle Stone Age



Michelangelo



Peter Vischer

signs, house marks, etc., and has not done so even in modern times despite the widespread use of scripts. There are various reasons for this survival. The ability to read and write is still far from universal, and it is not long since it was common for unlettered people to sign documents with a cross, especially in underdeveloped countries.

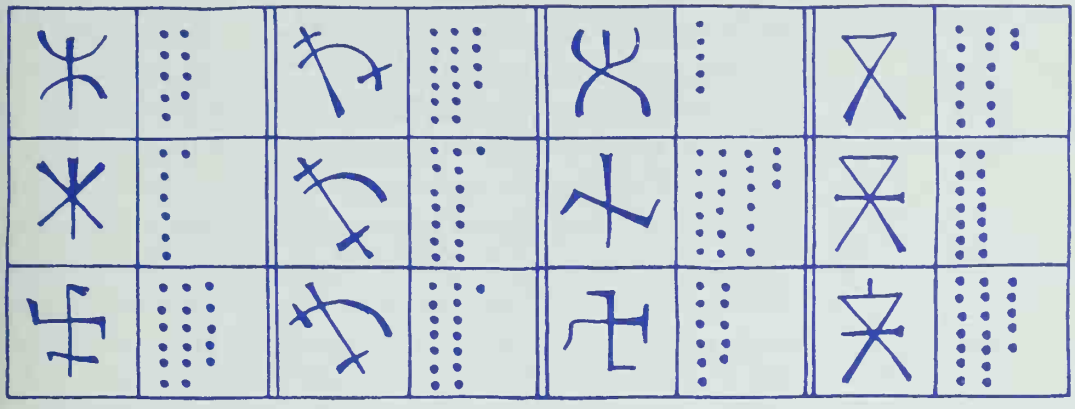
At the same time, even in educated circles, the signature sign still possesses the mysterious power of attraction of something hidden and it can also have a decorative effect. (On this page we show two typical examples of artists' signs from old masters.)

There is the further consideration that signature signs conform to a spatial style in that almost all of them are reduced to the simple dimensions of approximately equal height and width, unlike the long-drawn-out style of the fully written name.

A characteristic example, and one that speaks for itself, is provided by our illustration of a marking board, dating from the 17th century, which was used on a farm in Finland to record the correct payment of day laborers. Workers carved their personal signature signs in the board, and at the end of the working day or week a nail hole was made next to the sign. A similarity between some of the signs is to be noted, probably indicating relatives of some kind, or possibly workers of the same craft or trade. The origin of these forms of sign is hard to explain. There is an obvious influence from the ancient runic signs (see Part 2, Chapter III), and of course one cannot rule out resemblances to objects like the sun, a sawhorse, and so on.

The drive toward personal identification by means of visible signing may be regarded as a basic point of departure for the history of the sign in its widest sense

and must be dated back to the time of humankind's earliest mental awakening.



List of workers with entries for day labor. Finnish farm, 17th century

1. Stonemasons' signs

Signs used as a manufacturer's signature, an owner's mark, or confirmation of responsibility for a decision are to be found in large numbers on all kinds of objects surviving from the past. Manufacturers' or makers' signatures, which can be regarded as the earliest forms of trademarks (see Chapter VIII,) are of primary interest to us in the present context.

Stonemasons' signs are the ones that have survived in the greatest quantities, for the simple reason that a sign carved in stone is able to last through the centuries undamaged. These signs also provide a wealth of research and attribution material for historians of art, technology, ethnology, sociology, and other branches.

The architect responsible for the upkeep of the cathedral of Strasbourg, Dr. J. Knauth, has assembled an inventory of all the stonemasons' signs used in the building, amounting to the astonishing total of more than 1500 different signs. We have taken the liberty of showing a small selection taken from this outstanding study. The first glance at the table will make it clear to the reader that the development of sign forms during a building period extending over five centuries (1200-1700) involved some striking changes of style.

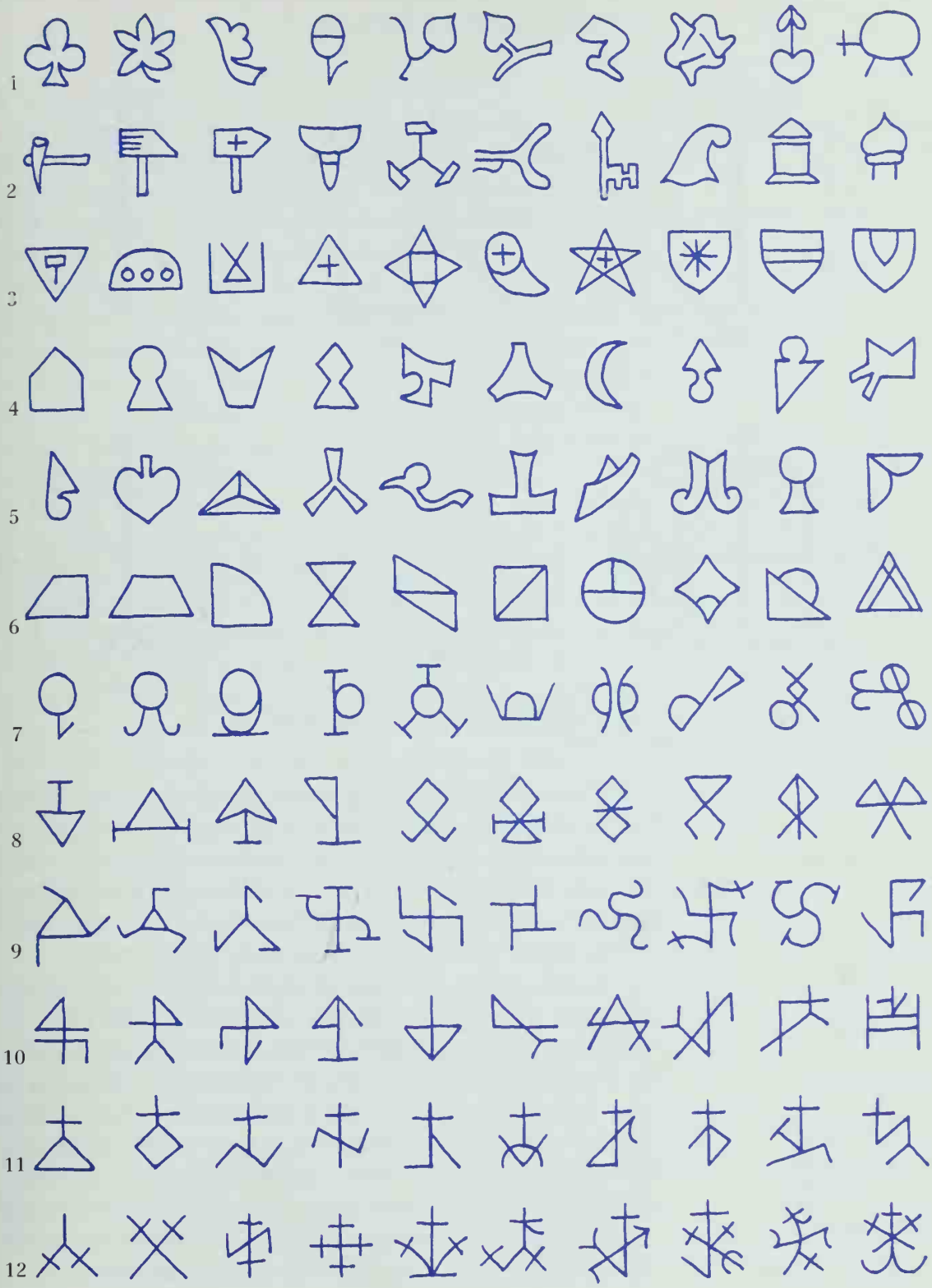
The origin and development of stonemasons' signs are closely associated with the social circumstances of the Middle Ages. In the early times of the Romanesque style, the masons were mainly ecclesiastical or lay members of religious orders, whose activities were repaid with the "heavenly reward" of food and shelter. Signs from this period are rare, but with the beginning of the Crusades, payment in money, the growing means of exchange, developed very rapidly. Payment in produce corresponding to a day's wages was customary for piecework. Stonemasons freed themselves from direct social dependence on the master builder and, as a sign of receipt of the correct payment, signed the cut stones. The first of these signs are very individual, figurative representations of objects from the immediate surroundings (rows 1 and 2). With time, the ever more frequently occurring signs take on abstract forms, but with an enclosed outline that still retains an objectlike appearance (rows 3 to 5), with the exception of the purely geometrical signs (row 6), which were by no means alien to the stonemasons since they had the shapes of their stones.

During the period of great expansion of the medieval building industry, the manual workers acquired more and more solidarity, forming associations that were true fellowships with principal locations, among which the cities of Strasbourg, Cologne, Vienna, and Berne were some of the most important. Membership of an association was made apparent by workers' signatures in a deliberate effort to give clear evidence of their origin, which can be explained by the employment of these "journeymen" in many different countries.

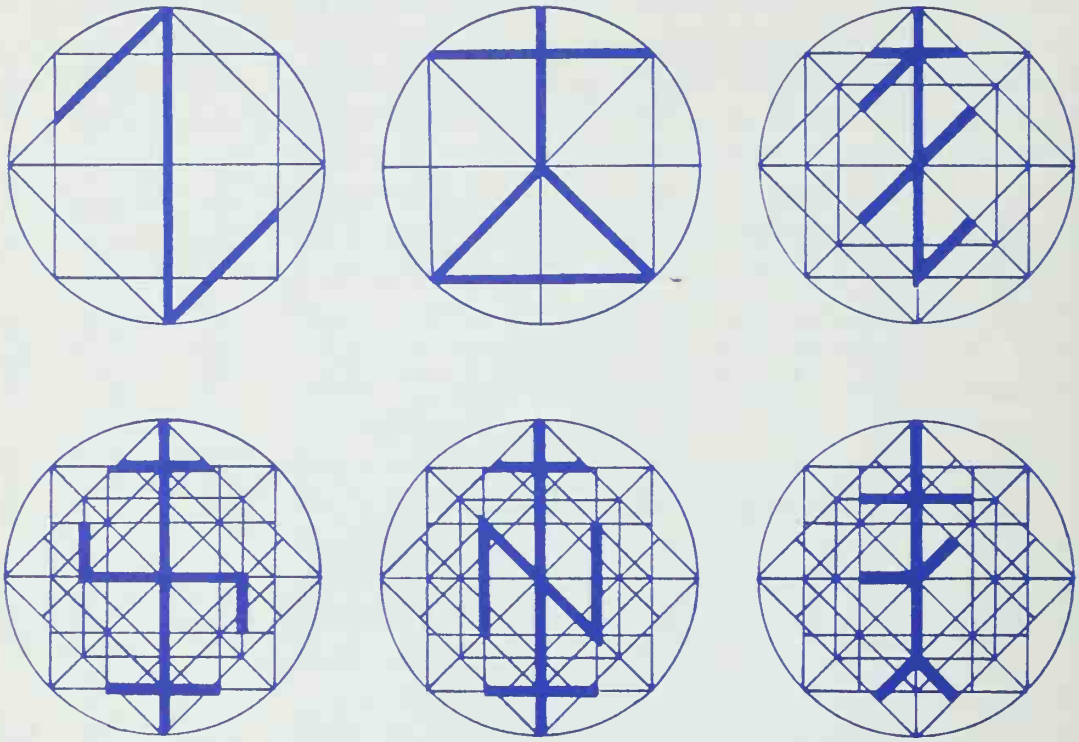
Marks of eight stonemasons from the same fellowship

Franz Rziha has put forward a theory that each association of masons had a basic schema rather in the nature of an individual geometric grid, passed on to an

Stonemasons' signs from Strasbourg Cathedral



journeymen on completion of their apprenticeship so that they could design their own personal signs in conformity with the fellowship.



Basic grids of fellowships of masons and formation of signs for individual journeymen (Rziha's theory)

This analysis seems very plausible from the viewpoint of modern logical thinking, and it can certainly be taken that such schemata were developed and used in post-Renaissance times, but Rziha's theory goes too far in assuming that the earlier signs were also constructed on the basis of a standard grid pattern.

Returning to our table of signs, it has to be pointed out that the sequence does not follow a strict chronological development. Nevertheless it can be quite clearly seen that in the later rows, 7 to 12, the formation of the signs increasingly departs from the figure with closed outline. Almost all the signs dating from the seventeenth century are of "open" design and completely nonfigurative, with more and more line crossings and an ever-increasing number of stroke endings (see the section "Sign Topology" in Part 1, Chapter I).

VII. Signs of Community

1. House marks

During the course of the Middle Ages, roughly in parallel with the introduction of stonemasons' signs, the same need for a kind of graphic personification developed mainly among farming families and prominent citizens of towns, leading to the design of individual signs that were applied to house walls, items of equipment, and also to gravestones and later to important documents. These family signs were developed over the centuries in association with matters of inheritance and later reappeared in heraldry, on coats of arms, shields, banners, etc.

Most farmers and tradespersons of the Middle Ages were, like the stonemasons, unlettered. The thematic bases of sign invention therefore lay at that time in the more or less stylized representation of objects of use (see rows 1 and 2 of the following table). The cross shape took a prominent part in the more abstract signs (row 3), as was also the case with the stonemasons. At a very early stage, tradespersons chose the Hermes/Mercury sign, which closely resembles the figure 4, as a basic allegorical form (row 4).

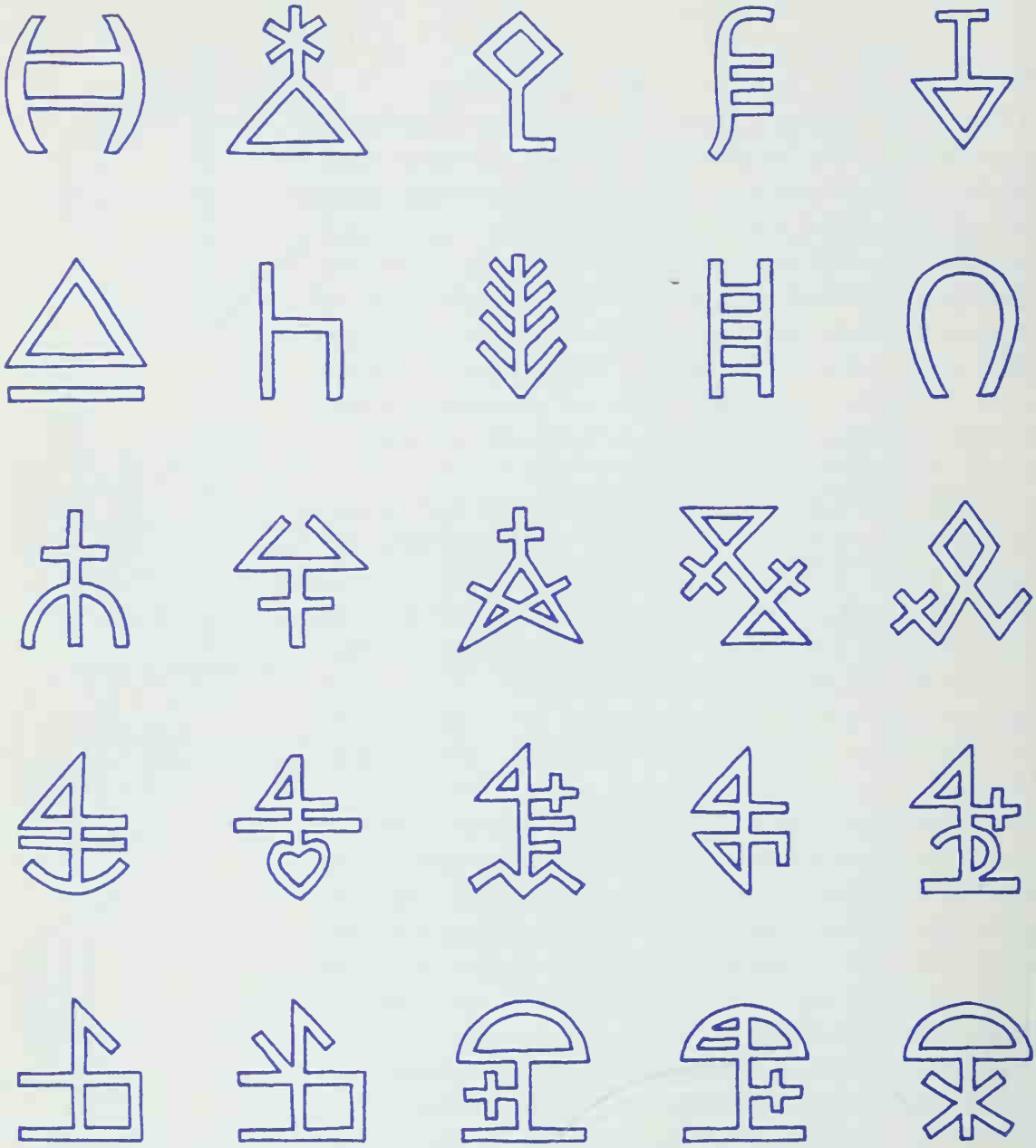
Within the family, individuals endeavored to express their own personality by adding some element to the basic form of the family sign (rows 4 and 5). This led to the development of groups of signs showing minor variations but still confirming membership of the group or family (row 5).

The Western world was not alone, however, in introducing personal marks and house marks.

Similar developments have come to pass in all cultures. As examples from the Far East one may mention Chinese seals, generally consisting of combinations of pictorial images and ideograms and often made into sealing stamps, but due place must be allowed above all to Japanese family arms as fascinating examples of applied art.

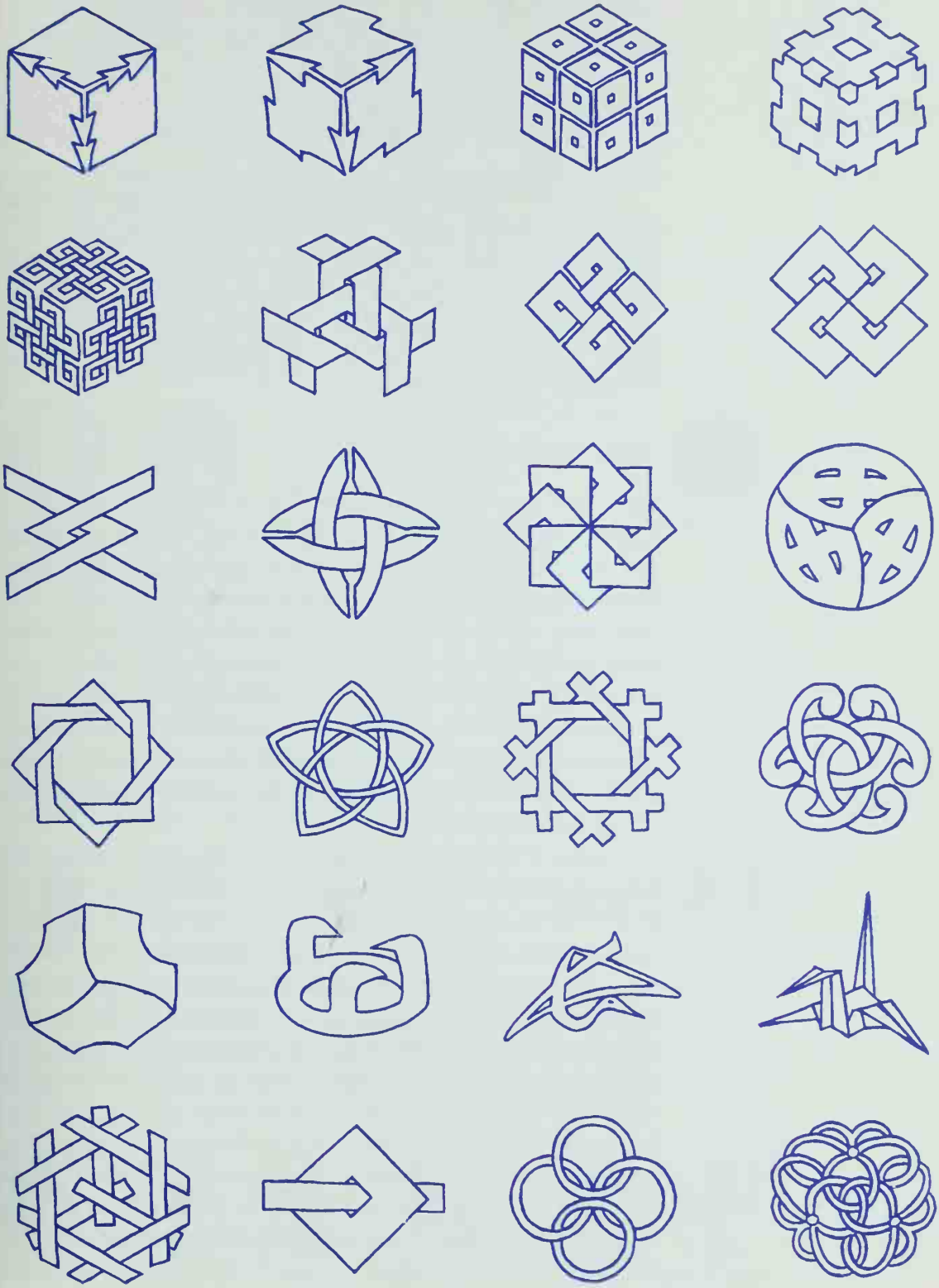
Chinese family signs

Western medieval house marks



Comments on these signs are given in the preceding text.

Japanese family arms



2. Japanese family arms

The entire spectrum of traditional Japanese culture provides an impression of pure and balanced beauty. The architecture of interiors and the design of all artifacts, clothing, and so on, have been influenced by a strongly spiritual and almost meditative communion with nature.

This concept of balance is particularly impressive in Japanese family signs. These armorial bearings were often embroidered to make wall hangings, which were the sole form of mural ornament. The first of these "mon," as they are called in Japanese, originated in the 9th century A.D. and they are still used today on clothing designed for ceremonial purpose.

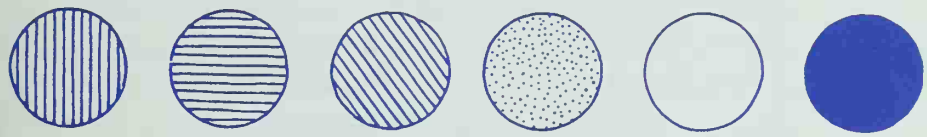
3. On heraldry

Heraldry has today become a branch of the study of history. In addition to the verbal mottos that have been handed down to us, the arms on coats of mail, banners, shields and documents provide revealing information, over and above any written records, concerning historical connections and the reasons for events. There are large numbers of scholarly works on this subject, dealing with every period and line of importance in cultural history. For the present purpose, there is only enough space to give this subject a general mention and sketch in a few basic principles.

The word "heraldry" derives from the herald (Old French *herault*), the messenger or proclaimer who in medieval times often exercised the function of a diplomat. Merely by their appearance, their costumes bore witness to their membership of a group or sovereign power, so that they would be unmistakably recognizable from the enemy camp. With the coming of the Crusades, all Crusaders soon acquired distinctive costumes as an outward and visible sign of their affiliations, since this expression of brotherhood "under *one* banner" became a psychological necessity when they left their native lands for regions of different language and customs, bestowing on them the courage to fight and the will to endure.

Whereas at first the entire appearance of the herald or knight was taken into account in heraldic design, which covered such items as the tunic and saddle cloth, this identification became limited in the course of time to individual items of equipment, such as the ornamentation of the helmet. Finally it was mainly the shield, as the largest flat surface of the knight in armor, that came to function as the bearer of the colors of kinship and the graphics of group membership.

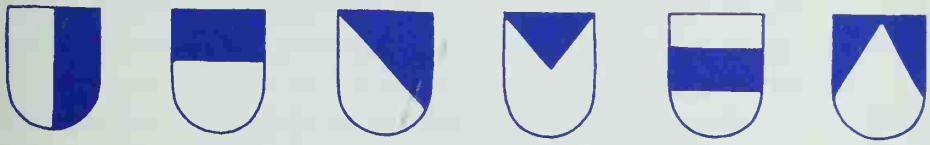
It is easy to understand that *color* was used as the first and most important sign of identification, even though the number of clearly distinguishable hues is limited to the small number of primary colors. (*Translator's note:* Since English heraldry still uses Old French



Gules (red) Azure (blue) Vert (green) Or (gold) Argent (silver) Sable (black)

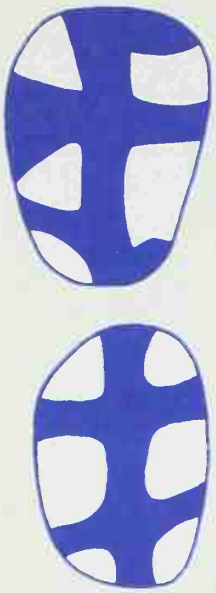
terms for colors and other aspects of the shield, these are used in the present context with explanations in modern English where necessary.)

The second means of identification consisted in the use of combinations of colors, such as red and blue, red and yellow, extending the number of distinguishable groups through several variations. The basic rule applied was that color always had to stand on metal (i.e., gold, silver), or metal on color, in order to achieve the



necessary long-distance visual effect. Another essential sign factor added to this multicolor effect was the direction of partition, i.e., the positioning of the color fields in relation to one another: horizontal, vertical, oblique, etc.

Chevron Fork Cross Saltire Double pale Maltese cross

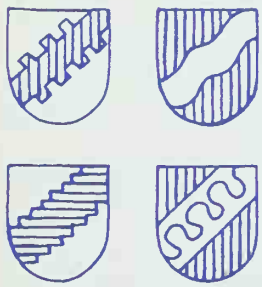


Stone Age precursors of coats of arms?

In time, this simple division of the field was refined in that the secondary color area was no longer merely a filling-in of space but took on a shape which gave it a signlike expression of its own.

At this point we would like to insert an observation that lies far outside the field of heraldry but applies in the broadest sense to the foregoing considerations of the subject of graphic expression: namely a comparison of early heraldry with the painted pebbles from the Stone Age cave of Mas d'Azil, where the surface of a given form, whether shield or pebble, is divided up in the same way by means of a two-dimensional sign running from one side of the object to another. In both cases the object and the drawing are fully united, thereby greatly reinforcing the effect obtained. The Stone Age pebbles are, as already mentioned, most probably markers for the identification of ownership. As a present-day example one could point to a Red Cross truck in wartime, where the signal sign is not applied merely in the form of a mark or vignette but is extended from edge to edge over the entire vehicle (cf. Part 1, Chapters I.4a and III.3).

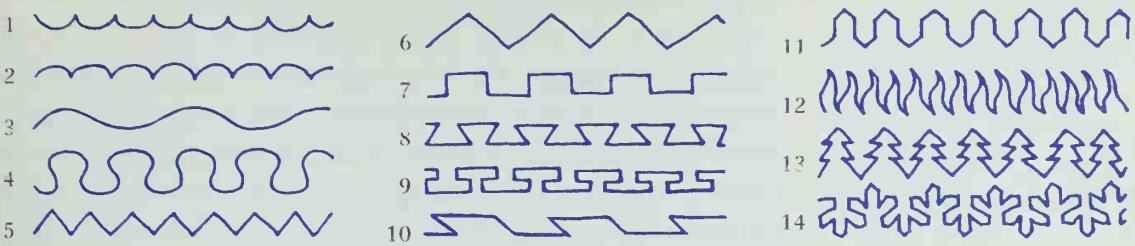
Another means of clear differentiation consisted in the structural division of the surface through the interpenetration of color areas in a more detailed pattern resembling a grid.



Ornamented lines of partition

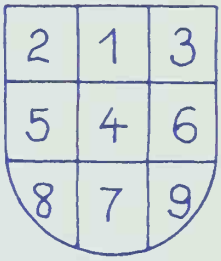
The division of the shield surface into "points" or "quarterings" enabled the various color areas to be juxtaposed with a straight-line boundary. The constant demand for enrichment and differentiation led to the extension of these "lines of partition" into a variety of rhythmically curved and bent variations, a few of which we illustrate.

The rules and regulations concerning the design of arms became stricter as time went on, so that the division of the shield surface, for example, became subject to precise conventions governing sign forma-



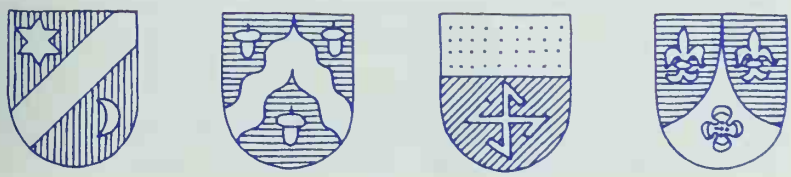
1 Engrailed
2 Invected
3 Wavy
4 Nebuly
5 Indented
6 Dancetty
7 Embattled
8 Dovetailed
9 Potenty
10 Raguly
11 Urdy
12 Rayonné
13 Fir tree
14 Fir twig

tion, division of the area, and structure of the design as a whole. On the field of the shield there were prescribed areas where the bearer's affiliations, rank, and origins could be clearly shown. Areas 1 to 3 in our diagram are known as "chief" and 7 to 9 as "base." The main emblem was naturally situated in the central area 4, while area 1 had the dominant position. Secondary characteristics such as relationships and alliances were indicated on the right and left (dexter and sinister) sides, as seen from the holder's point of view.



These comments cover only those aspects of heraldry that could be described as basic or background information.The specific personal sign or sign of feudal allegiance was incorporated in the basic structure of the arms and was known as the "charge." The personal attributes symbolized in these are many and varied, reaching far beyond the scope of those mentioned in the preceding section on house signs. In most cases they do not belong to the category of signs with which we are concerned and are often purely figurative representations such as those of beasts expressing the idea of power: lion, eagle, bear, and so on.

Countless images from nature and from the domestic and working environment have been incorporated into coats of arms, whereas the human figure is relatively seldom to be found used for this purpose.

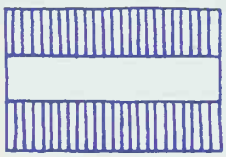


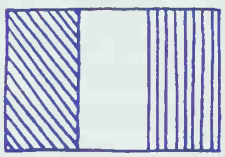
4. Community signs of the present day

Political, religious, and also ethnic movements are supported by the assumption that in modern times, and especially in the future, humankind will lose the urge toward kinship and grouping and will strive for an all-embracing community of "citizens of the world" as a future ideal, under the impetus of ever-widening means of communication. The UN is the representative example of this effort, and in this connection heraldry is also commonly regarded as a sign lore of the past.

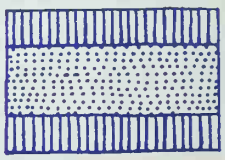
On the other hand, the powerlessness of the UN is obvious and the divisions between groups of people all over the world seem to be deeper than ever. The colors of the national flags that fly before the UN building will not be mixed together to make a global banner. Every country will defend its individuality as expressed in its representative colors.

National flags therefore form the substance of modern heraldry. In many cases the appearance of these arms has been simplified to the utmost, so that the entire design is formed simply by dividing the flag into areas of different colors. It is significant, however, that the recognition of a nation simply by the combination of its colors is difficult for the uninitiated.

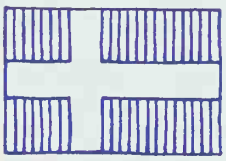

Austria

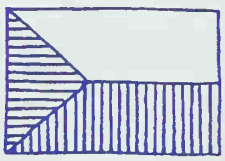

Italy

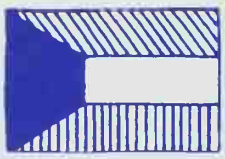
Poland

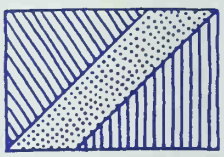

Spain

Some aids to memory in this respect are provided by area boundaries that not only divide the flag into fields but produce within its rectangle a new, if simple, self-evident shape, such as a cross, triangle, or oblique stroke.


Denmark

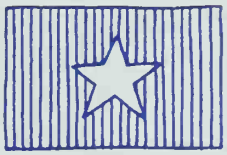

Czechoslovakia

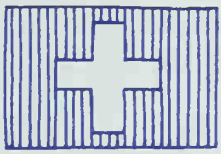

Kuwait

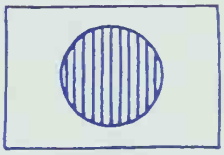

Congo

In addition to these simple divisions of area, many national flags have retained "charges" that make arms far easier to recognize. Two categories of sign formation can be distinguished in this connection, the first being characterized by abstract and partly symbolic images such as the circle or the cross, among which the star is by far the most commonly used, either signifying the federation of a number of states – as in the flag of the USA, where the 50 federated states are symbolized by an equal number of stars – or forming a part of the symbol of Islam, composed of crescent moon and a star. During the 20th century, socialist states have also adopted the star as an identifying mark.

Turkey

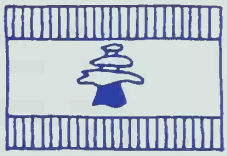

North Vietnam


Switzerland


Japan

The second category of national flag image is characterized by realistic representation, offering the strongest aid to visual memory.

Canada


Lebanon

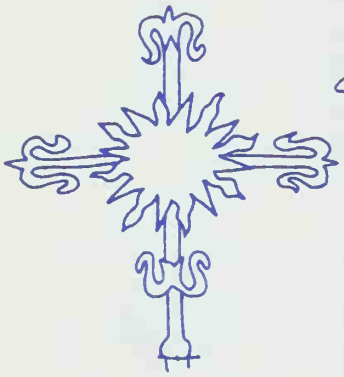
Uruguay

Cyprus

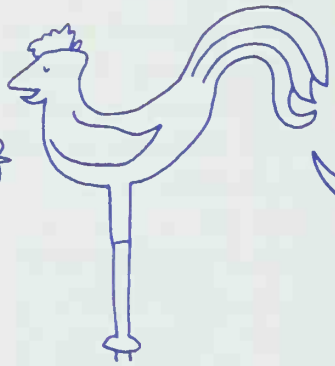
The variety of national colors and images are parts of a total world image, and it would be absurd not to recognize and support this diversity as an aspect of the human heritage. The division of peoples into groups holding common opinions does not necessarily follow national frontiers but rather the traditions of political, religious, and ethnic forces. To consider these worldwide problems of the present day would not come within the scope of our graphic subject matter, so it will suffice to show just a few of the most striking supranational signs of community, which may be regarded

in a certain sense as modern heraldry although they are, in fact, essentially symbol signs.

The towers, spires, and domes of present-day places of worship are identified by unmistakable religious symbols, visible from far off.

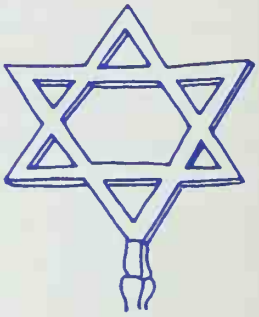


Catholicism



Protestantism

Islam

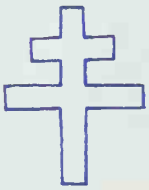


Zionism

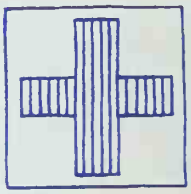
We conclude our chapter on heraldry and comments on the signs of national and supranational community with a few more examples of political and ethnological signs of identification.

Nuclear disarmament

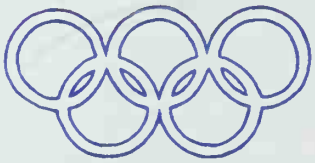
Communism



Cross of Lorraine
(Gaullism)



Red Cross



Olympic Games

VIII. Trademarks

1. Marking in the past

To call a sign a "mark" gives some indication of its meaning since such marks are signatures on goods of all kinds destined for the "market." They could therefore also be called ware signs or trade signs.

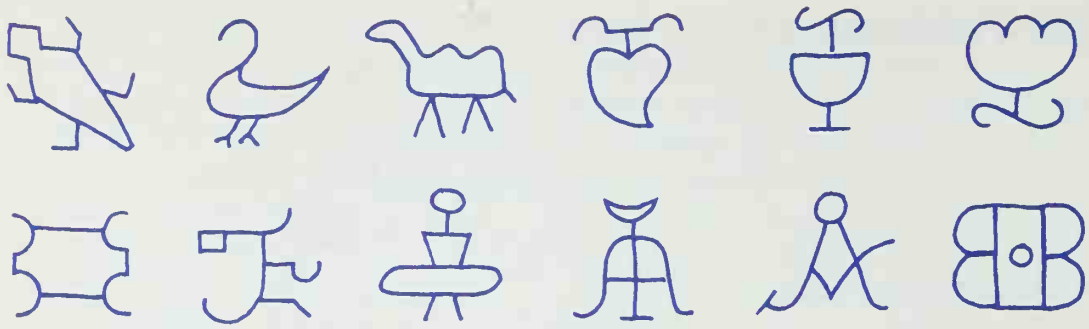
The origins of marking, however, belong to the category of ownership designation, which was covered in detail in the introduction to Chapter VI, "Signature Signs."

a From marking to the mark: cattle branding as example

As an example to provide a better understanding of the mark sign, we begin this chapter with an account of the brand marks used by stockbreeders.

Designation of ownership on tools, household goods, etc., was an expression of an individual will to mark property that was not entirely due to motives of security, since most equipment, furniture, and so on, remained under the owner's roof. Domestic animals, especially cattle, on the other hand, had no permanent geographical location within the boundaries of a property. Sheep, goats, and cattle were at all times assembled in herds, to be driven from pasture to pasture in search of feeding. For this reason, ownership marking of herds was an absolute necessity. The only possible way of marking the animal for life was to burn a sign into the horn and the skin or hide, making a brand mark. This method of distinguishing ownership is still practiced all over the world.

The significance of the original mark of ownership changes at the time when the animal is taken to market for sale, since it then becomes a sign of quality.



Cattle branding marks from North America, 16th-18th century

The sign of a good stockbreeder is known to the dealers and is sought after, becoming a market sign, and the animal fetches a correspondingly higher price as a "branded product."

b Traders' marks

The first trademarks for many products came into existence in the same way. The import or export trader would mark sacks, cases, and bundles of spices, groceries, fruit, and so on, in order to guard against possible mistakes during transport. On arrival at the marketplace, these package signs became marks for the identification of the goods inside the pack, their origin, and, through the evidence of experience, signs of quality. The simple mark of ownership had become the trademark.

A whole volume would not suffice for even a partial record of trademarks. In this connection it should be noted that, during the past three centuries, these attestations of quality or marks of assurance have taken on either a pictorial or a purely verbal expression, becoming illustrations and descriptions rather than signs. Of special interest are the earliest traders' signs from

Traders' signs of the 14th century

the 14th and 15th centuries, in which the purely sign-like, i.e., a dependence on symbols and abstractions, is an essential element of the design. In the examples shown, indications of the signs of the compass, the scales, the cross, the ship, the flag, etc., are clearly recognizable.

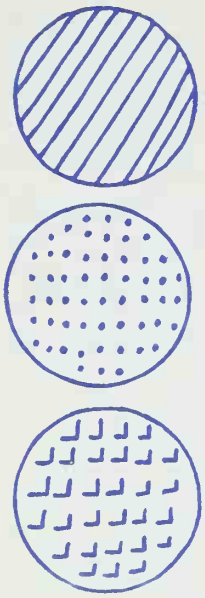
Figurative and verbal trademark of the 18th century

c Craftsmen's and manufacturers' marks

From Paleolithic times, humankind has lived with objects that are not found in the natural world but have been invented and developed by the human mind and manufactured by the human hand.

Specialization probably came to pass at a very early stage in the progress of handicrafts, so that individuals did not work in all fields but limited their activities to the production of specific kinds of artifacts. It can be assumed, for example, that the maker of weapons did not also work as a potter and that "vocations" to specific crafts were established, with the natural consequence of a general improvement in the quality of the products.

Professional pride was born, and it was in the interests of the maker to "sign" work by stamping in a mark as confirmation of the origin of the finished product.



Pottery grid marks

We have already shown some early craftsmen's marks on pottery found in Egypt and Mesopotamia, in the introduction to Chapter VI. With the growth of civilization, the differentiation of specialized activities became more and more diverse. It can be assumed that in the times of slavery in the ancient world it was only the masters who had the right to sign the objects produced by their underlings. The signature of the individual craftsman does not appear until the Middle Ages.

One of the types of craft signature already described is that of the stonemasons' sign (see Chapter VI). Subsequent signs of the artisan have come down to us from every century and from a great variety of occupations, ranging from gunsmith to printer, from painter to porcelain maker, from goldsmith to architect, and from weaver to papermaker. From this wealth of signs we have assembled a table showing some typical examples from the principal trades.

d Structural signs
Watermarks

Handicraft signs can be divided into two completely different types: on the one hand those that were engraved, printed, or drawn on the finished article as a signature, and on the other hand structural signs, which were incorporated in the working tool, the use of which gave the object itself a structural feature. The oldest known example of the latter method is provided by the various grid marks on the bottoms of pots from the Mediterranean region. The roughening of the working base, which stamped a typifying pattern into the base of the vessel, varied in style from one potter to another. Similar kinds of marking were used by bakers on loaves of bread, and some metal objects

1, 2, 3: Ancient ornamental bakery marks from the Near East, pressed into the dough before baking. Circa 1500 B.C. 4: Potter's mark on an ancient Roman oil lamp. 5: Ceramic marking sign, Doccia, Italy. 6: Delftware mark, in which the influence of the East Asiatic style is clearly discernible. 7: Meissen mark, to which the same comment applies. 8: Porcelain mark from Lyon. 9: One of numerous marks of the royal porcelain manufactory of Sèvres. 10: Mark of a medieval swordsmith of Solingen, stamped into the blade. 11: Peter Henkel, swordsmith of Solingen. 12: Signature stamp of a German pewterer. 13: An Austrian gunsmith. 14: Early printer's colophon, Fust & Schöffer, Mainz. 15: Isabelle Quatrepomme, copper engravings. 16, 17: Signature signs of two goldsmiths. 18: A wood carver's sign. 19: An antique dealer. 20, 21: French tapestry weavers, Gobelins. 22: A medieval Dutch copper engraver. 23: Michelangelo Buonarotti. 24: Frans Hals. 25: Albrecht Dürer. 26: Sign of a Swiss weavers' guild.

Craftsmen's marks from many centuries

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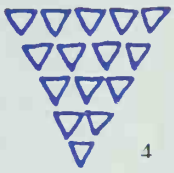
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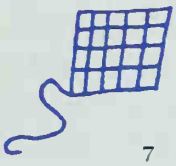
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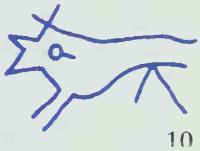
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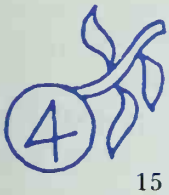

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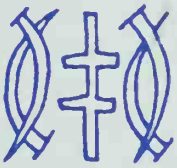
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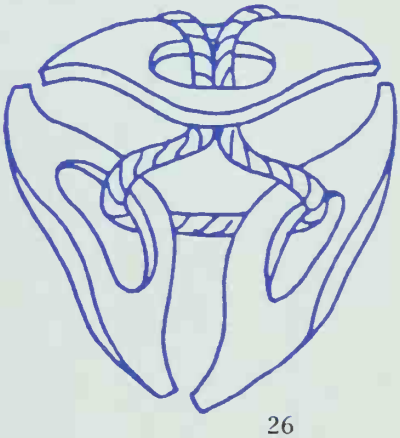
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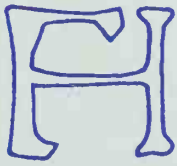
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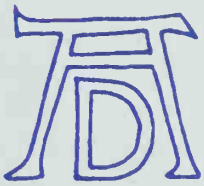


25

from the Bronze Age bear patterns that were produced by the engraving of signs in hammer or anvil.

Watermarks can also be included in this category. A sign was incorporated in the papermaker's wire by means of a raised pattern, with the result that the thickness of the paper was reduced in that area and the watermark was visible when the paper was held up to the light. The technique of sign formation in wire made a strong stylization of the image necessary for the papermaker, and it was this process of simplification that produced the special beauty of this rather naive style of sign. A notable characteristic is the complete absence of stroke endings, which is typical of figurative signs (see Part 1, Chapter I.4). The watermarks shown in our table are from the 15th and 16th centuries and were produced for the chancelleries of the nobility. Almost all of them are figurative signs. The raised hand, as shown in the bottom row, was a much-used motif for watermarks in the paper used by lords, with the intention of expressing their superiority. The raised hand is also the sign of oath taking, i.e., of truth.

2. Industrial signs of the present day

Nowadays, everyone is included in the modern economy as a consumer. Our lives are filled with consumer goods, without which life itself has become unthinkable. Commodities have become basic needs. One might say that the day really begins with the first glance at the familiar trademark printed on the packet of tea or coffee, and all our daily paths are lined with such marks, from this early morning sign to the last sight of the quality sign on the alarm clock before turning off the light.

Supply and demand bring consumer goods into our field of vision in such quantities that it is now necessary to mark them with condensed or abbreviated signs if they are to have a chance of being noticed and recognized and of finding and keeping a permanent place in the consumer's memory.

The invention and design of such eye-catchers, involving the decision about the appropriate sector of memory to be aimed at and the working out of the

Watermarks of the 15th and 16th centuries from Central Europe

strongest pictorial impression and most attractive graphic effect, have become two of the most important activities of members of a new profession: that of graphic designer.

The present work is largely dedicated to graphic designers, since it is from the symbols of the past that they can learn about the relationship between humans and their signs, in order to gain the necessary knowledge and make the right decisions on the basis of long-proven designs.

In an economy characterized by constantly increasing competition, visual anonymity has become a fatal drawback. The buyer no longer trusts the anonymous product or the unpersonified service. In order to win and retain a place in today's market, the creation of an "image" has become practically indispensable.

It cannot be the intention of the present work to give even an approximate survey of all the marks of industrial identity circulating throughout the world today. A large number of fully illustrated works of reference are already available on this theme (see Bibliography).

A deliberately condensed presentation of a selection of typical logotypes of the present day is given in the tables on the following pages. The selection and sequence of these signs have been worked out on the basis of an analysis of the derivation of the motifs, which means that they have not been chosen purely for their quality.

The first three rows of the first table show logos having a pictorial content based on purely figurative representations. What makes these signs into trademarks is their degree of stylization, consciously designed by the artist for its graphic effect. In each particular example, the degree of recognizability of the animal (ibex, hedgehog, dragon, etc.) is somewhat different, although there can be no doubt about the identity of each one.

In contrast, the signs in the lower three rows have already reached the verge of abstraction, even though images of objects are still in evidence (eye, rail signal, paperclip, TV aerial, electrical socket, etc.). At the same

Some modern logotypes based on concrete and abstract figures

time, the signs tend to have the appearance of diagrams such as graphs, or schematic representations of railway tracks, paper reeling, etc.

The second table and the top parts of the third show a selection of signs in which the resemblance to letterforms is a prominent feature. In the search for an identifying image, the use of the initials of the company or product is in many cases an aid to finding a precise graphic expression. The possibilities of sign creation for associations, organizations, and services whose activities are of a purely abstract nature are much reduced by the absence of any concrete image. This category of trademarks might well have been included in the chapter on monograms, but for purely historical and aesthetic reasons it falls into the sector of modern identity signs in the present collection.

The design of monograms follows a variety of styles of graphic expression. The letters may be in positive or negative form, outlined or solid. A typical manner of sign creation is the production of a continuous stroke, as in handwriting (table 3, rows 3 and 4). In the three middle rows, the recognizability of the letters is already somewhat veiled by a much more strongly marked style of graphic geometry.

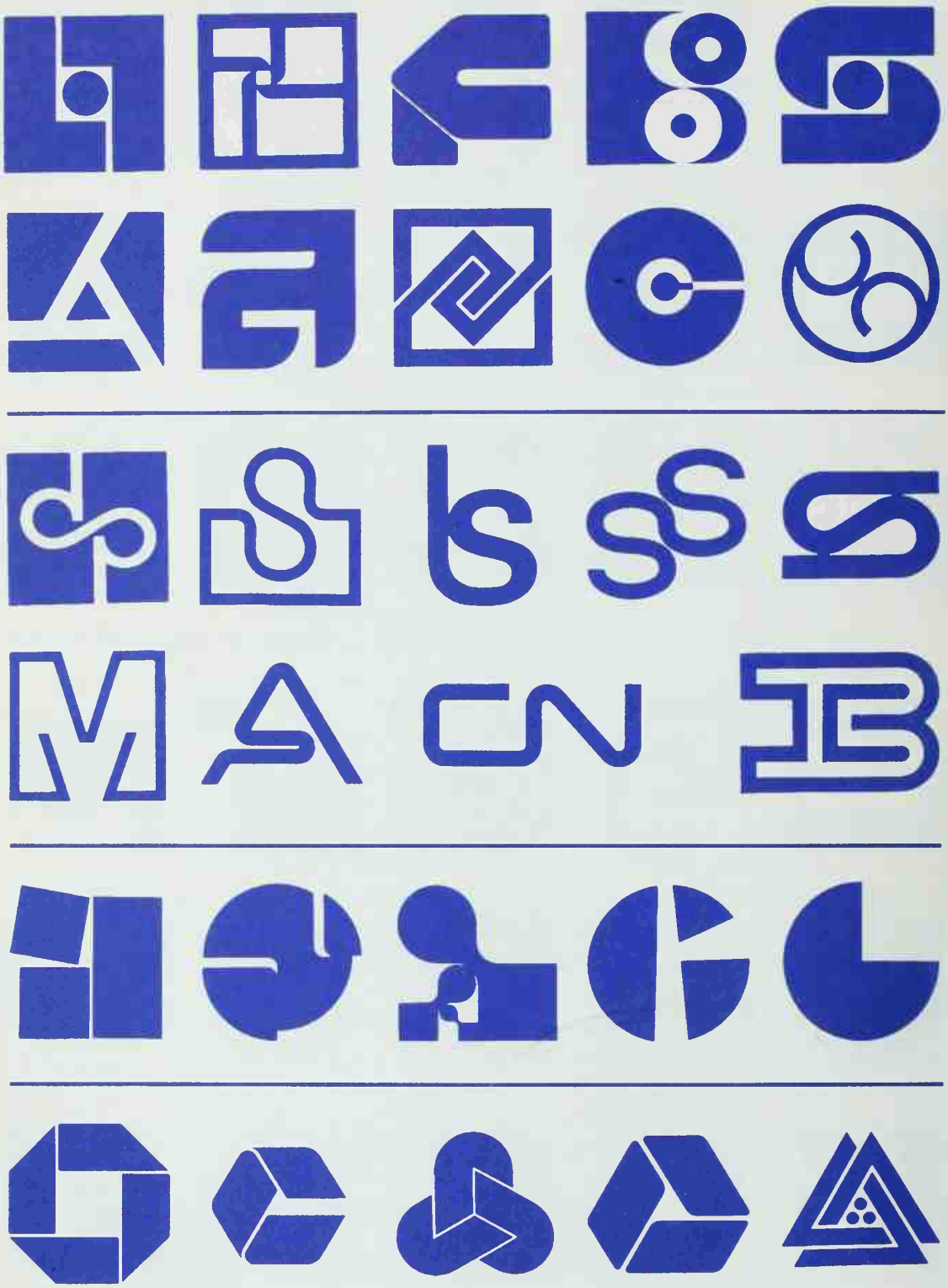
The two last rows of Table 3 and all of Table 4 are almost entirely composed of abstract images. These occur in the same sequence as was given in Part 1 (Chapters VI and VII) in an analysis of the different forms of expression used in signs.

The "handwritten" style of sign mentioned previously and formed of drawn lines (cf. Part 1, Chapter I.4d) is followed, in the fifth row of Table 3, by a series of logos consisting of cutout solids, tending to give a purely two-dimensional effect (cf. Part 1, Chapter VI). By contrast, the bottom row of the table contains signs intended to simulate three dimensions (cf. Part 1, Chapter VII). This category also includes the signs shown in the bottom row of Table 4, in which graphic tricks such as false perspectives and unaccustomed illusions of volume are used in an attempt to grab the viewer's attention.

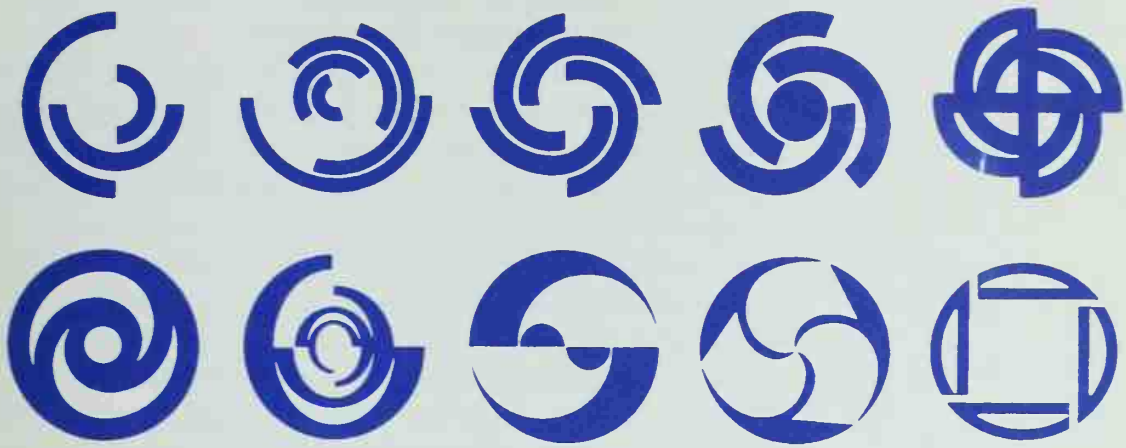
The top part of Table 4 contains a number of circular logos simulating rotary or spiral movement. For the designation of movement in the sense of extension,

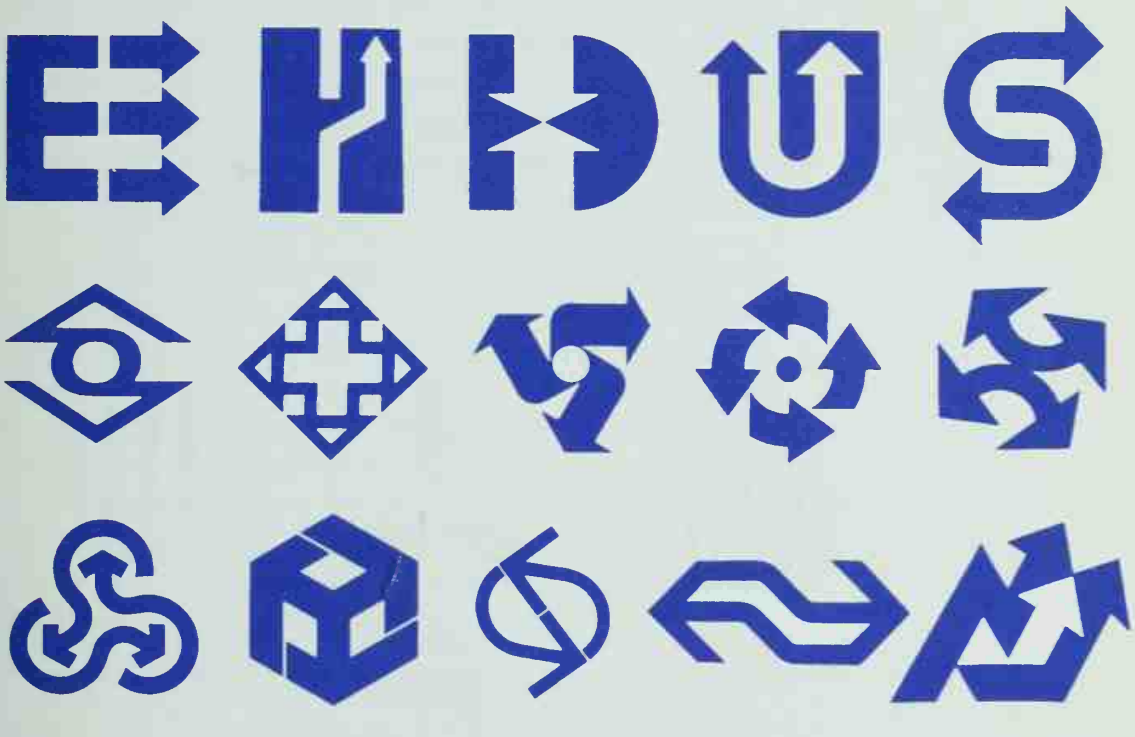
Letters are also welcome elements on which to base logotypes

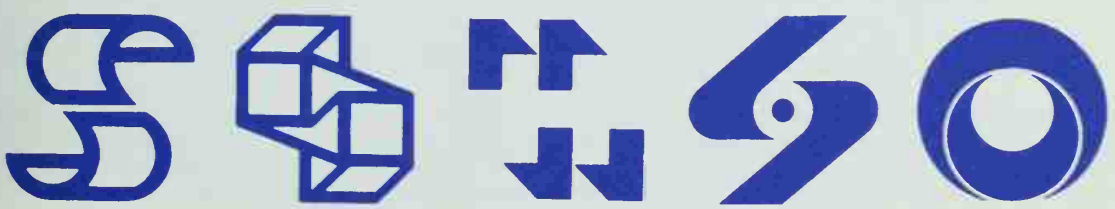
Logotype formation with contrasting areas, simulated volume, etc.



Pure abstraction can lead to unwanted similarities in logotypes





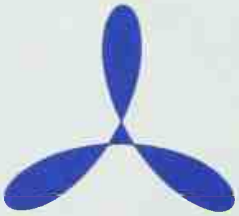


meeting, or running around, toward and through, the arrow has become the absolutely unequivocal and generally understood sign element, finding an almost excessive use in modern logo design.

Viewing this selection of graphic identity images dispassionately, we have to admit that the overall impression is of a certain monotony in the character of the signs used, a certain poverty of really new, far-reaching images. In the postwar period, graphic design schools have perhaps all too often been concerned only with a pure contrast of black and white, with the facile visual shock of a startling play of black and white forms obtained by crude contrast or ingenious association.

It is possible that we are now standing on the threshold of a new generation of logotypes. The signs that came into use with the economic upswing of the sixties and seventies, with their often rather too hard and crude contrasts, seem to have reached the end of their vogue. More and more signs of a finer, further-reaching and more original character are now beginning to appear, giving rise to hopes of good prospects in the sign creation of the future.

Woolmark
Francesco Saroglia



Admiral Corp., USA,
Morton Gordsholl

Polish Tailors Cooperative
Karol Sliwka

The examples shown in the four preceding tables are only a very small selection from a multitude of existing company logotypes. We have taken the liberty of reproducing them without reference to the designers and owners but gratefully acknowledge the main sources of the collection: *Journal of the American Institute of Graphic Arts, No 5*, 1966, and *Logotype, Signal, Symbol* by Walter Diethelm (ABC Editions, Zürich) 1974.

IX. Technical and Scientific Signs

1. Technical pictography

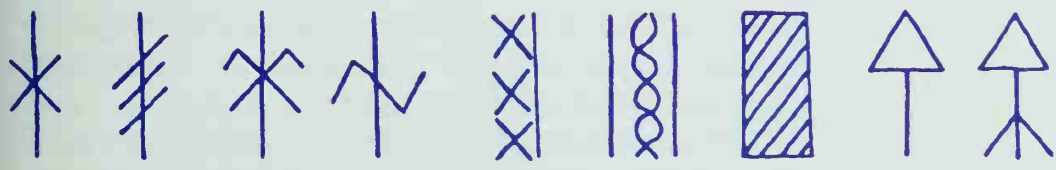
Technicians of the traditional sort, whose work consists primarily of the manual manipulation of tools and materials, are known as artisans. In earlier times they were mostly unlettered and untrained in technical drawing, carrying out the creative part of their work during the process of production. The carpenter visualized the positioning of the roof tree; there were no house-building plans on paper but only in the master carpenter's head. In order to simplify the assembly of the timber on the building site, after it had been prepared and cut to measure in the workshop, the artisan made use of certain signs by notching them into the beams. This was a sign language that could be easily understood by all the workers.

We illustrate some typical examples of carpentry signs as still used in chalet building in Alpine regions.

Sets of signs like these were customary not only in carpentry but in almost every trade, especially those whose work was not completed in the workshop but was taken elsewhere for a second procedure of assembly. Such was the case, for example, in stonemasonry, for which the actual building signs, not to be confused with the signature signs, have not generally remained visible, since they were placed on the inner side of the stones.

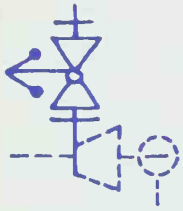
In the course of the centuries, this "spontaneous" method of working has been divided into a creative or

Carpentry signs



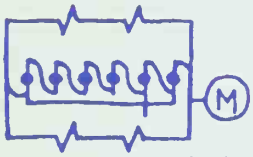
Cut Cancel Center Fastening Groove Relief Cut out Incision Joint

Centrifugal pump



Automatic stopcock

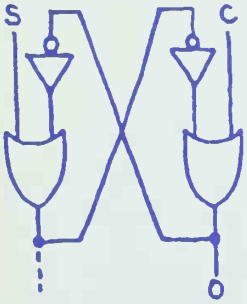
Tube tapering



Automatic shock absorber

Electrical amplifier

Transistor



Logical function

planning stage and a construction stage. It is typical of modern working techniques that the person who "plans" is no longer the one who puts the plan into effect. The paper of the technical drawing has been interposed between the hammer and the nail, the axe and the beam, as the intellectual element in the work. This major change came about because of the demands of increasing complexity in buildings, machinery and installations. Nowadays it would be unthinkable to erect a modern building without a drawing, diagram or plan. There are still manual workers and artisans to carry out the work but their function has become more and more specialized as their work is precisely divided up in accordance with instructions from a prearranged plan.

Engineers, architects and technicians now form working groups or teams, whose job is to assemble the building materials, installations, and fittings in accordance with a structural plan. In all fields of manufacture, research, and planning it has become a matter of course that whatever has to be made must first be planned in the office, on the drawing board, or more recently on computer-controlled display screens.

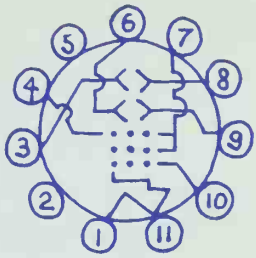
This ever-growing division into stages of development has inevitably led to the creation of new forms of visual expression for the optical fixing of new formulations, discoveries, and conclusions in a practical manner.

Creatively thinking people have found themselves compelled to extend the alphabetical limitations of "speech-fixing signs" by inventing independent signs to express formulas, connections, processes, and so on.

In the same way, schematic representation has made detailed verbal explanations superfluous in the various fields of technology. The wiring diagram of even the simplest electrical apparatus would fill pages of written explanations, whereas the trained technician, with a knowledge of the new sign language, instantly understands the functioning of the item as shown schematically.

The number of these specialized signs is growing all the time with continuing progress in all fields of devel-

opment. Even a limited survey of the multitude of such technical signs would go far beyond the bounds of our subject. The few examples given in the margins have a purely illustrative value as a glimpse of a world of signlike formulations that can be understood only by specialists and are at their service for working purposes as what might be called graphic tools.



Cathode ray tube

Programming signs for data processing

2. Signs of modern sciences

Scientific signs and formulas must be distinguished from those of technology, even though they meet and overlap at certain points. The scientist and research worker are mainly concerned with purely theoretical matters, without any advance consideration of practical applications of the subject of research, of the theory produced, or of the newly discovered concept. The invention and adoption of all the technical, economic, and social achievements that today influence the whole of life on our planet have been a consequence of free, theoretical research, which one might call "wild" research. The work of Albert Einstein may be cited as an example. In its purely theoretical nature, his intellectual work formed the basis on which technologists have developed, for example, equipment for all the known uses of atomic power.

In the realm of the sciences, with their high level of abstraction, the shorthand of signs has been much more strongly developed than in the previously mentioned field of technology. It is quite impossible to imagine mathematicians or chemists able to manage all

their mental work with the sole aid of alphanumeric signs, without using special signs and formulas.

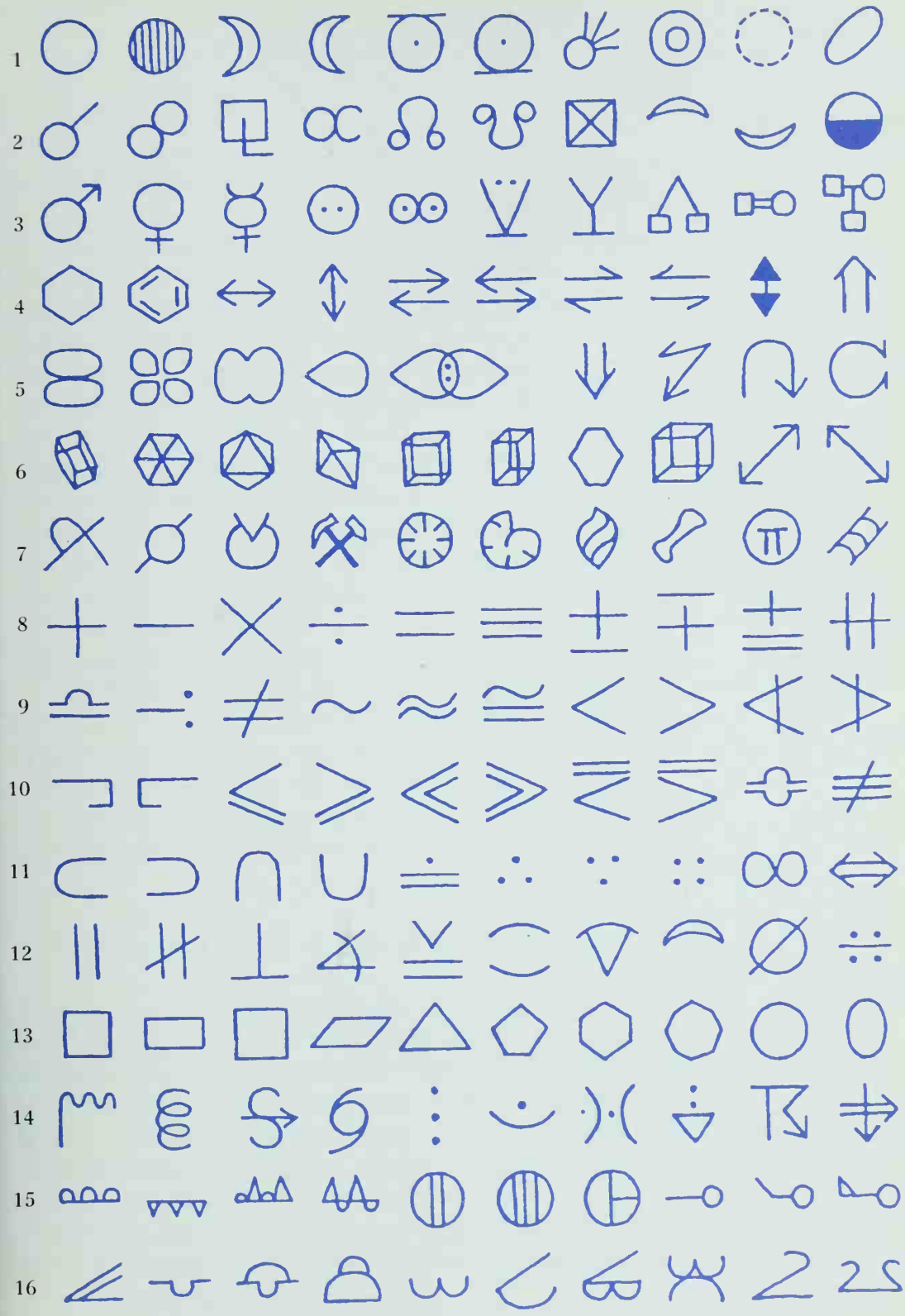
Starting with an existing range of elementary signs, research workers see themselves compelled to invent new signs and formulas all the time, in order to be able to formulate newly discovered facts, materials, connections, etc. Faced with this constantly growing multitude, it is possible to show only a small selection of modern scientific signs as examples of contemporary graphic expression.

The constantly revived notion of a return to a pictographic script for general purposes, with the idea of overcoming language boundaries, as proposed, for example, by the Australian C. K. Bliss in his "Semantography," seems to us to be completely unrealistic, in view of all the existing differences. The language of Esperanto is the pertinent example of an idea that is highly impressive in terms of pure theory, but in practice is unable to overcome the world's deeply rooted, fundamental ethnic structures.

So far as sciences and techniques are concerned, however, there is no doubt that in growing fields of specialization, signs and pictograms are still under development and will in future become an absolute necessity for the fixing and transmission of a worldwide fund of knowledge.

Lines 1 and 2: Astronomy (planetary and zodiacal signs, see Chapter V). Line 3: Botany and biology. Line 4: Chemistry. Line 5: Nuclear chemistry. Line 6: Crystalline structures. Line 7: Geology. Lines 8 to 11: Mathematics (signs of function and relationship). Lines 12 and 13: Geometry. Lines 14 to 16: Meteorology.

A selection of modern scientific signs



X. Signal Signs

1. Orientation

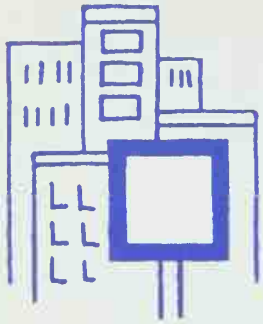
In contrast to all other kinds of sign, the signal sign has a function that departs from the field of merely passive communication and information. Being in the nature of a direction, an order, a warning, a prohibition, or an instruction, it has a purpose not simply to communicate but rather to produce an immediate reaction in the viewer. In its outward form, such as a placard or an inscription, the signal sign puts itself into humans' field of vision as it were against their will. An ordinary printed text, on the other hand, may be taken up or put down by readers, that is to say, included in their field of vision, and therefore of thought, or else dismissed from it. The materialized signal has become an essential and practically unavoidable part of our visual environment.

The industrial revolution has brought a basic transformation to the concept of the sign. If the age of religious faith was marked by the *symbol* and that of enlightening reason by the *sign,* our present-day world of universal communication and information exchange is ruled and structured by the *signal.*

a Meaning and interpretation of traffic signs

The traffic sign has become an essential part of modern life, since humans now move around at speeds that are alien to their natural being. The amount of time needed for human recognition of danger no longer matches the speed of movement that is usual in present-day circumstances and far exceeds the natural human capacity for reaction.

As new features of our environment, traffic signs have decisively affected the structure of our percep-



Too much similarity to the modern townscape

tions. Their characteristics may be divided into a certain hierarchy of strengths of command, which could be classified into the following steps, given with typical examples: *absolute prohibition:* No Entry, Stop, No Parking; *qualified prohibition:* Deliveries Only, Residents Only; *explanatory prohibition:* No Right Turn, Go Around Traffic Island; *instruction signal:* Single Carriageway, Speed Limit; *information signal:* Crossroads, Sharp Bend; *directional signal:* parking signs, indications of places and distances.

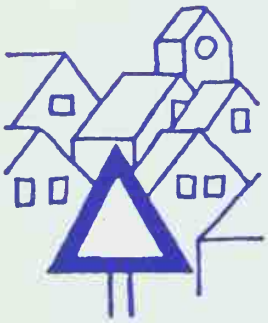
b Shape of the panel

Better contrast to the background

The shapes of signal panels are chosen, consciously or unconsciously, with regard to the intensity of their visual impression. Circular panels, which bear some resemblance to the raised open hand, are the most clearly visible against their background.

Aggressive triangular shape for prohibition signals

Square or oblong shapes, on the other hand, tend to become submerged in the general townscape, which consists mainly of the same outward forms. The circle and the oblique line provide a much stronger contrast to the urban environment. For this reason, most signal panels with a prohibitory content are given a striking shape, which may be in the form of a diamond or, as is most often the case, a triangle.



Warning signals with more resemblance to the older townscape or village

It is interesting to note that a triangle standing on its apex conveys, like the circular panel, a stronger impression of giving an order, whereas a triangle with its apex at the top more naturally carries a warning content. In the urban environment it is understandable that upside-down triangles produce a more aggressive form of expression than those with their apex at the top. One reason for this effect is provided by the older form of townscape with its sloping roofs, ridged at the top, a familiar image that has its place in the human subconscious (see Part 1, Chapter II).

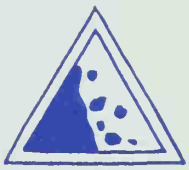
c Color

The primary color red is chosen as the most meaningful of all hues for prohibitions, instructions, and warn-

ings of danger. Quantitatively speaking, red is present in the landscape only in dots, never in wide areas. The use of red is therefore derived from the fact that this most obtrusive of all the colors of nature exists only in this exceptional way, but always as a primary color, for example, in flowers. Conversely, the color green, which is always visible in nature in broad areas, is unsuitable for signals; blue is used only for purposes of invitation or direction.

d The driver's reaction to the signal

In view of the constantly increasing density of road traffic and the need to regulate it sensibly, it is of interest to consider the fact that at least three basically different kinds of reaction to traffic signs are to be observed among the participants, particularly car drivers. In the first place they react to indications of danger with the normal human instinct for self-preservation, closing the sun roof, for example, immediately upon seeing the sign for "Falling Rocks" and slowing down when seeing the signal for "Level Crossing" or "Steep Descent." The same applies to the second class of reaction, when it is the driver's pocket rather than life that is immediately threatened, as in the case of "Radar Speed Trap." In the third type of reaction, it is more difficult to take the foot from the accelerator when one is faced with admonitions to take care, such as "Road Works" or "Road Narrows."



One's own life is in danger

The information is not basically ego-related

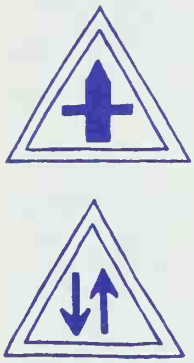
2. Pictograms

Pictograms are finding increasing use in modern directional and informative signs, for two reasons, the first of which consists in the necessary limits to the size of the panel. Whether it be circular, triangular, rectangular, or any other shape, the panel must carry condensed information. This principle is in opposition to that of written or printed information, which has to follow the linear development of word assembly and therefore needs wide, more or less lengthy panels, presenting an obstacle to the unification of any system of signalization.

Universally comprehensible pictograms speak for themselves

The second reason for the growing use of pictograms is that of language itself. Road and rail networks, shipping lines, and airways reach far beyond the frontiers of nations, languages, and peoples. Polyglot inscriptions would call for panels of excessive size and the information content would lose its clarity. Air traffic may form an exception here, allowing general comprehension to be reduced to a bilingual system consisting of the national language plus English, which, moreover, has increasingly taken on the character of a sole international language of air traffic, with the use of words such as Exit, Flight, and Bus.

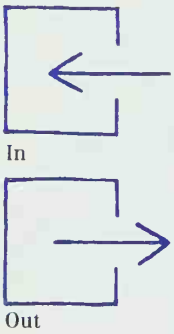
During the past few decades, information by means of pictorial signs has led to a general change of reading habits, and it may be said that today it would no longer be possible to provide directions without using a certain number of pictograms. In this connection it must be emphasized that there are at least three different kinds of pictorial information.



Diagrams that need some working out

The first comprises those signs that, as naturalistic pictures, generally in the form of silhouettes, leave absolutely no doubt about their meaning in anyone's mind, regardless of the viewer's native language and way of life. A crossed-out cigarette and the silhouette of a telephone receiver or a coffee cup have become universally comprehensible directives. No learning process is required to understand these signs, which give immediate information.

The second kind of pictorial information comprises diagrams whose meaning is not comprehensible at first glance, calling for a certain mental effort. This is the case, for example, with traffic signs indicating such contents as priority, two-way traffic and steep slopes.



In

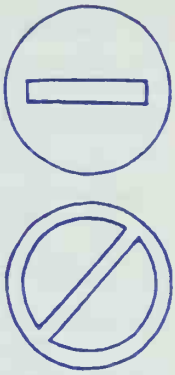
Out

Too hard to work out

In this group of schematized pictograms there have been numerous instances of signs whose meaning remains dubious to many people even after many years of use. Figures formed from a combination of different abstract elements, in the case of our examples the opened square for room or door with the directing arrow, require a "thinking time" that far exceeds the "decision time" available to the pedestrian approaching the door in question. A sign of this kind will never serve its purpose satisfactorily, since its intellectual concept is unsuitable both for spontaneous visual rec-

ognition and for a simple process of learning. In the case in point we would prefer the verbal information "In" and "Out."

The third group comprises indicators derived neither from pictures nor from diagrams but from abstract signs, thus requiring an outright process of learning. Once they have been absorbed into the subconscious, like alphabetical signs, they are understood spontaneously. The most striking example of this category is the "One Way Street" or "No Entry" sign, now used even for walkways and universally known and obeyed. Red, amber, and green traffic lights belong to the same category of acquired information. The arrow sign could also be included in the same group, even though its outline can recall a weapon, depending on the specific form used (cf. Part 1, Chapter II.4). The shape of the shaft provides exact information about the kind of movement indicated: detour, sharp bend, etc.



Once learned, these are perfectly comprehensible

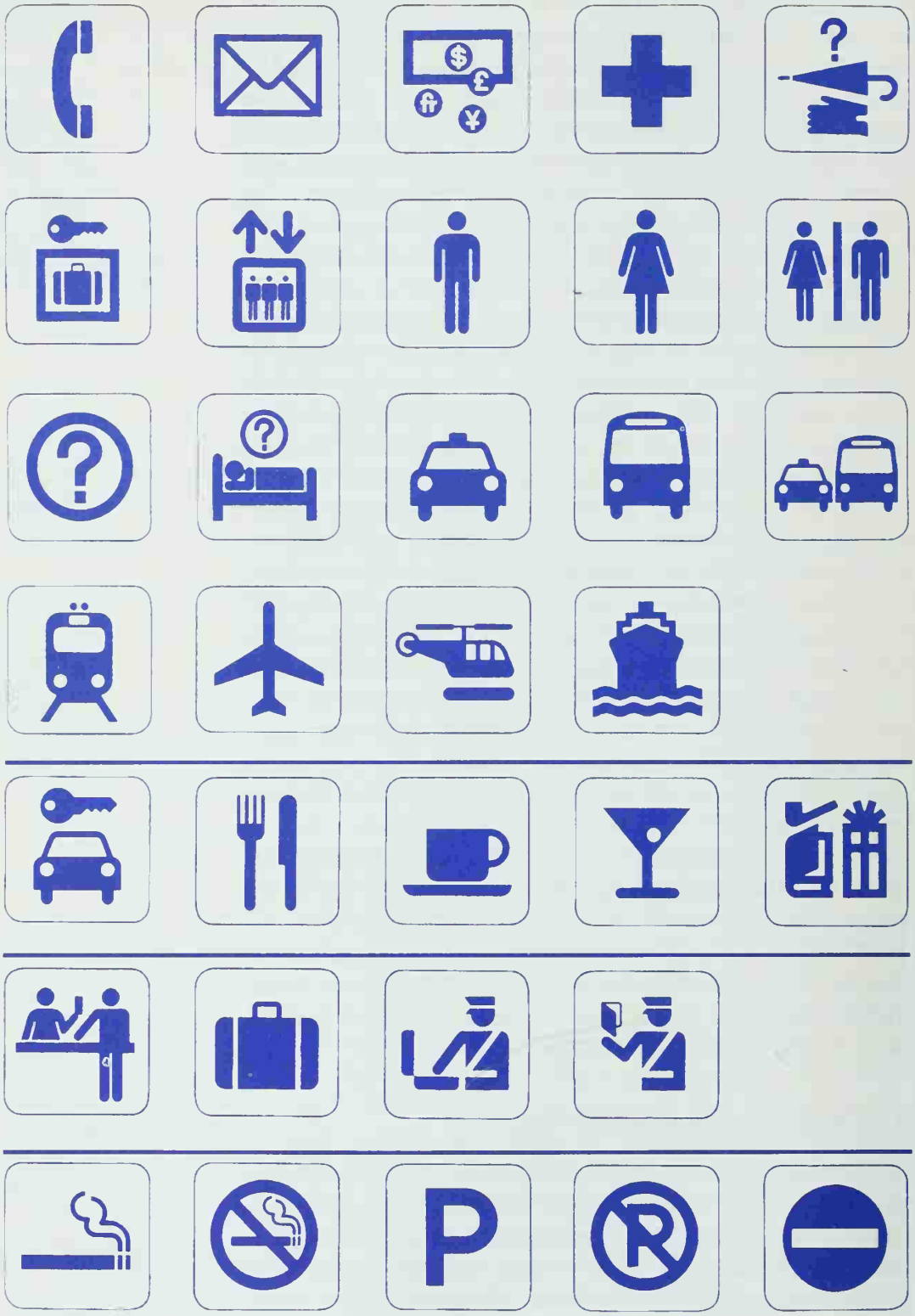
Particularly tricky problems of pictographic design are presented by information concerned with services rather than specific objects, for example, "customs," "Lost Property Office," "Self Service," "Waiting Room," "Luggage Delivery," "Left Luggage." The problem of indicating the toilets will probably never be solved on a worldwide scale except on a verbal basis, since even the division between men and women, typically designated in the West by the outlines of a skirt and trousers, does not work at all in this form in Arab countries, among others.

The best-designed series of travel pictograms known to the authors – a collection worked out by the American Institute of Graphic Arts as the norm for the United States – is illustrated here. The reproduction of the table is, however, subject to all the various reservations already expressed concerning the effectiveness of different kinds of sign.

3. Signal signs in printed form

In most cases travelers work out an exact timetable and route plan of their journey in advance, from the point of departure to the destination. For this purpose they use timetables, road maps, and other forms of printed schematic information, all containing a quan-

Standard pictograms for air traffic in the USA

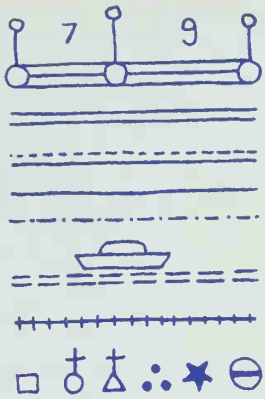


tity of signs that are to some extent identical with those to be met during the journey.

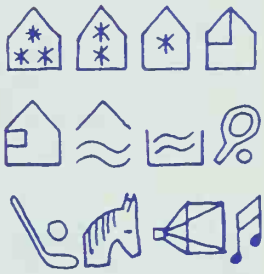
Travellers' reactions to the printed signs, which we can also regard in a certain way as theoretical signal signs, are fundamentally different from their reaction to the signs displayed in public. The gathering of information, the planning and preparation for a journey are carried out in an atmosphere of relaxation, one might almost say of meditation, whereas the journey itself subjects travellers to definite conditions of time and place, such as dependence on traffic regulations and punctuality of public transport.

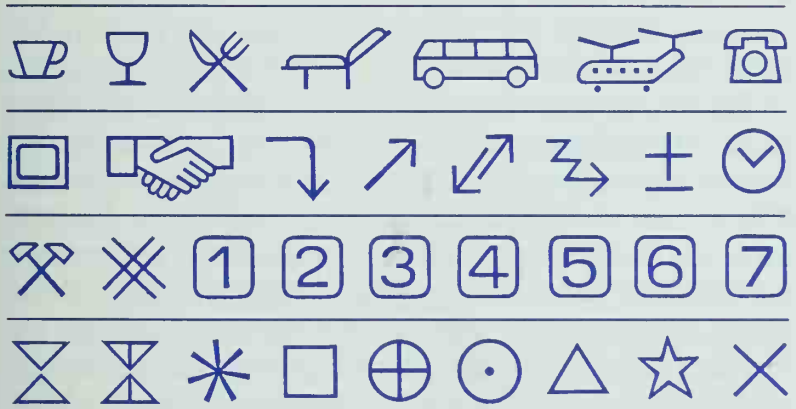
Public systems of signal signs in traffic require instant recognition, whereas the printed signal sign, viewed away from the traffic, can have a much more complex content. In addition to those pictograms whose meaning is obvious, a timetable or a map can make free use of abstract signs, for purposes of direction or reference, with explanations of their meaning in another part of the document, rather like footnotes in books.

Signs for maps, and especially for timetables, must, however, be simplified into the most strongly stylized form, since they must remain readable in very small sizes.



Map signs


Holiday resort signs



Signs for an air timetable

Legibility of pictograms in reduced sizes

As an example, we show a set of pictographic signs designed for an air timetable.

The first row contains signs with an immediately recognizable and understandable meaning due to their clear pictorial character.

The signs in the second row still have a thoroughly pictorial character, but their meaning needs an explanation, which in most cases will need to be given only once. From left to right, their meaning is In-Flight Cinema, Welcome Service, Change Flight, Single Journey, Return Journey, Telegrams, Local Time, and Flight Time. The signs in the third row also need to be explained only once. They mean Weekdays Only, Daily, and the days of the week from 1 to 7. In the last case there is always an element of doubt as to whether Day 1 means Sunday, Monday, or possibly Saturday (the Jewish Sabbath). The final row contains typical reference signs, i.e., clearly distinguishable geometrical figures needing an explanation in a footnote or table in every case and, where possible, on each page of the publication.

4. Emotional aspects of route finding

a Orientation in public buildings

One of the most important factors to be taken into account in the planning of modern directional systems is a kind of anxiety that might be called "doorstep nerves." The psychological attitude of persons seeking their way is quite different when inside or outside a building. As long as they are in the open air, their independent powers of decision are still fully intact and the visible environment provides a secure system of reference. Once inside a building for the first time, however, visitors tend to lose confidence in their powers of decision and are obliged to seek help and guidance. In most cases they will first look for a receptionist of whom they can ask their way verbally. In buildings lacking such an information service there is usually a guide plan on display. This kind of miniaturization or schematization of the building must be seen as the main element of signalization, because it is there that visitors have to learn and get to know the spatial structure of the whole building. The functioning of this process of instruction and of subsequent further guidance is very closely associated with visitors' personal dispositions. In a museum, for example, visitors are likely to be in a relaxed mood and will naturally be inclined to seek their own way.

In contrast, visitors to any kind of public building, from a post office to a police station or a hospital, will partly or even completely lose their sense of direction and seek verbal guidance.

This emotional factor is of particular importance at airports and railway stations, generally as a result of pressure of time or anxiety about taking the wrong flight or train. In such cases it is not possible to back up the system of signalization with a personal service, so the orientation panel must be correspondingly designed to show large quantities of information in a large size, in order to inform the anxious traveler quickly and precisely.

b Pictographic systems for events

In the context of the increasingly frequent organization of meetings of large groups of people at cultural, sporting, or political events, new systems of orientation are in constant demand. Their design must take equal account of the specific content, the scope, and the polyglot character of the event concerned. In such cases the designer becomes a kind of visual organizer with the specific job of orienting and guiding visitors.

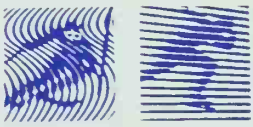
Since events of this kind are limited in time and place and the visitors will in most cases be in a relaxed mood, with the intention of enjoying themselves, it is our view that the design of pictographic systems with original sets of signs designed by local graphic artists is to be welcomed. The opinion is often expressed that an approved, permanent pictographic system should be worked out once and for all for the Olympic Games. On the contrary, it seems to us more sensible and better suited to the occasion that a set of signs appropriate to the specific character of the current host country be developed anew every four years. Visitors will come to understand the signs quite quickly, and their local color will be thoroughly acceptable as an expression of graphic resourcefulness. Even if there are occasional misinterpretations of the meanings of signs at such events, the consequences will not be very serious.

One exception to this rule must be observed, namely that safety signs must have a strict international unity, for obvious reasons.

Tokyo

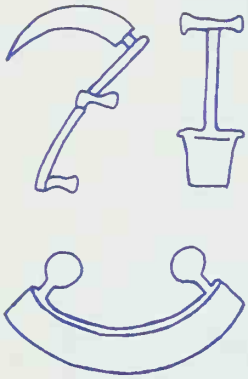
Mexico

Munich



Grenoble

5. Operating signals



Handy tools

The traditional tools of agriculture and handicrafts owe their forms to centuries of adaptation to the anatomy of the human hand. The combination of muscle power, dexterity, and the instruments concerned has made it possible to produce objects of practical use from raw materials such as stone and wood, leather and yarn. The invention of the motor initiated a growing tendency for human effort to be replaced by machine power, while the equipment concerned is no longer designed to be "handy" but to be technically suited to its mechanical functions.

The present generation has to deal with tools, domestic machinery, and means of transport with fashionably designed casings and frames covering their inner workings, which are now both invisible and incomprehensible to the user. In fact such understanding seems no longer necessary, since such equipment is not manually "used" but simply "operated." Furthermore, the electronic equipment now coming into domestic use has its own programmed sequence of operations, so that the expression "button pushing" no longer has a facetious connotation but is a genuine aspect of human activity in a mechanized age.

It is a daily experience that a completely different, not to say "alienated," relationship to the instruments we use has arisen from this development. In the old days, the washboard, bucket, and soap or the workbench, saw, and chisel needed no operating instructions, their uses being intrinsic to their very forms. In contrast, the workings of a modern washing machine or a stereo set are hidden behind their housings. The wiring diagrams provided with the equipment are generally readable only by the specialist and for that reason are, in any case, often hidden away in the interior.

It is not our intention to advocate traditional methods as opposed to innovations, but the fact remains that modern equipment is becoming more and more abstract and complex in character and must therefore be provided with full operating instructions. For every

manufacturer, the design and writing of such instructions for machinery and equipment are delicate and difficult matters. A typical example of the contradictions involved is the use of colors. From experience in road traffic, the public has learned that red means "stop" and green means "go," whereas on electrical apparatus a red light means "contact," i.e., running instead of stopping, while green indicates inactivity.

In the same way, knob-turning instructions still cause problems to most owners of equipment, since the instructions "turn left" and "turn right" are not necessarily absolutely clear and unequivocal for everyone.

In addition, multilingual operating instructions have become a matter of routine as a consequence of worldwide trade in equipment of the most varied kinds. Purely verbal descriptions and explanations therefore often lead to awkwardly expressed and even incomprehensible instructions, because of faulty translation, and every manufacturing company tries to develop pictograms that will explain the entire operation of its equipment without the need for words.

It must be acknowledged that it will take generations to complete a unified, worldwide solution to this problem, especially as far as the learning process is concerned, as this must be undertaken anew with practically every kind of equipment. Nevertheless, standardizations of graphic signs are in progress in a variety of fields and it appears that the basic rules of a generally understandable language of signalization have already been established.

On a sewing machine

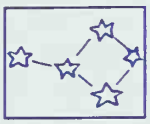
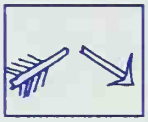
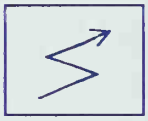
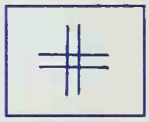
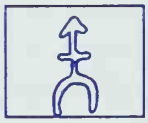
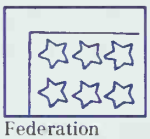
On an oven

On a washing machine

On a camera

On a tape recorder

In a car

		Star	Serpent	Arrow	Cross
Drawing	Realistic	Picture	Picture	Picture	Picture
	Schematic	 Diagram	Cross section	Technical drawing	Ground plan
Symbol	Sign or object raised to be a symbol	Solomon's seal	Serpent of eternity	 Peace	Christianity
	Combinations of signs or attributes in a symbol	Islam	Sin	Love	Trinity
Sign Science sign	Convention with recognizable object	Meteorology (frost)	Hieroglyph (Nahash)	 High voltage	 Equal or parallel
	Pure convention, loss of object	Asterisk	Similar to	Male, Mars	Female, Venus
Signature sign	Mark of ownership, signature, colophon	Stonemason	Lucas Cranach	 Cattle brand (Texas)	Hermes sign
Emblem sign	Sign of group, family, state membership	 Federation	Family sign (Japan)	Zodiac sign (Scorpio)	State (arms)
Trademark, logotype	Profession, company	Mercedes	Doctor, apothecary	British Rail	A bank
Signal	Instruction for traffic, operation, etc.	Danger of explosion	Bend in road	Direction	Red Cross

Toward a Synthesis

The table of signs on the facing page has been assembled in order to provide a comparative guide to the different kinds of expression that can be obtained by means of graphic modifications to four representative figures: two from nature, the star and the serpent, one human artifact, the arrow, and one figure from the borderland of abstraction, the cross.

The top row contains purely pictorial representations. Although reproduced by the technique of line drawing, the signs remain in the realm of the pictorial and their expression is above all illustrative.

In the second row, the same objects take on a schematic form, which means that they are no longer illustrations of outward forms but analytical versions, in which the image is arranged as a diagram, cross section, or ground plan.

One of the most fundamental transformations occurs in the third row, where the picture has been elevated to a symbol. This can be seen as a kind of "sublimation" of the purely objective item, in that the thing itself has been given a spiritual or imaginative content. In this context a naturalistic rendering is no longer required. On the contrary, the illustrative intention is abandoned in the process of converting the picture into a sign. The illustration has become a symbol.

As a means of increasing symbolic power, two or more objects are often associated in one image, as shown in the fourth row.

In order to provide further clarification of the much disputed question of the exact nature of the difference between a symbol and a sign, the four original objects appear from the fifth row downward in a variety of simplified and graphically polished versions of their signs. Of course, pure signs, such as those for lightning

or Venus, may become symbols, as may also be the case with armorial devices and even with trademarks. It is, above all, the underlying *meaning* of a figure that can be taken to draw the boundary line between a symbolic image and a neutral sign denoting a thing.

The division of the signs into groups does not in itself raise any problem of interpretation. The abbreviated sign used for a scientific concept, the signature sign or watermark, the sign of ownership, and the trademark are all made distinct by their specific applications.

The outward forms of the various classes of sign therefore give a fairly clear indication of their uses. The economical line of a scientific sign differs clearly from the filled-in, embellished armorial sign, and the functional simplification of a cattle-branding mark distinguishes its appearance totally from that of an advertising sign designed with graphic sophistication for maximum appeal.

The final row of the table shows the four basic images as used for purposes of signalization. Both the naturalistic and the symbolic effects have been eliminated and the signs have become abstract conventions. The image of the signal sign also includes the shape of its panel, which can strictly speaking be regarded as a basic geometrical sign in itself, enhancing the meaning of the sign that it bears.

Epilogue

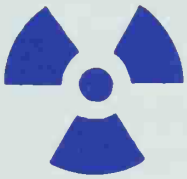
The illustration becomes a symbol, the sacred symbol is modified to make a prosaic mathematical sign, heraldic figures and signatures are transformed into trademarks and logotypes, and the drawing is simplified to make a sign.

Alphabetical signs alone have long been insufficient to record and convey human thoughts and statements. Orientation and communication would be impossible today without diagrams, signs and signals. Written or printed expression is necessarily complemented by pictorial communication.

The alphabets of verbal languages, having evolved in specific historical conditions, are fixed once and for all, but are abstract in character. The signs of pictorial language, on the other hand, are subject to constant, concrete adaptation to the ever-changing fields of their application and have a clarifying and standardizing effect wherever words are insufficient or hard to understand.

Signs, symbols, emblems, and signals, in all their diversity, are penetrating and deeply marking expressions of our times, pointing to the future by comprising and conserving something of the past.

Nuclear disarmament
Peace



Danger! Radioactivity

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In this standard work, now published in the English language for the first time, Adrian Frutiger writes about signs and symbols in general and about the development of writing in particular. Throughout Frutiger relates the basic principles and components of graphics to a wide range of considerations – historical, physical, linguistic and practical.
All of this is achieved by dint of an exceptionally clear text and hundreds of free-hand line drawings by the author, printed in a second color.
Adrian Frutiger is Linotype's master typographer who has, amongst other work, designed a typeface named after him.

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