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An Explicit Formulation of the Relationship Between Tool-Using, Tool-Making, and the Emergence of Language

Gordon W. Hewes

If man's propositional language did not begin with speech, but with a manual gesture or sign-language system, a plausible model can be built in which tool-making and tool-using play an important part in language emergence. Even in modern speaking cultures, we learn to use tools or weapons mainly by observation of their use by others, and by signs and gestures—rather than through speech. The motor and neural elements involved in manipulation of objects and in gestural communication are very similar. The fundamental visual basis of human cognition is stressed.

The problem of this paper is to make explicit the relationship between the emergence of human language and the rise of tool-making and tool-using. That language is analogous to tool-using is an old idea. In the *Cratylus Dialogue*, Plato has Socrates liken words to weaving shuttles, and he mentions other tools such as borers, lyres, and ships (Plato, 1963). The word used for tool is *organon*, which in Middle English was so strongly tied to language as to mean the speech apparatus. However, neither Plato nor most of his successors have done much with this suggestion, except to employ the tool-metaphor in discussions of language (Baier, 1951–52; Ryle, 1953; Wittgenstein, 1969; Meredith, 1962; Rossi-Landi, 1968). Our concern is not the aptness of a Platonic figure of speech.

The topic of this paper seems most productive when it is based on hypothesis that man's earliest language was gestural rather than vocal. This theory was launched in earnest in the eighteenth century (Condillac, 1746; Rousseau, 1755), elaborated in the nineteenth (Wallace, 1881, 1895; Morgan, 1877; Tylor, 1868, 1871; Romanes, 1888, 1889), and has supporters in the twentieth (Wundt, 1916; Paget, 1956, 1963; Johannesson, 1949, 1950). None has made serious efforts to connect language with tool-using. Only one major glotto-

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gonic theorist, Ludwig Noiré, linked glottogenesis and tools, but he espoused the notion that language arose from cooperative labor, in work-chants and in imitation of the sounds produced by various tools (Noiré, 1877, 1880; cf. Bunak, 1951; Golovin, 1961).

The question is not whether tools and their uses form a semantic domain in all natural languages, but whether language has had some causal relationship to tool-using. Such a connection has been referred to in many glottogonic theories, but explicit models have been remarkably few (Bunak, 1951, 1958, 1959, 1968; Clark, 1970; Count, 1962, 1965, 1968, 1969; Dart, 1959, 1960; Hallowell, 1960, 1961, 1962; Hockett, 1959, 1960, 1967, –and Ascher, 1964; Lancaster, 1965, 1958a, 1968b, 1968c; Semënov, 1959; Spuhler, 1965; Trân Dûc Thâo, 1966, 1969, 1970; Washburn, 1959a, 1959b, 1962, 1963, 1968a, 1968b, and J. B. Lancaster, 1971; –and Jay, 1967; –and C. S. Lancaster, 1969; White, 1940, 1942).[1] I propose that a quite plausible model can be built if we take the initial form of language to have been manual-gestural, but that a model which assumes that the earliest form of propositional language was vocal-auditory creates almost insuperable difficulties.

First of all I suggest that the tool/language relationship formed only a part of a much larger system exhibiting what Maruyama (1963) calls a deviation-amplifying "second cybernetic" effect, and which Bielicki (1969) has applied to hominization theory, wherein

1. Holloway (1969; cf. Durbin, Watson, and Holloway, 1971) has a lengthy discussion of relationships between language and tools; in several respects his conclusions agree with mine, especially on the similarity between the motor-skill performance program involved in tool-making or tool-using, and the neural programs underlying effective production of spoken language. In this paper, Holloway adhered to a vocal-auditory model for early language, and thus in my opinion missed several powerful points in the tool and language relationship. In Holloway's comment on Durbin and Watson (1971), however, he admits that he has been impressed by the reports on Washoe and Sarah's language acquisition, and is therefore less committed to a vocal-auditory language model. He reserves judgment on the significance of the Washoe and Sarah studies until chimpanzees can be observed teaching other chimpanzees some form of sign-language.

Other recent comments on language origins are by Washburn and J. B. Lancaster, 1971, in their comment on a paper by Carini (1970), and in Crombie (1971), who presents some elaborate schematic diagrams inter-relating various human behaviors, although Crombie's argument is basically concerned with paedomorphosis as a major feature of hominid evolution.

symbolic communication and tool-using interact with bipedal locomotion, increased brain size, predatory behavior, elimination of seasonal sexuality, food-sharing, mating rules, economic cooperation, and sexual division of economic functions. Although my focus is on tool-language connections, I assume that the real situation was much more complex. Bielicki is not committed to a gestural language origin theory. My own preference for it stems from its elegance, in keeping with the canon of parsimonious explanation. If mankind was at first and for a long time communicating chiefly by manual gesture, the problem of a relationship with tool-making and tool-using is much simplified. The early stages in this model apply to hominids of Australopithecine grade, where tool-making is first archaeologically documented.

The visual, kinaesthetic, and cognitive pathways employed in tool-making and tool-using coincide with those which would have been required for a gestural language system. Speech, on the other hand, utilizing the vocal-auditory channel, implied the surmounting of a neurological barrier—that of the cross-modal transfer of learning, which I think could only have taken place as a result of long-established natural selective pressures on the central nervous system, unlikely to have been completed in the early phases of hominization (Ettlinger, 1967; cf. Geschwind 1970a).

I argued for the priority of a visual-gestural language in a previous paper (Hewes, 1970; 1971; cf. Wescott, 1967; 1970a), and shall not repeat this argument here. In brief, I suggest that gestural language and tool-using developed together for a long time—say, for two million years—along with other aspects of Lower Paleolithic culture, and that the achievement of relatively easy cross-modal transfer of learning to the auditory and perhaps other sensory modalities was the result of a general cognitive enhancement, rather than a specifically language-based one, even though increasing language capacity played an important part in the process.

Today we are in a stronger position than we were even a decade ago, to evaluate glottogonic theories, thanks to more information about the Australopithecines, primate behavior, including anthropoid ape acquisition of simple language systems, child language research, neurological data on language and other sound processing, and psycholinguistics in general. The most striking addition to our

knowledge in this area has been the discovery by R. A. and B. Gardner (1969, 1971) and D. Premack (1970, 1971) that chimpanzees can master simple propositional sign languages, contrary to the expectations of most linguists and many psychologists, who have been insisting that the capacity to acquire language is species specific in Homo sapiens (cf. Chomsky, 1966; Lenneberg, 1964a, 1967; Brown, R. 1970; Bronowski and Bellugi, 1970; White, 1940, 1946, 1959). If language acquisition competence extends to Pan troglodytes, and possibly the other existing Pongidae, there is certainly no good reason to deny such a capacity to the fossil Australopithecinae, with brain cases at least as large as those of chimpanzees, bipedal locomotion, and tool-making traditions surpassing anything observed in apes (cf. Stopa, 1968). If a simple manual sign-language could somehow have come into being among the Australopithecines, it seems reasonable in the light of the Washoe and Sarah experiments (which are continuing), that such behavior could have been sustained, and in the very long run, gradually improved. It is not the same thing, however, to postulate that the Australopithecines could have acquired a *spoken* language; unless further evidence is forthcoming, we have no warrant to postulate a capacity for articulate speech in the Australopithecinae. The investigators who have recently reconstructed the parameters of Neanderthal speech (Lieberman and Crelin, 1971; cf. Lieberman, 1968; Lieberman, Klatt, and Wilson, 1969) have indicated, on the basis of preliminary work, that the Australopithecinae probably could not have produced articulate speech sounds, and perhaps that Homo erectus was not much better. While such pronouncements have been made in the past with respect to pre-Homo sapiens sapiens fossil men, they have been made by anthropologists or anatomists without technical backgrounds in acoustics or the modern technology of speech-synthesis. Although judgement should be reserved until other trained investigators can check the findings of Lieberman, Crelin, Klatt, et al., we have at least an independent evidential possibility for the gestural language thesis. Recent studies of the perception of speech sounds (Liberman, et al., 1968, 1967, 1970) strengthen the case for a very slow emergence of spoken language capacity. The modern human ability to produce and decode speech rests on a very intricate neurological apparatus, as well as on particular proportions and acoustical properties of the actual vocal tract.

I do not wish to appear to minimize the value of the work of such investigators of spoken language capacity as Geschwind, Lenneberg, Orr, and Cappanari. Lenneberg's heavy emphasis on the importance of cerebral lateralization and its connection with language (1967) is, in fact, very germane to my tool-language argument, as is Geschwind's lucid explanation of the role of the limbic region in the mediation of language symbols (1964, 1967, 1968). I simply say that such work makes even better sense if language for a long time did not employ the vocal-auditory channel, but took the path of least biological resistance in becoming established first of all in the gestural-visual channel, which is also where tools mainly operate.

The difficulty of forming cross-modal learning in monkeys is well known (Blakemore and Ettlinger, 1967; Ettlinger 1961a, 1961b, 1969; Ettlinger and Blakemore, 1969; Wilson and Shaffer, 1963), although anthropoid apes may be less handicapped. The inability of apes to acquire even a few quasi-articulate speech sounds does suggest that their cortical auditory centers are somewhat isolated from the centers where visual inputs and voluntary, precise motor outputs are integrated with comparative ease. Apes and monkeys can respond to complex visual stimuli with cognitive sophistication, and with subsequent manipulatory acts in a fashion which only our species can surpass. Visual stimuli, *including visible manual gestures*, can clearly elicit constructive, voluntary finger, hand, and arm movements; whereas as in other non-human animals, sound stimuli do not. Instead, sound signals only seem to trigger various holistic "emotional" responses—such as alarm, attention, fear, fright, attraction—followed by more or less stereotyped behavior patterns—such as flight, attack, protective mothering, submission. Of course, primates, like other hearing animals, can be conditioned to sound signals, as were Pavlov's dogs. But this is not at all the same thing as reacting to new elements or configurations in a complex sensory input by constructive motor outputs. The informational content of most sounds—except for such exceptional, intricately modulated ones as bird-songs, echo-sounding in bats or sea-mammals, or human speech—is exceedingly limited.

I shall have something to say later about the kind of neurological restructuring which the hominids must have undergone in order to transform what is basically a kind of alarm system into a mechanism encoding and decoding rich and complex information about the

environment, being provided not only through hearing, but by sig ht, touch, and smell.

It is scarcely original to observe that the same kinds of environmental pressures which were leading early hominids into more open landscapes—tool-making and tool-using, new patterns of food-getting through scavenging and hunting—two or three million years or so ago (as shown by recent finds not only at Olduvai and in various South African sites, but around the northern end of Lake Rudolf in Kenya and the lower Omo Valley) were probably also driving them toward propositional language. In addition to the exigencies of tool-making and tool-using, including the relatively new role of part-time predator, I should like to stress the cognitive demands of terrain and trail mastery required in more open environments—involving factors recently investigated by Stea (nd.; 1970), and implicit in Krantz's model of pursuit-hunting (1968). Emil Menzel, Jr., working with a group of young chimpanzees at the Delta Regional Primate Research Center, has been studying informational exchange and object-searching behaviors (Menzel, 1969a, 1969c) and has also had an opportunity to observe some extremely interesting, although unplanned-for, instances of chimpanzee collaborative and constructive behavior (Menzel, 1970; cf. and C. M. Rogers, 1970), which I think bears significantly on this matter of trail and terrain cognizance. The observations of new food-handling methods and new uses of the environment (particularly the littoral environment) in Japanese macaques by Kawamura (1963), Kawai (1963; 1965; cf. Menzel, 1966) and others are also very relevant, even if we accept K. R. L. Hall's contention that diffusions of new food-habits among these macaques were based on unintentional attention-directive behavior rather than "deliberate" communication of the gestures or manual and other activities. Maturana (1970) has emphasized the connotative rather than denotative function of primate behaviors which we may interpret as "communication". I do not find these strictures damaging to my hypothesis, any more than I find Roger Brown's reservations about the syntactical character of Washoe's early sentences (1970) upsetting. On the latter point, however, it is worth noting that Brown did not have access at the time he considered syntax in young chimpanzees and in human children to the results of

Premack's work with Sarah, whose syntax is quite acceptable (Premack, 1971; cf. Toulmin, 1971).

Trân Dûc Thâo, a perceptive Vietnamese scholar, has developed a schema for the emergence of propositional language from basic pointing gestures which could ultimately generate a wide diversity of signs in connection with Australopithecine hunting, tracking, tool-making, and tool-using, along with plant collecting which may also have been developing in a more human direction and away from the foraging patterns of apes and monkeys (Trân Dûc Thâo, 1966, 1969 a, b, 1970). Pointing has high face-value iconicity (cf. Wescott, 1967, 1970b, Swadesh, 1971). We may suppose that some gestures have greater inherent comprehensibility than others. The idea of a kind of natural selection in language as new signs were invented—although the items being selected were conceived of as spoken "roots"—goes back to Steinthal, and also was discussed by Whitney. I should think that differential effectiveness of manual gestures could be tested with chimpanzees.

I do not intend to worry much over the question of priority: tools before language, or the reverse. Since chimpanzees use some very simple tools (van Lawick-Goodall, 1964, 1968; Kortlandt, 1965, 1967 and van Zon, 1969; Menzel, Davenport, Rogers, 1970), this may seem to settle the matter, except that chimpanzees also appear to use a few simple manual or arm gestures. Simple pointing, since it requires no handling of extrasomatic objects, is conceptually less complicated, but I think a prolonged discussion about which came first, tool-using or gesture-language, would not get us far.

The limited record of stone implements is one of extremely slow technological progress: perhaps two million years on an Oldowan level, and then on to a very gently rising handaxe-, cleaver-, or more sophisticated chopper-chopping-tool and flake-using plateau for another half million years thereafter. While we are ignorant in detail of the other kinds of tools almost certainly in use during this long period, in which only the use of fire appears as a major technological addition, it is still reasonable to extrapolate from the snail-like progress of stone tools to language development. Just for the sake of illustration and not because vocabulary size is the sole measure of the cognitive growth of language, let us assume that by the year 100,000 B.C., about 250 distinct gestural signs were, on the average, in use

among the hominids. Starting with the earliest stone tools, which go back 2.6 million years, and assuming a straight-line rate of growth, this would yield a rate of one new sign every 10,000 years, certainly not a dizzy increment. Our hypothetical vocabulary of 250 signs is two or three times that so far achieved by chimpanzees in a few years, but under infinitely more efficient conditions of deliberate human instruction. It seems more reasonable, however, that the initial rate of vocabulary growth would have been slower than 1 per 10,000 years, and that toward the end of the 2.5 million year span there would have been acceleration. But even if we increased the lexicon to 1,000 signs by 100,000 B.C., this would entail only tiny adjustments in the growth curve. Semënov (1959) has shown in a series of ingenious diagrammatic illustrations, how the cognitive complexities of dealing with Oldowan tools, handaxes, and later prehistoric stone implements would have developed, and his model can be readily applied to growth in a manual gesture language. For later prehistoric times, see André Cailleux's 1953 paper.

In comparing tool-kits and lexicons, of course, we must remember that the applications or uses in both greatly exceed the number of items in each set. An Oldowan tool-kit with three components (hammer, chopper, and scraper) could be employed in dozens of different tasks, just as a gesture-language of half-a-dozen signs could handle far more than six situations. Despite the fact that no existing natural language is restricted to 1,000 or 250 signs, as countless authors of linguistics textbooks remind us, I think we must admit that at some time in the remote past, our ancestors managed with such limited lexicons.

Cerebral lateralization or hemispheric dominance plays a central role in all recent discussions of language and human cognition (Lenneberg, 1967). When and why this occurred in the course of hominization is a crucial part of any model of that process. I see it developing slowly, in connection with the evolution of tool-making and tool-using, and the rising complexity of hominid subsistence and social life generally, along with the growth of a manual-gestural language system. Hence, lateralization may have occurred to a significant extent prior to the emergence of articulate vocal language, although when it came it provided a further impetus to lateral dominance. The

distinctions between the precision and the power grip, for which Napier is best known, seem particularly cogent. Bruner has shown, in connection with the cognitive growth of the young child (1968) how the dominant hand comes to employ a variety of precision grips, while the subordinate (usually left) hand comes to act as a holder or steadier of whatever is being worked upon. More to our point, Bruner also observes (following Latif, 1934) that the left, subordinate hand plays a role comparable to the grammatical subject, and the right, dominant hand to that of the predicate. Goodnow has contrasted the diffuse functions of the subordinate hand and the focal role of the dominant hand (1969; cf. Semmes, 1968). I think there is more than metaphor here, and that both language and tool-manipulatory behavior reflect underlying cognitive mechanisms which have long been localized mainly in a single hemisphere, in order to reduce interhemispheric interference. In view of the complexities of some birdsongs, it comes as no surprise to hear that there is evidence for a degree of hemispheric lateralization in songbirds (Nottebohm, 1970).

Neither tool-using actions nor words, whether gestural or vocal, normally appear as isolated bits of behavior. Instead, they are components of more complex programs of action. Such programs can be disorganized or destroyed in cases of damage to the brain, and the disturbances of language are remarkably similar to those in motor skills. Some forms of aphasia are syntactical—the patient can still produce words, or recognize them, but cannot combine them into meaningful sentences—just as some forms of apraxia exhibit a deficit in programming sequences of meaningful action, rather than in isolated motor acts such as reaching or holding. The condition known as ideomotor apraxia (Goodglass and Kaplan, 1963; Poeck and Kerschensteiner, 1971; De Renzi, et. al., 1968; cf. Geschwind, Quadfasel, and Segarra, 1968) suggests a disturbance in an underlying deep structure very similar to that which makes propositional language possible. Both motor skill sequences and sentence constructions are adversely affected by the same lesion in many instances. It could be that this fundamental capacity to acquire and utilize complex patterned sequences, expressible in tool-manipulation, in gesture-language, and later in speech, is the "deep structure" Chomsky really should have been writing about, and that in the long course of hominization, it is the evolutionary growth in this kind of

syntactic capacity that has been so important, and not its separate manifestations in technology and language.

Motor guidance is a means of teaching new manipulatory or gestural behaviors, which consists of the mentor's actual positioning and movement of the learner's hand or hands or other body parts in conformity with the new pattern. Roger Fouts found that this was the most effective way to teach young chimpanzees new gestural signs (1970, 1971), and this method is widely used in teaching motor skills to children or adults. If such a teaching procedure came to be used during the early growth of tool-using and gestural language, it would have accelerated cultural growth. Unfortunately we have no way of determining the antiquity of this teaching method. It is important to note that such methods are not especially applicable to the acquisition of spoken language (as teachers of speech to the profoundly deaf have discovered), and that the normal hearing child must acquire speech in other ways.

Play should be mentioned as a possible arena for the interaction of tools and language. Among modern children, play is often imitation of adult motor behaviors. In older children it includes manipulation of mock-tools or weapons, and in less technologically developed cultures, of "toys" improvised from convenient natural environmental materials such as sticks, stones, sea-shells, or mud. With a postulated manual gesture language system, we would expect such play to include similar imitations of adult gestural behavior, just as it now contains much imitation of adult speech. Denzin has recently called attention to the prelinguistic gestural behavior of children (1971), in a paper which seems very pertinent here.

Without trying to justify each statement, I shall now outline my notions of the early phases of the interrelated development of language and tools.

I. For a long time, protohominids moved slowly toward bipedal locomotion in more open environments, shifting to a mixed diet (cf. Jolly [1970] on the possible part that grass-eating may have played), catching of small animals, and the making of simple tools on the order of termite-fishing twigs, palm-nut hammers, or water-soaking pads, along with tree-branches and rocks. Social communication continued to be based, as in other primates, on body postures and move-

ments, facial expressions, and vocal calls, along with some displays making use of extrasomatic objects such as sticks and branches, large stones, and handfuls of soil, sand, or gravel.

A few manual and arm gestures, describable as "pointing", may also have become part of the protohominid behavioral repertoire.

II. As territorial ranges expanded, more pressure was placed on landmark-based terrain orientation, trail-recognition, and perhaps a concomitant development of gestural signs related to terrain intelligence. Certainly ineptness at following routes through larger, open territory would have exerted a strong and, at times, even lethal pressure on individuals unfortunate enough to lose their way. Tools underwent further evolution and came to consist of some Oldowan lithic items, more carefully selected, prepared, and utilized sticks, etc., and possibly some osteodontokeratic tools of the kind which Dart has discussed. Transmission of the skills in selecting the raw materials and later fashioning of these tools, to say nothing of using them, would depend, as it does in the chimpanzee, on visual observation by juveniles of the manipulations or gestures of their elders. Observation would have sufficed for the acquisition of ways such tools would have been used to cope with the environment, whether in hunting, butchering, digging and other ways of getting plant foods, processing hard-shelled and otherwise not readily eatable foods, or the gestural signs used in integrating information about these and other activities. So far little pressure would have been generated for further development of cross-modal transfer of learning capacity, beyond what may exist in the modern pongids.

III. By the time culture had reached a "developed Oldowan" level, a modest gestural vocabulary may have been in existence. Technology, gesture language, increased terrain or geographic cognizance—now including some understanding of the movements and habits of game animals, of the ecological settings favorable for particular plant foods, under different seasonal conditions—and even some new social patterns, such as mating constraints, food-sharing, and the like, may have combined to initiate cerebral lateralization. Preferential handedness could have been important both in tool-manipulation and gestural language, and thus specifically instrumental in lateralization.

represented even though at some stage in hominization it became possible for propositional communicative functions to operate more independently of the manipulatory, constructive function.

Nothing in what I have been saying minimizes the possibility that onomatopoeia and sound-symbolism might have been of some service to hunters. Even the characteristic noises made in using certain tools could have generated some "onomatopoeic" names, although I doubt that this was a major source of any vocabulary. I am struck by the fact that in our noisy world of modern mechanical devices, some children exhibit a remarkable capacity for mimicry in this direction, even though such sound-imitations are very rarely converted into normal words. Hockett's idea that closed primate vocal calls would have led to more complex, blended new vocables, however, strikes me as unlikely (Hockett and Ascher, 1964).

A minor carry-over from the world of tools and tool-using to speech may survive in the form-classifiers which occur in many language families, although other sources for them can be suggested.

A factor which has not been emphasized and one which does not really constitute a linkage with tools, in connection with the emergence of spoken languages, is what we may call the biological benefit of Babelization. Among birds, "dialect" differences in song-patterns function as territorial markers, ultimately promoting survival through population dispersion. The diversity of spoken languages is usually regretted as a barrier to cultural contacts or as a frequent factor in military conflict, and so on. But it seems possible that diversity in local spoken language might have had some of the advantages that different birdsong dialects possess, or that territorial marking in general confers on many other species of animals. Now, as I have suggested, gesture-languages may have exhibited minimal ambiguity, and high iconicity, given the competing stimulus complexities of the visual field. But spoken language occupies a clear channel most of the time, and iconicity, aside from some traces of sound-symbolism, is unimportant. Phonetic drift and diversification may have been characteristic of speech almost from the start, whereas gesture even now may retain a basic universality.

Along these lines I may also suggest that not only did speech create new neural mechanisms for its rapid decoding, but that the olfactory sense, weak among the higher primates, may have been

cross-modally linked with visual inputs, also in connection with the hunting way of life. Human powers of smell are no more acute than those of apes, but we may surpass the apes in our ability to link visual memories with complex odors. It is not only French novelists who have been aware of the tremendous evocative power of old, familiar smells, and our remarkable capacity to re-experience complex events in visual settings when we sniff some unusual combination of odors out of times past.

Some traces of these postulated evolutionary events may explain recently detected sex-differences in sensory perception and analysis of percepts. Boys tend to exceed girls in their ability to analyze or identify environmental sounds, including animal calls, whereas girls are superior in analysis and identification of human speech sounds, on the basis of experiments with dichotic hearing (Kimura, 1961; 1967; Knox & Kimura, 1961). The experimenters believe their procedures rule out obvious experiential differences between boys and girls. No one seriously supposes that the consistent precocity of girls in acquiring speech, and their lower incidence of speech defects can be attributed to cultural learning differences (Gray and Buffery, 1971). The point is that these differences are compatible with our reconstructions of early hominid behavior, in which males would have been the principal hunters, trackers, and protectors of the group—with a survival premium on ability to analyze environmental noises, as well as spatial and constructional abilities—whereas females, as the main transmitters of speech to infants, as well as the sex with the greater need to detect the emotional overtones of vocal messages, could be expected to be more precocious in language-learning and less prone to speech-defects (Gray and Buffery, 1971).

We could break off our account here, with language now firmly vocal, except that the Upper Paleolithic exhibits an explosive upswing not only in technology, but in evidence of greatly increased cognitive and communicative powers. As André Leroi-Gourhan show us, Upper Paleolithic art can be regarded as "frozen gesture," embodying very complex cognitions. Alexander Marshack has recently examined much European Upper Paleolithic "art" on the assumption that some of it is a sophisticated notational system, partly for calendrical purposes (Marshack, 1964, 1970). Only a few millennia later, growing out of a comparable pictorial and notational art,

the first writing appears in the Middle East. Tools were now employed in direct relation to language—to engrave, impress, or paint the little pictures of animals, people, body-parts, plants, but also tools and weapons—which make the earliest writing systems more like manual gesture signs than like speech. But it was not long before the pressures of spoken language made these scripts into partly phonetic systems, and eventually into nearly completely phonetic writing—in the form of syllabaries or the alphabet. Pictorial graphics did not disappear, and they have enjoyed a significant modern comeback, despite the expansion of literacy based on phonetic scripts. Such pictorial signs have become frequent along international highways, in airports, and in great cities catering to travellers from different language areas.

I hesitate to join McLuhan in the claim that we are already in the post-Gutenberg Era, but the impacts of photography and the more recent electronic visual media force us to take a new look at writing, and even more fundamentally, at the spoken word. We are so used to speech and writing, and so impressed with the enormous powers their use has conferred on our species, that we may fail to see how awkward they are. Both spoken language and writing could be considered clumsy makeshifts, forced on a creature whose basic contacts with reality are visual and tactile. Until our own times, technology was unable to record for instantaneous transmission over immense distances, broadcast or to particular individuals, total facsimiles of complex visual events, in movement and color, and with sound accompaniment. Until 140 years ago, in fact, the replication of a single, motionless frame representing a visual scene required the work of a skilled artist for many hours or days, and further duplication, with great loss of fidelity, the work of engravers and printers. Such single frames of visual experience can now be prepared in milliseconds. The connection of tools to language has taken a most unexpected turn: many of the purposes for which language came into being in the first place can now, in principle, be taken over by tools, although it is clear that such tools or machines could not have been created without the antecedent use of language. Writing, much less speech, is not about to disappear, even though for many purposes machines have been created which handle non-language information at fantastic speed, not merely recording and storing it, or disseminating it, but analyzing it in ways very remote from spoken or written words.

Given the foregoing web of speculation, it is appropriate to ask if any part of it can be tested, or is falsifiable. Some points, as I have indicated, are based on experimental, clinical, or field observational work, though little of it so far has been conclusive. Validation of the entire hypothesis would require a huge research investment. Certain approaches are foreclosed: we cannot repeat Psammetichus' experiment on primordial speech, as reported by Herodotus. It is not feasible to wait for more wild boys from Avyeron, Caspar Hausers, or Indian wolf-children. On the other hand, there are great prospects for further work with chimpanzees, not only with language but with tool-using, just as we can expect much more to come from studies of aphasias, apraxias, child language, the deaf, speech pathology, and psycholinguistics. On the technological side, I would hope that prehistoric archaeologists interested in technology, as well as in ancient environments and social organization, might join with physical anthropologists knowledgable in primate behavior and the hominid fossil record, along with students of perceptual and motor skills. So far the interchanges among anthropologists, psychologists, and neurologists have tended to deal with such questions as man's inherent aggressiveness. I should like to see more attention devoted to what has given man his characteristic position on this planet: his tools and his language.

I am much indebted to Drs. R. Allen Gardner and Beatrice Gardner for several opportunities to visit them and their chimpanzee Washoe in Reno, Nevada. I am also grateful to Dr. David Premack, Santa Barbara, for a similar visit with him and the chimpanzee Sarah. In the summer of 1971 I was able to visit the chimpanzee group at the University of Oklahoma, in Norman, under the general direction of Dr. William Lemmon, where Dr. Roger S. Fouts is continuing the sign-language study with Washoe and several other chimpanzees. On that same trip I also visited the Delta Regional Primate Research Center, Covington, Louisiana, where I observed experiments with chimpanzee groups being carried on by assistants of Dr. Emil W. Menzel, Jr.

In 1968, thanks to a faculty fellowship from the University of Colorado, I was able to visit various African game reserves—in Kenya, Tanzania, South Africa, and Nigeria—where I observed wild baboons and other primates, but unfortunately no chimpanzees. I am also pleased to record my gratitude for hospitality provided on two visits to the Japan Monkey Centre at Inuyama and two monkey colonies on islands near Nagoya.

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Qwerty birthday

A hundred years ago last week Christopher Latham Sholes sold the idea of a production typewriter to Remington, the American gun and sewing machine worker. It was an idea which needed some hard selling. The astute Mr. Sholes told Mr. Remington that the "QWERTY" keyboard had been specially designed for speed and efficiency. So it had, but in a rather unusual way. Mr. Sholes had been unable to devise a keyboard which could be worked at speed without the keys jamming inextricably.

He turned to his brother-in-law, a mathematician, who devised the most inefficient keyboard the alphabet could fit, so that the fingers had to jump the farthest possible distance between the keys. It reduced the number of jammed keys per line, but even so, keyboard difficulties so delayed Mr. Remington's production that his typewriter company got into financial trouble, and he sold out to the Union Typewriter Company, which continued to use the Remington name.

Only 1,000 of those typewriters were ever produced. Sixteen are known to have survived and two of them are in the British Typewriter Museum, organised as a labour of love by Mr. W. A. Beeching. His book, *The Century of the Typewriter*, the first book the machine has inspired, is to be published later this month. He points out that Mr. Sholes was the 52nd man to invent the typewriter. The first was Henry Mill, an Englishman, who was granted a patent for a writing machine by Queen Anne in 1714. Nothing whatever is known of the Mill machine, but it and the next 50 inventions were all "one-off jobs," Mr. Beeching says.

Most of them were based on the piano keyboard and none of them was designed for the mass production which Mr. Sholes had in mind. Not that his invention was particularly sleek. It was built on a sewing machine chassis, the operator had to depress a foot pedal to go from one line to the next and it typed only in capital letters. But it was good enough for Mark Twain to peck out his *Life on the Mississippi* and to begin the routine of the modern office. . . .

—Martin Walker

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Introductory Education in Typography

Daniel Friedman

Design schools which deal with typography are plagued with inviable conventions, the phase out of typography as a handcraft, and an inaccessibility to the potentials of the newer, complexer, typesetting systems. Typographic form is being taught in terms of outdated mechanics and popular fashions ; no teaching methodology exists which will transcend the technical and stylistic and deal only with the generically perceptual or visual. The author shows examples of a simple typography exercise and from this exercise, makes general observations regarding simplicity and complexity, rhythmic structure, coherency, convention, unpredictability, legibility and readability.

Education in typography for designers is going through a major transition. It is in a period of frustration and renewal. Again and again, existing teaching methods seem to perpetuate the same typographic conventions. Perhaps the reason is that these methods have relied heavily upon an education in technical competence, historical preservation, and commercial simulation. They do not, however, rely upon the exploration of an open-ended, creative, new vision.

I do not mean to suggest here that an understanding of the technical complexities of typography, a knowledge of an historical context, and an awareness of the prevailing fashions are irrelevant to creative design. But such an understanding has been the substitute rather than the support for an imaginative visual education in typography, and it has clouded the path for students who wish to promote a fundamentally creative disposition.

What we realize is that any really new typography will be derived from a truly artistic energy and not automatically from the technician, historian, or practitioner—no matter how "competent" he may be. For this reason, a few schools in graphic design and typography are now trying to take advantage of the very unique position which higher education has in our society—a position which they perhaps failed to recognize in the past. It is a position which provides the opportunity to know existing standards but also to search freely for alternatives ; to experiment with typographic syntax liberated from the practical limitations of client or deadline ; and, to prepare students so they can be depended upon in the future for significantly fresh thought and action.

The advancements in the technology of typesetting and the (perhaps premature) death of letterpress have further complicated typographic education. Few schools can still afford to maintain a shop for metal typesetting, and even fewer can afford to convert to the newer, more sophisticated phototypesetting devices. Many schools must now depend upon typesetting machines such as the Phototypositor and the IBM Selectric Composer, and on Zerox or Diazo machines for printing. Trying to make do with the limitations of these rather primitive processes has the advantage of putting education on a survival basis which in some ways makes this a period of retrogression rather than of positive transition toward a new, highly sophisticated technology. Schools are searching for a way out of the problems created by the gap between a typesetting technology of the past which is disappearing too fast and the prospects of the future which are not yet fully accessable.

Visible Language, VII 2 (Spring 1973), 129–144.

Author's address : Department of Graphic Design, Yale University, New Haven, Conn. 06520.

The typographic principles applied to the newer typesetting methods still pivot (perhaps anachronistically) out of all that has evolved in the craft of handset composition ; against this the possibilities of the newer photographic methods imply and facilitate an emancipation from the characteristic restrictions of letterpress. A student who has no access to handset composition, cannot easily recognize the basis for the existing typographic measuring system. The fineness, order, and good proportion almost inherent to type when it is thoughtfully composed from metal becomes a lost experience. Without a knowledge of the conventional rules which stem from good letterpress typography, the student can neither work with or against those rules nor is he usually in a position to explore the new freedoms implicit in newer typesetting systems. Where students are lucky enough to have access to such systems, inclusive of computerized editing capabilities, the production methods have tended to be too sophisticated compared to the student's own flexibilities in designing a modest visually coherent, typographic composition. This has indicated a need for a much stronger introductory education in typography, based more on the generically perceptual or purely syntactic characteristics of arranging type on the page than on the technical characteristics of typesetting methods which are in many ways antiquated once they are learned.

Weathering information

A new method for teaching basic criteria for typographic order, harmony, and proportion is being investigated. It is a method more aligned with drawing, painting, and creative writing than with the technicalities, terminologies, and styles of the typography of the past and present. Shown on the following pages are some results of an exercise done in my classes for introductory typography. The students were graduate students in graphic design at Yale University and undergraduates at Yale and the Philadelphia College of Art.

These students were given a randomly selected weather report set initially in 30-point Univers in both a normal and bold weight. This particular message and typeface were chosen for their non-persuasive and rather ordinary content and as a vehicle for syntactic (and semantic) exploration. The examples on the following pages are not meant to be results, ready to be applied to television or press, but an expression of a program for perceptual learning. While the permutations are on a relatively basic level to facilitate comprehension, the same theories would apply to more complex situations.

Weather:
Sunny, hot, humid
today and tomorrow.
Fair and warm tonight.
Temperature range:
Today 96-75
Tuesday 94-72

Weather: Sunny, hot, humid
today and tomorrow.
Fair and warm tonight.
Temperature range:
Today 96-75
Tuesday 94-72

The problem was to play out a number of different design operations upon the given message, within a composition of square (neutral) proportions. Variations were programmatically developed in sets ranging from simple to complex. The main concern was to observe the effects of message variation, accomplished solely through perceptible, visual changes in :

position
type weight
type size
slant (italic)
line spacing
word spacing
letter spacing
clustering
symbolic gesture
pictorial
confrontation

Weather: Sunny, hot, humid today and tomorrow. Fair and warm tonight. Temperature range: Today 96-75 Tuesday 94-72

Weather:
Sunny, hot, humid
today and tomorrow.
Fair and warm tonight.

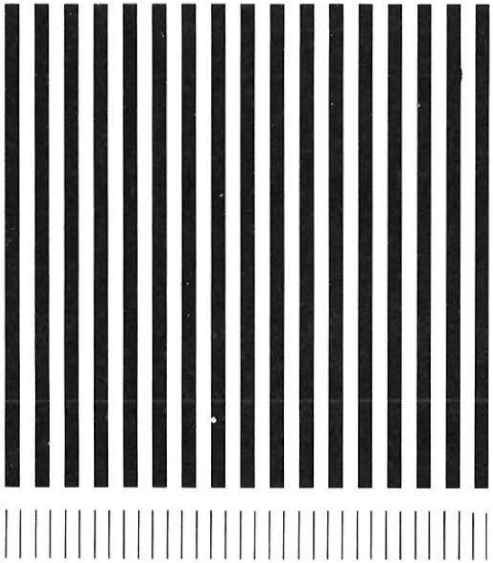
Temperature range:
Today 96-75
Tuesday 94-72

Weather:
Sunny, hot, humid
today and tomorrow.
Fair and warm tonight.

Temperature range:

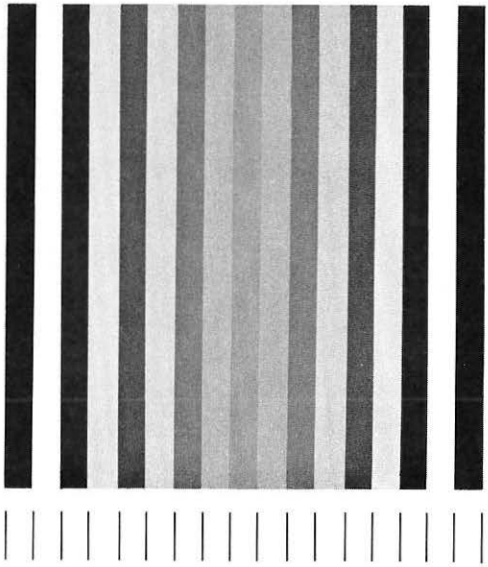
Today 96-75

Tuesday 94-72



Repetitious intervals

Repetitious values

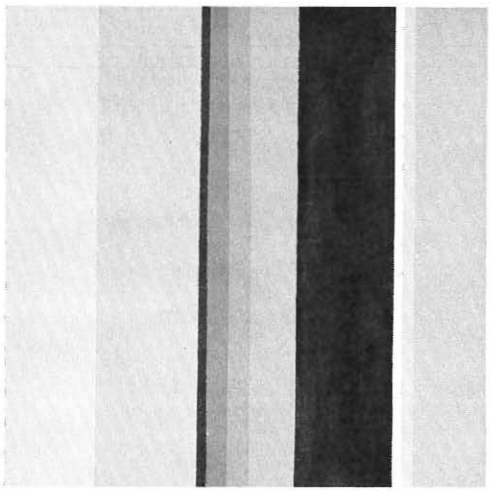


Repetitious intervals

Progressive values

Hybrid values

Hybrid intervals

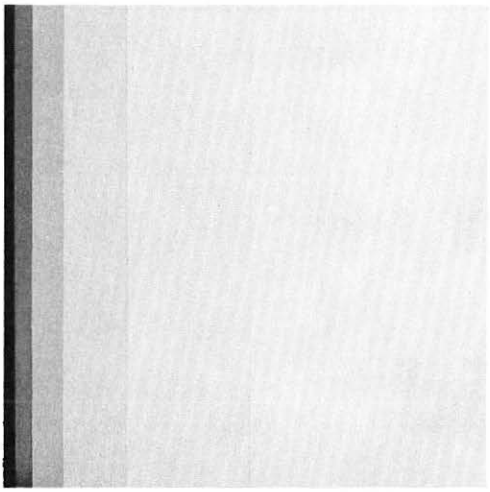


Rhythmics and structural notation

Designing with type must be preceded by a basic knowledge of proportion, harmony, and rhythm. Shown here are rhythm exercises using vertically delineated intervals and values ranging from black to white. They are based on three rhythm structures:

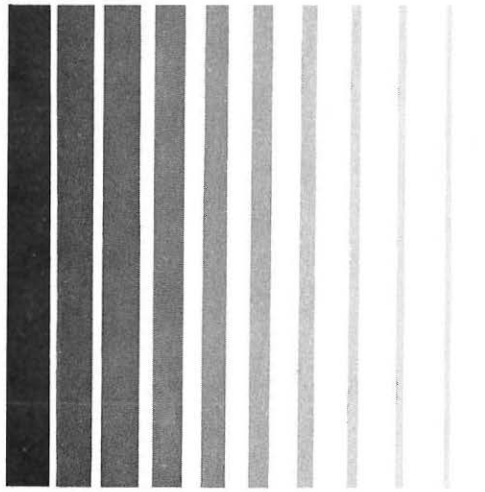
a repetition (static)
b arithmetic and geometric progression (dynamic)
c hybrid (dynamic repetition/progression mix)

Designing with these rhythms in mind provides for methodically creating structural order without loss of flexibility in choice. The rhythms are easily applied to the arrangement of type and can be made explicit and more versatile through notational translation.



Progressive intervals

Progressive values

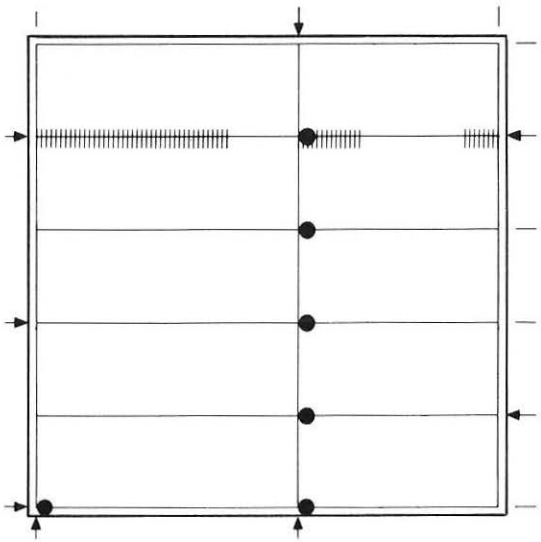


Progressive intervals

Hybrid values

A structural translation of a typographic composition

	Weather:	
Sunny, hot, humid	**T**oday	and
	Tomorrow.	
Fair and warm	**T**onight.	
	Temperature range:	
Today 96-75	**T**uesday 94-72	




Weather:
Sunny
hot
humid
today and
tomorrow.
Fair and warm
tonight.
Temperature range:
Today 96-75
Tuesday 94-72


sunny
Weather:
hot
humid
today and
tomorrow.
Fair and warm
tonight.
Temperature
range:
Today 96-75
Tuesday 94-72

Internal and external coherency

Weather:

Sunny

hot

humid

today

and tomorrow

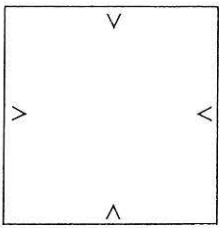
Fair and warm tonight.

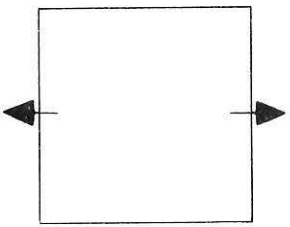
Temperature range:

Today 96-75

Tuesday 94-72

Studies involved the optimal clarity and activity of each individual typographic composition





and the fitness of one composition to others in a group or sequence.

Weather:

Sunny

h o t

humid

and

today

tomorrow.

and

Fair warm t o n i g h t.

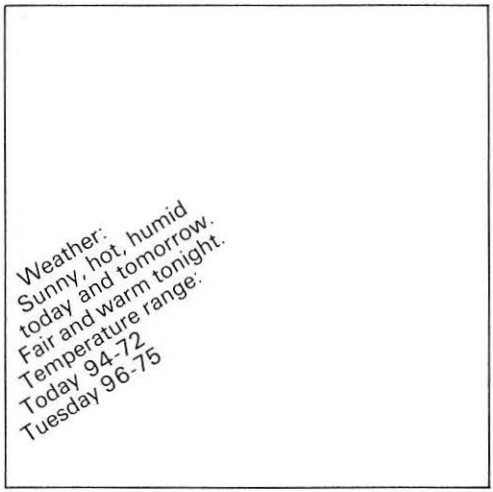
range:

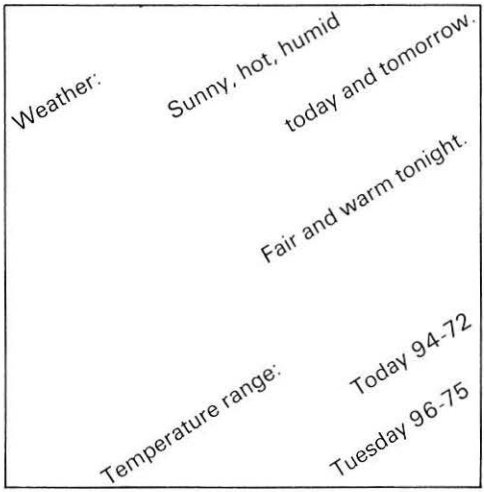
Temperature

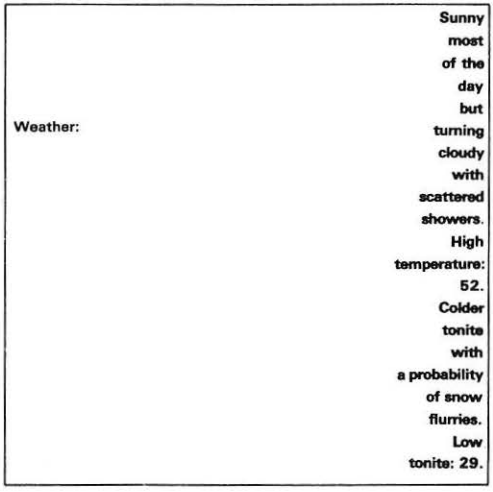
Today 96-75

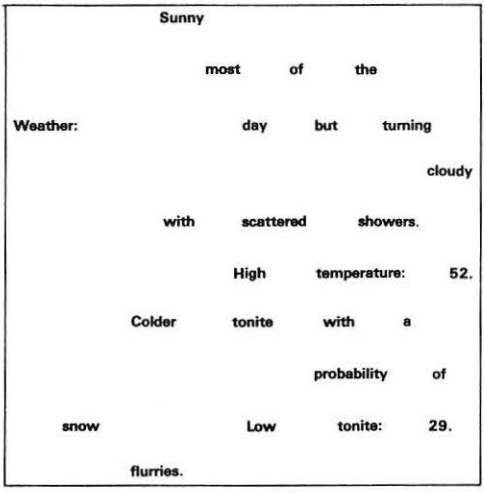
Tuesday 94 - 72

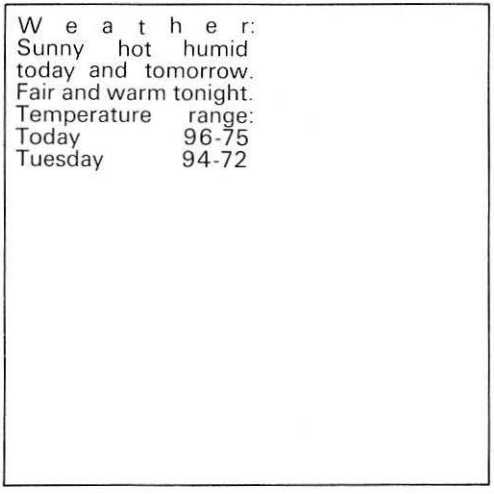
Making coherent groups of compositions evolves naturally into a discussion about typographic grid structures.

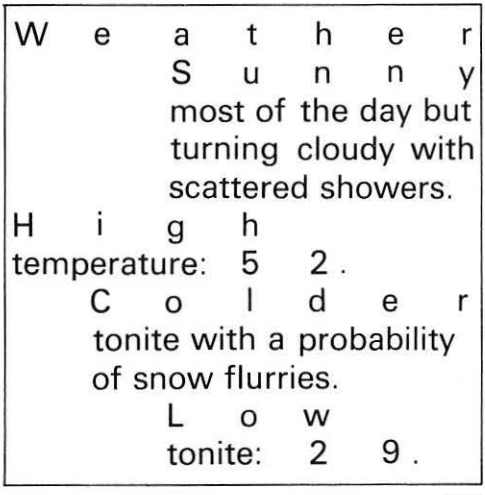

Weather:
Sunny, hot, humid
today and tomorrow.
Fair and warm tonight.
Temperature range:
Today 94-72
Tuesday 96-75


Weather:
Sunny, hot, humid
today and tomorrow.
Fair and warm tonight.
Temperature range:
Today 94-72
Tuesday 96-75


Weather:
Sunny most of the day but turning cloudy with scattered showers. High temperature: 52. Colder tonite with a probability of snow flurries. Low tonite: 29.


Weather:
Sunny most of the day but turning cloudy with scattered showers. High temperature: 52. Colder tonite with a probability of snow flurries. Low tonite: 29.


Weather:
Sunny hot humid
today and tomorrow.
Fair and warm tonight.
Temperature range:
Today 96-75
Tuesday 94-72


Weather
Sunny most of the day but turning cloudy with scattered showers.
High temperature: 52.
Colder tonite with a probability of snow flurries.
Low tonite: 29.

Weather:

S u n n y

most of the day
but turning **cloudy**
with **scattered showers.**

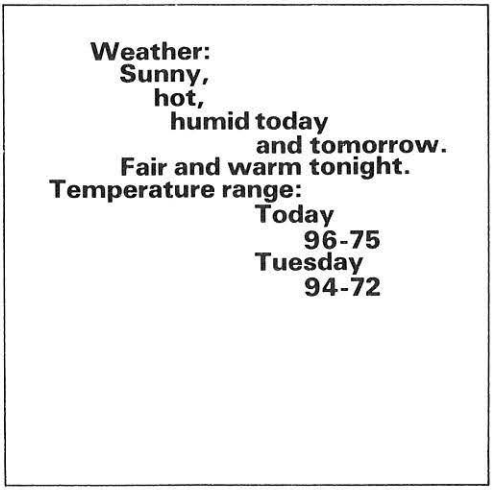
Colder tonite
with a possibility of

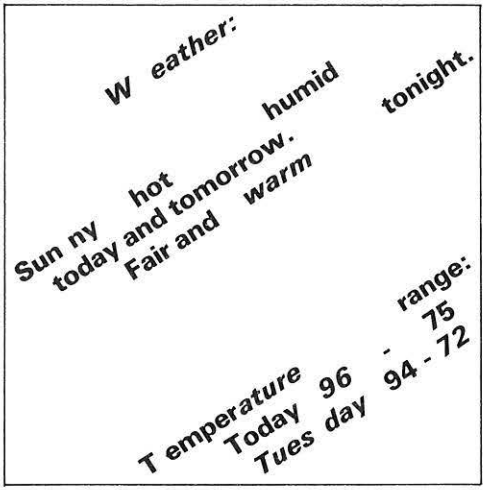
l u r e
S f **n** i **o w**
r s.

High temperature: **52.**
Low **tonite: 29.**

ART =
The unpredictable state of messages

Using the same message, experiments were made which show states of simplicity and complexity, the normal and the distorted, the static and the dynamic, and their subsequent effects on legibility and on originality.
Is legibility based on convention, and is convention based on legibility?


Weather:
Sunny,
hot,
humid today
and tomorrow.
Fair and warm tonight.
Temperature range:
Today
96-75
Tuesday
94-72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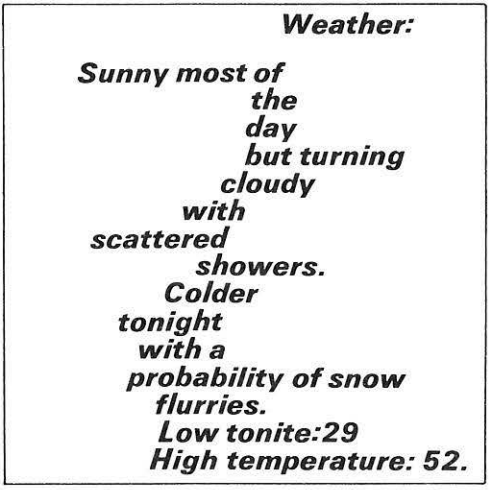
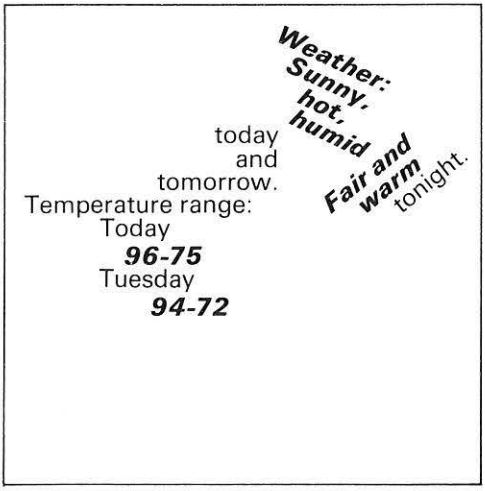
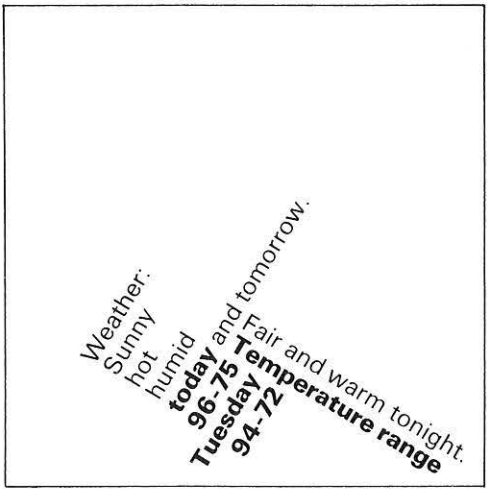
75
T emperature 96 -
Today
Tues day 94 - 72


Weather:
Sunny most of
the
day
but turning
cloudy
with
scattered
showers.
Colder
tonight
with a
probability of snow
flurries.
Low tonite:29
High temperature: 52.


Weather:
Sunny.
hot,
humid
today
and
tomorrow.
Fair and
warm
tonight.
Temperature range:
Today
96-75
Tuesday
94-72


Weather:
Sunny
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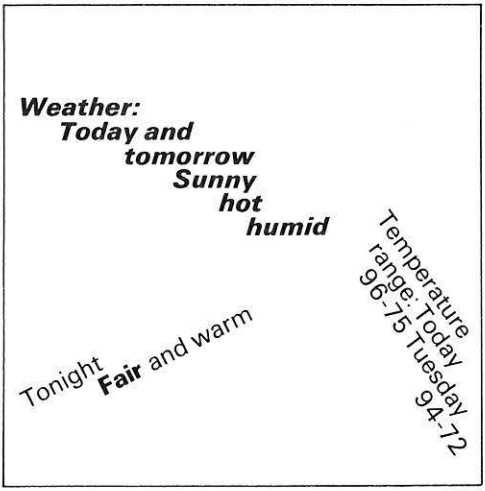
96-75
Tuesday
94-72
Temperature range
Fair and warm tonight.


Weather:
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Sunny
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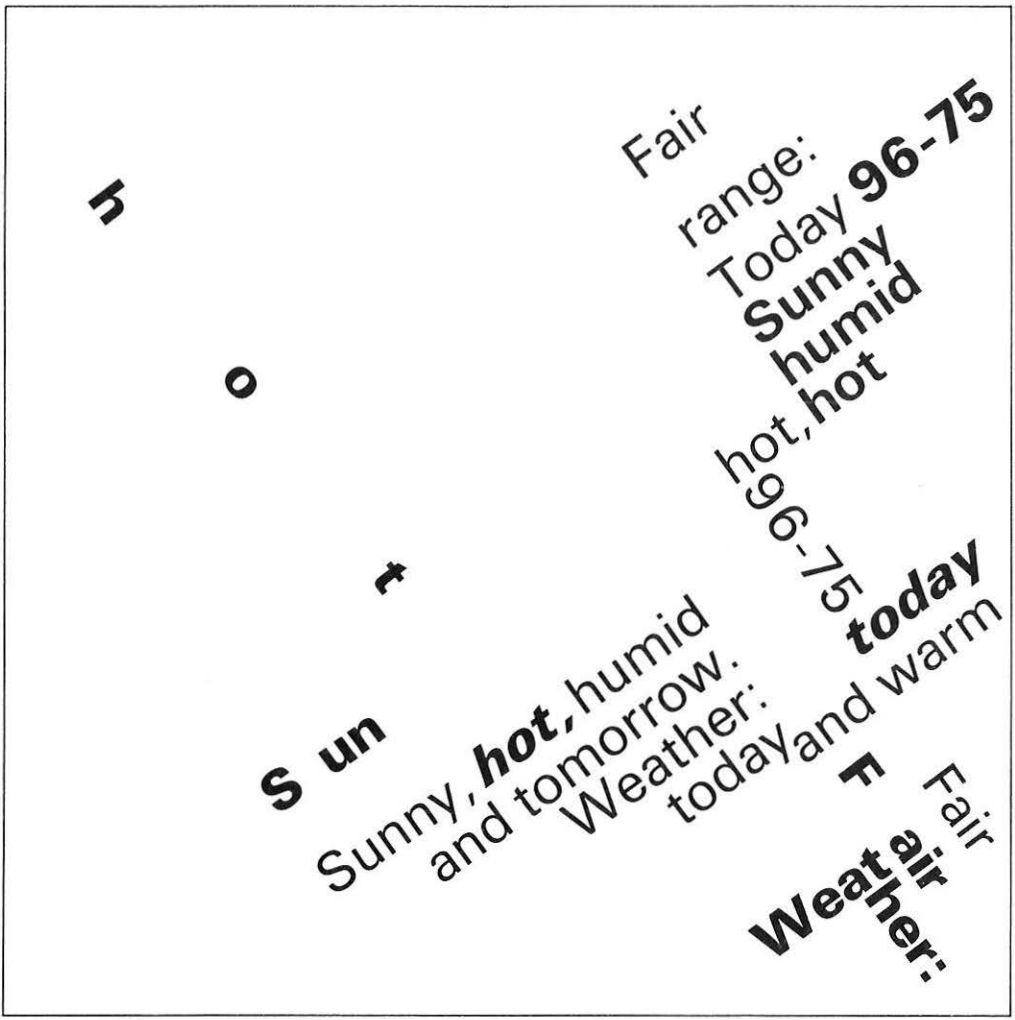
Tonight
Fair and warm
Temperature
range: Today
96-75 Tuesday
94-72



Legibility vs. Readability

functional	unconventional
orderly	disorderly
simple	complex
legible	unpredictable
static	dynamic
banal	original

We contend that legibility (a quality of efficient, clear, and simple reading) is often in conflict with readability (a quality which promotes interest, pleasure, and challenge in reading). To what degree can a typographic statement be **both** functional **and,** at the same time, aesthetically unconventional

Weather:

Sunny

hot

humid
today and tomorrow.

Fair and warm tonight.

Temperature range:

Today

96-75

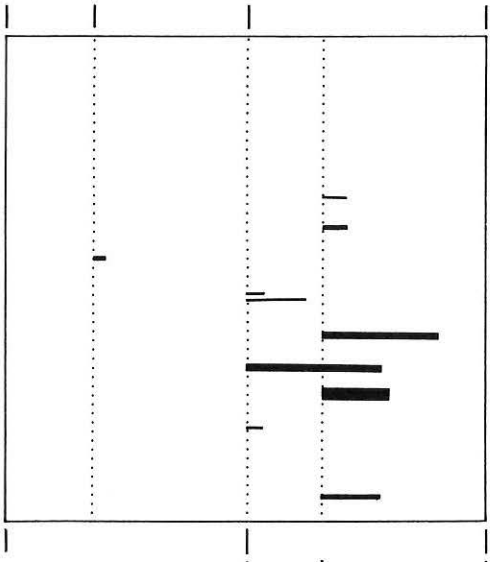
Tuesday 94-72

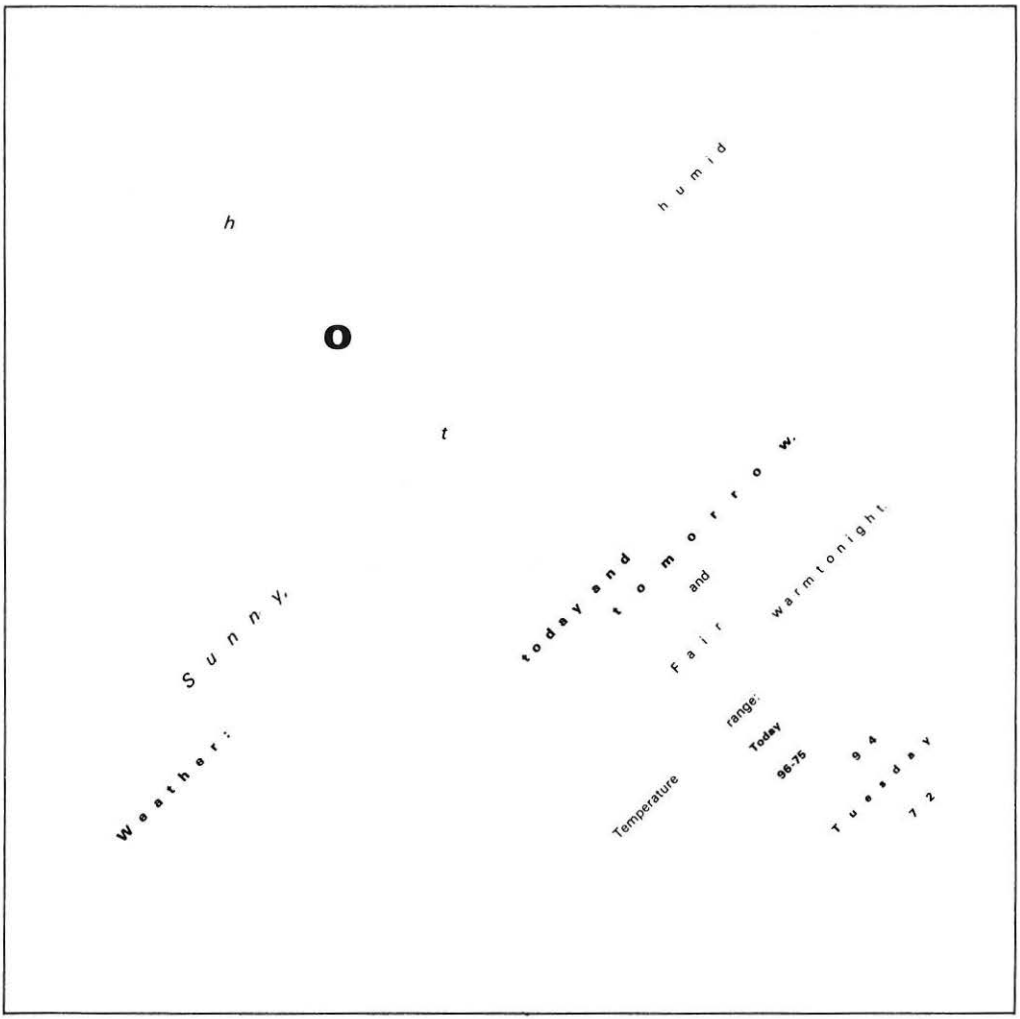
Making structure visible

The composition is organized by a hybrid of repetitious and progressive vertical rhythms. The line intervals along each vertical axis are also based on repetition and progression.

Type sizes and weights are based on progressive values.

Line lengths are based on progressive size intervals.

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Weather:
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Fair warm tonight
Temperature range:
Today
96-75
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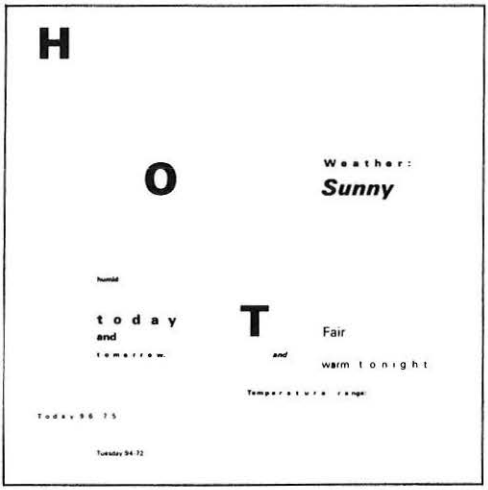
H
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Weather:
Sunny
humid
today
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tomorrow.
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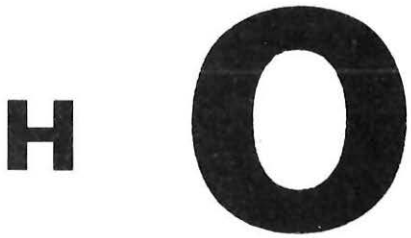
Fair
warm tonight
Temperature range:
Today 96 75
Tuesday 94 72

Sunny



Weather:

humid

today

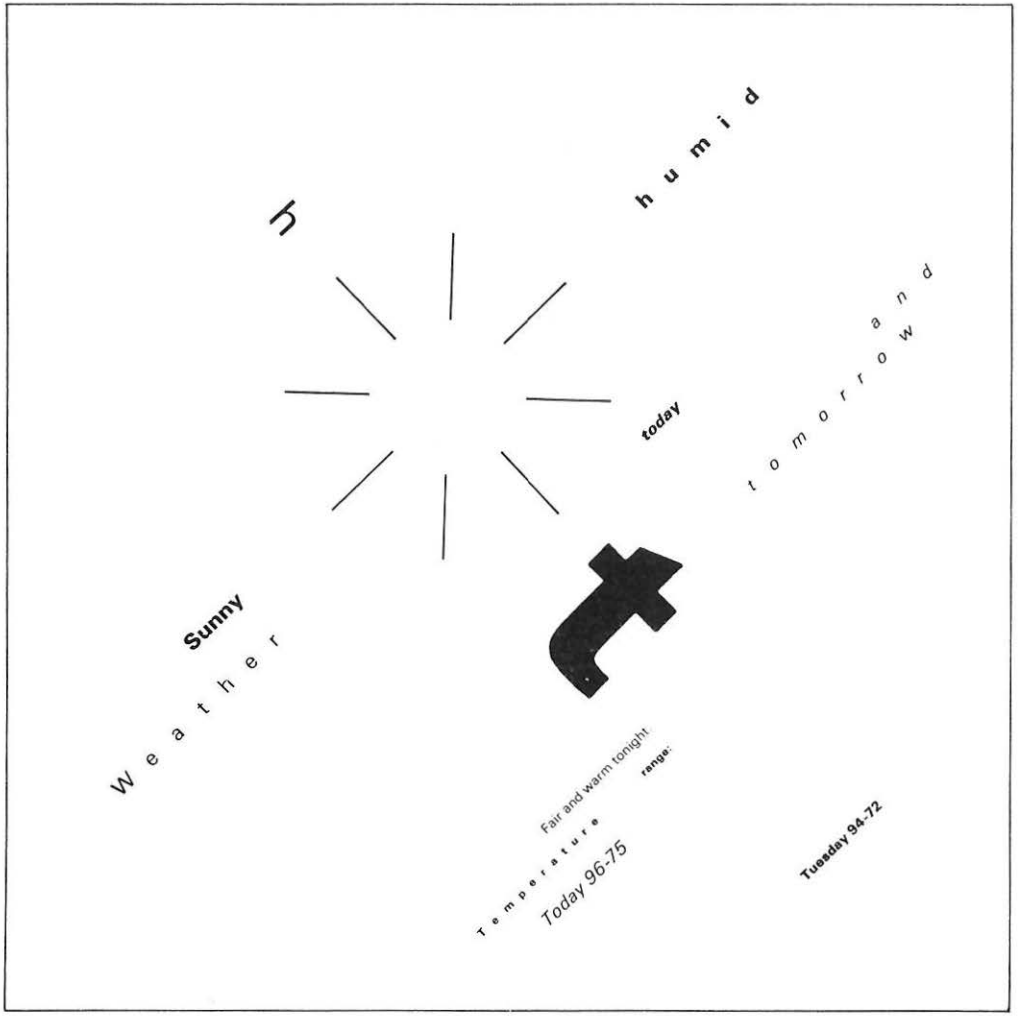
and
t o m o r r o w
F a i r

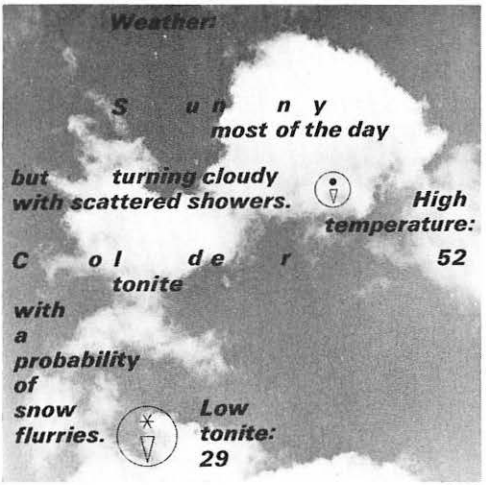
and

w a r m **tonight.**

Temperature range:

Today 96-75
Tuesday 94-72


humid
today
tomorrow and
Sunny
Weather
Fair and warm tonight
range:
Temperature
Today 96-75
Tuesday 94-72


Weather:
Sunny
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High
temperature:
Colder
52
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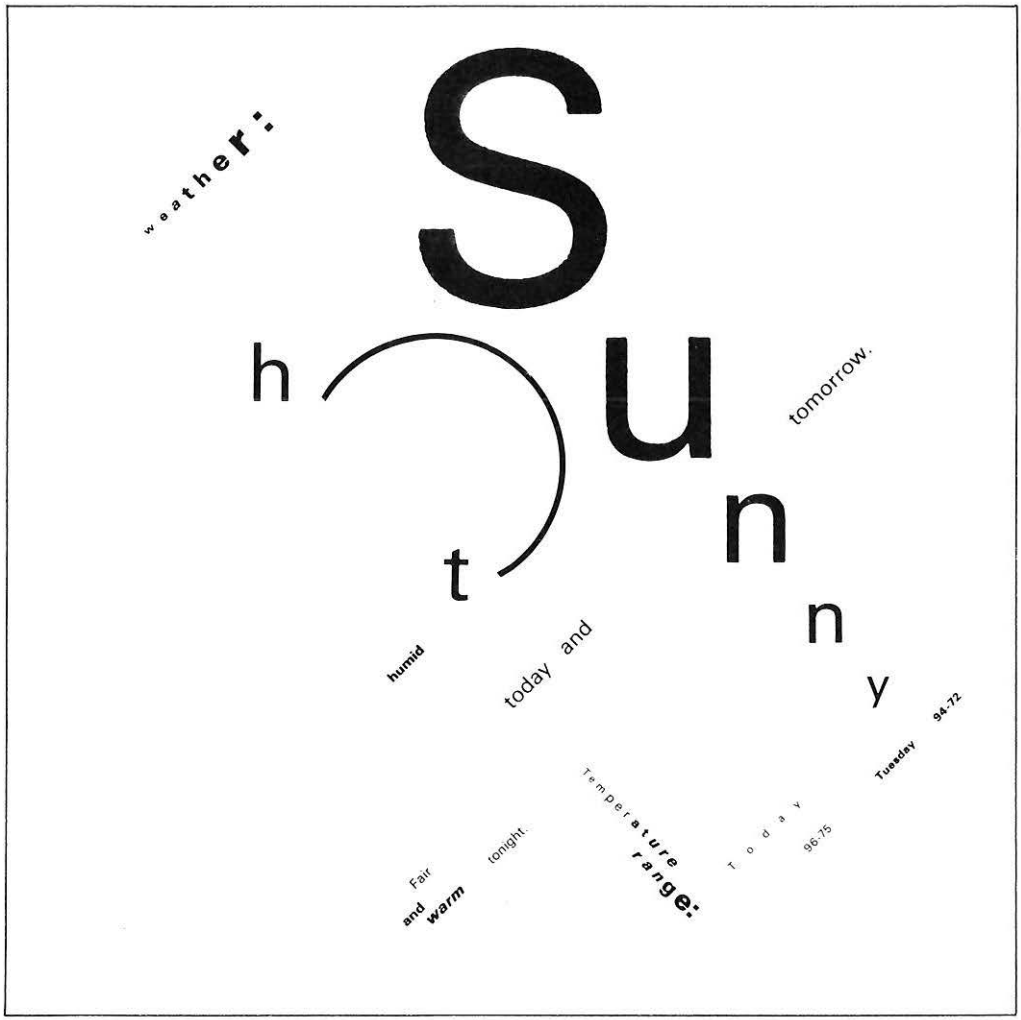
with
a
probability
of
snow
flurries.
Low
tonite:
29



Student work by

Rosalie Hanson
Wayne Bokum
Richard Burgess
John Devine
Cathy Johnson
Peter Johnson
Azar Khosrovi
Andrea Mackler
Lisa Meyerson
Bernt Sanden
Stephanie Segal
Upendra Shah
Susan Thornton
Garretson Trudeau
Rick Villastrigo

Design: D Friedman

Is Literacy Acquisition Easier in Some Languages Than in Others?

John Downing

It is frequently asserted that the Chinese logographic writing system is more difficult to learn than the English alphabetic system. This view seems to be based chiefly on the belief that the large number of Chinese characters is a heavy burden on the student. But this may be a misconception for two reasons: (1) there are far more items to be learned in the English system than is generally recognized; (2) the sheer number of characters to be learned is not in itself an important psychological factor. What is more important is the extent of redundancy in the system. Numerous alternatives may conceal the nature of the written code from the beginner and cause confusion. This and other variables in the writing system may prevent the child from perceiving that writing and print are indeed "visible language."

Whether it is easier to learn to read and write in one language than it is in another is just one of several problems which hopefully may be clarified in the new field of research: "Comparative Reading." This new research approach is based on the proposition that by making comparisons between the reading behaviors of people in different cultures and in varying languages a better understanding will be achieved of the fundamental psycholinguistic processes of reading and writing and the manner in which these are learned. It attempts to draw on the living laboratory of languages and cultures by sampling countries with contrasting linguistic and educational backgrounds.

As an initial effort to open up this area of research, the present author conducted the survey which produced, among many others, the findings reported in this article.

Method

Fourteen nations were slected to represent varying cultural, educational, and linguistic phenomena. These were: Argentina, Denmark, Finland, France, Germany, Great Britain, Hong Kong,

Visible Language, VII 2 (Spring 1973), 145–154.

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Israel, India, Japan, Norway, the Soviet Union, Sweden, and the United States. For each nation experts were selected to write a report on reading in that country. A copy of an earlier speculative paper (Downing, 1969) on the comparative reading method was given to each of the national authors. This insured that everyone would work toward a common set of aims. In addition, each national author was sent an outline of the probable form of the final report to show how his part would fit into the total project, plus some guidelines for preparing his national report. These indicated that the future readers of *Comparative Reading* would wish to compare one national report with another, and that therefore it would be helpful if each author would consider this when writing. However, the guidelines concluded, "The above list is only intended as a guide to some of the variables which have been mentioned by people interested in comparing reading in different countries. There may be other more important problems which must be understood in the study of the reading of a particular country."

This final instruction stressed the open-endedness of the inquiry, because an important aim was to permit spontaneous responses that might show the differences in cultural priorities from one country to another.

The difficult task of analyzing all the resulting data has been guided chiefly by one of Bereday's (1966) principles for comparative education, that ". . . never-ceasing watchfulness by the observer to control his own cultural and personal biases." An important additional precaution that has been taken is to publish in full (Downing, 1973) all the original data from the fourteen countries so that the reader can interpret them himself.

Results

This comparative reading study has indeed proved fruitful; new light is thrown on a number of different aspects of literacy acquisition. But this article focusses on the important question: Is literacy acquisition in the learner's mother tongue easier in some languages than it is in others? For example, it is frequently asserted that it is harder for Chinese-speaking children to learn to read than it is for English-speaking children. Another popular view in the English-speaking countries is that Spanish teachers of reading have an even easier task in developing literacy in their students.

Conventionally, writing systems are classified into three types. For example, Lado (1957) has three categories "according to the units of language that they represent." These are:

1. *Alphabetic* writing systems in which the characters represent phonemes of the language.
2. *Syllabic* writing systems in which the characters stand for syllables rather than phonemes.
3. *Logographic* writing systems in which the characters represent morphemes—that is, units of form and meaning—rather than units of sound such as syllables or phonemes.

All three of these types were represented in the present study. For example, Great Britain, Israel, and the USSR all have *alphabetic* writing systems, although the actual characters used to represent the phonemes of English, Hebrew, and Russian, respectively, are different. Hong Kong provides a case of a country using a *logographic* system for its Chinese language. Japan generally combines *syllabic* and *logographic* systems.

The general belief is that the order of difficulty in learning these alternatives is from alphabetic (the easiest) to logographic (the hardest) with some uncertainty as to the level of difficulty of syllabic writing systems. For example, Goody (1968) states, "Many scholars of China have seen a connection between a low literacy rate and the use of a non-alphabetic script." He quotes one Chinese writer: "The 'Chinese script' of China is certainly too difficult for the masses and only the gentry class can have time enough to learn it, so that politically and culturally it is an enormous impediment."

What is believed to be the cause of the difficulty in the Chinese logographic writing system? Goody states that "Any system of writing which makes the sign stand directly for the object must be extremely complex." This complexity arises, Goody claims, because Chinese "can extend its vocabulary by . . . making the sign stand either for a more general class of objects or for other referents connected with the original picture by an association of meanings which may be related to one another either in a continuous or in a discontinuous manner. Either process of semantic extension is to some extent arbitrary or esoteric; as a result, the interpretation of these signs is neither easy nor explicit." Therefore, Goody argues, each new character has to be learned "as a separate sign for a separate word."

This means in effect that "a minimum of 3,000 such characters have to be learned before one can be reasonably literate . . . and with a repertoire of some 50,000 characters to be mastered, it normally takes about twenty years to reach full literate proficiency. China, therefore, stands as an extreme example of how, when a virtually non-phonetic system of writing becomes sufficiently developed to express a large number of meanings explicitly, only a small and specially trained professional group in the total society can master it, and partake of the literate culture."

But, apart from primitive pictographs, all writing systems use arbitrary signs. Therefore, Goodys' criticism of the logographic system is concerned essentially with the *very large number of characters* that the literacy learner must acquire. Halle (1968) makes this same point by analogy: "Since the strokes [in Chinese characters] are arbitrary symbols, the writer's or reader's task is equivalent to that of a person trying to remember telephone numbers. And, since in order to read a newspaper one needs to be able to read several thousand words, the person who wishes to read a Chinese newspaper must have memorized several thousand arbitrary stroke sequences. This task is roughly equivalent to memorizing several thousand telephone numbers. . . ."

But in the present comparative reading study the native authors of the national reports on Hong Kong and Japan, which both use logographic systems, do not seem to view them as being exceptionally complex.

Leong, writing on literacy acquisition in Chinese in Hong Kong, actually quotes the same paragraph from Halle in order to stress his disagreement with it: "Although each character has to be learned, the often mentioned reliance on rote memory is overrated. . . . The comparison to memorizing telephone numbers is not quite apt, as chunking and other mnemonic devices can make the task more meaningful and increase one's storage capacity." Leong presents a closely reasoned argument that there is much greater similarity between learning to read in English and Chinese than is commonly supposed. In particular, the Chinese logographs can be analyzed into smaller units that operate systematically, and thus the burden of memorization may be much less than Goody and Halle suggest.

Similarly, Sakamoto and Makita in their report for this com-

parative reading project point out that in Japanese Kanji logographs can be classified according to various radicals. Therefore, students can learn that Kanji are not unsystematic symbols but are constructed from combinations of different radicals.

Thus the effect of having to memorize thousands of characters in Chinese and the somewhat smaller number in the Kanji system of Japanese may have been overestimated. On the other hand, the burden of memorization in the alphabetic writing system has certainly been underestimated. Many parents and teachers in Britain and the United States believe that their children have to learn only twenty-six characters in the roman alphabet. But, in truth, English orthography is much more complex. There are many additional characters that are overlooked by adults who have long since forgotten what it was like to be a beginner in literacy learning:

1. Printed characters take alternative forms: upper-case letters as well as lower-case ones, and some variations on the latter. There are also the varieties in the cursive form of handwriting. Thus, the word *beg* may have the following alternative graphic forms:

beg, BEG, Beg, beg, Beg, beg (etc.)

2. An alphabetic writing system's units are not merely the individual characters. The alphabetic system is primarily a code for phonemes. English has approximately forty phonemic units (varying with dialect), which are supposed to be signaled by the graphemic units of the writing system. Obviously, twenty-six individual letters cannot be enough for the forty phonemes. Furthermore, the variations listed as the first source here do not have any special phonemic function. The English phonemes that do not typically have a single-letter grapheme in the writing system are represented instead by digraphs: *ch*, *th*, *sh*, *ng*, *oo*, and so on. There would need to be at least forty graphemes to code the forty phonemes if the code were perfectly systematic.

3. In addition there is a great deal of redundancy in the English writing system. Although there are only about forty phonemes, some of them have many alternative graphemes: *ie*, *y*, *uy*, *igh*, *eye*, *i ui*, for the single phoneme common to the words *pie*, *my*, *guy*, *high*, *eye*, *rind*, *guide*.

Ellis (1845), the nineteenth-century linguist, analyzed all the alternative ways of printing and writing the forty or so phonemes of English and found more than 2,000 alternative graphemes.

Other alphabetic writing systems vary in the extent to which their total number of graphemes extends beyond the small number of characters in the basic alphabet. English probably is especially prolific in alternative graphemes, but the writing system of Hindi has more than one source of variation (which increase the total number of characters well beyond the fifty-two usually listed as the basic Hindi characters), for example, the alternative vowel symbols to be employed according to position in the word, and the special symbols for consonant clusters.

Therefore the difference between logographic and alphabetic writing systems may have been exaggerated in respect to their difference in number of characters. This may have caused an overestimate of the difference in the length of time needed to learn them. For example, Goody's claim that "it normally takes about twenty years to reach full literate proficiency" in China, assumes that it takes less time in Britain or the United States. But what does "full literary proficiency" mean? One could claim that very few people achieve full literate proficiency in the English writing system, if that phrase includes the ability to spell from memory any word according to the conventions of English orthography. Probably, both in China and in England it is more appropriate to recognize that literacy learning is a lifetime process. The existence of an apparently simple and limited alphabet in the latter country may be misleading to educators in judging the time needed for acquiring literacy.

Nevertheless some notable contrasts in the number of characters to be learned by literacy learners in different countries may exist. For example, Finnish children have very few to acquire, even when alternatives such as capital and lower-case letters are counted. Japanese children, in comparison, have to cope with several alternative writing systems for the one language: Hiragana, Katakana, and Kanji. But, despite the large number of alterative characters to be memorized, Japanese children achieve remarkably well in literacy.

These considerations lead one to question whether the sheer number of characters to be memorized is *in itself* such a significant cause of difficulty in learning to read and write as has been commonly supposed. Extending one's repertoire of logographic characters in

Chinese may not be so very different from extending one's word, phrase, and sentence recognition vocabulary in written English. Both take time and both probably never reach the ultimate ideal level of Goody's "full literate proficiency" in any individual.

Of greater psychological significance in the beginner in literacy learning is the extent to which the features of the array of written characters he meets in his early literacy experiences systematically parallel his past experience of features of spoken language; that is, how far the characteristics of the writing system match appropriately the features of language to which he has been and still is continually exposed. If the writing system is a code of one sort or another for units of speech, the child will understand its symbolic and coding function and mode of operation to the extent that the samples of written language he meets actually demonstrate them. The number of different characters presented to the beginner could have one important influence in this.

If the writing system to be associated with the spoken language is an alphabetic one, then the samples of written language provided for the child ought to reflect its alphabetic nature. Only in this way can the learner understand the characteristics of the decoding and encoding processes of reading and writing. One must hasten to emphasize additionally that if the samples also fail to demonstrate realistically the communicative and expressive functions of decoding and encoding, another, vital aspect of the written code will be missing. Decoding or encoding are meaningless terms if nothing *relevant* gets coded. But, provided that the material is clearly functional for the learner, it ought to reflect as obviously as possible the way in which the code operates. However, if the writing system has many alternative printed and written characters for the same linguistic units, and the initial learning samples contain a variety of these, it is likely to be more difficult for the beginner to perceive the *system* in the writing system. For instance, the English sentence, "I like my pie" quite clearly fits the need to provide beginners with linguistically functional samples, but the basic alphabetic nature of the English writing system is concealed when it is printed in the conventional English orthography:

I like my pie.

All four words contain the same phoneme, which coincides with the whole of the first word "I," but it is represented by four different

graphemes: (1) *I*; (2) *i.e.*; (3) *y*; (4) *ie*. Therefore, this sentence provides no experience whatsoever of the essential grapheme-phoneme basis of an alphabetic writing system.

It is this effect of an abundance of alternative characters with no *easily perceived* logic which makes English orthography difficult for learning to read. Of course, one can restrict the vocabulary presented to beginners by using such sentences as *Dan can fan Nan*, but this sacrifices the vital principle that early decoding must demonstrate the communication function of reading.

In learning to write, too, the existence of alternative written symbols either for the same phoneme or for the same morpheme is likely to be an important source of cognitive confusion in this aspect of understanding the logic of the written code for spoken language. For example, in writing the conventional orthography of English, the child must hesitate when writing a word like "cat." He hears /k/ but does not know whether to write *kat* or *cat* because both *c* and *k* are available. Therefore, he hesitates at this choice point. Actually the selection has no simple phonemic basis. But he does not know this, and therefore, it seems probable that the choice is puzzling to him. He hears no difference between the initial phoneme of words he has met in his reading such as *cap* and *kid*, yet they begin with different letters. He may wonder if he has a hearing defect. Hence the noticeable hesitations at such choice points in his written composition.

This is probably a very important source of puzzlement and confusion. It may cause a significant increase in the amount of initial cognitive confusion in the mind of the beginner who is striving to understand how the structure of the written form of language is related to his past experience and developing consciousness of the structure of speech. Writing systems vary greatly in this characteristic, and a cross-language comparison of hesitations in writing or spelling would provide better evidence on this question.

One empirical investigation provides some evidence that redundant symbols do cause difficulty. Malmquist (1964) compared one group of children in Sweden who learned cursive script in addition to manuscript print in the latter part of first grade (as is conventional) with an experimental group who learned *only* the manuscript print. They did not transfer to cursive script until the end of the third grade. The experimental group's written work was superior in clarity and

legibility during the time they continued to use manuscript print. Also they were better in silent reading comprehension. Furthermore, at the end of third grade after only a few weeks of cursive writing it became superior in quality and equal in speed to that of the control group, which had been using cursive writing for over two years. Thus the reduction in the variety of alternative symbols during the first two and a half years led to the experimental group's superiority in reading as well as writing.

Linguistically, of course, there is no logical mismatch between the units of spoken language and the symbols of written language when the former have two or more alternative symbolizations in the latter. but *experientially* for the literacy learner there may appear to be mismatch in this situation. Malmquist's experimental data strongly suggest that cognitive clarity was readily developed in his experimental group because the superfluous variety of symbols was reduced. The amount of unnecessary "noise" in the stimulus situation was cut down sufficiently for these students to perceive more rapidly the important structural elements of the code and the way they operate. In contrast, the control group pupils were hindered in their groping for cognitive clarity by the extra superfluous variations in the cursive characters thrust on them before they had mastered the manuscript symbols.

Other Variables in the Writing System

The number of characters in a writing system is not the only variable to be considered in exploring the problem of whether one language is easier than another for the native literacy learner. The comparative reading project investigated five other possible variables:

1. The type of lingustic unit coded, e.g. morphemic versus phonological units.

2. The complexity of the individual characters in a writing system.

3. The spatial direction of representing the temporal order of the units of spoken language.

4. The names given to the characters of a writing system.

5. The complexity of the decoding and encoding operation in a writing system as it affects the child's *perception* of regularity.

Each of these variables would require another article in *Visible Language*. Briefly, like numerous other investigations, this comparative reading study has raised many more difficult questions than the apparently simple ones with which it began. However, a sort of answer emerges to the question which is the topic of this article: generalizations about the comparative difficulty of literacy acquisition in Chinese or its simplicity in Spanish, for example, are of very dubious validity. There may be differences in the relative difficulty of literacy acquisition in different languages, but it is a much more complex problem than is usually supposed.

But of greater importance for the future of teaching children to read and write is the final conclusion to our survey of all these variables: "One thing, at any rate, is quite clear from these investigations: the writing system is an important variable in the learning-to-read process. A perceived mismatch between the writing system and the language in which the child is expected to respond is an important cause of difficulty in the early stages of learning to read and write."

Writing and print become visible language *only when the child perceives them as visible language*. Writing systems contain many potential sources of confusion which may cloud the child's recognition of their function and operation. It is an important task for all who contribute to this field to find better ways in every language of presenting writing and print to children, so that they may more readily arrive at a clear perception of them as visible language.

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The Formal Economy of Written Signs

E. J. W. Barber

Those portions of a sign's shape which are distinctive, yet in themselves valueless, can be viewed as forming a system. Such systems have ranged historically from the very loose to the very tight. When the possibilities of arranging these elements are also considered, the great range in economy of design becomes even more apparent. Our own roman script, in fact, is rather inefficient in these terms; Morse Code, on the other hand, is quite efficient, though not perfect. It might prove useful to develop other scripts based on these principles of internal economy. But economy of form is not the same as efficiency of use: it is merely one possible component of efficiency, and must be carefully distinguished as such.

Much has been made of the relative economy of alphabets over syllabaries, logographic scripts, etc., for representing a language: alphabets require the fewest different symbols. But little has been written about the economy of purely formal design within a script—about the use of distinctive design elements and of patterns of arranging them. One might assume that the fewer the signs, the greater the economy of formal design would be, but historically that has not always been the case. Nor should economy of design be confused with problems of efficiency. Efficiency implies a purpose; and what is efficient for one purpose (e.g., writing) may be very inefficient for another purpose (e.g., reading). Economy of formal design, on the other hand, is an entirely self-contained measure, concerning merely the number of basic elements and patterns present. In order to see what is involved in formal economy, let us consider the structural principles of symbols and then some historical examples.[1]

Each sign in a script can be viewed as composed of elements which are distinctive—that is, serve to distinguish one kind of sign from every other—yet are in themselves without any direct representational value. These basic elements occur in various arrangements, each unit thus formed corresponding to some value.[2] Consider, for

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example, the Cyrillic letters ш (*sh*), щ (*shch*), ц (*ts*), and п (*p*). They are composed entirely of short and long vertical and horizontal lines—the presence, number, and position of which distinguish the letters from each other. But none of these single composing lines has a phonetic value of its own which it carries with it.[3] In short, the letters are the minimal units with linguistic values, while there are smaller critical units with no such values. The economy of the formal design of a script can thus be measured in terms of the number of these minimal critical units used, and also in terms of the number and complexity of patterns in which they are arranged.

The history of writing systems shows that most ancient scripts developed from pictorial sign forms of some sort, rather than from abstract marks.[4] Since the scripts did not originate as abstract contrastive systems (although pictorial signs were generally reduced to considerable simplicity), there is no particular reason to expect great economy of *system* in the critical elements and their arrangements. In many cases no such economy ever developed; but in others, particularly where a medium less versatile than pen and ink prevailed, varying degrees of economy of form in fact arose.

Perhaps the earliest script to attain a considerable measure of formal economy was cuneiform. The Sumerians began, like most people, with pictorial signs representing such common sights as fish and grain (Fig. 1): complex shapes in comparison with the abstract world of circles and crosshatches. But the chief medium of writing in mud-bedded Mesopotamia was clay. Unfortunately, if one line is required to cross another, scratching the second line in this medium will cause partial or complete obliteration of the first, for little rolls of clay shoved aside by the scratching point will be pushed into the furrow which forms the first line. So the Sumerians eventually resorted to the technique of pressing rather than scratching the lines. The shapes were thus gradually converted from recognizable curvilinear pictures to groups of short, straight, impressed lines (cf. Fig. 1). Because of the shape of the stylus used to form them, moreover, these lines came to have more the appearance of little wedges than of little lines (hence the term "cuneiform," or "wedge-shaped"). By the late third millennium, the signs had become pure patterns of wedges.

These wedges constitute an extremely economical system of minimal critical writing units—units corresponding to no linguistic value

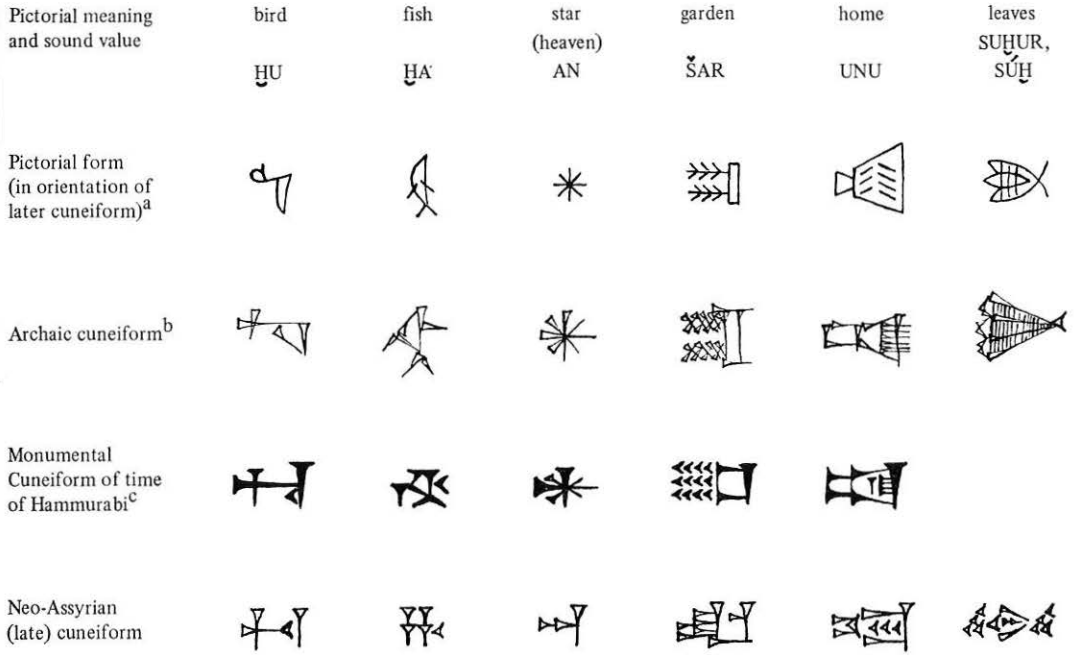


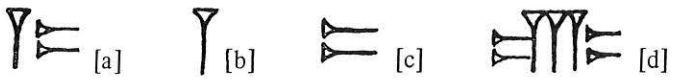
Figure 1. Development of Cuneiform.
a. From Uruk and Jemdet Nasr; as shown by A. Falkenstein, *Archaishe Texte aus Uruk*; Berlin, 1936.
b. From Uruk and Fara; as shown by Falkenstein.
c. As shown by R. F. Harper, *The Code of Hammurabi*; Chicago, 1904.

and yet serving to distinguish one sign from another. From Old Babylonian to Neo-Assyrian times, the signs consist exclusively of two types of wedges, tailed and tailless, of a small number of sub-varieties. Tailed wedges occur with tails straight down, slanting down to the right, horizontal to the right, and (more rarely) slanting up to the right:

Wedges pointing straight up or to the left have dropped out: evidently it was a nuisance to have to turn the stylus that far. In some periods and areas the tails even seem to occur distinctively long and short, or large and small. Tailless wedges, too, occur large and small.

(Examples of almost all of these types can be seen in Fig. 1.) Thus an extremely small number of elements comprise the basic building blocks from which hundreds of signs are composed.

On the other hand, when we turn to consider the patterns according to which these few wedges are arranged, the extreme economy breaks down. Nothing remotely approaching the total number of patterns simpler than the most complex patterns in use can be found in the script. Numerous simple patterns are missing, whereas other signs are wildly complicated. For example, the combination [a] is not found in Old Babylonian, although both [b] and [c] occur (as the numeral "1" and the syllable "tab," respectively), and the combination occurs in, among others, the sign [d]. Of course, the



historical reason for this looseness of form is obvious: the signs grew up more or less accidentally from pictures, instead of being invented from the start as abstract patterns of wedges.

Of all the prealphabetic scripts that I know of, cuneiform has the greatest claim to economy of form, even though this economy is chiefly in the distinctive elements rather than in the patterns. Egyptian, Hittite, and Mayan hieroglyphics—each having, like cuneiform, several hundred signs apiece—are composed of countless types of lines, squiggles, and curliques. Considerations neither of speed nor of medium[5] ever forced them to abandon such wealth of form. The Chinese, on the other hand, evidently found the paintbrush a not entirely versatile tool, and reduced the composition of their thousands of characters to a handful of brush strokes—more types of strokes than there are wedges in cuneiform, but still significantly few. And as in cuneiform, there is no tight economy of pattern.

With the advent of purely phonological scripts, in which every sign represented a sound or sound combination rather than a word, the number of signs was reduced from hundreds and even thousands of signs to well under one hundred (the exact number varies with the script). The chances of developing a script economical in terms of pattern simultaneously increased; but such a development, even then, did not often occur.

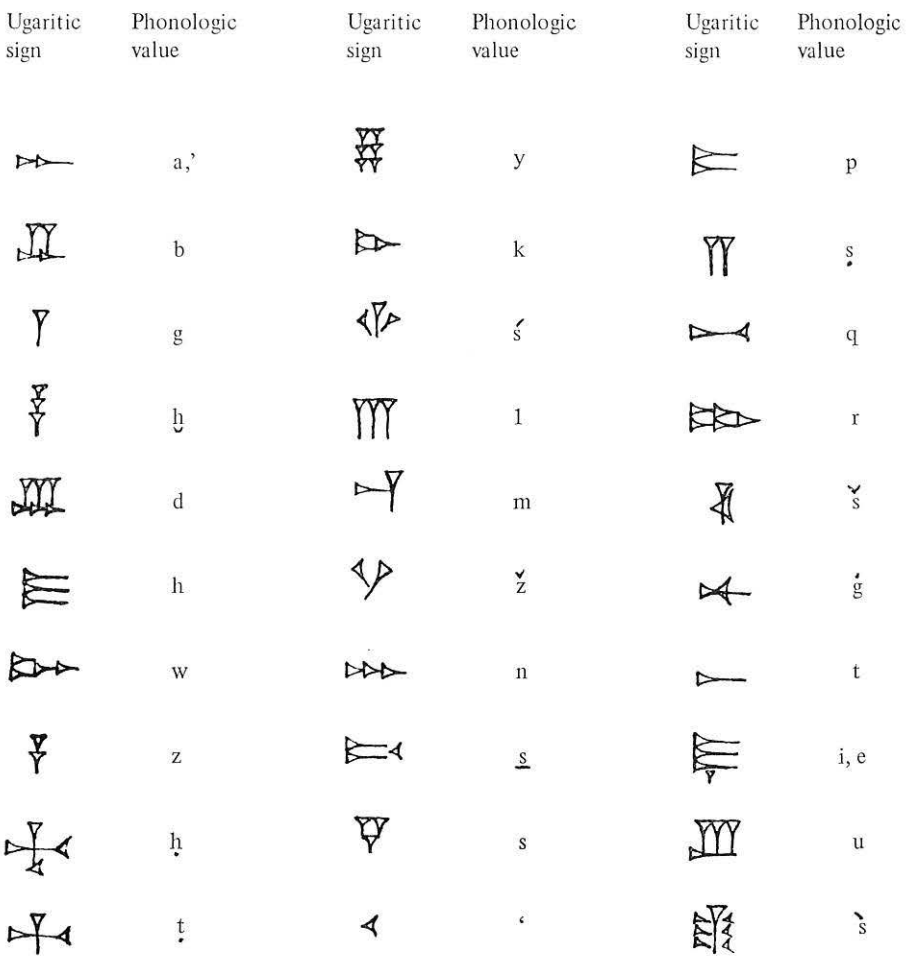


Figure 2. Ugaritic Cuneiform. After "Textes en cunéiformes alphabétiques," *Palais Royal d'Ugarit* II (ed. C. F. A. Schaeffer); Paris, 1957; pp. 199–202.

The earliest phonological script of noteworthy economy is the cuneiform "alphabet" used in the late second millennium B.C. at the ancient city of Ugarit on the Syrian coast (Fig. 2). Although cuneiform in method of production, this group of thirty signs is not historically derived from the complex Mesopotamian script. The signs were evidently invented afresh, perhaps even to be simple abstract patterns. But although the maximum number of wedges per sign is

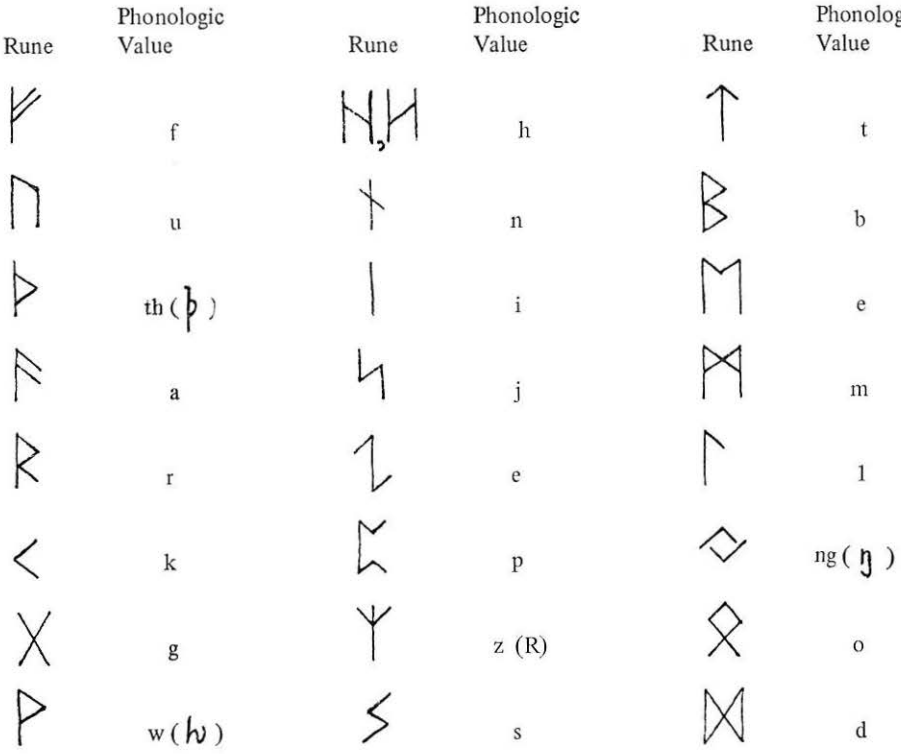


Figure 3. Early Runic Alphabet (in traditional order).

cut down to a mere seven, still not all the patterns simpler than the most complex are used. There is no sign consisting of four verticals, for example, although there is one with six verticals.

Another notably simple ancient system is the early runic alphabet, used in the mid-first millennium A.D. in Scandinavia (Fig. 3). The signs are composed entirely of three sorts of straight lines, each occurring both long and short: lines slanted to the right and to the left, and verticals. Once again this simplicity of design is the result of the historical medium, it seems, for the runes were originally slashed into wood with a straight knife.[6] The complete lack of horizontal straight lines is usually explained by the suggestion that if the grain of the dressed wooden plank is running horizontally, a horizontal slash would be hard to distinguish from the grooves in the grain of the wood—in addition to the fact that a knife blade would get caught

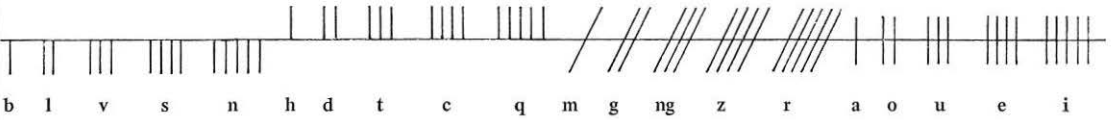


Figure 4. Ogham Alphabet.

in the grain and be forced out of the desired path. As long as the knife slashes across the grain, either directly or at a considerable angle, the grain presents no problem. But despite the economy of the component lines, the runic alphabet still is not particularly economical when it comes to patterns. Instead it was the Celts, living to the west of the Germanic rune-writers, who came up with the ultimate in economy of form in ancient scripts and did so with letter forms intended, like runes, to be slashed.

The Ogham script (Fig. 4) is, all told, perhaps the most economical ever used before modern times. Each sign consists of one to five straight and identical lines, the lines being of four sorts: (1) to one side of the median, (2) to the other side of the median, (3) crossing the median—all three of these types being short and at right angles to the median—and (4) crossing the median but long and slanted. (The "median" was generally the running edge of a squared timber or block of stone, the signs bending from one face to the other.) Since all combinations are used, these few patterns and line types account exactly for the twenty signs of the script. The only superfluous feature is in the last category of signs, since either slanting or length technically would have been sufficient to differentiate this series; the inventor need not have added both.

Still more economical in terms of elements, though less so in terms of patterns, is modern international Morse Code. We usually think of it as visible dots and dashes, but the sign system is predicated solely on the opposition of long against short; it can be used in any medium where such an opposition can be defined—sound, light, electricity, or whatever.[7] It thus consists of one pair of oppositions (long/short), whereas Ogham had consisted of a three-way opposition (one side/other side/crossing) and two pairs of oppositions (long/short, perpendicular/slanting).[8] When we come to consider patterns, however, standard international Morse Code falls slightly short of true economy. All of the simple patterns are used: all combinations

and distinguishable permutations of dots and dashes taken up to four at a time are used (Fig. 5), with the single exception of four dashes. But since there are only thirty such combinations, and Morse Code accommodates 52 signs (including punctuation and digits), obviously the code has to spill over into the next series, namely taking dots and dashes five at a time. Instead of doing that, it uses only fourteen of these 32 possibilities, and for the remaining nine uses combinations of six dots and dashes, a considerable breach of economy.

The most economical of all in terms of elements is Braille, which uses only dots. These occur in combinations of one to six, permuted in six positions. In addition all 63 possible combinations are used, one way or another,[9] although a few are used purely as signals to alter the value of the succeeding block of dots. The use of these signals vastly increases the flexibility of Braille, but decreases its overall economy, since relatively few two-block groups have special values.

By the criterion of economy which we have been developing here, our roman script is a disaster. Like most scripts, it developed from pictorial signs, and the fact that it remained chiefly a pen and ink script through all but its most recent history long shielded it from having to become more economical in design. For a while in the Middle Ages, indeed, the roman script became less and less economical in form, as anyone who has tried to read the average lot of old manuscripts will ruefully testify. It was chiefly the invention of printing that reversed the trend and brought the script back nearly to the simplicity of the classical Roman source. But even its current form has not been sufficiently economical to accommodate either Samuel Morse and his telegraph or the modern computer engineer. Both were driven to the expedient of inventing entirely new systems, which recode the alphabet altogether. Recent attempts, on the other hand, to redesign the roman script to make it directly readable by computers have generally succeeded in reducing the number of minimal critical elements to a handful (Eden, for example, reduces cursive to four).[10] Perhaps economy of formal design is the direction in which we are now heading.

On the other hand, I must emphasize once again that economy in the sense that we have been discussing is not to be confused with efficiency. If a script is being designed to be practical, there are

1:	·	E	−	T
2:	··	I	−−	M
	·−	A	−·	N
3:	···	S	−−−	O
	·−−	W	−··	D
	··−	U	−−·	G
	·−·	R	−·−	K
4:	····	H	(−−−−	does not occur)
	·−−−	J	−···	B
	··−−	Ü	−−··	Z
	···−	V	−−−·	Ö
	·−··	L	−·−−	Y
	·−−·	P	−··−	X Q
	··−·	F	−−·−	Q
	·−·−	Ä	−−−·	C
5:	·····	5	−−−−−	zero
	·−−−−	1	−····	6
	··−−−	2	−−···	7
	···−−	3	−−−··	8
	····−	4	−−−−·	9
	··−··	È	−−·−−	Ñ
	·−−·−	Á	−····	/

(remaining 18 patterns of 5 dots and dashes do not occur)

6:	·−−−−·	'	−····−	hyphen
	··−−··	?	−−·−−·	,
	·−·−·−	period	−·−·−·	;
	··−−·−	dash		
			−·−−·−	parenthesis
			−−−···	:

(remaining 55 patterns of 6 dots and dashes do not occur)

Figure 5. The 52 Signs of International Morse Code Arranged According to Internal Pattern.

several important considerations beyond mere economy of form—although an analysis of the form often helps in understanding the broader concept of efficiency. For example, in Morse Code a dash takes so much longer to transmit than a dot that it is more efficient in some media, especially where time and electricity are concerned, to ignore the combination of four dashes in favor of five dots.

Still more important than economy of materials, in most cases, are problems of human perception. Precisely because Morse Code is so economical in form, it lacks the redundancy which we humans use to catch our own mistakes. Thus Morse Code can be difficult to perceive accurately in a hurry or in the face of outside interference. And if the human decoder should make a mistake in perception—say, picking up three dots where there were really four, or inverting the order of a dot and dash somewhere—the result is a totally unrelated member of the alphabet: S (···) for H (····), or B (-···) for L (·-··). Sometimes the high redundancy of human language can be used to straighten things out again ("Send a salf ton of coal"); but where it does not, the code gives no clue that anything is even wrong, let alone how to fix it ("Send three babes to the warehouse"). There is thus great advantage to be gained, when human fallibility is concerned, by using a system which is not so economical. If the form "ɵ" turns up, in our Roman script, we instantly know something is wrong, because no such combination occurs, although circles and straight, horizontal lines occur. Furthermore, we can narrow our search for a remedy down to two most likely letters: "o," on the hypothesis that an extra horizontal crept in, and "e," on the hypothesis that the circle somehow got closed. A certain flouting of economy thus has its place, both in speed of perception and in trouble-shooting.

Overall efficiency and economy can be affected by yet another design consideration. Just as big words are sometimes built out of little words, such that the meaning of the big word is at least partly composed of the meanings of the little words (e.g., "spoonful"), so complex meaningful signs can be formed out of minimal meaningful signs. The Ogham script, alone of all the ancient scripts that I know of, took this principle into account, by putting all the vowels into one series of signs. Thus the series of one to five short lines crossing the median at right angles represents all the vowels and only the vowels. One could therefore reanalyse the script to say that being short and

crossing perpendicularly indicated a vowel, and that the number of lines indicated which vowel. The Celts did not carry this composition principle to the extreme—if the consonants are organized, the basis is not clear—but we could carry it out.

Suppose, for example, that one reorganized and elaborated upon the economical Ogham system to produce a phonetic (or, for that matter, a phonemic) notation. It would not be efficient for hasty field transcription, but it could be quite revealing as an analytical tool under less hectic conditions. Voiced sounds might occur on one side of the median, voiceless sounds on the other: the analyst could then see at a glance the structure of the language in terms of voicing. Suppose that stops were represented by long lines, spirants by short ones, and resonants by dots: the syllable and cluster structures of the language would again be evident at a glance. The number of lines might code the distance of the articulation from one end of the vocal tract (e.g., one for lip articulation, two for dental, etc.). With the system worked out in full, a particular sound could be recorded by a particular "sign," where the sign was made up of lines or dots. But each pattern, type, and number of the formal elements within that sign would carry a component meaning. Such a script would indeed have a kind of ultimate economy of form, and for its limited purpose (leisurely phonologic analysis) even be quite efficient.[11]

It would be interesting to develop other scripts to be as economical as possible for the contexts in which they are to be used. A code to be used entirely within a machine, for example, or one which is not intended for rapid human use, can afford to be less redundant than one to be used in daily life. Current efforts to develop "self-explanatory" codes to send out into space, in hope of reaching other intelligent beings, represent yet another interesting branch of this same problem. Unfortunately, many of the factors which have been cited here as contributing to ultimate efficiency, as opposed to mere economy of form, are difficult to measure or are virtually unexplored. The problems of human perceptual limitations, moreover, are perhaps the least known right now. Nonetheless, it might be worth the time and trouble to investigate thoroughly the economy and efficiency of the roman script—by mere accident of history the chief vehicle of communication in the most hurried society the world has known.

1. Elaborated from material in the author's forthcoming book, *Archaeological Decipherment*, to be published by Princeton University Press in 1973.
2. Such an analysis will be familiar to linguists, as being parallel to the distinction between phonemes (minimal distinctive units, but without meaning) and morphemes (minimal units with meaning).
3. In the Ukrainian version of Cyrillic, it is true that a single vertical stroke has the value *i*, all by itself; but it does not maintain that value within the above-mentioned letters. Thus ш still represents *sh*, not *iii*.
4. Cf. I. J. Gelb, *A Study of Writing*, Chicago, 2nd ed. 1963.
5. Quite probably the chief medium for each was pen and ink, although that has not been proved in every case.
6. When occurring in other media, some of the letters also show more curved forms. But the angular forms seems to predominate.
7. It is interesting that, although other writing systems too use the contrastive opposition of sign vs. space (or blank), Morse Code is so economical in its system of oppositions that the entire system, even including the spaces, reduces to only two oppositions. The underlying system is merely "something" (sound, light, electricity, or whatever) vs. "nothing" (pause, blank, etc.) ,each occurring short vs. long, measured appropriately in time or space.
8. Since, as in Morse Code, the opposition short/long is also used in the spacing of lines within and between signs (short within and long between), dropping the opposition of perpendicular/slanting would do most to tighten the formal economy of Ogham.
9. At least, as commonly used in the U.S. Some represent the 26 letters of our alphabet, others punctuation and diacritics, still others frequent combinations of letters (ligatures, as it were). The few left over—purposely left, it seems, because they are too difficult to tell apart from their mirror-image counterparts—are used as signals to alter the value of the succeeding sign. Counting these signals, every combination is used.
10. Murray Eden, "On the Formalization of Handwriting," *Structure of Language and its Mathematical Aspects* (*Proceedings of Symposia in Applied Mathematics* XII); American Mathematical Society, Providence, 1961; 83–88. Although Eden reduces the letters to forms containing only these four distinctive strokes, the forms are not necessarily instantly recognizable to one who knows only ordinary American cursive script. (In the same way a syllable-initial American *r*, stripped of its characteristic, but nonphonemic, lip-rounding is generally unrecognizable in initial position to the average American.) This wealth of characteristic but nondistinctive forms adds enormously to the lack of economy in roman script.
11. Henry Sweet, father of modern phonetics, attempted a structural notation system much along these lines, although with not quite the degree of economy suggested here. See Sweet, *Primer of Phonetics*; Oxford, 1890.

Research in Brief: Subjective Preference and Retrieval of Information from Reference Materials

James Hartley, Susan J. Timson, and Peter Burnhill

There has been in recent years a considerable increase in the amount of reference material available, and consequently it has become important to ask what typographical conventions make for ease and efficiency in terms of information retrieval from such literature (catalogues, directories, tables, etc.), and whether or not the methods of layout now adopted by printers and typographers can be improved.

The investigation reported here explored the relationships between subjectively preferred layouts and their use in information retrieval. The enquiry was divided into two stages: first we determined the rank order in terms of preference for eight versions of a page of information from an imaginary Good Food Guide; and second we tested the two most preferred versions against the two least preferred versions in terms of efficiency of information retrieval.

The subjects (10 men and 10 women) were each given the eight versions of the page from the Good Food Guide and its use explained. They were then asked to indicate their order of preference for the different versions and to do this by the method of paired comparisons; i.e., each passage was to be compared in turn with every other passage, and the preference noted on a specially prepared answer grid. The overall preference pattern was built up by summing the times each version was preferred to another version: the version with the most preferences being "the most preferred." See Table I.

TABLE I. Preference rankings for eight versions of a page from a Good Food Guide (low rank = high preference).

	Version							
	d	*e*	*f*	*b*	*c*	*g*	*a*	*h*
Sum of rankings	45	59.5	69	80.5	84.5	120	127	134.5
Preference ranking	1	2	3	4	5	6	7	8

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■ specially recommended □ provisional **area 8 see map 3**

Berkshire

Abingdon, Queen's Arms
Bracknell, Thatched House Grill
■ Bray-on-Thames, Hinds Head Hotel
Bray-on-Thames, Monkey Island Hotel
Cookham, Bel and The Dragon
Cookham, King's Arms
Hurley, East Arms
Hurley, The Old Bell
Kintbury, Dundas Arms
Knowl Hill, Bird in Hand
Long Wittenham, Plough Inn
Longworth, Lamb and Flag
Old Windsor, Bells of Ouzeley
Pangbourne, Swan Hotel
Reading, Taj Mahal
Reading, The Lion
Remenham, The Angel
Stanford Dingley, Boot Inn
□ Streatley, Bull Hotel
Swallowfield, Mill House Restaurant
□ Wargrave, St George and Dragon
Windsor, Royal Oak
Winkfield, Jolly Gardener
■ Winkfield, White Hart
Yattendon, Royal Oak

Dorset

Blandford Forum, Crown Hotel
■ Chideock, Chideock House
Chideock [illegible]lock House Hotel
Ferndo[illegible]my Hotel
□ Ferndown, The Green Parrot
Grimstone, Royal Yeoman
Lulworth, C[illegible]tle Inn
Spywa[illegible]orseshoes

Version d (the most preferred), set in Monotype Univers, 9d on 10-point, medium and bold.

Version e (the next most preferred), set in Monotype Imprint, 10-point on 11, roman, bold, italic and small caps.

specially recommended
provisionally accepted

AREA 8
see map 3

HAMPSHIRE

ASHURST — Happy Cheese Restaurant
BASINGSTOKE — The Venture Restaurant
BOTLEY — Botleigh Grange
BOURNEMOUTH — Le Bistro
The Continental
Czech Restaurant
Fortes
Royal Bath Hotel
San Marco Steak House
South Western Hotel
BROCKENHURST — Rose and Crown
BROOK — *Bell Inn*
CRAWLEY — Fox and Hounds
DROXFORD — **White Horse Inn**
HAMBLE — Bugle Inn
ITCHEN ABBAS — Plough Inn
LEE-ON-SOLEN[illegible] — The Swordfish
LYMINGT[illegible] — Au Bon Plaisir
OWER — [illegible]orest Motel

BERKSHIRE

ABINGDON — Queens Arms
BRACKNELL — Thatched House Grill
BRAY-ON-THAMES — **Hind's Head Hotel**
Monkey Island Hotel
COOKHAM — Bel and The Dragon
King's Arms
HURLEY — East Arms
Old Bell
KINTBURY — Dundas Arms
KNOWL HILL — Bird in Hand
LONG WITTENHAM — Plough Inn
LONGWORTH — Lamb and Flag
OLD WINDSOR — Bells of Ouzeley
PANGBOURNE — Swan Hotel
READING — The Lion
Taj Mahal
REMENHAM — The Angel
STANFOR[illegible] — Boot Inn
STRF[illegible] — *Hotel*

Specially recommended
Provisionally accepted

Gourmet Society

Area 8 see map 3

Berkshire

Abingdon, Queens Arms
Bracknell, Thatched House Grill
Bray-on-Thames, **Hinds Head Hotel**
Bray-on-Thames, Monkey Island Hotel
Cookham, Bel and the Dragon
Cookham, Kings Arms
Hurley, East Arms
Hurley, The Old Bell
Kintbury, Dundas Arms
Knowl Hill, Bird in Hand
Long Wittenham, Plough Inn
Longworth, Lamb and Flag
Old Windsor, Bells of Ouzeley
Pangbourne, Swan Hotel
Reading, The Lion
Reading, Taj Mahal
Remenham, The Angel
Stanford Dingley, Boot Inn
Streatley, [illegible]
Swallowfield, [illegible]use Restaurant

Oxford

Banbury, **Whateley Hall Hotel**
Banbury, White Lion
Burcote-on-Thames, Riverside Hotel
Burford, Bay Tree Inn
Burford, The Bull Hotel
Burford, The Cotswold Gateway
Burford, The Lamb Inn
Charlbury, The Bell
Dorchester, The George Inn
Horton, Studley Priory Hotel
Nettlebed, Bull Inn
Nettlebed, White Hart
Newbury, La Riviera
Oxford, Capri Restaurant
Oxford, Fox Inn
Oxford, Restaurant Elizabeth
Oxford, **Tudor Cottage**
Roke, Home Sweet Home Inn
Stonor, [illegible] Arms
Tetsworth, [illegible]

Version a (the next least preferred), set in Monotype Univers, 9d on 10-point, light, medium and extra bold.

Version h (the least preferred), set in Monotype Imprint, 10-point set solid, roman.

AREA 8 see MAP 3

HAMPSHIRE
Ashurst, Happy Cheese Restaurant
Basingstoke, The Venture Restaurant
Botley, Botleigh Grange
Bournemouth, Le Bistro
Bournemouth, Czech Restaurant
Bournemouth, The Continental
Bournemouth, Royal Bath Hotel
Bournemouth, San Marco Steak House
Bournemouth, South Western Hotel
*Bournemouth, Fortes
Brockenhurst, Rose and Crown
*Brook, Bell Inn
Crawley, Fox and Hounds
Droxford, The White Horse Inn
Hamble, Bugle Inn
Itchen Abbas, Plough Inn
Lee-on-Solent, The Swordfish
Lymington, [illegible]u Bon Plaisir
Ower, M[illegible]t Motel
Portsmouth, [illegible] of Technology Restaurant
Po[illegible] Restaurant

BERKSHIRE
Abingdon, Queens Arms
Bracknell, Thatched House Grill
§Bray-on-Thames, Hinds Head Hotel
Bray-on-Thames, Monkey Island Hotel
Cookham, Bel and the Dragon
Cookham, Kings Arms
Hurley, East Arms
Hurley, The Old Bell
Kintbury, Dundas Arms
Knowl Hill, Bird in Hand
Long Wittenham, Plough Inn
Longworth, Lamb and Flag
Old Windsor, Bells of Ouzeley
Pangbourne, Swan Hotel
Reading, Taj Mahal
Reading, The Lion
Remenham, The Angel
Stanford Dingley, Boot Inn
*Streatley [illegible]l Hotel
Swall[illegible]ill House Restaurant
*W[illegible]ge and Dragon

The next stage in the investigation was to examine the efficiency—in terms of information retrieval—of the various versions, and to compare this with the rankings obtained. Because of limited resources, in this study only the efficiency of the two most preferred and the two least preferred versions were studied (i.e., versions *d* and *e*, *a* and *h*).

To investigate efficiency, subjects were asked to locate the restaurants which were "provisionally accepted" or "specially recommended" by the Good Food Guide in certain of the English counties, and the time taken to turn over the page, to locate the restaurant, and to read out it's name and the village or town in which it was situated, was recorded. Thirty-two subjects (16 men and 16 women) did this task four times, using each of the four versions once, the order of presentation being counterbalanced. See Table II.

Statistical analysis showed that version *a* took significantly longer for information retrieval than all three other versions, and version *e* took significantly longer than version *h*. A simple overall comparison of the preference rankings and the efficiency rankings is shown in Table II. These results indicated that there was no significant correlation between the preference for and the efficiency of the different versions of the printed page (Spearman's rho = +0.20).

In this investigation, therefore, there was no significant relationship between subjective preference for the appearance of a particular page of information and the efficiency of information retrieval from it. It did appear, however, upon further examination of the different versions, that the use of asterisks and similar markers aided information retrieval compared with typeface changes which a typographer may recognize but which the reader may not notice.
(Unfortunately it is not possible to present a detailed analysis of the typographic variables in this short report: these are available from the authors for interested readers.)

TABLE II. Subjective preference and retrieval time (in seconds).

	Version			
	d	*e*	*a*	*h*
Preference ranking (N = 20)	1	2	7	8
Mean retrieval time (N = 32)	16.2	18.3	29.3	15.6
Standard deviation	7.6	6.5	31.9	6.4
Retrieval ranking	1.5	3	4	1.5

Excerpt: Archives in the Ancient World

Ernst Posner

The keeping of archives constitutes a significant aspect of mankind's experience in organized living; without these archives, in fact, the story of our past could not be told. Since archival material is a primary source for the historian and the social scientist, those engaged in analyzing and reconstructing the story of our civilization should be thoroughly familiar with the genesis and character of the archives of successive ages, their significance as components of the various cultures, and the considerations that help account for their survival. Also, since we are living in an age in which our everyday life is affected by a multiplicity of recorded public and private relationships and in which our wallets are bulging with identification cards evidencing such relationships, we may derive wry satisfaction from the knowledge that to some degree those before us were made as record conscious as we are forced to be. In ancient Egypt, too, everybody was "catalogued and inventoried."

Medieval and modern archives have been the subject of a wide variety of studies, and the story of the archives of these two periods has been thoroughly explored. We still lack, however, a synthesis that makes the development of the archives as an institution fully understandable and that also gives due attention to the growth of archival thought. Except for individual articles on archives-keeping in ancient Mesopotamia, Greece, and Rome, no effort has been made to provide an integrated picture of the archival institutions and practices of antiquity. As we all know, in the Middle Ages, a period of great experiment in governmental decentralization, record-making and record-keeping became a concern of local authorities, and it was only in the Byzantine Empire and in the Arab lands that

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the governing of great empires still demanded record-keeping on a large scale. In Western Europe, on the other hand, where the direct nexus between the state and the individual had ceased to exist, records were no longer created on a country-wide basis, as had been the case before the downfall of the Roman Empire. But ancient institutions and practices lingered on, and in time would directly and indirectly influence record-making and record-keeping in the cities and nation states that emerged out of feudal Europe.

When compared to the small volume of medieval archives, the archives of the ancient world seem to have much in common with those of our own times. The Greek and demotic records of Ptolemaic Egypt "constitute bodies of archives" and these bodies, "by virtue of their number and their nature, resemble those of the more recent ages."[1] A system of organization and administration that can truly be called bureaucratic, and the cheapness and availability of writing materials—both lacking during the Middle Ages—resulted in a mass production of records on clay and papyrus that created preservation problems similar to those confronting the archivist in the age of paper. These circumstances make the study of ancient archives particularly interesting and rewarding. In fact, in the great river cultures of the Nile and of the Euphrates and Tigris—where the control of material, men, and man-made installations became inevitable—we find already those basic types of records that may be called constants in record creation, whatever the nature of governmental, religious, and economic institutions. These include:

1. The laws of the land.

2. Records consciously created and retained as evidence of past administrative action. These records may be in the form of the "royal skins" of the Persian kings, the *commentarii* or day-books of Roman officials, the registers of the Popes and the Patriarchs of Constantinople, or the chancery rolls of the English kings.

3. Financial and other accounting records originating from the need of a ruler or other authority to administer his domain and its resources, such as the records of the palace and temple economies of the ancient Near East.

4. Records of the ruler or other authority to assure his income from land and persons not belonging to his immediate domain, namely: land surveys, commonly called cadastres; land records that establish legal ownership of areas of the land and make possible their orderly transfer from owner to acquirer; records establishing tax obligations from real property.

5. Records facilitating control over persons for purposes of military service, forced labor, and the payment of a capitation or personal tax.

6. "Notarial" records of state agencies or state-authorized persons that safeguard private business transactions between individuals.

Although in one form or another these constants in record creation are encountered among the records that have survived from antiquity, are we justified in calling these records archives? There are two basically different definitions of the word archives. One of them limits the term to non-current records that, because of their long-range value, have been transferred to an ad hoc agency, called an archives, and it is in this sense that the term is used in German. American usage, as it has developed during the last decades, shows a somewhat similar approach in that it considers as archives only those records that have lasting value, regardless of whether they are still in the hands of their creators or have been turned over to the custody of an archival agency. In the majority of countries, however, and particularly in the Romance countries, the records of any agency or institution are designated as its archives. In other words, the terms records and archives are used interchangeably. In Italian, for instance, *archivio* stands for records in general. If the records have outlived their everyday usefulness but are still under the care of their creator, they are called an *archivio di deposito*. Records of demonstrated or demonstrable value become the concern of a general archives (*archivio generale*), in which archival materials of many origins are assembled.

Except for a few isolated cases, the general archives is a product of the last two hundred years. Although the Tabularium (the archives of Republican Rome) showed a tendency to absorb records of various administrative origins, the idea of concentrating in one place the archives of different creators was alien to ancient and medieval times. The ancient world did not even have the concept of an *archivio di deposito*, for nowhere are there to be found arrangements revealing an intention to differentiate administratively between current records and those no longer regularly needed for the dispatch of business. It was only in the Middle Ages that a discriminating attitude toward the value of records developed. This was expressed in the practice of copying important records in cartularies so as to have them available for frequent use, while the originals were carefully protected in an inner sanctum, as, for instance, the Byzantine *skeuophylakion*. By and large, however, it was the emerging recognition of the research value of records that led to the distinction between records of daily usefulness and others to be preserved because of their long-range importance.

In the ancient period this distinction was not made; this means that by archives we must understand all kinds of records. In fact, the term archives itself may be slightly inappropriate, for even in its broadest meaning the

word suggests an intention to keep records in usable order and in premises suitable to that purpose. In the Near East, where great quantities of records have been found on excavation sites, only rarely could any part of the site be identified as an archives room. Most of the time we cannot tell whether we are dealing with an archival aggregate or with a collection of trash, the equivalent of a modern waste-paper basket. And yet we cannot exclude such *disjecta membra* from our consideration, because they may still reveal a pattern worth discovering. When Bernard P. Grenfell, Arthur S. Hunt, and J. Gilbart Smyly discovered the mummies of the "papyrus enriched" holy crocodiles in Egyptian Tebtunis, they sensibly decided to include in the first volume of their publication a "classification of papyri according to crocodiles," for papyri in the belly of the same animal might reveal relationships reflecting their administrative provenance and an original arrangement.[2]

Such insight of early papyrologists compares favorably with the attitudes of the Assyriologists toward their clay tablets. Understandably, in the age of the early discoveries about the middle of the nineteenth century, the remains of the palaces and temples, monuments, sculptures, and artifacts captured the enthusiasm and guided the activities of the excavators, while the humble clay tablets ranked low in their scale of values. This attitude changed, of course, when the writing on the tablets could be deciphered and read and when their importance as historical sources was appreciated. Interest was focused, however, on what the individual document (called a text) had to say, on its content, and on its significance as a literary or historical witness. The lowly *Wirtschaftstexte* (economic texts) and administrative documentation in general were slighted. What was worse, the inter-relationships of the tablets were disregarded, and when they were published their character as elements of larger assemblages was neither taken into consideration nor made apparent.

Although it is easy to criticize the earlier Assyriologists for not recognizing the archival nature of much, if not most, of their source material, archivists should refrain from raising their voices in righteous indignation, for a good part of the blame must be laid at their doorsteps. Archivists have never been persuasive salesmen of their cause, nor have they always succeeded in convincing scholars of the contributions they can make to other disciplines. Nevertheless, the extent to which archivists for a century ignored the significance of the great clay tablet discoveries is simply amazing; and since they ignored them they could not and did not object to the dismembering of archival bodies by Assyriologists. It should be borne in mind, however, that archivists during this period were still dedicated to the subject approach to documents, and that they themselves disrupted

bodies of archives in order to rearrange them into subject-oriented collections under headings such as *Biographica*, *Ecclesiastica*, and *Militaria*. True, *respect des fonds* and the principle of provenance began to guide the work of archivists during the second half of the nineteenth century, and should have enabled them to suggest their application to the records of ancient Mesopotamia. But until quite recently, archivists have turned their backs on the first great chapter in the history of their profession.

Besides the clay tablets, the papyri of Egypt are the other large body of original record material that has survived from the ancient world. In dealing with their material, papyrologists were in no better position than the Assyriologists. On the contrary, much of their material came from the refuse heaps of the Fayyûm, that is, from record dumps; and the native diggers sold piecemeal what they found there, so that papyri of the same provenance are now scattered in libraries and collections all over the world. More often than not, therefore, papyrologists had to work with isolated pieces and fragments rather than with bodies of records. And yet, even in the early stages of the discipline, the archival point of view was present in the papyrologists' thinking. In fact, when Josef Karabacek, head of the Imperial-Royal Library of Vienna, took charge of the vast body of papyri that Archduke Rainer of Austria had acquired from the Vienna antiquarian Theodor Graf in the 1880's, he thought that he had before him the holdings of a single large provincial archives.[3] This was, of course, not the case, but it shows that, in spite of the fragmentary nature of the papyrus material, its provenance was always borne in mind. In line with that early readiness to accept an archival approach to the papyri, the great work of Ludwig Mitteis and Ulrich Wilcken, *Grundzüge und Chrestomatie der Papyruskunde* (Leipzig-Berlin, 1912), definitely established the archival character of most of the papyrus material. In this great work of historical and legal scholarship, the administrative genesis of the papyri was clearly delineated. Papyri were considered in their relationship to governmental functions and activities, to financial administration, taxation, agriculture, the military, and so on. Throughout much of the literature on the papyri, their "precious quality of constituting dossiers"[4] is realized, and this realization is brought to bear on their publication. In Karl Preisendanz' *Papyrusfunde und Papyrusforschung*, there is constant reference to the archival character of the papyri discovered, and more recently Erwin Seidl has attempted to identify the various kinds of Ptolemaic archives,[5] although most of them have been scattered. In view of the wide dispersion of papyrus archives, the plan of the late Fritz Heichelheim to compile a guide to the Greco-Roman archives of Egypt would have been a great and eminently useful achieve-

ment.[6] Regrettably this guide, which was to be organized by types of archives, has not been published.

Viewing the history of ancient archives as a whole, it is clear that our knowledge rests on uneven and incomplete foundations. In Section 20 of their well-known *Manual for the Arrangement and Description of Archives* (New York, 1968), S. Muller, J. A. Feith, and R. Fruin say this about the archivist's task: "The archivist deals with a body of archives just as the paleontologist deals with the bones of a prehistoric animal; he tries from these bones to put the skeleton of the animal together again." Similar but far more difficult is the task of the historian of ancient archives who—to retain the metaphor—sets out to bring to life a creature of the past with only the footprints and a few bones to go by. Although for some periods there is a wealth of pertinent data supporting a reconstruction, for others this is lacking. Where neither archival sites nor their contents are known, the archival historian, rather than giving an account of the archives that existed, must be satisfied with telling what archives should have existed. As a result, the history of the ancient archives must remain uneven and partly contestable. In the case of the countries of the Near East and the Aegean, it stems from our having unearthed numerous archival installations of one kind or another with their contents; and in the case of Egypt, where archival depositories have not been discovered, we have at least great quantities of records and excellent information about their genesis and the way they were kept. A totally different situation confronts us in ancient Greece and in Rome. True, the foundations of the Athenian Metroon have been laid bare, and Rome's Tabularium still looks down on the Forum Romanum, but unless reproduced on stone or bronze or referred to in the literature, we do not know the records themselves nor the conditions under which they were kept.

Other difficulties, too, stand in the way of a great design embracing all the archives of the ancient world. Records written on wood tablets or on leather have almost completely vanished. In addition, there are vast areas and peoples for which, in the absence of systematic efforts, information about archives is largely lacking, as for instance Urartu, north of Assyria. Information is also lacking for Carthage and Etruria, two lamentable gaps in our knowledge. Finally, we cannot tell what excavations now in progress in Mesopotamia and Asia Minor or undertaken in the future will add to our store of knowledge.

Although these considerations largely determine the degree of completeness of a history of ancient archives, there are certain phenomena that indicate important interconnections and, in fact, continuity in matters of archives-creation and archives-keeping. One of these interconnections, for

instance, throws revealing light on the endurance of administrative and record-keeping practices in an area that saw a succession of regimes. When the Greeks under Alexander the Great conquered Persia and seized its archives, they called them the "royal skins" (*diphtherai basilikai*), for leather, in addition to the clay tablet taken over trom Elam, served the Persians as a writing medium. The term *diphtherai* was inherited by the Arabs and the Turks, and in the form *deftar* it designates a key series in Turkish archival terminology. With the Arabs the term went to Sicily, where *defetarii*, the Italianized version of it, indicate the financial records of the Norman *doana regia*. To close the circle, the term returned from Turkish into modern Greek as *tefteri*, which means notebook.

Other instances of interconnection and possible transfer or exchange of administrative and archival experience seem plausible but are not yet confirmed. Did the beginning of a "royal notariat" in Syrian Ugarit influence developments in the Greek cities of Asia Minor and on the Greek mainland, where the notarial function became an integral part of the duties of the city archives? Was it Greek precedent that led to the establishment of the *kibotoi* (record chests) in Ptolemaic Egypt, and later to the institution of the property record office, or must we rather look for a connection between these institutions and those of Pharaonic Egypt? Was Greek practice with regard to the official recording of private transactions responsible for the institution of the *gesta municipalia* toward the end of the Roman Empire? Generally speaking, do these constitute instances of cultural transfer rather than cases of parallel development? And are we aware of similar instances of interconnection in the matter of record-making rather than record-keeping? The field seems to be wide open. . . .

In its great design, the contours of Western archival development can already be discerned. There is good reason to believe that "the princely courts of the Occident owe their archival organization as well as their register techniques to a twofold inheritance: the ancient Roman institutions as continued in the tradition of the Roman curia and the chancery practices of the ancient Orient that reached [these courts] through the administration of the Fatimid Arabs of Egypt and Sicily, which, [in turn], had absorbed Persian influence."[7] In the East, on the other hand, Persian experience, and with it the art of record-keeping, determined the character of financial administration of all of the Near East down to the eighteenth century.[8]

1. Claire Préaux, *L'économie royale des Lagides* (Brussels, 1939), p. 10.
2. *The Tebtunis Papyri*, I (London, 1902), xvi–xvii.
3. Karl Preisendanz, *Papyrusfunde und Papyrusforschung* (Leipzig, 1933), p. 112.
4. Préaux, *L'économie royale*, p. 12.
5. Erwin Seidl, *Ptolemäische Rechtsgeschichte*, 2d rev. ed. (Glückstadt, Hamburg, and New York, 1962).
6. Fritz Heichelheim, "Bericht über ein Papyrusverzeichnis nach Gauen, Archiven und Jahrhunderten geordnet," *Chronique d'Egypte*, VII (1932), 137–150.
7. Walther Hinz, "Das Rechnungswesen orientalischer Reichsfinanzämter im Mittelalter," *Islam*, XXIX (1949–1950), 119.
8. *Ibid.*, p. 4.

Ernst Posner, a professor emeritus of history and archives administration of The American University, Washington, now resides most of the year at 66 Aegeristrasse, CH 6300 Zug, Switzerland. His concern with the role of records in the governance of human affairs, secular as well as religious, resulted in his *Archives in the Ancient World*. A recent article on archives in Medieval Islam, part of his study of medieval archives, explores the continuity of record-keeping practices in the Mediterranean countries.

Comment: The Future Role of the Printing Historical Society

James Moran

When I founded the Printing Historical Society in 1964 I did so in the belief that the study of printing and typographical history and the preservation of records and equipment were not only valuable in themselves but that they were internationally indivisible. I cannot believe, for example, that type design can be comprehended on anything but a world basis, and even, say, a purely local type specimen, no matter how interesting, cannot be fully appreciated without knowledge of its antecedents in other parts of the world. The whole culture and technical development of printing has to be viewed internationally.

It is true that the Society was formed initially in London, but that was because the founder lived in London, one of the great printing centres (although declining somewhat today). This was one of those historical accidents with which we are all familiar. The Society could just as well have been started in Paris or New York, and have expanded outwards as it has done. The point I am trying to make is that the P.H.S. is not a purely British or London organization, although superficially it may sometimes appear to be. It has members in more than twenty countries, and in the United States in nearly every state of the Union.

At first, lectures, visits, and other activities were certainly confined to members living in and around London; and for severely practical reasons the administration was carried out in the metropolis. But soon, active members in the North of England formed their own group and the reports of their work and activities makes interesting reading. There is no reason why their example should not be followed.

On the other hand, there have been suggestions that an American Printing Historical Society be formed. There are sound reasons behind this suggestion, but I think that if it were carried out it could lead to the formation of other national societies and the fragmentation of what has proved to be a worthwhile international organization. While it is clear that it benefits every student of printing and typography for there to be localized

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Author's address: 208 Elm Tree Court, Elm Tree Road, London NW8 9JT, England.

activity and research, the object should be to share the knowledge so obtained throughout the world, as far as it is practically possible.

A much better development, in my view, would be for P.H.S. members —in any region where the conditions are suitable—to form a semi-autonomous organization as part of the P.H.S. To this end the P.H.S. committee recommends the following:

1. Membership should be drawn from a geographical area small enough to allow meetings to be held without too much difficulty, but large enough for there to be sufficient numbers for a reasonably-sized group.
2. Groups should be run by a committee elected at an annual general meeting. The chairman of the P.H.S. might be considered an *ex officio* member of such a committee. Activities should be arranged in consultation with the P.H.S. committee to avoid working at cross-purposes.
3. Activities might include meetings and visits; production of a local newsletter; research into local printing history and support for local printing museums. Publications should bear the imprint "The . . . Group of the Printing Historical Society." Where keepsakes or books are given to a local group or to the whole Society, they should bear a statement as to their origin; but local committees should make sure that only work of real merit has the name of the P.H.S. on it.

The P.H.S. committee does not at this stage feel the need to proceed further. If and when regional organizations begin to grow, then will be the time to consider a more appropriate form of international organisation. At the moment the P.H.S. is governed by an annual general meeting held, for practical purposes, in London (although this is not laid down as the venue). Every member is entitled to attend but obviously this is not possible for most members outside of London and the nearby counties. The tendency is therefore for the elected committee to reflect the composition of the annual meeting.

This situation might change, but it is not thought desirable to impose an artificial constitution from above, even though it might appear to meet international requirements. It would be preferable to see how far regional groups do, in fact, develop, and at an appropriate stage consider how their representatives could be drawn into the running of the Society internationally. In the meantime, as an experiment, an international convention might be held for an exchange of views.

As suggested, as P.H.S. chairman I will act as the link between the committee and those who wish to form groups. My address is: 208 Elm Tree Court, Elm Tree Road, London NW8 9JT, England. This is my private address so correspondents should simply write to me by name.

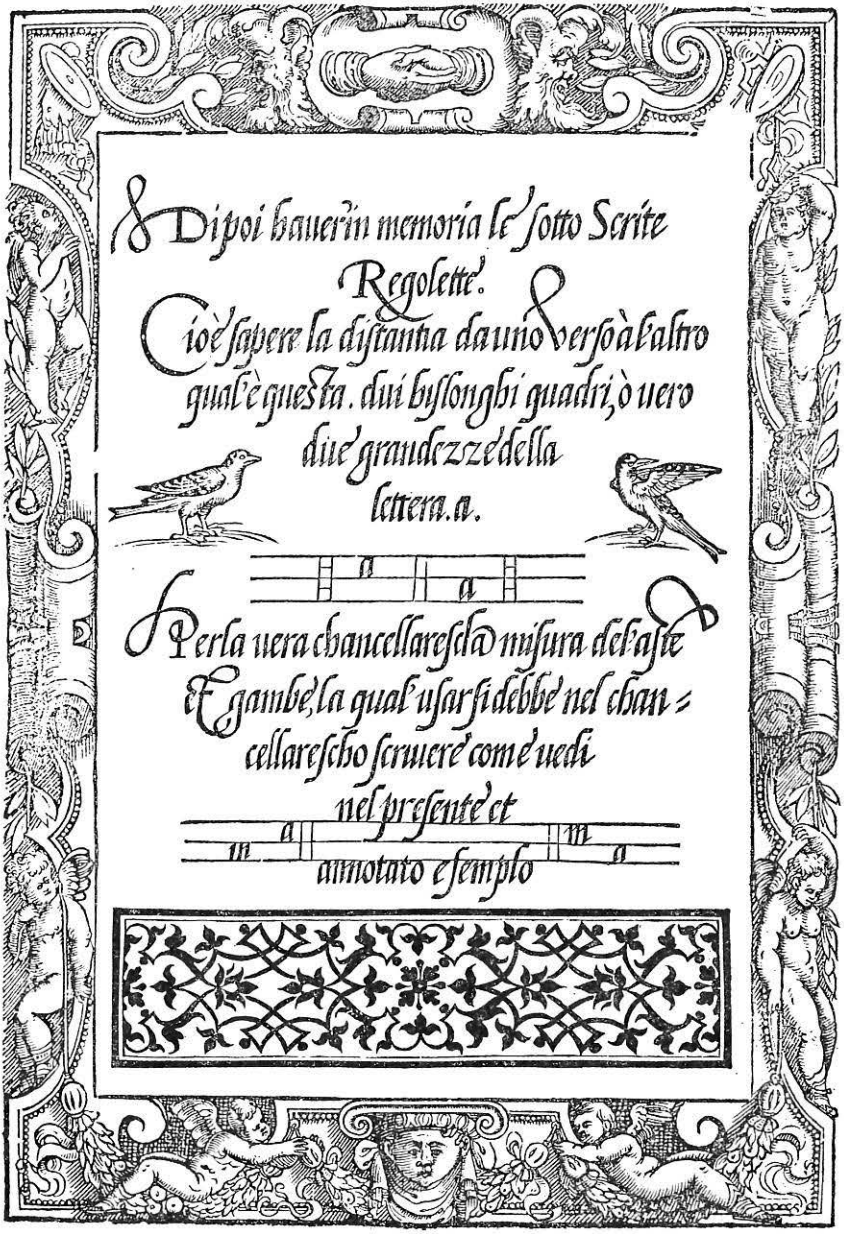
Book Review

A. S. Osley: LUMINARIO. An Introduction to the Italian Writing-Books of the 16th and 17th Centuries. xiii 173 pp. with 116 illustrations; plus checklist of 105 first edns; bibl. of 113 items, & full index; clothbound sm. folio with paper wrapper. Nieuwkoop/Netherlands: Miland Publishers, 1972. Price £21·50 or $56.50.

Such is the extent of current interest in calligraphy on both sides of the Atlantic, that it is pure gratification to be greeted by this first complete survey of early Italian writing manuals. And that the "surveyor" of this forest of letterforms should be Dr. A. S. Osley, is one of those rare instances where subject and author seem preordained for each other. For a decade now Osley has been editing the quarterly *Journal of the Society for Italic Handwriting*. In 1965 he organized and edited *Calligraphy & Palaeography*, a festschrift of essays presented to Alfred Fairbank. Two years later Cresci's 1578 *Essemplare di piu sorti lettere* was published with Osley's introduction and translation. This was followed in 1969 by his extensive *Mercator* monograph, which brought to light the contributions to lettering and the innovations of that sixteenth-century mapmaker. Thanks to his gift of languages and to his judgmatical eye, Osley becomes an ideal guide through a scribal thicket long in need of critical exploration.

The calligraphy of the western world was something largely forgotten until William Morris in the 1850's began his tentative self-instruction in Renaissance scripts. Providentially he had acquired a single morocco volume in which were bound four calligraphic items—two of Ludovico Arrighi, one of Giovanniantonio Tagliente, and one of Ugo da Carpi—so that by the 1870's Morris was producing manuscript books in italic and other scripts, all now treasured by fortunate museums. The morocco volume, along with some of Morris's scribal efforts, were lent for showing at the first exhibition of the Arts & Crafts Exhibition Society in 1888. An inaugural lecture there on November 15, 1888, by Emery Walker was reported in *The Pall Mall Gazette* of November 16 by Oscar Wilde, who described how the projection of a chancery italic page from Arrighi's *Operina*

Visible Language, VII 2 (Spring 1973), 181–188.
c/o The Cleveland Museum of Art, Cleveland, Ohio USA 44106.
Author's address: 445 East 65th Street, New York, N.Y. 10021.



Augustino da Siena, *Opera . . . nella quale si insegna a scrivere*, Venice, 1565.

of 1523 "was greeted with a spontaneous round of applause." This disclosure by John Dreyfus[1] thus sets a date all calligraphiles can accept for the revival of the italic hand, especially since Walker further spoke of italic's virtue as a model for printing type, saying, "With letters like these before him, it was almost impossible for a punchcutter to produce types without grace." Since that historic burst of applause, a stream of facsimiles has brought the major writing manuals to a far wider circle of calligraphiles. These reproductions began to appear in the 1920's, and continue to this day; their very availability has created a need for a critical assessment of the early manuals.

Osley begins by describing the High Renaissance in Italy, where an unexampled expansion of trade brought new methods of commerce, banking, finance, and civil administration—along with the growing cultural and political exchanges. By the fifteenth century her separate principalities (centering around the city-states) saw in Rome, Florence, and Venice, an extension of diplomatic reports by means of codes that required ciphering, deciphering and even espionage techniques, in addition to more routine expedients. The Venetian Republic and the Catholic Church, like most civil powers, received written reports from their ambassadors abroad and now began the practice of selling transcripts to merchants interested in the history, customs, economy, and style of government of the foreign powers around them. This created a mass of paper-work calling for extra staff. As a single example, Osley notes: "When the Vatican Library was reorganized under Paul III (1534–49), Cardinal Cervini instituted the offices of Latin scriptor and Greek scriptor (copyists of Latin and Greek manuscripts); under Paul IV (1555–59) we find the number already increased to six scriptors—three Latin, two Greek, and one Hebrew—and one corrector (*emendator*)." Indeed, in a recent study[2] Professor H. Trevor-Roper calls the Renaissance State "a great and expanding bureaucracy, staffed by an evergrowing multitude of courtiers and officers." These, he finds, increased at such a rate that by the beginning of the sixteenth century they outran the needs of the state, leading him to conclude that "originally the need had created the officers; now the officers created the need."

The like needs in commerce and in government produced (and produce) the like proliferation, but the Vatican's expansion in this respect attracted many a gifted scribe into its various services, men of some cultivation, able to draft and to execute documents and correspondence. Such a civilian army of secretarial paper-workers needed scribal instruction. Yet the very earliest printed manuals were far more concerned with the inscriptional roman capitals and with what we call lettering than with the cursive hands needed by merchants, secretaries, chancery employees, and copyists in the

service of the Church. In fact, the very first printed manual of our period, the *Divina Proportione* (Venice 1509) of Fra Luca Pacioli, a mathematical philosopher and friend of Leonardo da Vinci, contained an alphabet of roman capitals based on human proportions and on the square and circle, but lacking true geometric construction in detail—a lack noted also in Felice Feliciano's pioneer manuscript of 1460.

With the *Theorica et Pratica* (Venice 1514) of Sigismondo Fanti we come to the first printed manual that includes at least the promise of two cursive hands—the *chancery* and the *mercantile*—along with models of rotunda, black letter, and roman inscriptional capitals. The first two are described in detail, but the spaces for their graphic models are blank because, as Fanti explains, he cannot find anyone equal to the task of cutting them in woodblock form. The other three scripts are illustrated as well as described, and the *black letter* (which we know also as *textura*, whereas Fanti calls it *gallica*) is newly treated to geometric construction, as if to raise it to the arcane region of the roman capital, wherein compass and square were usual from Feliciano's 1460 manuscript onward. Fanti's opening section goes beyond its forerunners by at least describing the shaping and spacing of both *chancery* and *mercantile* hands, giving directions for choosing and cutting a quill, and trimming it to the width requisite to the particular script, with sensible hints for pen-hold and pen-management, plus suggestions for making ink and choosing papers. And in these pages for the first time appear woodblock illustrations of the instruments of writing and of the hand holding (rather than gripping) the pen. Altogether, Fanti's book gives enough evidence of performance and good will to win him Osley's designation of Founding Father of his tribe.

Fanti's woodblock blanks were destined to be filled—doubly—within less than a decade by Ludovico degli Arrighi in Rome and by Giovanniantonio Tagliente in Venice. Both these masters are admired to this day for the quality of their chancery cursive—Arrighi for his matchless dozen surviving manuscript volumes, for his work as writer of papal briefs at the Vatican (*scrittore de' brevi apostolici*), and for his early printing types; Tagliente for his virtuoso career and for his forty years' teaching in Venice. Each had found a woodblock artist who could cut the narrow roundings of the chancery script. Arrighi had come upon Ugo da Carpi, and so made possible the publication in Rome of his *Operina* in 1522 and *Il Modo* in 1523. At about the same time Eustachio Celebrino was performing a like service for Tagliente, whose *Lo Presente Libro* appeared in Venice in 1524. It was this double break-through that established the fundamentals of the chancery cursive throughout Italy, whence it soon spread into all neighboring countries.

Osley gives generous space to the many merits of these two manuals, and makes clear much of the quarrel each master was destined to have with his engraver. As a result of this acrimony, each engraver produced a writing-book of his own, each claiming the right to his share in developing the techniques which had made such publications possible; and da Carpi even obtained a papal privilege protecting that right. But both scribes used much of the material shown in the master-volumes of 1522 and 1524. *La Operina*, for instance, was printed without any recognition of engraver da Carpi's contribution; its colophon claims the "invention" as Arrighi's own, and in the introduction Arrighi allows himself to say that the printed version did not properly represent his hand. Tagliente and Celebrino quarrelled in much the same way, each feeling aggrieved by the other. Quarrels apart, it remains a fact that Arrighi's and Tagliente's manuals have not been surpassed since their time. The writing-books that followed —by Palatino, Amphiareo, and Ruano—represent for Osley the Indian summer of the classic chancery hand. They showed liberal varieties of scripts for the use of many artisans, along with some added vigor and precision, and some slight mistrust of the use of geometric methods in cursive scripts.

Of these immediate followers the most important was Giovambattista Palatino's *Libro nuovo d'imparare scrivere* (Rome 1540). Its 125 pages gave the Vatican scriptor ample space for a range of popular subjects, including a rebus of some complexity, alphabets in Greek, Hebrew, Arabic, Chaldaic, Indian, Syrian, Saracen, Illyrian, and Cyrillic, plus the usual hands required of a secretary or notary, and an unexpected essay of exceptional merit on cryptography (*Dalle Cifre*[3]). The section on the chancery cursive hand shows his obligation to Arrighi, though the narrow upper curves of *m*, *n*, and the nether curves of *u*, *a*, *c* degenerate into sharp wedges. But his letter proportions and spacing confirm Arrighi's, thus lending the cursive scripts a needed continuity in principle and performance.

With Giovan Francesco Cresci (another Vatican Latin scriptor) we come to a scribe with strong views against the now established chancery models. They seemed, to him, lacking in speed and slope; so he offered, in his *Essemplare* of 1560, models of his own "improved" chancery cursive whose fussy, curly, sprawling forms were to undermine the legibility of the original. His book promises to redeem chancery's faults, but his pages show him merely appropriating the chancery name for a script of his own. From this beginning in 1560, Cresci proceeded to what he deemed his definitive redemption of the script, a book titled *Il perfetto cancellaresco corsivo* (1579), wherein his "perfected" chancery cursive becomes the sheerest self-indulgence of a lively, arrogant, and vigorous spirit. The new script duly falls

G. F. Cresci, *Essemplare di piu sorte lettere*, Rome, 1560.

into the many traps of its author's making, a script rendered truly illegible by his own ingenuity. Any amateur studying Cresci's pseudo-chancery forms will wonder how their maker could have failed to see faults so glaring.

Yet it is to this same master that we owe the truest gratitude for inducing a complete turn-around in our judgment of the inscriptional roman capitals. He it was who struck the decisive blow for liberation from the geometric mystique which had so long cumbered the classical roman letter. Osley properly calls him a revolutionary for the roman section of the *Essemplare* (1560) and the fuller treatment given in *Il perfetto Scrittore* (1570). In both, Cresci threw overboard the compass, square, and straight-edge, declaring that not even Euclid, the Prince of Geometry, could have made well-proportioned letters by mechanical methods. Instead, he uses the broad-edged pen and such varying ratios as 1:8, 1:9, 1:10 to set up working heights of alphabets according to position or height of the inscription. He wants letters written first with the broad pen and then finished (as to serifs) with a pointed nib; and the same principles apply to the small letters of the

roman book hand (*antica tonda*), derived from their parent capitals. Cresci thus became the first to sense that roman inscriptions had first to be written before they were cut with a chisel—written with a brush of proper breadth to lend vitality to component straights and curves. No compass-made capital is alive. That truth was first proclaimed by Cresci, but art schools well into the present century were still using geometry for classical romans. A single look at the brave five-inch-high letters Cresci shows in *Il Perfetto Scrittore* must bring to every layman a sense of the new freedom he brought to artisans in 1570. The sole extension of this freedom in our time wins a footnote on page 10, where Osley suggests, "See Father Edward M. Catich's important account, *The Origin of the Serif*, Catfish Press, Davenport, Iowa, 1968," a footnote that now breaks into a reviewer's text. Not since Cresci scrapped geometry have we had a technique that goes beyond his until Father Catich's text showed a technique for truly *writing* the roman capital—body and serif both—with a single brush of chosen breadth. This takes some doing, but Catich is uniquely qualified, as his book and lectures show.

With norms for the running hand and for the roman caps and small letters established, Osley prepares us to see style change into fashion, as letterforms are exploited by a succession of gifted masters who sense a change in the winds of fashion or in social movements—or both. Giulian-tonio Hercolani's *Essemplare Utile* (Bologna 1572) was the first Italian writing-book to be produced entirely by copper plate. His model of classic chancery he called *cancellaresca acuta*, a name perhaps better suited to some of Palatino's pages of 1540. Hercolani also offers a *cancellaresca circonflessa* or rounded chancery with clubbed ascenders, rounder forms and greater slope—in general a legible model, but formal and self-conscious, promising none of the speed this book claims for its cursives. In Venice the virtuoso Marcello Scalzini begins, in *Il Secretario* (1581), to exploit the scribal vanity known as "command of hand" to convince the public of his powers as a teacher. He was also a micrographer, often writing the Paternoster on one side of a lentil, and the Credo on the other. He also learned how to flatter beginners into signing up with him. His own writing (which he too, following Cresci, miscalls chancery) is evidently fast and, by its regularity, even attractive, though it seems little concerned with legibility itself. Thus, a full decade before the 1600's, handwriting is no longer a branch of education. As Osley perceives, "active market men are forcing it into the mould of vocational training. Scalzini is the Father of the Crash Course."

With his concluding dozen pages of text—supported by 24 of illustrations—Osley rounds out his 150-year span marking the rise and decline of a craft important to civilized society. When the year 1600 arrived, there was

still much of grace and ingenuity to admire among the score or more of practitioners these pages represent—a gallery whose very gathering can have been no simple task. It may surprise Osley to be deemed a pioneer of the extensive field he has now made his own. His narrative remains stimulating and instructive throughout, and the major scribal figures are portrayed not only by his text but by the generous showing of their works in full size.

To Osley, the dominant figure of the entire period is Giovanni Francesco Cresci, whose two books, the *Essemplare* and *Il Perfetto Scrittore*, "regulated the pattern of Italian writing-books for a hundred years. . . . His written criticisms, though clothed in vainglorious, forceful language, were always painfully to the point and threw a fresh, searching light on their subject." He concludes with the sobering words: "If it is legitimate to consider the handwriting of that period as the battlefield of legibility, then no-one did more, all unwittingly, to lose that battle than G. F. Cresci." Equally sobering for our day is the confusion of counsels, so largely proffered by the unpractised, as to the legibility and quality of the running hand to be taught in our grade schools. A reading of Osley's text, and a study of what once passed for legibility, can do much towards bringing a better-informed common sense into decisions by or for our educational establishments.

Paul Standard

1. See *Calligraphy & Palæography*. London, 1965.
2. *Religion, the Reformation and Social Change*. London, 1967, p. 6.
3. Translated with an introduction by A. S. Osley as *Palatino on Cryptography*. Glade Press, Wormley, 1970.

Paul Standard (445 East 65th Street, New York, N.Y. 10021) has taught calligraphy and lettering at the Cooper Union (18 years), Parsons School of Design (13 years), and at New York University (10 years). He is the author of *Calligraphy's Flowering, Decay & Restauration*; his writings have appeared in the leading graphic arts periodicals in the United States and abroad. He continues to teach privately and to lecture on letterforms.

This review is being published concurrently in *The Journal of the Society for Italic Handwriting* (41 Montpelier Rise, Wembley, Middlesex, England).

Readers may also be interested in the new publication: *Italix*, published quarterly in the interest of calligraphy, particularly italic handwriting. (Editor and Publisher: William F. Haywood, P.O. Box 279, Fair Lawn, N.J. 07410.)

A Secret of Calligraphy

We wonder whether the secret of the parallel between the arts might actually turn out to be only a secret of calligraphy. . . . Each epoch has its peculiar handwriting or handwritings, which, if one could interpret them, would reveal a character, even a physical appearance, as from the fragment of a fossil palaeontologists can reconstruct the entire animal. The arabesque extracted from Chopin's music bears the same relation to it that a sample of handwriting bears to the complexity of the live individual. . . . Souriau has shown us that a piece of music can be translated into a graphic form which is, so to say, its cipher, the sign manual of the artist. And what else is handwriting but the concentrated expression of the personality of an individual? Of all the sciences or pseudo-sciences which presume to interpret the character and destiny of man from signs, graphology is surely the one which has the soundest foundation. Handwriting is taught, and certain of its characteristics belong to the general style of the period, but the personality of the writer, if it is at all relevant, does not fail to pierce through. The same happens with art. The lesser artists show the elements common to the period in a more conspicuous manner, but no artist, no matter how original, can avoid reflecting a number of traits. In terms of handwriting one can speak of a *ductus*, or hand, or style of writing not only in actual handwriting, but in every form of artistic creation, which is to an even greater extent an *expression*, something pressed or squeezed out of the individual.

From Mario Praz, *Mnemosyne: The Parallel between Literature and the Visual Arts*. Princeton: Princeton University Press, 1970; pp. 25–27.

Résumé des Articles

Traduction: Fernand Baudin

Les relations entre la fabrication et l'utilisation des outils et les origines du langage, *par Gordon W. Hewes*

S'il est vrai qu'avant d'être verbal, le langage humain était un système gestuel, une mimique, on peut concevoir un modèle où la fabrication et l'utilisation des outils joue nécessairement un rôle important. Aujourd'hui encore, nous apprenons à nous servir de nos armes et de nos outils par des gestes et en regardant faire les autres, bien plus que par la parole. Les éléments moteurs et les centres nerveux qui interviennent dans la manipulation des objets ressemblent fort à ceux de la communication gestuelle. Ce qui renforce l'hypothèse du fondement visuel du savoir humain.

Une proposition concernant l'initiation à la typographie *par Daniel Friedman*

Les fléaux des écoles d'art qui ont une section typographique sont: les conventions périmées, la disparition du métier, l'inaccessibilité et la complexité des techniques de composition récentes. L'enseignement est donné en termes d'une mécanique démodée et de modes passagères. Il n'existe aucune méthode qui aille au-delà du technique et de la stylistique pour ne s'occuper que de ce qui est essentiellement perception et vision. L'auteur donne des exemples d'un exercice de typographie élémentaire et fait quelques remarques générales sur la simplicité et la complexité, le rythme, la cohérence, l'habitude, le caprice, la lisibilité et le confort de la lecture.

Est-il plus facile d'apprendre à lire et à écrire dans certaines langues que dans d'autres? *par John Downing*

On dit souvent que les idéogrammes chinois sont plus difficiles à apprendre que notre alphabet. Nous avons en effet l'impression qu'un grand nombre de caractères constitue en soi une difficulté. En quoi nous nous trompons peut-être pour deux raisons: 1. Le système alphabétique suppose l'acquisition de bien plus de notions qu'on ne le soupçonne généralement. 2. Ce nombre de signes n'est pas en soi un facteur psychologique bien important. Ce qui est plus important, ce sont les redondances. Les nombreuses options possibles peuvent fort bien provoquer la confusion et empêcher l'écolier de comprendre la nature réelle du code écrit. Ceci, et bien d'autres variables du système, peuvent empêcher l'enfant de voir que l'écrit et l'imprimé sont en fait un langage visuel (visible language).

L'organisation interne des systèmes de symboles écrits *par E. J. W. Barber*

Les éléments distinctifs d'un symbole et qui n'ont aucune valeur propre peuvent être considérés en tant que système. Historiquement, les systèmes ont varié depuis le minimum jusqu'au maximum d'organisation interne. Si l'on envisage le nombre de combinaisons auxquelles les symboles se prêtent, la diversité devient encore plus apparente. A cet égard, notre alphabet romain fait assez piètre figure. Le Morse, lui, est très réussi, mais non pas parfait. Il serait peut-être utile de former d'autres écritures selon ces principes d'organisation interne. Mais le degré d'organisation interne ne coïncide pas avec l'efficacité à l'usage: il n'est qu'un des éléments qui contribuent peut-être à l'efficacité et il faut bien faire cette distinction.

Kurzfassung der Beiträge

Übersetzung: Dirk Wendt

Eine explizite Darstellung der Beziehung zwischen Werkzeuggebrauch, Werkzeugherstellung und der Entstehung der Sprache *von Gordon W. Hewes*

Falls die hier behandelte Verständigung des Menschen nicht mit der gesprochenen Sprache, sondern mit Gesten und Zeichensprache-Systemen begonnen hat,läßt sich ein einleuchtendes Modell aufstellen, in dem die Herstellung und der Gebrauch von Werkzeugen eine bedeutende Rolle spielen. Sogar in den modernen sprechenden Kulturen lernen wir den Gebrauch von Werkzeugen und Waffen hauptsächlich durch die Beobachtung ihres Gebrauchs durch andere, und durch Zeichen und Gesten, und weniger durch Sprache. Die motorischen und neuralen Elemente, die an der Kommunikation durch Gesten und die am Umgang mit Gegenständen beteiligt sind, sind sehr ähnlich. Die visuelle Grundlage der menschlichen Erkenntnis wird hervorgehoben.

Ein Gesichtspunkt: Anfänger-Ausbildung in Typographie *von Daniel Friedman*

Hochschulen für Gestaltung, die mit Typographie zu tun haben, leiden unter lebensunfähigen Konventionen, einer Entwicklungsstufe der Typographie als Handwerk, und mangelndem Zugang zu den Möglichkeiten der neueren, komplexeren Setzsysteme. Typographische Formen werden in Begriffen gelehrt, die an veraltete Mechanismen und beliebte Modeerscheinungen geknüpft sind, und es gibt keine Lehrmethodologie, die das Technische und Stilistische überschreitet und nur das Allgemein-Wahrnehmungsmäßige und Visuelle behandelt. Der Verfasser zeigt Beispiele einfacher typographischer Übungen, und macht von diesen Übungen ausgehend allgemeine Bemerkungen über Einfachheit und Komplexität, rhythmische Struktur, Zusammenhang, Konvention, Unvorhersagbarkeit, Erkennbarkeit und Lesbarkeit.

Ist das Lesenlernen in einigen Sprachen leichter als in anderen? *von John Downing*

Es wird häufig behauptet, daß das chinesische Wort-Schrift-System schwerer zu lernen sei als das englische Alphabet-System. Diese Ansicht basiert haupsächlich auf dem Glauben, daß die große Anzahl chinesischer Schriftzeichen eine schwere Belastung für den Schüler sei. Dies kann aber aus zweierlei Gründen ein Fehlschluß sein: (1.) Es gibt im englischen System weit mehr Elemente zu lernen als allgemein erkannt wird, und (2.) die reine Anzahl zu lernender Schriftzeichen ist an sich noch kein bedeutender psychologischer Faktor. Viel wichtiger ist das Ausmaß der Redundanz in dem System. Zahlreiche Parallelformen können es dem Anfänger erschwerren, das Schriftsystem zu erkennen, und so Verwirrung stiften. Diese und andere Variable des Schriftsystems können das Kind daran hindern zu erkennen, daß Schrift und Druck tatsächlich "visible language," sichtbare Sprache sind.

Die formale Ökonomie geschriebener Zeichen *von E. J. W. Barber*

Diejenigen Teile an der Form eines Zeichens, die zwar charakteristisch für dieses Zeichen sind, aber an sich wertlos, können als systembildend angesehen werden. Solche Systeme haben im Verlaufe der Geschichte variiert, von sehr locker bis sehr festgelegt. Wenn man dazu auch die Möglichkeiten der Anordnung solcher Elemente betrachtet, findet man eine große Variationsbreite in der Ökonomie der Gestaltung. Unsere eigene Antiqua ist, so betrachtet, tatsächlich sehr ineffizient; der Morse-Code dagegen ist sehr effizient, wenn auch nicht vollkommen. Es mag sich als nützlich erweisen, andere Schriften auf Grundlage dieser inneren Ökonomie zu entwickeln. Aber Ökonomie der Form ist nicht dasselbe wie Effizienz im Gebrauch: sie ist nur eine mögliche Komponente der Effizienz und muß sorgfältig als solche von anderen unterschieden werden.

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