Chinese characters - a study and application in graphic design

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Chinese characters -
A study and application in graphic design

by

William Yeng-Hung Mo

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of
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MASTER OF ARTS

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Signatures have been redacted for privacy

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INTRODUCTION

Visual elements and verbal elements are the two basic means by which to achieve graphic communication everywhere in this modern world. As far as the popularity of usage and effect are concerned, the verbal element is more important than the visual element.

It is our ancestors' invention of writing, which makes it possible to record human experiences, that has made world culture as it is today. The later improvement of writing instruments and the inventions of paper and printing have helped human knowledge to spread broadly and speedily, and has freed the communication of thoughts from the boundaries of time and place so that human culture could develop with remarkable speed. Were there no invention of writing, the modern culture would be impossible, let alone its graphic communication systems which are established on the basis of writing. Therefore, it is not too much to say that the world culture is, indeed, based on writing.

When writing was gradually evolving, our forefathers also started beautifying writing. Aesthetic writing can reinforce the function of communication. The harsh competition of communication business makes it more important to design more attractive lettering and to set more fascinating layouts, which has been a special topic for designers. Chinese characters have been considered traditionally abstract art. How to adapt them effectively as a useful subject in graphic art is a new direction for study by designers, especially Chinese designers.

Chinese characters were invented, according to Mr. Tung Tsuang-Pin's
supposition in *The Origin of Chinese Characters*, about 4,800 years ago. Tang Lan (唐蘭) believes that Chinese characters may have been invented 10,000 years ago (16, p. 4). The earliest Chinese writing that has been found is "Shell-and-Bone Writing" of Yin Dynasty, more than 3,000 years ago. The population who read and write Chinese characters is about 1,000,000,000; many East-Asian countries, like Japan and Korea, are influenced by the characters. From the viewpoints of historians, archeologists, psychologists, linguists, designers or in literature and mass communication, an influential writing system with a long history and use by one-fourth of the population of this world is, indeed, a worthwhile and profound study. From the viewpoint of graphic art designers alone, it is essential to have an overall understanding of the features, history, and structural rules of Chinese characters and their adaptation in Chinese graphic art, to improve it more effectively or innovatively.

---

1Mr. Tung Tshaw-Pin is one of the most famous scientists of characters, specializing in the "Shell-and-Bone Writing" (甲骨文) of Yin (殷) Dynasty (the 18th-12th century B.C.)
THE FEATURES OF CHINESE CHARACTERS

The basic difference between Chinese writing and Western alphabetic writing are two:

(1) Chinese characters represent sounds as well as meaning, while in Western writing, letters represent only sounds; individually they do not carry meanings. This is the main difference between these two writing systems. Each Chinese character is, in a certain sense, a letter with its special shape, sound, and meaning. Two or more characters can compound a relevant phrasing. While the Egyptian pictographs were modified by Phoenicians, Hebrews, and Greeks into modern alphabetic writing systems, it is the combination of shape, sound, and meaning that has enabled the Chinese writing system, one of the oldest in the world, to keep its own style on the basis of pictographs, and become a world-renowned system (13, p. 1).

Words are the symbols of language, dependent upon language. In Chinese a monosyllable represents an object or a meaning, which is different from the multisyllables in Western language. This is also the reason why Chinese has never been modified into an alphabetic system. When a character records a syllable, more than a thousand sound symbols would be enough to record the language of the people. In this case, an alphabet system is not necessary. Therefore, the earliest Chinese characters have been continually adapted. Since a square character can represent a sound as well as an object or concept, it is a word of sound and meaning. Therefore, Chinese characters are writing of both sounds and
meanings (19, pp. 8, 38). Because of monosyllables, there are many characters of the same sound which would be difficult to distinguish without pictographs. For example, the sound of "Tsu" can represent "book", "lost", "comb", but the meaning will not be clear until the character is read. In this sense, Chinese characters are symbols of concepts. Meanings attached to characters are not subject to the diversities of dialects or change of time, but are well-comprehended by people speaking different dialects in different areas and time. This differs greatly from the alphabetic writing system, which changes when sounds change. The modern "word" may not be recognized after thousands of years. From this point of view, the unity of the culture of such a country of vast territory, dense population, various dialects, owes very much to Chinese characters.

(2) Thousands of years ago in the evolution, Chinese characters were not only used as written records of human communication, but developed to be an art of writing which occupies a distinguished place in Chinese traditional art. This is the world-famous Chinese calligraphy (書法). The art of writing may also be appreciated in other cultures, yet being fully accepted as an independent course, such as painting in art, Chinese characters may well be the only such example among writing systems (20, p. 25).

Chinese characters have evolved from pictures to combinations of lines. Lines themselves can express the beauty of construction. Furthermore, the adoption of traditional Chinese writing instruments—brush pen and ink give the lines even more subtle changes.
The earliest "Shell-and Bone Writing" is not a primitive, concrete picture, though it embodies some imitation of concrete pictures. It can be considered half-concrete and half-abstract in character, but later underwent modifications. When it simplified into the formation of "Cursive Hand" (草書), the characters had lost the forms of concrete pictures and moved into a pure abstract realm. They are similar to Western abstract painting, in which thoughts (意) express different moods (Figure 1). Thus, Chinese calligraphy is an optical abstract art, based upon characters, and the usage of brush pen developed through a precise process (26, p. 36). Even today, the "faces" of the most commonly used types in graphic designing are the pictorial calligraphic styles from different times in history, most "Text Hand" (楷書).

Pictorial lines may not be as lively and full of variety as the lines made by brush pens, but this is a small sacrifice to the legibility of characters and the effectiveness of communication. High legibility is the aim of the design of modern communicative characters, though a clear, legible character is not necessarily the most beautiful style (27, p. 2). Nevertheless, the printed characters derived from "Text Hand" still keep their basic beauty of structural forms and lines. The calligraphy written with brush pen is still widely adapted in different kinds of graphic design: in poster titles, in cover designs, in logotypes, in distichs (對聯) and in optical paintings.
Figure 1. The comparison of the primitive concrete image (left) and the abstract image today of the same character - 龍 (dragon)
THE ORIGIN OF CHINESE CHARACTERS
AND THE PRINCIPLES OF THEIR CONSTRUCTION

Language comes first, followed by picture images representing the language, which are developed into words--this is a universal rule in the evolution of all languages. Words are, thus, symbols of language. The origin of Chinese written symbols, according to Hsu Sen's (許慎) (86 B.C.-?) (Han Dynasty 206 B.C.-220 A.D.) Shuo-Wen-Chieh-Tze (說文解字), was "Pa-Kau" (八卦) and "Knotted Strings" (結繩). In Fu-Hsi's (伏羲) time (the 28th century B.C.) "Pa-Kau" and "Knotted Strings" were already being used as communicative symbols of language. By the time of Emperor Huang (黃帝) (the 25th century B.C.), Tsang Chieh (苍頡), the official recorder, invented "Hsu-Che" (書契), or notched-stick, which is the very beginning of Chinese characters. No obvious sources or dates can be relied upon; we can only say that, whether or not Tsang Chieh was responsible for the invention, they were definitely established in his lifetime (4, p. 20). After the Chinese invented characters as the method to record communication, since there were no rules concerning how to create characters, people in different areas freely produced them. These characters had been used for several centuries. Then the people in later years established the principles by which the characters were produced as "Liu-Shu" (六書), or six categories of characters.  

Kuo, Hung-Gin (高鴻鑑), scientist on characters, holds the opinion that a scholar of Chin (秦) Dynasty (246-207 B.C.) established the principles by which the ancients created characters (16, p. 14).
Structurally, Chinese characters can be divided into "simple figured, individable Wen (文)" and "compounded by two or more Wen, subdividable Tzu (字)". In "Lui-Shu", the construction of "Wen" includes "Imitative Symbols" (象形) and "Indicative Symbols" (指事) and the construction of "Tzu" includes "Phonetic Compounds" (形聲), "Logical Combinations" (會意), "Expressed by Reciprocation" (轉注), and "False Borrowing" (假借). From a viewpoint of evolution, each character has undergone a great deal of change in appearance; nevertheless, its structure can always be included in the "six categories."

(1) Imitative Symbols: Simple figures of sketches representing an object.

Sun: ancient character - 艳; modern character - 日.
Moon: ancient character - 月; modern character - 月.

(2) Indicative Symbols: Simple figures used for abstract description and the expression of imaginative ideas.

Above: ancient character - 上; modern character - 上, indicating something above the ground.

(3) Phonetic Compounds: Compounds of two or more simple figures.

One element of the characters indicates the meaning, the other the pronunciation. Man in primitive times imitated sounds before he had writing. His first attempts at writing were done with simple figures. For some other figures which could not be expressed by this means, a clever expedient was devised. Beside the simple figure indicating the main attribute

3The first four categories of the "Lui-Shu" are based upon the composition of characters. The last two are based upon their usage (28, p. 10).
of the intended meaning, a second element was set bearing the sound of what they wished to express (4, pp. 27, 28). About half of all Chinese characters belong to this category.

Crow: ancient character - 々； modern character - 々， pronounced as "ya". The element on the left side 々 gives the sound of "ya" and the one of the right side 々 is the "Imitative Symbol" for bird.

(4) Logical Combinations: Compounds of two or more simple figures. The meaning of each part of these characters contributes to the meaning of the whole; but here the meaning of the whole is a synthesis, not a joining of the meanings of the components. "Logical Combinations", as "Imitative Symbols", represent abstract ideas.

Many, Multitude: ancient character - 々々； modern character - 々々々． 々 is the symbol of man in "Imitative Symbols". "Three" is considered many.

(5) Characters Expressed by Reciprocation: 4 Two or more characters whose meanings are understood in an extended or derived sense. For example: Characters like "老", "考", "歳", keep the sense of age by including the element of "老" which means age. According to Mr. Chang Tei-Yen (章太炎), this kind of character came from the difference between dialects (19, p. 80). This is also why there are many different characters with the same meaning. Originally there might be only one symbol (character) for one meaning, yet for the sake of fitting into different

4The last two categories of "Lu-Shu", Express by Reciprocation and False Borrowing, have never had universally accepted meanings and even today are still the subject of controversy in China.
dialects, many characters of the same meaning were produced. "Flood", in certain areas, is pronounced as "洪" (hung), in some other area it is "江" (jiang); the constructions and sounds may be different, but the meaning is exactly the same.

(6) False Borrowing: This type of character comes from the borrowing of relevant characters through association or derived meaning to express a certain object which has no exact word meaning it. Thus, a character comes to mean more than one thing. "令" (ling) originally meant an order; it has been borrowed to mean "a person giving an order".

With these rules for creating characters, there is nothing that cannot be expressed by Chinese characters.
THE EVOLUTION OF CHINESE CHARACTERS

The Main Factors

To meet both the practical and aesthetic aims, in thousands of years of evolution, there have been different styles produced.

From the practical viewpoint

The main reason for the characters to evolve gradually from the earliest picture-characters to the present ones is the convenience for usage. The character of "elephant" has evolved from the earliest picture-character "象" to "象". Practically, it saves much time, and is more convenient. For the same reason, different styles had been developed: "Seal Character" (篆書), "Official Hand" (隸書), and "Cursive Hand". Some of the styles, for the sake of convenience, have changed too much and decrease their effect in communication; for example, the "Cursive Hand". Some styles, like "Running Hand" (行書), were produced on the basis of both legibility and convenience in writing (Figure 2).

From the aesthetic viewpoint

Chinese characters are formed by lines; between these lines we can discern a formative and lively beauty from the changes in these lines.

Formative beauty This includes the look of a whole character, including its form, balance, proportion, and the movement of the lines which includes cursive lines and straight lines. Some characters demand symmetrical beauty, like the "Official Hand" and "Seal Characters".

Figure 2. Four styles of Chinese characters (24, p. 13)
Others pursue active beauty, as in "Cursive Hand". Some are formed by curves as in "Seal Characters", others by straight lines as in "Official Hand", or by continuous cursive as in "Cursive Hand" (Figure 2).

Lively beauty The written lines of a character may be thick or thin, dark or light, made possible by Chinese traditional writing instruments—brush pen, ink and ink stone. Due to the adoption of these special instruments, calligraphers could express their talents freely, shaping their strokes with varied thickness and rendering them steady or hasty, heavy or light, dry or wet, square or circular, as taste demanded. Thus, different styles were produced. "Seal Characters" demand the unification of the strokes (in thickness), and the balance of the formation, so, in this case, the formative beauty is more important than the lively beauty while the opposite is true of "Text and Cursive Characters" (Figure 2).

The Change and Development of Styles

The styles of Chinese characters can be generally divided into five categories: "Seal Hand", "Official Hand", "Cursive Hand", "Text Hand", and "Running Hand". They will be discussed on the basis of their features and the order of their evolution.

---

5 Brush pen, ink, ink stick, and paper are called "four valuables in the studio". Brush pen, ink and ink stick were adopted no later than Yin Dynasty. The method of making paper was also invented no later than West Han Dynasty.

6 The lines by modern ball-pointed pens are the same in thickness. They lack the beauty of variety; therefore, the effect can only be seen in formative beauty (14, p. 11).
Seal characters

Generally "Seal Characters" include "Palaeography" (古文), "Great Seal" (大篆), and "Small Seal" (小篆).

Palaeography These characters were popular in the two thousand years from the time of Tsang Chieh to the time of Emperor Hsuan of Chou Dynasty (周宣王) (the 8th century B.C.). "Palaeography" had also undergone quite a few changes. The "Shell-and-Bone Writing" of Yin Dynasty, the "Bronze Characters" (金文) of Yin and Chou (周, 1122-249 B.C.) Dynasties as well as the "Palaeography" recorded on bamboo and wood strips are the main traits of "Palaeography".

In Yin Dynasty people engraved characters on turtle shells or ox bones for prayer and prediction. This is called "Shell-and-Bone Writing". In Yin and Chou Dynasty people engraved the characters on the bronze vessels and objects as inscriptions called "Bronze Characters". No standardization was achieved in these styles; the different shells, bones, or bronzes showed a great variety of forms of the same characters. The "Shell-and-Bone Writing" was carved; some of them may have been carved after being written with brush pen (23, p. 260); the strokes, thus, are square, monotonal, and straight. There are no exact lines to each character because each was newly adopted at that time. The directions of simple figures are not certain. The elements of compounds may be on either sides. For convenience, there are simplified characters. For "Bronze Characters", the lines of the characters gradually became standardized, not as casual as the "Shell-and-Bone Writing" (19, pp. 123, 129) (Figures 3 and 4).
Figure 3. Shell-and-Bone Writing (carved on a tortoiseshell)
Figure 4. Bronze Characters (carved on a bronze bell and bronze bowl of Chou Dynasty) (4, p. 47)
Great Seal  Late in the Chou Dynasty, Chou (~), a recorder at the court of the Emperor Hsuan, invented a new style called "Great Seal". This is not very different from "Palaeography". The elements of the characters were standardized. The pictorial sense decreased, while the sense of symbolism increased. Complicated lines and square structure show "Great Seal" as a strictly united style (Figure 5).

Small Seal  "Great Seal" seems to have been adopted, and with slight local variations, widely used until the Chin Dynasty, when the separate feudal states of China became united under one Emperor and the Prime Minister Li Szn (~) decided to unify the scripts of the various states. To this end he devised the style called "Small Seal". This style, which was based on the one used in the Chin state, was a modification of the "Great Seal", and was more suitable for universal use. This style has standardized characters for each object and action, and does not confuse the mind with a variety of forms as does the "Great Seal". Since then, all the irregularities of the ancient writing were dropped, and each character was made to "occupy" an imaginary square. On this basis were built all the later styles of writing. These characters are of uniform size; and every line is of equal thickness, smoothly curved and well-balanced (4, pp. 52, 53) (Figure 6).

Official Hand

This style is said to be the invention of Ching Miao (~) of Chin Dynasty. It was for practical purposes that this style was produced; lines and strokes were simplified to meet this aim. At first, "Official
Figure 5. Great Seal (part of the inscription on the stone drums 石鼓文) (4, p. 50)
Figure 6. Small Seal (part of the inscription on Yee Shan, Chin Dynasty) (29, p. 41)
Hand" was regarded as a kind of short hand, as was used only by clerks and officials. Yet, this style changed after Ching Miao to increase the undulating movement. By Han Dynasty, it was a popular style. Its features in that time were firm, decorative characters, and the varied shapes of strokes which transformed the circular, curved, and rounded lines of "Small Seal" into the square, the polyangular, and the straight (Figure 7).

Here, the art of calligraphy made a remarkable step forward. This sudden leap forward can be credited to the improvement of writing instruments. It became possible for calligraphers to exert their talents freely, shaping their strokes with varied thickness and rendering them steady or hasty, heavy or light, dry or wet, square or circular as taste demanded. These facilities were denied to earlier writers, who worked in bronze and stone with knives that could not be turned with ease (4, p. 60).

Cursive Hand

"Cursive Hand" originally means in Chinese "rough draft"; that is, something written quickly and perhaps carelessly. "Cursive Hand" started in the early Han Dynasty. In the first instance, it may have been written in a hurried, sketchy manner for the sake of convenience; but later scholars found a certain beauty in it and an interest in practicing and perfecting it.

"Cursive Hand" was set free from the shape and style of "Official Hand", and the cursive lines impress readers with a sense of uncurbed.
The Hsi-Ping Doctrine of Han

The broken epitaph of Tsao-Chen of Wei (魏, 220-264 A.D.)

Figure 7. Official Hand (4, p. 62)
force and rapidity. In the most carefree style, every character has a visible link with the rest (Figure 8).

**Running Hand**

"Running Hand" is a style developed from "Official Hand" during late Han Dynasty. Its strokes are more cursive than the latter, but more precise than "Cursive Hand". Thus, it is better than "Official Hand" in speed, and "Cursive Hand" in legibility. In its most highly developed form it departs from the strict formality of "Official Hand". The angles of the latter are softened and a great deal of movement and ease added (Figure 9).

**Text Hand**

"Text Hand" is the style formed in the Wei and Jin Dynasties, also developed from the "Official Hand" of Han Dynasty. Its style is in between those of "Official Hand" and "Running Hand". It preserved the essential characteristics of squareness and precision of "Official Hand", and the simplicity and speed of "Running Hand" (Figure 10).

From a practical viewpoint, "Seal Characters" and "Official Hand" slow the speed of writing; "Cursive Hand" causes difficulties in legibility. Thus, they are out of consideration for daily use. "Text Hand" and "Running Hand" are the two satisfactory styles; the latter betters the former in speed; the former, the latter in legibility. Precise, uniform as "Text Hand", it has been the standard of Chinese characters for thousands of years. Today it is the style used in official documents and printing types, while "Running Hand" is popular in common letters or
Figure 8. Cursive Hand (by Wang Hsi-Chih 王羲之 of Jin 晉 Dynasty 265-420 A.D.) (4, p. 95)
Figure 9. Running Hand (by Su Tung-Po; of Sung Dynasty 960-1280 A.D.) (4, p. 865-868).
Figure 10. Text Hand (by Ou-Yang Hsun of Tang Dynasty 618-907 A.D.) (4, p. 71)
other types of recording. Today, when hard-point pens take the place of brush pens, the beauty in the change of strength and darkness of ink is lost, but the structural beauty can still be discerned.

From an artistic viewpoint, all styles show beauty in their own ways. The "Shell-and-Bone Writing" and "Bronze Characters" show beauty in their primitive simplicity; "Great Seal" and "Small Seal" show a sophisticated kind of beauty; "Official Hand" and "Text Hand" show a magnificent beauty in their strict squareness; "Cursive Hand" and "Running Hand" show a subtle beauty in their lively shapes (16, p. 12). However, "Text Hand" is the basic style for new learners. In graphic designing, it is also the most useful. Types in printing are derived from it. Other styles as well as pictorial hand lettering are useful for different aspects of graphic designing.
THE GRAPHICS OF CHINESE CHARACTERS
IN MODERN TAIWAN, REPUBLIC OF CHINA

The development of industry and harsh competition have brought into being other trades: advertising, mass communications, and design in art. Better selling depends not only on the good quality of products but also on appearance, packaging, and advertising. From this trend, graphic designing has become an independent course of art, in which character designing is one of the most important elements. A poster or even a newspaper advertisement is made up of two principal elements—the verbal element and the visual element, the appropriateness of which has direct influence on the effect of communication (9, p. 234).

Character designing in Taiwan, Republic of China, has become important only in these modern years, and has developed an independent system from the Western one on account of the unique writing system. Designed characters have been applied to newspapers, magazines, layout of books, posters, diverse covers, calendars, trademarks, packaging, titles and credits for movies or television programs, and even in modern "optical art". Characters are either employed as part of a design, or as the main topic (Figure 11). The material for character designing is copious, such as printing inks, colors, hardware, wood, acrylic.

How to design beautiful original forms of characters is the basic lesson in graphic design. Modern graphic designing in Taiwan can be divided into two aspects for discussion: type or typography and hand-lettering.
Figure 11. A book cover using the character "福" (Blessing)
Type and Typography

Type refers to a set of carved or cast or, in the broad sense, graphic characters which are set by hand or by machine and are used mainly to print words for body copies or titles. Typography is the science of selecting type or type faces, considering the space between words or lines, lineage, the size of a plate, the arrangement of titles and subtitles, and other ways possible to improve the legibility of verbal elements to attract readers.

Typography

Typography includes the arrangement of body types, display types, white space, and illustrations. This thesis has emphasized the type and the type faces rather than describing the technology of typography. The author wishes to describe some basic principles. In selection and arrangement, one must take into consideration: first, high legibility, then appropriateness, that is, all type faces should suit the content; and, finally, using type creatively, altering type face to be more lively to attract readers (25, p. 61; 5, p. 101). These principles are almost the same as those of alphabets, though the basic difference in typography is that in English, words move from the left to the right horizontally, while in Chinese, they move from the right to the left vertically. In modern times, Chinese culture has been influenced by Western culture. Many books have adapted the Western way (Figure 12). They all maintain a rule of proximity; that is, the space between characters must be less than that between lines to guide the correct direction of reading (Figure 13).
慶祝青年節
大溪地華僑
寄贈堅背

馬年看馬
謝國城的收藏世界

YEAR
OF
THE HORSE-
SHIEH KUO-CHENG’S
HORSE
COLLECTION

Figure 12a. Two examples from magazines to show the vertical (top) (6, p. 24) and the horizontal arrangement (22, p. 12) in Chinese typography
Figure 12b. An example to show the arrangement of verbal elements in a Chinese newspaper
Figure 13. The rule of proximity. --- to show reading direction (27, p. 21)
The horizontal lines are good for the extended style, and the condensed style is good for vertical lines. This is the major difference in Chinese characters for typography.

**Type and type-face**

Type in its broad meaning, can be divided as hot type and cold type, although often "type" is used to mean "hot type" or "lead type".

**Hot type**  
Hot type is the casting of the characters in hot metal. It is usually adopted in letter press printing. In Taiwan, the main hot type is hand-set, leaded, movable type.

**The history of movable type**  
Movable type was a product of the invention of printing. Ancient printing in China compares to "seal" today. Characters were carved on a piece of wood, with color added, and then pressed onto paper. In this simple manner, printing started in China. In Tang Dynasty, Wang Chen (王玠) carved a script of prayer --"Diamond Sutra" (金剛般若波羅密經) in 868 A.D. This is the earliest carved wood printing in existence. In Sung Dynasty, Bee Sheng (畢昇) (1038 A.D.) invented movable type. In time, it was brought to Europe. In 1452, the German Johann Gutenberg invented a wooden

---

7 Type can also be made by carving the wood and rubber like the seal we use today.

8 This kind of hand-set type can be used in letterpress by printing with the original plate or with stereotype, and in offset printing after protoprint and photographing.
printing machine. Thus, printing became useful for many people. In the beginning, Bee Sheng used clay to make type. Gradually, this changed to wood and copper. Until 1445, lead type was invented by Johann Gutenberg and still in use today (3, p. 13).

The movable type in modern Taiwan is applied mainly in letter press printing, seldom for offset printing.

**The styles of the type faces** The main styles adopted today are "Text Style (楷體)", "Ming Style (明體)", "Imitated-Sung Style (仿宋體)", and "Bold Style (黑體)". Since type faces are used mainly for books, newspapers, magazines, periodicals, and the body copy of advertisements, legibility is a major concern. "Text Hand" is the one among all styles of Chinese writing that functions best in communication because of its high legibility. All styles of type face today are derived from pictorial "Text Hand".

**Ming Style** "Ming Style" is derived from a school of "Text Hand"—"Yen Style (顏體)". Its horizontal lines are thinner, vertical lines thicker; sweeping-left strokes are thicker in the upper part and thinner in the lower part, and contrary in sweeping-right strokes (27, p. 32) (Figure 14). High legibility makes it the most popular and basic style of type face.

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9Johann Gutenberg is often called the inventor of printing. What he actually did was to develop the first method of utilizing movable type and the printing press in such a way that a large variety of written material could be printed with speed and accuracy. (Gutenberg did not invent movable type; that was invented in China in the middle of the 11th century by Bee Sheng.) Gutenberg combined all elements of printing into an effective system for production (7, p. 3B).
Figure 14. Styles and sizes of lead type (3, p. 98)
Imitated-Sung Style  At the time that Bee Sheng invented movable type, he also imitated a school of "Text Hand" of North-Sung (北宋) Dynasty--"Oh Style" (欧体), to carve type faces; this is called "Imitated-Sung Style". Its features are oblong, horizontal lines tending to the upper right side with little difference in thickness between horizontal and perpendicular lines, the ends of strokes showing the track of start and finish (Figure 14). This style is particularly appropriate for short articles.

Bold-Style  The lines are monotonous, full of a sense of force. The middle part of each stroke is a bit thinner. It is appropriate to title-designing, and only second to "Ming Style" in popularity. "Bold Style" is similar to English Gothic, while "Ming Style" is similar to Roman style (Figures 14 and 15).

Text-Style  This is a close imitation of the "Text Hand" in calligraphy. Its strokes are forceful, with proper thickness and high legibility (Figure 14). It is also popular in usage.

The size and variations of type faces  English type faces depend on points; Chinese type faces on numbers. They start from zero to eight, plus new zero and new five. No. 0 is equivalent to English type of 42 points. Three different systems of size are: 0 - 2 - 5 - 8; 3 - 6; 1 - 4. The preceding one is always twice as large as the following one (9, p. 241) (Figures 14 and 20). Generally speaking, for the sake of legibility, newspapers use No. 6 and magazines use No. 5.

In regard to the proportion of thickness of strokes, except for "Ming Style", the ratio of thickness between horizontal and perpendicular
Figure 15. The comparison between Chinese and English type faces
lines is certain. When the type face is larger (the number decreases) or thicker, horizontal and perpendicular lines increase in thickness by ratio. "Ming Style" is peculiar in the sense that it does not increase as much in thickness on horizontal lines, yet is much thicker on perpendicular lines. Therefore, the ratio changes according to that of size and thickness of face (Figure 16). For example, the ratio is 1:5 in No. 0 type, 1:3.5 in No. 5 type and 1:2 in No. 7 type.

Each style in English type faces has quite a few variations. Cheltenham style includes Cheltenham old style, wide style, italic style, condensed style. These variations make up a family within Cheltenham style (25, p. 51). Basically, each Chinese style may have quite a few variations, also, as thick style, thin style, condensed style (長體), italic style (斜體), extended style (平體). There is no difficulty in designing. There are less Chinese variations of type faces than English variations because Chinese characters are equivalent to letters and there are about half a million Chinese characters; those commonly used number around 4,000 (4, p. 24). In other words, for one variation, at least 4,000 new types would be reproduced. In English, 26 letters serve all the variations. This is a burden and inconvenience in using Chinese characters. In modern Taiwan, only large printing companies could afford to maintain many variations (Figure 17). This difficulty was not improved until the invention of photo-typing.

Cold type Cold type is the graphic character which can be cut off and pasted up into camera-ready copy. It is generally a suitable method for offset printing. In Taiwan, it includes photo-typing, and
1:5 in number zero type face  
1:3.5 in number five type face

Figure 16. The ratio between horizontal and vertical strokes in thickness of Ming Style lead type

Figure 17. Some variations in Imitated-Sung Style of lead type (27, p. 33)
The origin and function of photo-typing

Photo-typing aims to apply the same theory as the camera to do the typesetting and composition by means of photo-composing machines. This kind of machine was invented in Japan in 1924. This machine takes all required characters by moving around the typemaster (which is a metal plate carrying transparent character models) between the light and the lens, which is thus exposed on print paper or film (Figure 18). They are then cut off to make up the original copy for printing. A typemaster has 273 characters, 35 typemasters to a set; all together a set could create 9555 characters. The typemaster is a "negative plate" which means that the shape of the character is transparent on the metal plate to let the light pass through and strike the negative, positive film, or the print paper.

The face designing of photo-type

It is the same as hot type. Photo-type also has four different styles of faces: "Bold Style", "Ming Style", "Text Style", and "Imitated-Sung Style", but it has rich variations in thickness of strokes (which may be called substyles). "Ming Style" alone includes thin, medium, thick, extra thick--four different substyles. "Bold Style" has thin, medium, demi-thick, thick, extra thick and round--six substyles or twelve styles altogether (Figure 19). Each style demands a set of plates to carry; yet, when it changes to italic or a different size, no new plate or no new character is necessary as in the case of hot type; it can make use of the lenses of the camera to achieve its aim.
Figure 18. Photo-typing machine (top), typemaster (right top), the construction of a photo-typing machine (right) (27, pp. 116, 117)
<table>
<thead>
<tr>
<th>Style</th>
<th>Company Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thin Ming Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Medium Ming Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Thick Ming Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Extra-thick Ming Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Text Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Imitated-Sung Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Thin Bold Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Medium Bold Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Thick Bold Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Extra-thick Bold Style</td>
<td>照相排字有限公司</td>
</tr>
<tr>
<td>Round Bold Style</td>
<td>照相排字有限公司</td>
</tr>
</tbody>
</table>

Figure 19. Styles of photo-type
The sizes, thickness, variations and reversed white character of photo-type. Photo-type counts sizes by grades. The lenses of a photo-typing machine have twenty different ratios. Any style from grade 7 to grade 62 (equivalent No. 8 to No. 0 of hot type, and 5 point to 42 point of English letters), can change its sizes freely, though the original size on the typemaster is grade 16 (equivalent to 11 point of English letters) (Figure 20). As for thickness, the ratio of the thickness of horizontal line and vertical line does not change with the change of the thickness of style (the change in substyles); in other words, the ratio of lines of an extra-thick Bold is the same as that of lines of a thin Bold. Though the ratios of "Ming Style" do change; that is, the ratio of a thick Ming is smaller than that of a thin Ming (Figure 21). Since in photo-typing, the different sizes of type are obtained by changing the lenses, the ratios of each style in different sizes would be the same.

In regard to variations, a photo-typing machine can use a shape-changing lens to enable characters to be condensed, extended, or italicized. Condensed and extended characters have five different degrees while italicized characters have four. The angle of inclination of italicized characters can be $80^\circ$, $70^\circ$, $60^\circ$, or $50^\circ$ (Figures 22 and 23).

Reversed white character can be achieved through the change of the use of film or print paper (Figure 24).

The comparison between photo-type and lead type

(1) The characters developed from the typemaster of a photo-typing machine are quite even and well-formed; they remain the same in
<table>
<thead>
<tr>
<th>Grade</th>
<th>Number</th>
<th>Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>56</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td>32</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>28</td>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>24</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>18</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>10.5</td>
</tr>
<tr>
<td>14</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>6</td>
<td>7.5</td>
</tr>
<tr>
<td>10</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td></td>
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<tr>
<td>8</td>
<td>7</td>
<td>5.5</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 20. Type sizes in grade (photo-type), number (lead type) and point (English type) systems (27, pp. 24, 25)
<table>
<thead>
<tr>
<th></th>
<th>Style</th>
<th>Ming Style</th>
<th>Bold Style</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Substyle</td>
<td>Thin</td>
<td>Medium</td>
</tr>
<tr>
<td>The ratio of thickness of horizontal stroke and height of character</td>
<td>1/40</td>
<td>1/40</td>
<td>1/40</td>
</tr>
<tr>
<td>The ratio of horizontal and vertical strokes in thickness</td>
<td>1:1.1</td>
<td>1:2</td>
<td>1:3</td>
</tr>
<tr>
<td>Sample</td>
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<td>-</td>
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</tr>
</tbody>
</table>

Figure 21. Diagram of the ratio of horizontal and vertical strokes in thickness of photo-type (27, p. 26)
Condensed Italic Style

Figure 22a. Principle of variations (condensed italic faces) by using changing lenses in photo-typing (27, p. 28)
Extended Italic Style

<table>
<thead>
<tr>
<th>Italic-1 (90°)</th>
<th>Regular (90°)</th>
<th>Italic 1 (80°)</th>
<th>Italic 2 (70°)</th>
<th>Italic 3 (60°)</th>
<th>Italic 4 (50°)</th>
</tr>
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<td></td>
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<tr>
<td>5. 10</td>
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</tbody>
</table>

Figure 22b. Principle of variations (expanded italic faces) by using changing lenses in photo-typing (27, p. 28)
Figure 23. Samples of variations of thin Ming Style by using changing lenses in photo-typing (3, p. 119)
Figure 24. Example of reversed white characters
quality. There is no distinction between the new and the old, as there is in lead types (Figure 25).

(2) The typemaster does not occupy too much room, which enables it to afford many kinds of faces and with the help from the change lens and film, it is easy to get different sizes and variations, while lead types are too much bound by space to offer variations.

(3) Lead type depends on hand-setting, which is time-consuming; yet photo-type has the machine do the typesetting; the turning of cogs also makes space between words and lines, and saves trouble in composition.

(4) In modern Taiwan, the price of photo-typing is much higher than that of lead type composition whereby the body copy of most books and magazines is still made by lead types, except for some photo-types in headlines and cut lines.

Photo-type is popular among printing designers and advertising agencies, in briefs, synopses, posters, packaging, etc. If the price of the photo-typing can be lowered, it would be adopted by more books and magazines.

(5) Photo-typing is better for offset and gravure printing while lead types are better for letterpress printing. In Taiwan, letterpress printing usually is done by lead type composition, while offset printing is done by photo-typing and Chicoding. In some countries, like Japan, it is common to have letterpress printing done by photo-typing, though it is still not usual in Taiwan because of an extra process of making photo-engraving.
Figure 25. The comparison of the printed effectiveness of lead type and photo-type (3, p. 121)
In recent years, some books of characters have begun to adopt the method of offset printing done by lead type composition. Though it may take more time in processing, it costs much less than photo-composition. The collective appearance of old-fashioned lead type faces shows more adjustment than that of new photo-types. Individually, the designing of photo-type faces is more modern and beautiful than lead type faces.

Chicoding (Chinese typing) Chicoding is one of the major methods of making original copy for offset printing. The body copy is first typed by means of a chicoder, and then cut off to make an original copy. The type faces vary with different brands, yet basically they consist of four styles.

A chicoder is unsatisfactory in that each has only one type face and one size. Thus, in designing, a bigger display type for titles is sacrificed for the body copy. The help of a photo-typing machine is necessary for making the larger characters for the copy. Also, the faces of its characters do not have the quality of those of lead types and photo-types. Nevertheless, it is inexpensive and, therefore, popular among some small newspapers and magazines.

Hand-Lettering

Hand-lettering in graphic design refers to a style designed in ways other than hot type, photo-typing, or chicoding. These styles are copious and complicated, varying with the designer's imagination. They can roughly fit into two categories.
Designing of Chinese characters expressed through calligraphy

The art of traditional calligraphy can be applied to character-designing. Calligraphy can be considered an independent art. Calligraphers have been appreciating calligraphy by hanging distichs on the wall as works of art. The definition of calligraphy is a visual art developed from the movement of brush pen. As described earlier, it has five styles: "Seal Hand", "Official Hand", "Running Hand", "Cursive Hand", and "Text Hand". These are widely used in many kinds of designing: Seal Style, showing classical simplicity in its close relationship with the pictograph, is usually used in the design of New Year's cards, invitation cards, and insignia (Figure 26); while Official Hand, showing a sense of traditional prestige, is always widely used in the logotypes of firms and companies (Figure 27). The legibility of Cursive Hand is not quite suitable to commercial design, yet it shows an abstract sense of lively movement, and is adopted in abstract painting or stage scenery (Figure 28). On the contrary, the high legibility makes Text Hand and Running Hand popular in logotypes and titles of books, periodicals, posters, and movies (Figure 29).

Chinese calligraphy is under "automatism" in art designing; and with the special instruments: paper, brush pen, and ink, there are subtle changes in effect: thick, light, dry, wet, slow, or fast. While the beauty of the characters produced by hard-point pens and ink is limited to decoration, the characters in calligraphy are lively and variegated; therefore, in graphic designing, from a small card to a movie title, calligraphy is the subject of worthwhile and serious studying.
Figure 26. Examples of trademarks and logotypes designed in Seal Characters
Figure 27. Examples of logotypes designed in Official Hand (9, pp. 248, 258)
Figure 28. Examples of abstract paintings, stage and poster designs using the Cursive Hand (9, pp. 129, 133; 8, p. 39)
Figure 29. Examples of logotypes designed in Text Hand (horizontal lines) and Running Hand (vertical lines and photo)
(9, pp. 235, 236) (Figure 30).

**Pictorial hand lettering**

Other than calligraphy most "hand lettering" belongs to this category, which employs different instruments and is used widely in different places. If the purpose is to attract attention, beauty is the main concern to them. These can be seen in packaging or as designs for clothes and rugs (Figure 31). When communication is also an aim, it is important to be concerned with both the legibility of the lettering and the match of lettering, design, and basic intent. For example, in commercial headlines (Figure 32).

The designing of Chinese character, covering form-designs, ratio, spacing, the visual-psychological effect, instrument, and the process of creating the form, can be a special topic. Generally the shapes are first sketched in draft. Then, the material and instruments of expression are selected according to designer's ideas. They can be shown through drawings made by ball-pointed pens, ink and rulers, by computers, or by acrylic paints. The designing of pictorial lettering may include variations between styles (imitation of different styles of type faces or combination of all styles) and variations in a "family" such as italicized characters, decorated characters, and outline characters and, of course, other designs of personal invention (Figure 33). In graphic designing, this is the kind of character designing with the greatest variety for it is easy to execute and is widely used.

The above description of categories is made according to the process
Figure 30. A set of stamps using Chinese calligraphy as the subject
Figure 31. Examples of pictorial hand lettering used in a rug design (top) and a packaging design (bottom) (10, p. 244)
Figure 32a. Examples of pictorial hand lettering used as logotypes, book and article titles
Earthquake in Alaska (17, p. 178) →

Figure 32b. Continuation of Figure 32a
Figure 33. Example of three-dimensional character design
of its production. Yet in graphic designing, character designing is an artistic task. Subject to change, art is not limited to rules. After we have a basic understanding of how characters are used in graphic designing in Taiwan, we should then create and invent and cultivate a better road in this field.

Designers could be innovative in discovering a unique style of lettering on the basis of combinations of other styles such as a design of collected words by chicoders or a special visual art by combining colors, design, and calligraphy.\(^{10}\)

The author has created some of these forms after a study of Chinese characters in graphic designing.

\(^{10}\) As in the countryside in Taiwan, there are characters in calligraphy lined up by butterflies or conchs.
PORTFOLIO BY THE AUTHOR
Figure 34a. "Return Our Land" number 1
Experimental use of calligraphy in an acrylic painting
Acrylic on canvas
Spring, 1978, I.S.U.
Figure 34b. "Return Our Land" number 2
Figure 34c. "Return Our Land" number 3
Figure 34d. "Return Our Land" number 4
Figure 35. "Happiness, emoluments, and longevity"
Acrylic paint on Masonite
Spring 1978, I.S.U.
Figure 36. "Longevity"
Pictorical character applied in graphic design
Two-color offset print
Spring, 1978, I.S.U.
Figure 37. "Happiness"
The use of calligraphy in graphic design
Combined three layers of color-keys of black, magenta and cyan
Spring, 1978, I.S.U.
Figure 38a. A 16 mm black and white animated film showing the evolution of the character "虎" (tiger) Kodak Plus-X film and Bell and Howell camera Winter, 1978, I.S.U.
Chinese characters may not quite differ from Western words in sources or time, yet in evolution they followed an entirely different pattern. The Western writing system has evolved from pictographic images to today's phonetic symbols, while Chinese characters have developed from pictorial characters to today's system, showing shapes, sounds, and meanings.

In the process of evolution, Chinese characters have not only been a means of communication, but also have entered the realm of art as calligraphy. Beauty is also deemed important in Western writing and there are many magnificent writings in classical manuscripts, yet in the difference of formation of lettering and instruments of writing, Chinese calligraphy is more subtle in art. Therefore, from an aesthetic viewpoint, the evolution of Chinese characters seems superior to that of the Western world.

In the 18th and 19th centuries the speedy development of industry and an explosion of knowledge has developed the business of mass communication; thus, Western scholars started their study in the art of lettering to improve legibility, economics, and the beauty of letters and layout, and to seriously study it as a science. From the viewpoint of communication instruments, Western writing started much earlier than Chinese.

Yet the ancestors have left the Chinese people a complete, magnificent writing system. The aim of this thesis is to introduce this system
to the Western graphic designing world, and, at the same time, to review what has been done in Taiwan in character designing to find a direction for researcher's future studies. I sincerely hope Chinese or Western designers would think highly of Chinese characters as a subject with potentiality, in all applied areas, cultural or business, as a means of mass communication, or as abstract forms for fine arts.

To regard it as a means of graphic communication, lettering design in Taiwan or China is several decades behind the Western. In the United States, there are many devices which can produce type easier and faster. For example, the machine-set Linotype and monotype are more convenient than the hand-set Foundry type (11, pp. 404-405). To be a designer, one should not concentrate research only on creating the beautiful characters, but also on how to apply these characters in graphic communication or printing more convenient and faster in order to save time and labor. The designer should also concentrate on improving the layout for higher legibility and lower cost, economically. This will enhance the science of Chinese printing and typography. The research area is very broad, including printing methods, type-casting machines, and optical psychology. The invention of photo-typing and computer-aided chicer (1, p. 3) is a large step in the contribution to character communication. From this viewpoint, communicative character design is not only the work of artists and designers, but also the task of scientists, psychologists, and literary men.
8. Hsieh, Li-Fa (謝里法). "The Use of Ink by the Artists in 60's Taiwan" (60年代台灣書壇用筆情趣), Lion Art (雄獅美術), Vol. 78, Taipei, Taiwan, Republic of China: Lion Art Book Co., 1977.


29. Yuen Tan, Col. 43. Taipei, Taiwan, Republic of China: Yuen Tan Publisher, 1971.
GLOSSARY

Automatism: Any form-making work done under a state in which consciousness does not control action, but is a mere adjunct of physiological changes.

Body copy: Text, in English, usually 14 point (equal to number 4 or grade 20 in Chinese printed character) and smaller size.

Bronze Character (金文): The characters engraved on the bronze vessels and objects as inscriptions by people in Yin (殷) and Chou (周) Dynasties (the 18th-3rd century B.C.) in China.

Chicoding: Typing with a Chinese typewriter.

Cold type: Type composed other than traditional method, hot type or foundry. Cold type includes photocomposition, paste-up, and such type composed by typewriter.

Condensed style: Letter or character with a narrower face than normal type of the same series.

Display type: In the English system, 14 point type and larger size. It is mostly used for headlines and for emphasis.

Distichs (對聯): A Chinese strophic group disposed in two vertical rows, usually written by brush pen and hung on the wall for appreciation.

Extended style: Letter or character which is considerably wider than the standard for the same height.

Grade (級): The unit used for Chinese photo-types. Grade 62 equal to 42 points and grade 7 to 5 points.

Gravure: Printing method in which the image to be reproduced is carried by incised lines or tiny wells of inks.

Hot type: Type produced by casting in hot metal, usually in lead.

Hsu-Chi (書契): Notched-stick. Similar to the English tally. It consisted of a piece of wood engraved with a symbol. The two people or parties concerned in a transaction would divide it between them. The object was invented by Tsang Chieh (蒼頡), official recorder of Emperor Huang (黃帝) (the 25th century B.C.) in China.

Italic style: Letters or characters which slope up toward the right.
Knotted strings (結繩): Before the time of Fu-Hsi (伏羲) (the 28th century B.C.) in China, those in charge of the administration used these knotted strings to remind themselves of matters which had already been dealt with and to remember those which had still to be done.

Layout: A pattern, roughly or carefully drawn, to show placement of elements for a proposed printed piece.

Legibility: That degree of visibility which makes printed matter read easily and rapidly.

Letterpress: The traditional method of printing from a raised surface. Also known as relief process.

Linotype: Mechanical typesetting by molding a line of type at a time. The Linotype machine is operated by a keyboard resembling that of a typewriter.

Logotype: Logo is short for logotype. Symbol. Also several letters, words, or a slogan cast in one piece of type. Example: An advertising signature, newspaper, name plate, trade name.

Monotype: Type set by a machine in which the individual letters are separately molded and automatically assembled into lines.

Movable type: Each type is separate from the others and carries only one letter or character. The various types are assembled within a frame and wedged into position for printing.

Number (叐): The unit used for Chinese foundry types. Number "zero" equal to 42 points and number 8 to 5 points.

Offset: Also known as photo-offset-lithography. A printing process in which the image is transferred from a smooth plate to a rubber blanket and then to papers.

Pa-Kau (八卦): A simple system of notation which covers all natural phenomena in China. This is said to be the invention of Fu-Hsi.

Photo-engraving: Original letterpress plate used to reproduce line and halftone illustrations.

Photo-copying: Typographer materials produced by exposing the negative of the characters on film or paper. Also known as photo-composition or photo-typesetting.

Point: In the English system, the smallest typographic unit of measurement. About 0.01384 inch high, approximately 1/72 of an inch.
Reversed white lettering: White characters shown on black background in photo-type.

Shell-and-Bone Writing (甲骨文): The characters engraved on turtle shells or ox bones by people in Yin Dynasty used in China for prayer and prediction.

Stereotype: Duplicate printing plate made by casting molten metal into a Matrix or mold of wood fiber which has been made under pressure.

Type and Type face: Small pieces of metal, each having a letter or other character in relief on one end. Made of different sizes, the character each type is to reproduce is known as its face. Hence type face.

Type Family: A number of type faces closely related in design, such as the Cheltenham Old Style, Cheltenham Wide Style, and Cheltenham Bold Style are all in the Cheltenham family.

Typography: The art or process of setting type.

Verbal elements: All the words of a printed message.

Visual elements: Anything other than words in a printed message. For example, the illustration.

Wood and bamboo strips: Strips of wood or bamboo which were connected by string. They were used by ancient Chinese for recording before the invention of paper.