

## II

## Ts'ai Lun and the Invention of Paper

THE INFLUENCE OF CALLIGRAPHY UPON PAPER AND  
THE INFLUENCE OF PAPER UPON PRINTING

BEFORE the invention of paper the Chinese scribes wrote with a pointed stylus upon strips of wood or bamboo,<sup>1</sup> but this material was difficult to write upon and difficult to store, for the wooden strips tied into bundles for the orderly preservation of records were cumbersome and consumed much space (Figure 31).

After many centuries of use by the Chinese scribes the strips of bamboo were succeeded by woven material as a writing substance, especially after the introduction of the hair brush, an invention attributed to Mêng T'ien in the third century B.C.<sup>2</sup> The cloth adapted itself readily to the purpose of calligraphy, or writing with a brush in the Chinese manner.<sup>3</sup> (Even in Europe and America at the present time it is not unusual to employ cloth for both writing and printing, the material being entirely practical for these uses.) The Chinese made books and scrolls of woven cloth, and as there was much waste when the textile was cut and trimmed, it is only natural that an ingenious artisan conceived the idea of beating the discarded cloth into fibre and forming sheets that could also be used for writing. Cloth was expensive and even in ancient times, as at present, there was a desire to produce necessary material quickly and cheaply. It was probably the narrow strips of waste woven fabric trimmed from the edges of the primeval manuscripts and documents that first suggested to the ever practical Chinese mind the idea of matting and intertwining the fibres into sheets of paper through their knowledge of felt-making, a craft which antedated even that of weaving.

The date usually given for the actual invention of paper is

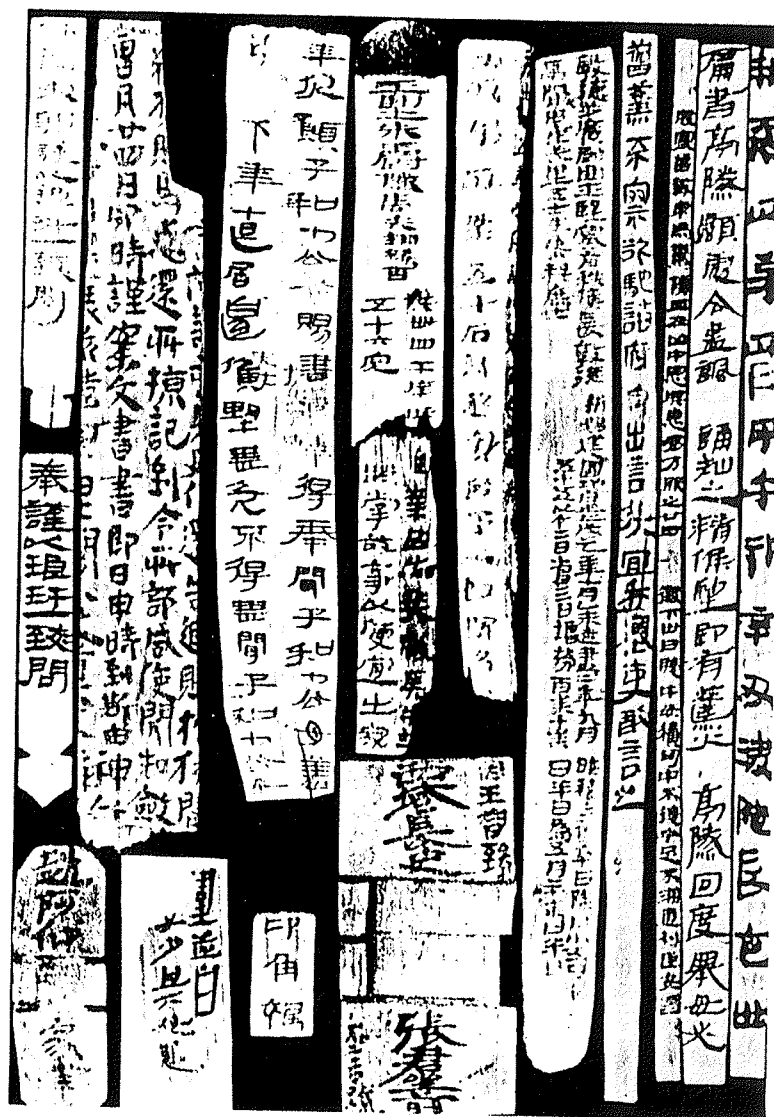


FIG. 31 Long before the invention of paper, the Chinese scribes wrote upon strips of bamboo. From the ruins of the Niya and Lop-Nor sites, and from the Tun-huang Limes. (Reproduced from *Ruins of Desert Cathay*, by Sir Aurel Stein; London, 1912.)

A.D. 105, but this date is chosen rather arbitrarily, since the first experiments in papermaking from disintegrated fibre probably extended over a long period before the process was actually brought to any degree of perfection and publicly announced. The date A.D. 105 is usually cited as the time of the first papermaking because in that year the invention was officially reported to the Emperor by the eunuch Ts'ai Lun (Figure 32). It is not known whether Ts'ai Lun was the actual inventor or simply the court official who became the patron of the invention, but with the Chinese people themselves the name of Ts'ai Lun will always be closely identified with the beginning of papermaking. Every schoolchild in China is familiar with the couplet: "Ts'ang Chieh \* made characters and Ts'ai Lun made paper."

An ancient Chinese scholar has this to say about the illustrious Ts'ai Lun: "Under the reign of Ho Ti † (A.D. 89-105), Ts'ai Lun, of Lei-yang, conceived the idea of making paper from the bark of trees, discarded cloth, and hemp well prepared; the paper was then in use in the entire universe." The following biography of Ts'ai Lun was compiled in the fifth century of our era by Fan Yeh ‡ and appeared in the official history of the Han Dynasty:

At the close of the reign of Yen P'ing (A.D. 106), Ts'ai Lun was employed at the court and later he was made a member of the Imperial Guard. The Emperor Ho Ti, upon his accession, learning of Ts'ai Lun's superior qualities and talents, named him private counsellor and he was not spared by His Majesty in either praise or criticism. In the ninth

\* Ts'ang Chieh is the mythical inventor of Chinese characters, about 2700 B.C. (See *The Evolution of Chinese Writing*, by G. Owen, King's College, Oxford; London, 1910; page 6.)

† 和帝

‡ The Chinese scholar Fan Yeh (范曄), who was born A.D. 398, prepared at least two sections of the *History of the Later, or Eastern, Han Dynasty* (*Hou Han Shu* 後漢書). Fan Yeh was responsible for the memoir of Ts'ai Lun (蔡倫) (Ts'ai Lun, chüan 8), a chapter containing biographical sketches of certain eunuchs, of which the inventor of paper was one. The writings of Fan Yeh were not incorporated in the famous history until after his death, A.D. 445. The *Hou Han Shu* is one of the original twenty-four official histories of the dynasties prepared under government supervision, and to a great extent the 120 volumes were compiled by individual Chinese scholars such as Fan Yeh. The books, covering the period A.D. 25-220, were annotated by Li Hsien, heir to the throne of T'ang, A.D. 651-684. The books were printed by Imperial order, A.D. 990-994.

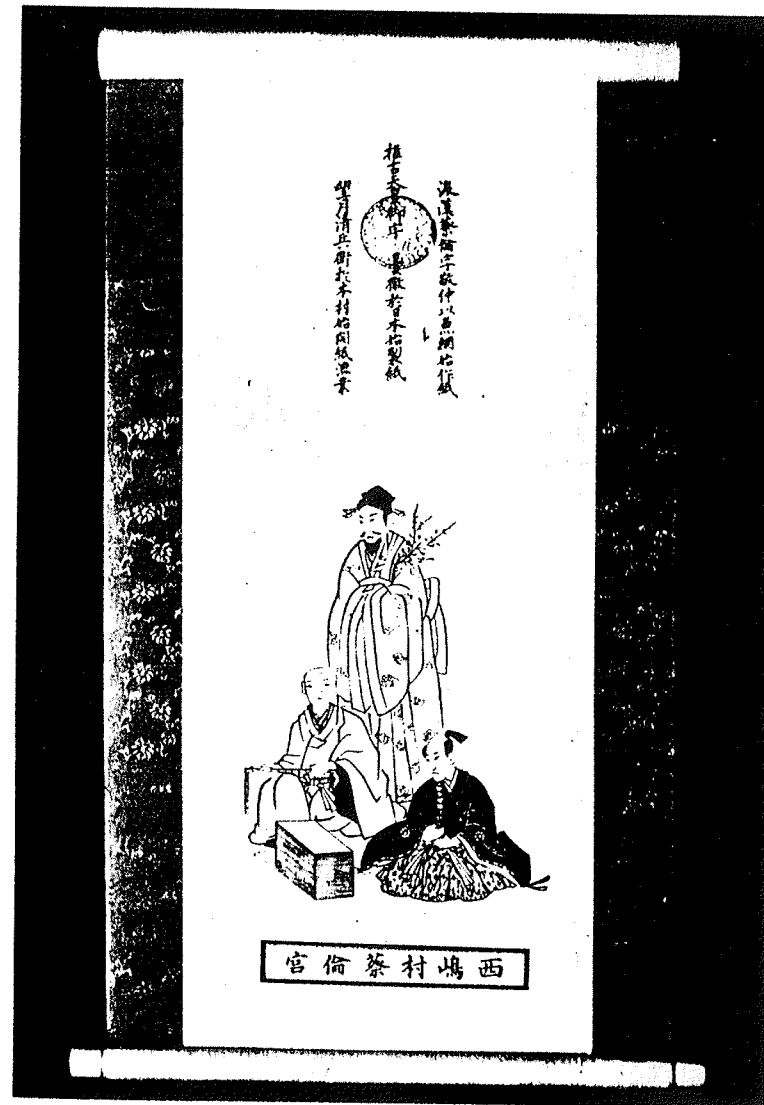


FIG. 32 Ts'ai Lun, the inventor of paper, A.D. 105. From a kake-mono produced by a Japanese artist in memory of Seibei Mochizuki, who established papermaking in Hishijimamura, Japan, in 1572. Of interest because it depicts, along with Mochizuki, the imaginary portraits of Ts'ai Lun and Dokyo, the Korean monk who introduced paper into Japan. Ts'ai Lun, in conventional dress, stands in the centre, Dokyo (left) is shown as a Buddhist monk, and Mochizuki, in formal costume, is holding a "laid" mould-cover. No authentic portrait of Ts'ai Lun exists.

year of the reign of Yung Yüan (A.D. 97), Ts'ai Lun was made inspector of works and through his efforts the engineers and workmen by the use of fine materials and skill produced swords and arms that served as models for future generations.

In ancient times writing and inscriptions were generally traced upon pieces of bamboo, or upon strips of silk, which were given the name *chih* (paper). But silk being costly and bamboo heavy, these two materials could not be used conveniently. It was Ts'ai Lun who conceived the idea of making paper from the bark of trees, hemp waste, old rags, and fish nets.

He made a report to the Emperor, the first year of the reign of Yüan Hsing (A.D. 105), upon his researches in papermaking and was highly commended upon his competency. In the first year of the reign of Yüan Ch'u (A.D. 114), the Imperial Mother gave Ts'ai Lun the honourable title of Marquis for his lengthy service at the palace; the government accorded him the ground-rent taxes and the proceeds from three hundred dwellings. Later Ts'ai Lun became one of the chiefs of the palace.

In the fourth year of his reign (A.D. 117), the Emperor, finding that there were some faults in the books of history, ordered two competent scholars to attempt the correction of these faults, according to the rules adopted by the Han Dynasty. It was Ts'ai Lun who was placed in charge of this important work of correction.

Ts'ai Lun received of the Empress To a secret order to invent slanders against a member of the Imperial family. After the demise of the Empress the successor to the throne was an Emperor of less animosity and he ordered Ts'ai Lun to give himself up to the Minister of Justice so that he might be judged. Ts'ai Lun experienced such profound remorse and shame that after bathing and dressing himself in his finest and most elaborate robes, he drank poison.

Ts'ai Lun's residence was situated in the district of Lei-yang, which belongs today to the department of Hengchow, province of Hunan. Early writers relate that near the home of Ts'ai Lun there was found a pool, and south of the pool, at the west of the house, there could be seen the stone mortar that had been used by Ts'ai Lun in the maceration of his material for papermaking. This mortar was offered to the Emperor in payment for some ground rent and he had it placed on exhibition in the Imperial Museum. It is said that this mortar was still preserved as a curiosity in the T'ang Dynasty (A.D. 618-907). The honour tendered such a modest ap-  
pliance spoke highly of the esteem in which Ts'ai Lun and his in-

vention were held by the Emperor. Improvements in the process of papermaking were advanced by Tso Tzū-yi, a young apprentice to Ts'ai Lun, and the craft of forming sheets of paper spread throughout the Empire. The records of following centuries contain many references to the use of paper, not only for writing and bibliographical purposes, but for ornamental use in Chinese houses and temples.

The people of Japan had communication with Korea from early centuries and it was from that locality, then part of China, that the Japanese, at the beginning of the seventh century of our era, gained their first knowledge of paper when sheets of this substance in the form of manuscript books fabricated from the bark of the paper mulberry (*Broussonetia papyrifera*) were brought to Japan by Buddhist monks. Ancient records inform us that the Japanese began the craft of papermaking about A.D. 610, over five hundred years after Ts'ai Lun had conceived the art in China. It is thought that a Buddhist monk named Dokyo was the actual person who brought papermaking to Japan. Dokyo was learned in painting, ink-making, and papermaking, and aside from these accomplishments he was a physician. This versatile monk eventually became chief physician to Empress Shōtoku and within a short period after his appointment he gained unusual influence over the Empress, being made her most trusted adviser. While paper had its origin in China, the first printing was actually accomplished in Japan; and, what is more surprising, the original printing was sponsored, perhaps invented, by a woman, the Empress Shōtoku. (See Chapter iii for account of the world's first printing.)

From China, by way of Korea, the Japanese received their knowledge of the arts, and of agriculture, religion, philosophy, ethics, medicine, and science. The Japanese did not even possess a written language until the third century, when Chinese characters and literature were introduced to them by Atogi, a son of the King of Korea, who visited the court of Japan about A.D. 286.<sup>4</sup>

After the Chinese artisans imparted their knowledge of papermaking to the Japanese, the craft spread rapidly in the Island Empire and during the Nara period (A.D. 708-806) paper was being made in nine different provinces, and in the Heian period (A.D. 806-1155) forty provinces of Japan were engaged in this manufacture.<sup>5</sup> By the eighth or ninth century the Zushoryō (department

of the library where the books, drawings, and paintings belonging to the Emperor were stored) had set up a paper mill with a guild of four expert papermakers. This establishment was created with the hope of influencing papermaking in Japan. In the year 807 this guild introduced papermaking in the neighbourhood of Kyōto, always one of Japan's great artistic centers. At the close of each year the various mills that had been established contributed 20,000 sheets of the finest plain paper to the Kuraryō, the keeper of the Imperial storehouse where the Emperor's personal clothing, gold, silver, and curios were housed. This tribute paper, along with 4,600 sheets of coloured paper from the ancient papermaking province of Mino, was used by the Imperial court.

With the decline of the whole central administration during the Heian period the Zushoryō ceased to have such extensive importance and the slave-like guild of papermakers, which had heretofore been kept apart from their contemporaries, gradually merged with the common people and it was not long before the entire Imperial staff was reduced in number and talent. Because of the absence of materials, paper, and skilled workers, the owners of private estates began the erection of small paper mills and they endeavoured to induce the former Zushoryō papermakers to resume their work for them in the fabrication of paper. Up to this time about the only materials used for the making of paper in Japan were the mulberry, *gampi* (*Wikstroemia canescens*), and hemp (*Cannabis sativa*), but as early as 1031 it was recorded that waste paper became a useful material for remaking into sheets of paper. The Chinese, no doubt, had used the method of reclaiming material much earlier, and inasmuch as the Japanese received nearly all of their ideas from China it is reasonable to surmise that there was no exception in this instance. In Japan the remade paper became the sole commodity of the paper-shops (*kamiya*) and was known by the name of *kamiya-gami*, literally paper-shop paper. The reclaimed material used in the making of the *kamiya-gami* was charged with ink and pigment and therefore the paper manufactured from the used material was of a grey tone. It has been stated that even books from the Imperial Library were macerated into pulp to be formed into sheets of the *shukushi* paper, always of a dull colour due to the writing on the paper from which it was fabricated. The demand for this paper continued, and to meet this

need in the fifteenth century, guilds, called *za*, were established. In 1522 there were the upper and lower *shukushi-za*, the upper headed by the Togai family and the lower by the Osaji family. Both of these families were hereditary officials of the Zushoryō, or Imperial Library, and they no doubt had access to quantities of old manuscript books and written papers, which were beaten into pulp for use as papermaking material in their mills. In the Edo period there were six councillors, three foremen, and 121 paper workers in Kyōto and Fushimi under the jurisdiction of these two influential Japanese families, all making the reclaimed paper, which was highly esteemed throughout Japan.

At the present time the Japanese manufacture a vast variety of papers by the traditional hand process and in the early centuries of the craft there was also this abundance of varieties. The names Danshi, Sugihara, Hanshi, Torinoko,<sup>6</sup> and scores of other appellations are as familiar today as they were centuries ago.<sup>6</sup>

The exact date of the origin of papermaking in Echizen, one of the great Japanese papermaking districts of the present day, is not known, but there is a fanciful local legend that purports to be ancient. A certain deity, so the legend goes, revealed himself by the side of the stream, and, disguised as a beautiful woman, he placed a part of his kimono upon a bamboo stick in imitation of a papermaking mould; this he then dipped into the stream and shook as if in the act of forming a sheet of paper. The villagers upon seeing the strange happening were much excited and astonished and implored to be told the significance of the unusual actions. The reply, according to the story, was: "The soil of this dukedom is poor and lacks fertility, but the water from the mountain streams is pure and clear. I shall therefore teach you papermaking so that all may live by this craft." The villagers asked who the stranger might be and received only the reply: "My name is

<sup>6</sup> The name Torinoko paper literally means "egg" paper, due, no doubt, to the paper having somewhat the tone and texture of eggshell. After the draft of the Versailles Peace Treaty, following the first World War, had been formulated and was ready for the final engrossing, there was considerable speculation as to what paper would be chosen by the authorities for inscribing this important document. Numerous makes of paper were examined and eliminated and finally the selection rested with just two papers: the famed Whatman handmade paper made in Kent, England, and the Torinoko handmade paper of Japan. For political reasons it was at last agreed to use the Japanese Torinoko paper, a choice that proved none too appropriate.<sup>7</sup>

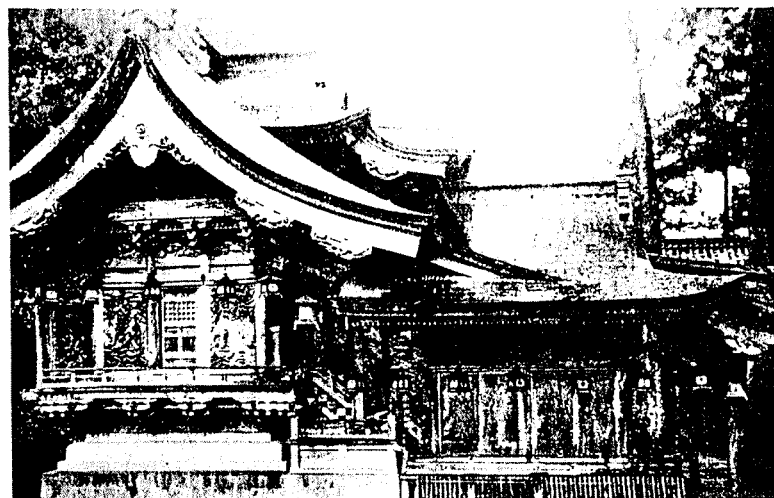


FIG. 33 The main building of the shrine at Okamoto, Japan, one of the most impressive sanctuaries in the world dedicated to the ancient craft of papermaking.

Mizuha-Nome-no-Mikoto." The moment the answer was given, the apparition disappeared and was seen no more by the simple village people. Soon after this strange occurrence the art of papermaking was established in Echizen, and the people from the surrounding countryside built, near the village of Okamoto, a beautiful Shinto shrine and dedicated it to Mizuha-Nome-no-Mikoto, the mythical founder of Echizen papermaking. The lovely old grey group of wooden, tiled-roof buildings, some half dozen in number, is set on a quiet and lonely hillside amid giant evergreen trees through which penetrate thin streaks of light casting weird patterns upon the moss-covered roofs of the inspiring shrine — one of the most impressive sanctuaries in the world dedicated to the craft of papermaking (Figure 33).

While the first paper of China was probably fabricated from disintegrated cloth, it was not long before the bark of trees and other vegetation was employed as a material for the purpose. It is recorded that the mulberry, hemp, and China grass were used as papermaking materials previous to the third century of our era. The first paper introduced into Japan from Korea (about A.D. 610) was made from mulberry (*Broussonetia papyrifera*) bark (Fig-



FIG. 34 Paper mulberry (*Broussonetia papyrifera*), the universal papermaking bark of the Far East.



FIG. 35 Gampi (*Wikstroemia canescens*), used in Japan in making the Far East.



FIG. 36 Mitsumata (*Edgeworthia papyrifera*), from which the well-known Imperial Japanese velum is made.

ure 34). Gampi (*Wikstroemia canescens*) (Figure 35), a plant of wild growth, has apparently been in use as a papermaking fibre since the ninth century. Its use was probably discovered by the Japanese. According to the Chinese scholar Su Tung-p'o, who lived from 1036 to 1101, bamboo was just beginning to be employed in China for making paper. Rice straw as a paper material dates from a later period, 1334–1521. The origin of mitsumata (*Edgeworthia papyrifera*) (Figure 36) as a papermaking material is uncertain, but there is a record stating that in the year 1597 a papermaking family was granted the privilege of gathering mitsumata bark in a certain locality of Japan. This plant is of the family *Thymelæaceæ* and is symbolized in Chinese by the character "lucky fragrance." The genus *Edgeworthia* denotes "yellow lucky fragrance" (Figure 37).

The earliest specimens of Oriental papers in the Hunter Paper Museum collection date from the fifth century onward and are composed of hemp and mulberry fibres; the earliest of these papers are exceedingly well formed. Papermaking in China deteriorated from the seventh to the tenth century, when the paper became rather coarse and lumpy. The Japanese have made excellent

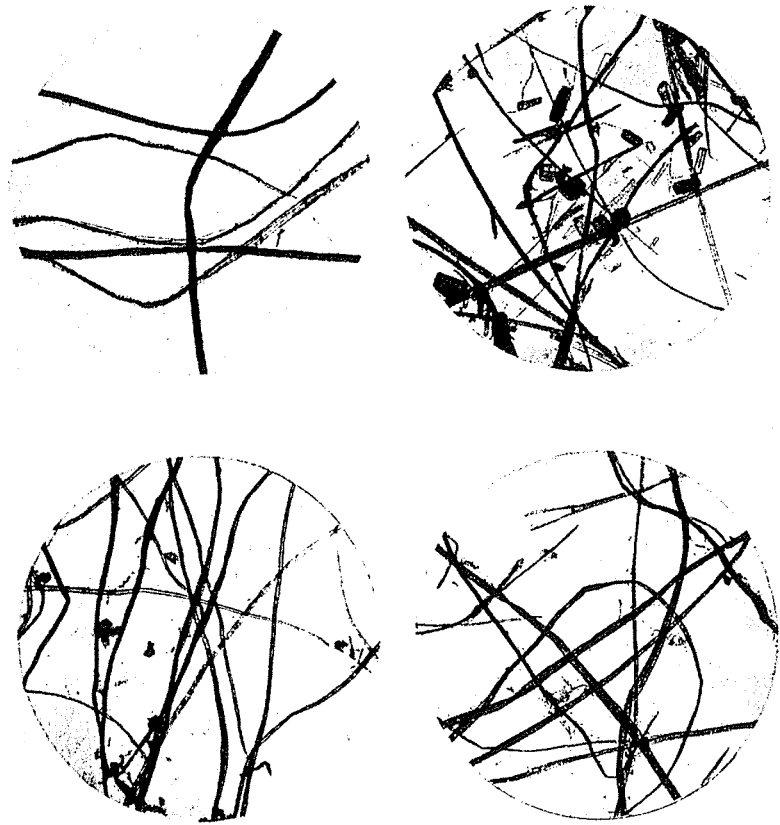


FIG. 37 The four most important papermaking fibres of the Orient:  
 Paper mulberry (Broussonetia papyrifera, Vent.)  
 Mitsumata (Edgeworthia papyrifera, Seib. and Zucc.), (E. chrysantha, Lindl.), of the family Thymelaeaceæ.  
 Bamboo (Phyllostachys edulis, Carr.) H. de Lehaie.  
 Gampi (Wikstroemia canescens, Meisn.), (Passerina gampi, S. and Z.), of the same family as the mitsumata.

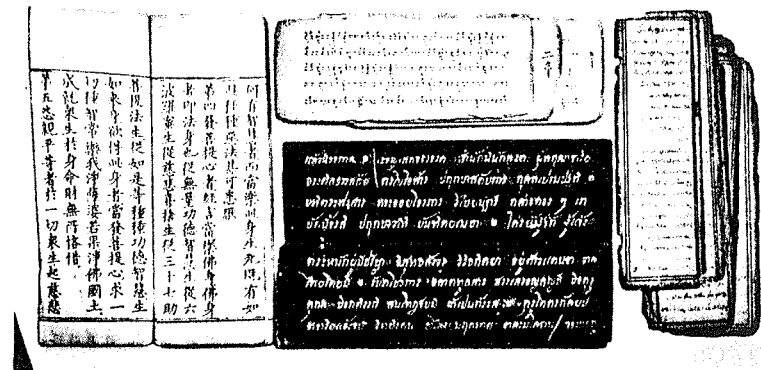


FIG. 38 Old manuscripts written on the soft, absorbent paper of the Orient. The Chinese, Tibetan, and Mongolian manuscripts are on paper made from the inner bark of the mulberry (Broussonetia papyrifera); the black Siamese manuscript is on paper made from the bark of the khol (Strobilurus asper), stained with a pigment made from the nuts of the betel palm (Areca cathecu).

paper from the introduction of the craft in the seventh century. Practically all of the ancient Chinese and Japanese paper was formed on the flexible type of mould upon which all papermaking is founded.

The Chinese and Japanese people had a profound reverence for paper and for the craftsman who fabricated the thin, delicate sheets. This was only natural, as the earliest paper was used chiefly for inscribing the sayings of Kung Fu-tsū (Confucius) and for other writings deeply concerned with the religious life of the East. It would be just as difficult for an Occidental to understand the traditions of the ancient Chinese and Japanese classical writings as it would to comprehend the study, thought, and practice given by them to the technique of calligraphy, and the important part that paper and all manner of writing materials played in the lives of the great Asiatic scholars.

The history of Chinese calligraphy is believed to be as ancient as the civilization of China. It is difficult, however, for the Westerner to comprehend and appreciate the mysteries and perplexities of Chinese brush writing, even though he may have a knowledge of Chinese painting. Calligraphy is one of the highest forms

of Chinese art, and every painting is accompanied by beautifully executed characters. To the Chinese scholar his calligraphy — and in turn his paper, ink, ink-stone, and brushes — are his very life. Unless an Occidental connoisseur has been reared in the artistic traditions of China it is difficult for him to grasp the æsthetic significance of Chinese writing and to visualize the time and thought given to the perfection of brush strokes with carbon ink upon thin absorbent paper (Figure 38).

From China paper found its way into central Asia and Persia by a route well known to the caravans which sought to open a road connecting the Pacific with the Mediterranean. This road was later mapped by Marco Polo in the thirteenth century, following the Gobi Desert, the Desert of Takla Makan, and the Tarim Valley, and finally arriving at Samarkand. Chinese paper made from bark and the fibres of rags and hemp may possibly have been imported and sold in Samarkand, but it is thought that paper was not actually made in Samarkand until after A.D. 751, the year a battle was fought by the Chinese in Turkestan on the banks of the Tharaz River. It is recorded that among the Chinese prisoners taken in this conflict there were a number of skilled papermakers, and their captors set these craftsmen to work fabricating paper. Up to this time the art of making paper had been a closely guarded secret in the country of its inception. The manufacture of paper was favoured in Samarkand by the abundant crops of flax and hemp, as well as by the numerous irrigation canals, as plenty of pure water was then, as now, a necessary requisite for paper-production.

From Samarkand the craft of making paper spread to Baghdad and Damascus and finally into Egypt and Morocco. It required almost five hundred years to find its way into Europe from Samarkand, as there was little communication between the East and the West. It is not known whether the craft was first introduced into Spain or Italy, each country having its own claimants. In any event, the first papermaking in Europe was accomplished in the twelfth or thirteenth century, or over a thousand years after its inception in China. The early paper of Europe was regarded with disfavour, as not only was it higher in price and more fragile than parchment, which had been used for bookmaking, but it was distrusted

on account of its introduction by Jews and Arabs. A fanaticism drove the Christian world to condemn, and even destroy, everything that suggested the Moslem civilization, although the European scribes no doubt knew that the newly introduced substance, paper, would eventually take the place of their cherished parchment.<sup>8</sup>

Since papermaking in China, as well as in Europe, was an established art long before the advent of printing, it is only natural that paper vitally influenced the craft of printing. The nature of the paper dictated the methods employed in printing. In both the Orient and the Occident much of the first paper had been made especially for calligraphy, the inception of the art of writing having preceded the invention of papermaking and the later invention of printing by many hundreds of years. The first block printing of the Orient and the earliest impressions made from movable types in Europe were imprinted upon sheets of paper that had been made primarily for the purpose of writing. Chinese and Japanese paper has always been thin, soft, pliable, and absorbent, owing to the Asiatic vegetable fibres and their preparation as well as to the process of forming the sheets of paper upon flexible moulds made of bamboo. This paper lent itself readily to the steady, firm strokes of the brush used in the drawing of Chinese and Japanese characters. This particular style of calligraphy required an absorbent paper, and on account of the thin, transparent quality of the sheets, only one side of the paper was written upon. When the Empress Shōtoku of Japan had her million printed charms executed, A.D. 770,<sup>9</sup> and when the Diamond Sutra was printed in China by Wang Chieh, A.D. 868,<sup>9</sup> only paper that had primarily been made for writing was available and therefore the method of printing was adapted to the paper at hand — not the paper to the printing. The printing was naturally influenced, for with the soft, pliable paper it was possible to make an impression from a wood-block in the simplest and easiest manner. The process consisted in spreading the incised surface of the block with pigment, placing a sheet of paper upon the inked relief, and rubbing the upper side of the paper with a fibre or cloth ball by hand until a definite impression was made. (For a description of ink-making see page

<sup>8</sup> See Chapter iii.

75: note.) Following the practice of all Chinese and Japanese calligraphy, only one side of the sheet was used, and to this day in all Chinese wood-block book-printing, only one side of the paper is employed.

In the same way the first book-printers of Europe had to make their work conform to paper that had been made primarily for writing. When Johann Gutenberg established his printing office in Mainz, there were no European-made papers suited to the simplicity of the Chinese and Japanese methods of making an ink impression from wood-blocks. The paper of Europe was made from macerated linen and cotton cloth, each sheet being dipped in a solution of gelatine rendered from the hoofs, hides, and horns of animals. The linen and cotton rags and the animal glue formed a hard, opaque, and impervious surface well adapted to the European mode of writing with a quill pen, but entirely unsuited for printing in the non-laborious and unpretentious manner long before adopted by the Chinese and Japanese. There is no record that Gutenberg had paper made specially for his purpose, and as it was no doubt his desire to keep the newly invented process of typography and printing to himself, it is not likely that he would have exposed his secrets by venturing to the paper mills and demanding paper that would precisely suit his own special printing requirements. Therefore, in Europe, as in the Orient, paper that had been made primarily for writing was employed for the first book-printing. In China and Japan the thin, soft mulberry-bark paper was suited to the most simple and direct manner of reproduction from wood-blocks, while with the hard rag paper of Europe a method of printing that would give a much stronger impression had to be devised. It was this unyielding linen and cotton paper, made impervious to fluid writing ink by the application of animal gelatine, that made necessary the invention of the printing press.

Paper that had been fabricated purposely for writing not only determined the sizes or dimensions of the books printed by Gutenberg and the volumes that were to follow, but highly influenced the method of making an ink impression from type to paper. Unlike the thin, transparent papers of the Orient, only one side of which could be used for writing or printing, the paper of Europe, thick and opaque, lent itself readily to writing or printing on both sides of the sheets. The construction and form of Oriental and

Occidental books were therefore influenced by the paper available, and for this reason we have two distinct schools of book-printing — the Oriental with its delicate wood-block impressions on one side of the sheet, and the European on both sides of the paper with the comparatively heavy indentations made from metal types with the aid of the cumbersome hand press.