THE PICTURE OF THE TAOIST GENII PRINTED ON THE COVER

of this book is part of a painted temple scroll, recent but traditional, given to Mr Brian Harland in Szechuan province (1946). Concerning these four divinities, of respectable rank in the Taoist bureaucracy, the following particulars have been handed down. The title of the first of the four signifies 'Heavenly Prince', that of the other three 'Mysterious Commander'.

At the top, on the left, is Liu Thien Chün, Comptroller-General of Crops and Weather. Before his deification (so it was said) he was a rain-making magician and weather forecaster named Liu Chün, born in the Chin dynasty about +340. Among his attributes may be seen the sun and moon, and a measuring-rod or carpenter's square. The two great luminaries imply the making of the calendar, so important for a primarily agricultural society, the efforts, ever renewed, to reconcile celestial periodicities. The carpenter's square is no ordinary tool, but the gnomon for measuring the lengths of the sun's solstitial shadows. The Comptroller-General also carries a bell because in ancient and medieval times there was thought to be a close connection between calendrical calculations and the arithmetical acoustics of bells and pitch-pipes.

At the top, on the right, is Wên Yuan Shuai, Intendant of the Spiritual Officials of the Sacred Mountain, Thai Shan. He was taken to be an incarnation of one of the Hour-Presidents (Chia Shen), i.e. tutelary deities of the twelve cyclical characters (see p. 262). During his earthly pilgrimage his name was Huan Tzu-Yü and he was a scholar and astronomer in the Later Han (b. +142). He is seen holding an armillary ring.

Below, on the left, is Kou Yuan Shuai, Assistant Secretary of State in the Ministry of Thunder. He is therefore a late emanation of a very ancient god, Lei Kung. Before he became deified he was Hsin Hsing, a poor woodcutter, but no doubt an incarnation of the spirit of the constellation Kou-Chhen (the Angular Arranger), part of the group of stars which we know as Ursa Minor. He is equipped with hammer and chisel.

Below, on the right, is Pi Yuan Shuai, Commander of the Lightning, with his flashing sword, a deity with distinct alchemical and cosmological interests. According to tradition, in his earthly life he was a countryman whose name was Thien Hus. Together with the colleague on his right, he controlled the Spirits of the Five Directions.

Such is the legendary folklore of common men canonised by popular acclamation. An interesting scroll, of no great artistic merit, destined to decorate a temple wall, to be looked upon by humble people, it symbolises something which this book has to say. Chinese art and literature have been so profuse, Chinese mythological imagery so fertile, that the West has often missed other aspects, perhaps more important, of Chinese civilisation. Here the graduated scale of Liu Chün, at first sight unexpected in this setting, reminds us of the ever-present theme of quantitative measurement in Chinese culture: there were rain-gauges already in the Sung (+12th century) and sliding calipers in the Han (+1st). The armillary ring of Huan Tzu-Yü bears witness that Naburistic and Hipparchus, al-Naqqâs and Tycho, had worthy counterparts in China. The tools of Hsin Hsing symbolise that great empirical tradition which informed the work of Chinese artisans and technicians all through the ages.
To
three eminent scholars who have contributed to
our knowledge of the History of Printing

L. CARRINGTON GOODRICH
Dean Lung Professor Emeritus of Chinese
Columbia University

HOWARD W. WINGER
Professor Emeritus of Library Science
The University of Chicago

and

KWANG-TSING WU
Former Head, Chinese and Korean Section
The Library of Congress
Washington, D.C.

this volume is dedicated
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FOREWORD

It was in 1948, some thirty-six years ago, that the writing of this series of volumes began, after I came back from China and from Unesco. My first collaborator was Wang Ling (Wang Ching-Ning); and then eight years later Lu Gwei-Djen came over from Paris to occupy the same position of Adjutant-General of the Project which she still fills. While Wang Ling’s background was rather mathematical and chemical, Lu Gwei-Djen’s is more medical and biological. Then, some fifteen years ago, we found ourselves faced with a great dilemma, whether to leg away alone for the rest of our lives, or whether to associate with ourselves a group of collaborators, who would bring us nearer to seeing the conclusion in our own lifetime. We decided on the latter course. It was a veritable turning-point.

Now, with the present Volume, we see the first-fruits of this plan. We were able to persuade our dear friend Professor T. H. Tsien (Chhien Tshun-Hsiin), of the University of Chicago, and one of the world’s most eminent authorities on the subject, to accomplish this task in our series. We greatly admire what he has done. Of course, the book of T. F. Carter has long been a classic, but it is now quite old, having seen the light first in 1925 and not revised since 1955; since then many archaeological finds, and many literary perspectives, have intervened, so that a new synthesis was urgently necessary.

We expect that in due course other Volumes not written personally by us will be appearing in our series; notably next Vol. 6, pt. 2, on the ‘History of Agriculture in China’, which has been written by Ms. Francesca Bray. This again deals with a subject of the highest importance for the general theme of the history of science and technology in China, and we feel fortunate that her work for some ten years past on the subject has proved so successful. We now anticipate that still further Volumes will be contributed by our collaborators.

I suppose that no theme could be more important for the history of all human civilisation than the development of paper and printing. Francis Bacon, ‘the bell that call’d the wits together’, fully recognised this. In the present Volume readers will be able to follow all the vicissitudes of paper and printing during those Chinese centuries when Europe knew nothing of such arts. I always suspected that the Chinese Buddhists may have had something to do with the technique of documentary reproduction, because of their mania for the infinite replication of images, as I had plenty of opportunity to observe on the walls of the Thang cave-temples at Chhien-fo-tung (Tunhuang).
FOREWORD

It has always been extremely hard to believe that Johann Gutenberg about +1454 knew nothing (even by hearsay) of the Chinese printed books which had been circulating in large numbers in China for five previous centuries—and there are some sources fairly contemporary which aver that he did. It seems perhaps less likely that he ever knew of his predecessor Pi Shèng, the artisan who had anticipated him as the inventor of movable type by some four centuries. We have already alluded to the celebrated passage about Pi Shèng in the Míng Chì Pi Thàn, and we have illustrated a rotating "case" for the type sorts depicted by Wang Chen later. Many printers in Korea as well as China, subsequently made use of this invention, but of course it was much more inviting to use movable type for the alphabetic languages needing only twenty-six letters, than for the ideographic ones—where as many as 35,000 characters, with some 400 radicals, would be involved.

Be that as it may, however, there is plenty of evidence that Chinese printing and book-production were the envy of the whole world that knew them before Gutenberg's time. Even long afterwards we have Jesuit relations which show their great admiration for the books of China, which enshrined so much of human learning and knowledge. True it is that, as Francis Bacon again said: "The wits and knowledges of men remain in books, exempted from the wrong of time, and capable of perpetual renovation." Let us pray that no evil fire-storm will be let loose upon the world to destroy in an instant much, if not all, of the accumulated culture of the ages, and put an end to that most glorious of human achievements, printing and the paper on which it may be done. So let us wish all success to this story told by Tsien Tsuen-Hsun.

JOSEPH NEEDHAM

Cambridge
January 1984

AUTHOR'S NOTE

This volume is devoted to the study of the origin and development of papermaking and printing in Chinese culture from their earliest known beginnings to the end of the 19th century, when both handicrafts had gradually been replaced by modern technology. It is intended to be a comprehensive study, covering all periods in their history and all aspects of their techniques, aesthetics, applications, and worldwide spread and influence, based on extensive investigation of literary records, archaeological discoveries, scientific reports, as well as artifacts available for examination. Previous contributions to the field are either limited in scope or outdated in many respects. Numerous Chinese documents concerning paper had not been explored and many important topics had not been covered in Western scholarship. Details of printing, on the other hand, are rarely documented in Chinese literature, but hundreds and thousands of items printed from the +8th century onward are available for investigation. The present work tries to bring up to date or fill gaps in previous studies; it also offers new interpretations based on fresh data and new evidence. An attempt in this direction is briefly explained at the end of the Introduction.

The project started in late 1968 at the request of Dr Joseph Needham to contribute a section on "Paper and Printing" to his great series of volumes Science and Civilisation in China. His proposal actually suggested a sequel to my previous work on pre-paper and pre-printing records of China. A travel grant from the American Council of Learned Societies for 1968–9 enabled me to visit Cambridge and many libraries and museums in Europe and America for a preliminary exploration of opportunities. During the next few years, basic sources were collected and screened, a series of lecture-discussion sessions was held on several university campuses, and three sections on paper were then drafted. To pursue further the study of printing, a seminar was set up at the University of Chicago in 1972 and again in 1974 for a systematic examination of the sources and a discussion of various problems involved. But the actual writing of subsequent sections was interrupted by the increasing load of my duties at the University. With the generous support of the U. S. National Science Foundation and National Endowment for the Humanities from 1977 to 1980, I was relieved of part of my teaching and administrative responsibilities at the University. This allowed me to devote more time to research. Additional support from the East Asian History of Science Trust in Cambridge made it possible for me to complete the entire work by the end of 1982. The original plan was to write a section of about 100 pages, but subsequent studies

went deeply into the sources, and this resulted in a volume much broader in scope and size and one which consumed more time than originally planned.

The present work consists of ten sections, with a bibliography of nearly 2000 entries and about 200 plates and figures for illustration. Three sections each deal separately with paper, printing (including inking and bookbinding), and their worldwide spread and influence, in addition to an Introduction as a summary and orientation. The last section on the contributions of paper and printing to World civilisation serves as a conclusion. Each part on paper and printing is treated both chronologically and topically. Special attention is given to technical and artistic aspects of each subject as well as to their role in society. Where previous studies are available, a brief description of the topic or events is usually given; where gaps exist in earlier scholarship, fuller discussion is provided. For special editions of works in Chinese and Japanese cited in this volume, their publisher, date, or inclusion in a series are given in parentheses following the specific title in the footnotes and bibliographies. Abbreviations for titles of journals, large collections, symposia, and tshang-hu are found in a list preceding the bibliography.

In the preparation of this volume, many of my friends, colleagues, and former students have contributed significantly. I am especially indebted to three eminent scholars and specialists in the field who served as consultants of the project, Professor L. Carrington Goodrich, Professor Howard W. Winger, and Dr K. T. Wu, for their constant advice, reading and criticism of the entire manuscript. Professor and Mrs H. G. Creel also gave generously of their time to read over the final draft. All their comments from different perspectives have been most useful in improving this work. I wish also to express my gratitude for the valuable help in many ways from Dr Poon Ming-Sun, Mr James K. M. Cheng, Mr Ma T'ai-Loi, Mr John Grobowski, Dr Michael Finegan, and Miss June Work, who served at one time or another as research assistants in the project.

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For supply of materials for my study and photographs for illustrations, I am indebted to the librarians and curators of the British Museum and British Library, the Cambridge and Oxford University Libraries, the Bibliothèque Nationale, the Musée Guimet, the Austrian National Library, the Museum für Völkerkunde, the Royal Ontario Museum, the Dard Hunter Paper Museum, the Field Museum of Natural History, the Metropolitan Museum of Art, the Fogg Art Museum, the...
32. PAPER AND PRINTING

(a) INTRODUCTION

Or all the products from the ancient world, few can compare in significance with the Chinese inventions of paper and printing. Both have played a profound role in shaping world civilisations; and both have exerted a far-reaching impact for a very long time on the intellectual as well as the daily lives of countless people everywhere. Paper has proved to be the most satisfactory material on which human thoughts are committed to writing, and when printing came to be allied to it, the ideas of one individual could be communicated to a multitude of others separated across great stretches of space and time. In short, the printed message has brought about changes in the intellectual mode of the human mind, and paper has provided the most economical and convenient means for its transmission. But of course paper has other uses than for writing and publishing; it has penetrated into every corner of ancient and contemporary society to become an indispensable article in daily life. Even though new media of communication have developed in recent times, the unique combination of paper, ink and printing are still the basic, permanent, portable, and perhaps the least expensive and most accessible communication device known to us today.

(i) ORIGIN, DEVELOPMENT, AND MIGRATION OF PAPER AND PRINTING

It is common knowledge that paper was invented in China some time before the Christian era. From early in the +2nd century its manufacture became improved, using new materials and superior techniques. By the +3rd century it had become widely used in China itself and had begun to migrate across the Chinese borders; it reached the Western world only just prior to the modern age. Printing from woodblocks was first practised by the Chinese around +700, and movable type several centuries earlier than Gutenberg. Even the indelible ink of lampblack, prized by scholars and artists throughout the centuries in the East as well as the West, and which has been manufactured in the West under the misnomer ‘Indian Ink’, can be traced back to antiquity in Chinese civilisation. It was the introduction of these ingenious elements that made possible mass production of written records for wide circulation. Of the materials and techniques for the modern book, printed with black ink on white paper, the Chinese have contributed most to its development.

Paper is a felted sheet of fibres formed from a water suspension process using a sieve-like screen. When the water escapes and dries, the layer of intertwined fibres becomes a thin matted sheet which is called paper. Over the span of the two millennia which have elapsed since the inception of the idea of papermaking, the
Northwest China has changed and the tools have become more complex, yet the basic principles and processes remain the same.

Traditionally, the invention of paper was attributed to Ts'ai Lun early in the +2nd century, but recent discoveries of very ancient paper fragments in North and Northwest China have pushed back the date of this invention at least some two to three centuries before him. Indeed, as we shall see, the invention of paper in China is now believed to have originated from a process of pounding and stirring rags in water several centuries before the start of our Era. It is very likely that an accidental placing of fibres from the rags on a mat with water draining away, may have suggested the idea of making a thin sheet of paper. But paper was not invented expressly for writing, as has often been presumed. It was extensively used in China in the fine and decorative arts, at ceremonies and festivals, for business transactions and records, monetary credit and exchange, personal attire, household furnishings, sanitary and medical purposes, recreations and entertainments, and so on. What is more, all these non-literary applications were common in Chinese society before paper was introduced into Europe in the +9th century.

Paper was not used for writing until perhaps early in the +1st century, and even then did not entirely replace the more cumbersome bamboo and wood slips as the chief materials for making books until the +3rd century. But when it came, the use of paper enabled books to be cheaper and more portable, though their extensive production and wide distribution was not possible until the invention of printing. It is uncertain when and where the first book was printed in China and who was the earliest printer, but probably the process developed gradually.

There is a long history of pre-printing techniques in China, including the use of seals for stamping on clays and later on silk and paper, of stencils to duplicate designs on textiles and paper, and of the inked impressions taken from stone inscriptions. All these processes gradually led to more efficient methods of the mechanical multiplication of copies and, as archaeological and literary evidence indicates, by the +7th century or around +700, printing began in China. Movable type was introduced by the middle of the 11th century and multi-colour printing some time in or before the 12th century. The movable type was first made of earthenware, but later various other materials, including wood, metal, and a variety of ceramics, were also adopted repeatedly and intermittently in the following centuries.

Because of the great number of characters in written Chinese, woodblock printing was used far more often than movable type for book production in China until recent times. Wood blocks were simpler and more economical, and could be stored easily and were readily available when a reprint was needed; movable type was preferred only for large-scale production of voluminous books. Nevertheless, both wood blocks and movable type have gradually given way, since the mid-19th century, to the modern printing press.

After papermaking was perfected, it not only became popular in China but spread in all directions throughout the world, first eastwards in the +2nd century, then westward during the +3rd century. However, it did not reach India until the +7th century, and only became popular there in the 12th. Paper arrived in Western Asia in the middle of the 8th century, and to Africa in the 10th. The Arabs monopolised paper-making in the West for some five centuries. Only in the 12th century was it manufactured in Europe, and it did not reach America until the 16th century and Australia in the 19th. Thus it took more than fifteen hundred years for paper to spread from China to almost every part of the world.

Whether or not typography in Europe was influenced by the Chinese is controversial, but it is certain that Chinese printing and printed materials from China were known in Europe before printing began there. As might be expected, there are many theories about how printing reached Europe. Some suggest that it travelled from China to Europe along routes similar to those taken by paper, others, emphasising the differences between European and Chinese printing, suggest that European typography was independent in origin. However, there is strong evidence from cultural considerations of a close connection between them. Certainly there is no doubt that paper-making originated in China, and was already a fully developed craft before it spread over the rest of the world. It is probably the most complete of all the inventions China has given to civilisation.

(2) Factors Contributing to the Early Invention of Paper and Printing in China

The prerequisites for a useful invention include both the physical and the mental readiness for the event; besides a creative mind and a popular demand, proper materials and the essential basic techniques must be available. Since all the material facilities for the invention were present in Europe as well as in China, several questions arise. Why did the invention occur in one civilisation but not the other? What were the factors responsible for such development? What was it that made those two great inventions appear very early in Chinese culture but only after a long delay in the West, at least a thousand years for paper, six hundred years for wood-block printing and four centuries for movable type? In an attempt to find the answer, we shall discuss and compare the conditions that led to these developments.

The key elements for the manufacture of paper are water, fibres, and a mould. The first was present almost everywhere and fibres were available from rags or hemp or linen just as soon as textiles were woven in the ancient world. The use of the two together was common enough, but not so the process of turning rags into separate fibres through maceration, and using a screen mould to hold these fibres while allowing the water to drain away. Perhaps, as will become evident later, the Chinese tradition of washing rags in water and allowing the fibres to form a felted sheet on the mat was responsible for this discovery in ancient times. The earliest

* See pp. 36 ff. below.
The invention of paper-making was, of course, a continuing process rather than a single event. An important step came with the introduction of new and fresh raw fibres, allowing unlimited production. Here the discovery of the suitability of the paper mulberry (Broussonetia papyrifera) was certainly significant. It is a plant that is native to China, though it has been cultivated extensively in many other temperate and tropical zones throughout the world. Its bark, after being beaten into a cloth, was used for clothing in China as well as in other regions along the equator, and ancient Chinese literature provides evidence that it was manufactured and traded by native tribes in the southern part of China, as we shall see. The invention of paper-making with tree bark attributed to Tshai Lun in the early +2nd century was possibly influenced by the acquaintance of the people in his area with the paper mulberry. Tshai Lun was a native of Lei-yang in what is now Hunan province, and it was here that the bark was made into cloth by beating and then into bark paper after maceration. Since then, the maceration process of turning rags into pulp was already known in China, it was very likely that the people in the south of the country were the first to convert paper mulberry bark into a pulp for paper-making. Neither paper mulberry nor bark cloth was, it seems, used in Europe, where its cultivation appears to have been unknown, even in the +18th century; indeed among the numerous kinds of plant tested for paper-making by European scientists at this time, paper mulberry was not included. Furthermore, it was described with curiosity by the early Jesuit missionaries to China, and they suggested its transplantation to France.

The popular demand for a better writing material was another important factor leading towards the invention and utilisation of paper. In China, paper was a much cheaper and more ideal writing medium than expensive silk and the clumsier bamboo or wood. But in Europe, paper did not have too many advantages over papyrus or parchment. Papyrus was plentiful, simple to prepare, inexpensive, and perhaps as light and convenient as paper. Parchment, although it cost more, had a smoother surface and was more durable than paper. Indeed, in the early days, paper was not much cheaper than parchment, in contrast to silk, and not any more portable than papyrus, in contrast to bamboo and wood. Because of its fragility, paper was even banned for official documents in Europe. It was also not a welcome commodity when it was first introduced to Europe from the Arab world, since Europeans were distrustful of anything from a hostile land during and after the Crusades; its use was even attacked by clergymen like the abbot of Cluny. Not until the spread of printing in Europe during the second half of the fifteenth century did a great demand for paper arise, although it had gradually come into use for manuscripts and household records before then. The situation was so different in China, where paper established its supremacy as a popular medium for writing even before it was officially adopted by the court in the early +2nd century.

The basic materials needed for block printing included wood, ink, and paper. The same kinds of wood, including pear, boxwood, or other deciduous trees, were used for woodblocks for printing in both China and the West. Ink of lampblack was probably discovered very early by people of all civilisations, since soot was naturally collected when fire was controlled. The use of black ink or a carbon mixture in China can be traced back to remote antiquity, and a similar ink of lampblack mixed with an aqueous solution of vegetable gum was used by Egyptian scribes as early as -1300; it spread to Western Asia a little later. The Greeks also made an ink of soot consisting of the same basic ingredients of lampblack and gum and in the same solid form as the Chinese ink.

Of the three basic necessities for printing, paper was perhaps the most important. Without a soft and absorbent medium, it would have been impossible for printing to develop, and the prior use of paper by the Chinese certainly contributed to the early invention of printing in China. Clearly, the late introduction of paper to Europe had a significant effect on the slow development of printing in the West. However, paper was certainly not the only essential prerequisite for this invention, for printing did not appear in China until paper had been used for writing for at least six or seven hundred years, and there were still four printless centuries after the arrival of paper in Europe. Printing developed quite naturally from techniques developed in making and using seals and stamps, engraving on stone and metals, and taking inked rubbings from stone and other inscriptions. Religious and secular demand for a great numbers of copies, however, called for some mechanical means to replace hand copying.

Seal inscriptions in a mirror image, from which a correct position was obtained by stamping on clay and later on paper, embody the technique closest to that which eventually led to the invention of printing. The use of seals began in antiquity in both Chinese and Western civilisations. In China, seals cast in bronze with designs and inscriptions in relief survive from the Shang dynasty. Other seals

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* See pp. 36 ff. below.
* See Ling Shun-Sheng (1), pp. 1 ff.
* See Tshai Chi of the +3rd century said that the bark of paper mulberry was used by the people south of the Yangtse River to make cloth or was pounded for making paper; see discussion of tape and cloth, paper, pp. 19 below.
* Searching for new materials for paper-making, Dr. Jacob Schaffer (1718–90) tells of how he tested over thirty kinds of raw material including corn, asparagus, potatoes, wood, and various other plants, for use in paper making to be mentioned in his six-volume work published between 1765 and 1771, but he did not include paper mulberry or bamboo, which had been major raw materials used in paper making in China and other nations in east and south Asia; see Hunter (2), pp. 305 ff.
* In 1359, 31 quires of parchment, each containing three dozen sheets, cost 76 livres, 5 sous, 8 deniers in Tours; in 1359, two quires of paper cost 18 deniers; and in 1360, four quires of paper cost 4 shillings, 4 deniers; see Blum (1), pp. 62–3, note 2.
* Paper was forbidden for official use by King Roger of Sicily in 1145 and again by Emperor Frederick II of Germany in 1221; cf. Blum (1), pp. 83, 90.
* See further discussion on pp. 233 ff. below.
made of metals or carved on stone, jade, ivory, horn, earthenware, and wood have continued in use until this day. They are characterized in general by a flat surface, square, oblong, or occasionally in other shapes, bearing inscriptions of characters in relief or intaglio of personal names of official titles, always in reverse. They have been used always to indicate ownership, authenticate documents, and establish authority.  

The use of seals in Western culture began and flourished in Mesopotamia and Egypt, perhaps even before the invention of writing. These seals made of stone, ivory, shell, or metals were of two principal types, cylinders and stamps. The cylindrical type was used in Mesopotamia and in areas under Babylonian influence. Their designs, primarily of deities, heroes, animals, celestial bodies, instruments, and emblems, were impressed by rolling the cylinder over a flat surface of clay, mortar, cement, or wax. The stamp seals have a variety of shapes. Those used in Egypt were of scaraboid form with a beetle on the back, a sacred symbol of resurrection and immortality. Their bases are flat and engraved with designs or inscriptions of mottoes, personal names and titles of officials. These had strong religious overtones as well as practical functions. Both the cylindrical and stamp forms of seals were also used in Asia Minor, Syria, and Palestine. Their use was discontinued after the fall of the Western Roman Empire but revived in the second half of the 8th century. Since then, round or oval seals engraved with designs and legends have been employed in the West until modern times.

Generally speaking, the seals developed in Chinese and Western cultures bear some similarities and differences. They were both made of the same kinds of materials, impressed originally on the same kind of surfaces, and used primarily for the same purposes. But there were some major diversities which led perhaps to development in different directions. Chinese seals were mostly made in a square or rectangular shape with a flat base, inscribed with characters in reverse, and used to stamp on paper. These characteristics are very close to those of block printing. Although the surface and inscriptions of most seals were small or limited, some wooden seals were as large as printing blocks and were inscribed with texts more than one hundred characters long.

The seals of the West, on the other hand, were cylindrical or scaraboid, round or oval, and inscribed primarily with pictures or designs and only occasionally with writing. The cylindrical seals used to roll over clay had no potential to develop into a printing surface. While the scaraboid seals were flat-based, their primarily religious nature was predominant over their functional aspects as a tool of multi-

The technique of engraving on stone tablets is close to that of carving on wood blocks, and taking inked squeezes or rubbings from stone inscriptions is very similar to the process of block printing. Inscribing on stone was developed very early in both China and the West. Chinese inscriptions on stone survive from the Chou dynasty, and subsequently stone became the most popular medium for commemorative and sacred writings, and for the preservation and standardisation of the canonical texts. The Mesopotamians also used stone in addition to clay tablets for writing, the Egyptians used it for tomb inscriptions and it was adopted for monuments by the Romans as well as other peoples in the ancient world, but inscriptions in the West were neither as extensive nor as refined as they were in China, and were never in scale with those of the Chinese, where hundreds of thousands of characters of Buddhist, Taoist, and Confucian texts were carved on stone throughout many centuries. Moreover, stone was used in the West more as an artistic material than, as it was in China, for writing. Such differences in the nature, scope, and content of stone inscriptions caused them to develop in divergent directions in China and in the West.

Taking inked squeezes or rubbings from stone inscriptions is similar to printing in principle and purpose, but different in process and end-product. Both result in duplication on a sheet of paper of an engraved object, but their different methods
result in different kinds of reproduction. The technique of taking inked rubbings from stone, and eventually from all kinds of hard surfaces, can be traced back to the 6th century or earlier in China. Yet it does not seem to have been used in the West until perhaps the 19th century, when antiquarians and artists began to experiment with the use of a crayon-like agent in tracing designs from memorial brasses, tombstones, brick walls, carved wood, and sewer-plates. The duplications they obtained were, however, far less sophisticated than those of the inked squeezes originally made by the Chinese, and it was the combination of this skill in making duplications by inking and rubbing on a sheet of paper coupled with the art of carving seals with a mirror image in relief that resulted in the methods of block printing.

Besides the necessary materials and techniques, there were also social and cultural factors which had a great effect on the application or rejection of printing. Since printing is a mechanical extension of writing, the system of writing used is one of the most important factors affecting the development of printing. Chinese writing was from the very beginning characterised by an ideographic script which is basically composed of numerous separate strokes of different shapes. Since each character has a definite and distinct form, the writing of characters tends to be elevated to an art and is thus more complicated and time-consuming than alphabetical writing, especially when a special style is sought in a formal and respectable text. On the other hand, Western writing, ever since the Phoenicians developed the rudiments of an alphabetic language, has evolved into a system of symbols representing sounds. Its written components are merely substitutes for their spoken counterparts, and have tended to evolve into simple signs composed of continuous lines. Copying in an alphabetic language is easier than in an ideographic script. It is likely, therefore, that the slower and more complicated process of copying Chinese resulted in a greater demand for mechanical aid in duplication in China than in the West. It is also natural that movable type was more acceptable to an alphabetic language, while block printing was more suitable to the Chinese writing system.

Religion is another cultural factor that has played a great part in the long history of the development of printing; religious zeal in spreading sacred writings to all believers has created a demand for a ready means of reduplication, and Buddhism, Islam, and Christianity all exerted an influence. Buddhism even teaches that mass multiplication of religious images by means other than by hand-copying is a way to receive blessing from the Buddha. Indeed, the Buddha is said to have remarked, 'Whoever wishes to gain power from the Buddha is said to have remarked, 'Whoever wishes to gain power from the Buddha must write seventy-seven copies and place them in a pagoda... This dharmic is spoken by the ninety-nine thousand kals of Buddhas and he who repeats it with all his heart shall have his sins forgiven.' The enthusiasm of the Buddhist devotees for producing a great multitude of sacred texts was highly influential in the birth of printing in China, which occurred during the high tide of Buddhism in the early Tang. This religious motivation is further confirmed by the earliest printings of the dharmic discovered in Japan and Korea.

In the West, on the other hand, the demand for multiple copies was not strong as early as it was in China. Hand-copying by slave scribes could produce more texts than were needed in the Roman Empire. In the Middle Ages the reading public was very small, and the copyist tradition was carried on in monasteries and churches. Such demand as these was for books could be met with handmade copies prepared by scribes; there was no incentive to produce them in large quantity. Not until the renaissance and the Reform did the demand for Bibles and other reading materials significantly increase.

Another factor in the relatively slow development of printing in Europe may have been the influence of the growth of various kinds of craft unions and guilds. First organised in Greece and Rome to facilitate the sharing of common interests by skilled men, by the Middle Ages they had gained political power and took on the role of protecting the professional skills and livelihood of their members. These guilds naturally became very strict and exclusive as far as their membership was concerned. For instance, the block printers who engraved and printed playing cards and religious images belonged to the company of painters or artists, which represented such craftsmen as scribes, illuminators, sculptors, stonecutters, glassmakers, and wood-engravers. Typographers were not admitted as members of that society. As late as 1470, guilds of scribes and illuminators in France still forbade multiplication of religious images by means other than by hand-copying. And between 1485 and 1590, among all the early typographers of Antwerp, it seems that only one was probably admitted to guild membership as a wood-engraver, and this most likely on account of his illustrations printed with his text. This power of the guilds in the Middle Ages to limit membership to certain crafts may well have had a negative effect on the early development of printing in Europe.

To sum up, then, the early use of printing in China was chiefly due to the early invention of paper, the specialised use made of seals and rubbings for duplication, the greater need for mechanical aid in duplicating texts written in a complex ideographic script, the standardisation of Confucian texts used for civil service examinations, and, finally, the demand for great quantities of copies of Buddhist

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1 See discussion of the methods of making inked squeezes in Tilden (2), pp. 86 ff., and on pp. 143 ff. below.
2 Cf. K. Starr (2), p. 3. An archaeologist said in 1930 that she learned a most satisfactory method employed by Orientals to make rubbings from inscriptions and decorations, 'even the finest of lines appear most distinctly'; see Margaret Ashley (1).
3 Chinese characters have been composed of one to more than thirty independent strokes or dots, straight or curving lines, and squares since their development into the clerical and regular styles from around the advent of Christian era in the Chin and Han dynasties.
4 For a comparative study of word-syllabic and alphabetic systems, see Diringer (1), Gelb (2); for development of written forms, see Anderson (1).
5 A kals is variously put at one hundred thousand, one million, and ten million; cf. Carter (1), p. 53, note 15.
8 Chatto & Jackson (1), p. 121.
10 Chatto & Jackson (1), p. 192.
scriptures which could not be met by hand-copying. In the West, paper was not introduced until a rather late date, seals were not used as duplication devices, rubbing was not known until fairly recently, while printers were restricted by craft unions or guilds, and added to all this, the relative simplicity of the alphabetic script lessened the need for a mechanical duplication aid. Thus the materials and techniques necessary for the invention of printing were either not developed, or did not lead in the direction of a printing process. Furthermore, there was no such incentive or demand for huge quantities of copies as developed in connection with Buddhism; the needs that did exist could be met by hand-copying. Until all these factors were changed in the middle of the 15th century, the threshold for the invention of printing was not reached in Western society.

3. INFORMATION ON PAPERMAKING AND INKMAKING IN CHINA

Sources of information for the study of paper and papermaking include paper specimens, scientific and field reports, early records, and secondary sources. We shall take these in order.

Paper specimens are important because they can be subjected to microscopic, chemical, and physical analyses for determining their composition, technique of manufacture, and other features. Since the turn of the century, tens of thousands of early paper specimens have been found within China and outside it, including some fragments from the 2nd century which are at present the oldest known papers in the world. A few specimens bearing characters of perhaps the +2nd century attest to the use of paper for writing before or at this time.*

Paper fragments and documents found in modern Sinkiang by various expeditions were primarily products of the Three Kingdoms, Chin, and Southern and Northern Dynasties from the +3rd to 6th centuries, when paper began to be used widely and to travel across Chinese borders.® Paper rolls dating from the 4th to the 10th centuries discovered at Tunhuang represent the best examples of paper and paper books in a roll form before and during the Thang period. From this time on, specimens of different varieties of paper survive in books, documents, works of painting and calligraphy, in stationery, paper cutting, and other paper products. In addition, certain old paper documents extant outside China testify to their early diffusion worldwide.*

* Up to the present time (1989), at least seven discoveries of old paper fragments of the Han period have been reported, but only one or two said to have been dated to the Later Han bear some writing; see discussion on pp. 98 ff. below.
® Cf. Tsien (t), pp. 142-58; see also discussion on pp. 93 ff. below.
© A grotto library of some 30,000 rolls of paper books and documents in Tunhuang was first visited by Aurel Stein in 1907 and later by many others; see Stein (q), Gille (2), Pelliot (6b), Chien Yüan (5), and a summary of the documents by Fujieda (6).
© Some 12,000 paper documents discovered in Egypt, dating from +800 to 1388, are now preserved in the Erzherog Rainer Collection at Vienna, and many Chinese papers of the Sui and Thang periods survive in Japan and Korea.

Samples of these old papers have been scientifically analysed, and reports are available concerning fibre composition, surrogates used for sizing and coating, and such physical qualities as thickness, strength, opacity, absorbency, and watermark, if any. In 1885-7, Joseph Karabacek (2) and Jules Wiesner (1, 2) made the first analysis of Arabic paper documents from the +9th to the 14th centuries, which had been found in Egypt. Then, in 1902-11, Wiesner (3, 4, 5) studied the papers found by Aurel Stein in the course of his first two expeditions to Chinese Turkestan and Tunhuang. It had formerly been believed in the West that cotton papers were first made by the Arabs in the 8th century and that the making of rag papers was discovered by the Europeans in the 13th century, but the findings of these studies confirmed that paper was invented in China at least in the early Christian era, as recorded in Chinese histories. Moreover, using the scientific data obtained from these analyses and with the support of documentary sources, the history and routes of the migration of paper step by step from China westwards over a period of more than a thousand years have been reconstructed.

The Tunhuang papers at the British Museum were further studied by Robert Clapperton (1) in 1934, M. Harders-Steinhauser (1) in 1950, and Jean-Pierre Deige (1) in 1961, and those in the Peking collection by Phan Chi-Hsing (6) in 1966. Samples of other discoveries have also been examined by Chinese scientists. A piece with characters of the Later Han period found at Chü-yen in 1942 was analysed by Wu Yin-Chuan,1 a botanist, and reported by Lao Kao (1). Specimens of the +4th to +8th centuries found in Sinkiang by Chinese archaeological teams in recent years and now at the Sinkiang Museum, as well as samples of papers used for calligraphy and paintings dating from the +3rd to the +12th centuries now kept at the Palace Museum in Peking, have also been studied and reported on by Phan (4, 5, 7). The data collected on their physical appearance, the fibres used in manufacture, and the techniques for treating them, in addition to descriptions in ancient literature, have been used in reconstructing the methods of old papermaking in China (Fig. 1052).2

Literary sources on paper in Chinese can be divided into two major categories. One consists of general works, the other of chapters or books specifically on historical documents, local gazetteers, literary and miscellaneous writings, and classified encyclopedias. For instance, the beginnings of paper are recorded in such historical works as the Tung Kuan Han Chi,3 a contemporary official record covering the period about +120, and the Hou Han Shu,a a standard history of the Later Han dynasty based on earlier sources. The subsequent development of paper and its manufacture in different periods are described in dynastic and other histories, and also in works on administrative codes of successive dynasties, such as the Thang Liu

1 Wù yínchún 2 東觀漢記 3 Phan Chi-Hsing

* Experiments of papermaking with hemp fibres according to analyses of old specimens and descriptions of the Han period were conducted in 1965 by the Institute of the History of Natural Sciences, Academia Sinica, and the results were reported to be successful; see Phan Chi-Hsing (6).
Fig. 1052. Old method of papermaking in China. A modern drawing of the ancient process according to steps described in early literature, showing: (a) cutting, stamping, and washing the raw material; (b) cooking, pounding, and mixing fibres; and (c) dipping and lifting the mould; drying and sorting the sheets. From Phan Chi-Hsing (9).

Tien1 (c. + 738) of the early Thang period, in which official positions of those in charge of the manufacture, acquisition, processing, and use of paper in various branches of government are listed. Local materials, products, or tributes are recorded in local gazetteers or regional descriptions, including the T’ien-Ho Chih Hsien Thu Chih2 (+ 814), a Thang geography; Chia-Thai Kwei Chi Chih3 (+ 1201), a local history of Kuei-chi, Chekiang; Chiang-Hsi Sheng Ta Chih4 (+ 1356), a provincial history of Chianghsii; and many of other periods. Occasionally references to paper are found in literary collections by noted writers of the Thang and Sung periods, whose poems acknowledging gifts made of paper are included. Descriptions of paper and paper products or the use of paper at festivals or ceremonies are found in such memoirs as the Tung-Ching Meng Hua Lu5 (+ 1148), about the Northern Sung capital of Kaifeng, and such collections of miscellaneous notes as Kai Yi Tsang Hsien6 (+ 1750). Finally, special chapters or sections devoted to paper are found in classified encyclopedias, including the Thai Phing Yü Lan7 (+ 983) and the Thu Shu Chi Chheng8 (+ 1726), in which quotations from histories, anecdotes, poems, prose, and miscellaneous items on paper are systematically arranged, even though they may not always agree with the original texts.

The other category of literary sources consists of chapters or works exclusively on paper and papermaking. The earliest one, Wen Fang Suo Ch’u9, a general treatise on implements for writing in a scholar’s studio compiled by Su I-chien (+ 953–96),10 contains a section on paper which is divided into four parts: history, manufacture, anecdotes, and literature selected from earlier sources, chiefly of the Thang period, many of which have since been lost. Another work limited to local descriptions, the Shu Chien Phu11 on Szechuan papers written by Fei Chu12 of the 14th century, includes information on local products, papermakers, and designers in that particular province. Many similar works by noted men of letters, such as the Phing Chih Thieh13 by the Sung artist Mi Fu,14 describe the qualities and appreciation of paper. The most important and only early work on the technology of paper making is included in the Thien Kung Khai Wu15 by Sung Ying-Hsing16 (1587–c. 1660), in which an illustrated chapter is devoted to methods of papermaking with bamboo and paper mulberry. Later works of a similar nature include an eyewitness account of papermaking by Huang Hsing-San17 of c. 1850, a technical work on papermaking with bamboo by Lo Ch’en-20 (1), published in 1935; and a recent illustrated work on various plant fibres used in papermaking in China by Yü Chheng-Hung21 & Li Yün22 (1).
The contributions of modern scholarship to Chinese papermaking include the scientific studies of old papers already mentioned, and historical research into the origin, development, and migration of paper, and field surveys of traditional papermaking in modern societies. The historical studies were initiated primarily by sinologists like Stanislas Julien (13), Friederich Hirth (29), Edouard Chavannes (24), Berthold Laufer (48), and especially Thomas Carter (1), whose chapter on paper in his book on printing is still an authority on its dissemination westwards. Since then, works by paper historians and experts, including André Blum (1), Armin Renker (1), Henri Alibaux (1), R. H. Clapperton (1), and especially Dard Hunter (9), have given the Chinese invention a proper place in the history of papermaking. Hunter was not an expert on China, but his field investigations of handmade paper mills in China, Korea, Japan, Indochina, Siam, and India, and his personal experience with handmade paper, have added a new dimension to the comparative study of traditional papermaking in Asian civilization.a

The few articles on papermaking published by Chinese scholars during the first half of the 20th century largely consisted of translations of Western sources on the subject or expositions of traditional opinions. An early study by Yao Tshung-Wu (1) on the introduction of paper to Europe, published in 1928, was primarily based on Western scholarship supplemented with documentation from Chinese sources. Lao Kan (2) in 1942, reaffirmed and further elucidated a theory advanced by the Chhing scholar Tuan Yu-Tahai (9) that paper originated from the use of silk fibres and from washing rags in water, and this has since been followed by many Chinese and Western scholars.b

During the second part of the 20th century, little has been added to our knowledge of Chinese papermaking in Western languages, but more contributions have been made in Chinese and Japanese. Works in three major areas may be mentioned. On the origin of paper, reports and studies of new discoveries of what are now the oldest known paper specimens, identified with the Former Han period, have not only pushed back the date of invention at least two or three hundred years before Tshai Lun, but also confirmed that early papers were made of hemp and not silk fibres. Also, a theory was advanced by Ling Shun-Sheng (1) that the origin of paper might have been influenced by the tapa culture widespread in southern China, the Pacific, and other tropical regions in ancient times. Although this theory is not new and some of his conclusions are doubtful, c his thesis, supported by full documentation from Chinese sources, offers a new interpretation of this subject.

The development of papermaking during different periods following its beginnings in the Han, has been studied by Chang Tzu Kao (2, 7) and Yuan Han-Chhing (2) on the early period, Wang Ming (2) on the Sui and Tang, Shi Ku-Feng (1) on the Sung, and Phan Chi-Hsiao (7, 12) on all aspects of Chinese paper, especially its origin and technology. Recent discoveries of stone tablets inscribed with regulations for paper mills in the +18th century have provided original documents for the study of the social and economic conditions of papermaking in Chinese history. Finally, several general histories of Chinese papermaking have recently been published. These include a popular work by Hung Kuang (1) & Huagenthien-Yu (2), a brief account by Liu Jen-Chhing (7), and a comprehensive treatise by Phan Chi-Hsiao (9). Phan's work, which consists of eighteen chapters on historical development in different periods, topical studies based on scientific analyses of old paper specimens, and field surveys of papermaking by Chinese minority peoples and with different materials, is by far the most complete and detailed study of the technology of Chinese papermaking in any language.

Japanese sources for the study of handmade paper include artifacts, old documents, and modern compilations. The Shōsōin in Nara has a collection of many old paper specimens from China and Japan. Early historical documents, including the Kojiki (7, 172), Nihongi (6, 720), and Engishiki (9, 927), contain records of the early introduction of paper into Japan, the offices in charge of papermaking, the transplanting of paper mulberry, the manufacture of a great variety of papers, and the uses of paper for writing, wrapping, garments, making screens, and mounting on walls and houses. Important excerpts from these documents, together with quotations from Chinese works, are arranged in chronological order in a collection edited by Seki Yoshihikui (2). He has also published a history of handmade paper, appended with sources from Korean documents, and a companion volume of pictures illustrating the papermaking processes and paper shops of different periods and different countries. Numerous monographs and articles on Japanese handmade paper by modern authors can be found in bibliographies and the works of Jugaku Bunshū (2). Japan remains noted for its continuing manufacture of fancy handmade papers, and specimens have been assembled and published in several collections, including Tindale & Harriet (1), Seki Yoshihiki (7), Mainichi Shimnbi (1), and Takeo Kabushiki Kaisha (14). The set by Mainichi

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a Hunter published some twenty monographs on paper, most of which were printed by himself on his own handmade paper; see partial list in Bibliography; the specimens collected during his trips are exhibited at the Dard Hunter Museum, Appleton, Wisconsin.

b The article was first published under the name Yao Shih-Au in 1928 and was reprinted under the pseudonym Shuan-Ying in 1966; see Bibliography B under Yao Tshung-Wu.

c See the discussion of the definition of paper in the Shosōin Chibō 70 in pp. 93 ff., below.

d Ling's theory that paper money, paper armour, and Chin-Shu paper were all made of bark cloth and not bark paper has been proved to be wrong; literary records or recent tests of the products confirm that they were made of real paper.

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1 報徳吾 2 華順 3 慕玉誠 4 原田源 5 菊水

Together with paper, there is also a great deal of information for the study of Chinese ink, which has been closely associated with the writing brush, the inkstone, and with paper, these comprising the 'four treasures of the scholar's studio'. The literary records include general treatises and history of ink, biographies of ink-makers, recipes and procedures for inkmaking, albums of ink designs, catalogues of ink dealers and connoisseurs, collections of works on ink, and modern studies in English, consisting of samples of raw materials and some kinds of handmade makers, recipes and procedures for inkmaking, albums of ink designs, catalogues of ink makers, and with paper, these comprising the 'four treasures of the scholar's studio'. The literary records include general treatises and history of ink, biographies of ink-makers, recipes and procedures for inkmaking, albums of ink designs, catalogues of ink dealers and connoisseurs, collections of works on ink, and modern studies in different languages. Besides these, artifacts, ink traces on ancient relics and on paintings and in calligraphy are also available for examination to help determine the composition of old ink.

The first general treatise on ink, as on paper, is included in the 11th-century work, *Wen Fang Su Pha*, which also contains sections on other writing materials. Since then, numerous monographs have been written exclusively on ink and inkmaking, and these include at least five or six titles written by Sung and Yuan authors between 1100 and 1350, and nearly two dozen such works by Ming and Chhing authors between 1400 and 1900. Many interesting but not easily accessible writings can be found in the two comprehensive collections of ink: the *Shih Lü Chia Mo Shuo*, which contains sixteen titles mostly by Ming-Chhing writers, compiled by Wu Chang-Shou in 1922; and the *She Yuan Mo Tshu*, which includes twelve works by authors from the Sung to the Republican period, published by Thao Hsiang between 1927 and 1929.

Interest in ink has continued into modern times, especially in its new techniques and the artistic appreciation of its use. This is exemplified in two Japanese monographs, one by Watanabe Tadachi (1) on colour pigment, crayon, and inkmaking which has been translated into Chinese, and another by Togari Soshinan (1) on the connoisseurship of Chinese, Korean, and Japanese ink. A more recent treatise in Chinese by Mu Hsiao-Thien (1) contains an historical account of inkmaking in Shensi, Anhui, which has been the centre for manufacturing the four scholar's 'treasures for writing' for many centuries. A catalogue of four modern ink collections in Peking was published as late as 1956.

The earlier studies in Western languages of Chinese ink include those by Stanislas Julien & Champion (2) in 1833 and J. Goschkewitsch (1) and Maurice Jametel (1), who translated into German in 1838 and French in 1869 respectively the Chinese work on inkmaking *Mo Fa Chi Yao* by Shen Chi-Sun of the 14th century. The most comprehensive translation of Chinese sources on ink was made by Herbert Franke (28), who in 1963 published in German the full text of four monographs on Chinese ink by Sung and Yuan authors, in addition to parts on ink in seventeen other works and verses on ink by six poets from before the 10th century. Other monographs on Chinese chemical arts, printing, and writing also contain some information on ink. Other accounts include those by Berthold Laufer, who contributed five chapters on Chinese, Japanese, Central Asian, and Indian ink in F. B. Wibroe (1); by Wang Chi-Chen (1) on the appreciation of Chinese ink, based on the fine examples at the Metropolitan Museum of Art in New York City; and by van Gulik (9, 11) on the connoisseurship of Chinese ink. Finally, a recent study by John Winter (1) on ink traces in old Chinese paintings, which uses scanning electron microscopy, represents a new approach to the study of this subject.

### 4 Sources for the Study of Chinese Printing

Information on Chinese printing is available primarily from artifacts, printed materials, descriptions in book catalogues, and other literary records. The artifacts include printing blocks and movable types made of various materials from different periods and various kinds of tools for carving and printing. These objects provide us with details about some of the technical aspects of the craft which are not normally described in literary sources. Only a few such specimens pre-date the Ming period. One wooden block of an Amida Buddhist sutra said to have been made in the Northern Sung period is kept in an American collection. Two other pieces with human figures, perhaps of the same period, are now kept in the Chinese Historical Museum, Peking (see Fig. 1053). Two other pieces with human figures, perhaps of the same period, are now kept in the Chinese Historical Museum, Peking (see Fig. 1053). Over 1200 wooden blocks from the 16th century are in the Thien I Ko Library in Ningpo. Many more of the Chhing and Republican periods are kept in various libraries and publishing houses in Peking, Nanking, Hangchow, Szzechwan, and other places. Bronze blocks for printing...
clay moulds of the early 19th century found recently in Hui-Chou, Anhui, which are now kept in the Institute of the History of Natural Science, Academia Sinica, in Peking. A small number of wooden types of later date are also on hand. Aside from these, types made of clay, wood, or bronze are virtually no longer extant. Failing also to survive are the tools for carving, brushing, and printing used in former times, but some of those used by modern craftsmen are believed to be similar.

While few blocks and movable types survive, printed books and single sheets are available for study. These range in date from the earliest use of block printing to the early years of this century, when traditional block printing was still in use. Specimens of woodblock printing from the 8th to the 10th century are extant in and outside China. Some 2000 printed works of the Sung, colour printing from the Yuan, and about thirty titles printed with bronze type from the late Ming period are known to be kept in public and private collections throughout the world. In North America alone, more than one-half of the four million volumes of Chinese books in various library collections are believed to be traditionally printed and bound editions, including over 100,000 volumes printed in the Sung, Yuan, and Ming periods.

Besides these original editions, many such books have been reproduced in facsimile using woodcut, lithography, offset, or a photo-duplication processes. The facsimiles provide near-exact copies of the originals, except for paper and ink, and permit study of their calligraphy, format, and other details. There are also several compilations of selected samples of rare editions in facsimile, such as the woodcut specimens by Yang Shou-Ching (1), the photolithographic Sung, Chin, and Yuan samples by Chhi Chi-Chia (1), and Ming editions by Phan Chheng-Pi and Ku Thing-Lung (1). Also notable in this regard is the Chung-Kuo Pan Kho Thu Lu, an illustrated catalogue compiled by the Peking Library, which includes

...om several colour pictures attributed to the Thang period from Tun-huang are extant, but the colour appears to have been added by hand to the printed outline; samples of a Kuang-yin image coloured on a printed outline and on the back sheet are kept at the Bibliotheque Nationale, Paris.

...For a list of the Sung editions, see Poen Ming-Sun (1); appendix, for Sung editions in Japan, see Liang Tsu-Han (1); for Ming bronze movable type editions, see list in Chang Hsiu-min (9); Chhien Pin-Lun (1), appendix.

...A census of rare Chinese editions in American libraries as at 1957 indicates that twenty-eight titles in 887 volumes of the Sung, thirty-five titles in 2445 volumes of the Yuan, and 4518 titles in 92,899 volumes of the Ming were kept in thirteen libraries in the United States and Canada; see Tsien (11), p. 16. These include large sets or rare editions such as those reprinted in the Siu Pu Tahng Khau...and those from Japan, the Photolithographic Sung, Chin, and Yuan dharani from Japan, the Photolithographic Sung, Chin, and Yuan dharani from Japan, the Photolithographic Sung, Chin, and Yuan dharani from Japan, the Photolithographic Sung, Chin, and Yuan dharani...
samples of all kinds of Chinese printing by woodblock, movable type, and multi-colour processes from different periods.8

Where original works no longer survive, much information about them can be gathered from bibliographical descriptions in catalogues of public and private collections, in which dates, names of printers, and descriptions of formats are sometimes given. Unlike the great deal of information that can be found for paper, there is very little on printing in Chinese literature. Almost nothing about such technical matters as how blocks were carved or used in printing is mentioned in any pre-modern documents, except for occasional records made by foreign observers. Descriptions of printed editions or publishing records are often found in standard histories, histories of institutions, individual literary collections, miscellaneous writings, local histories and sometimes clan records, but they are generally very scattered and sketchy.

Two early systematic studies of Chinese printing of great influence may be mentioned here. One is the Shu Lin Ching Hua1 by Yeh Te-Hui,9 first published in 1911 and with a supplement in 1923. It consists of an initial chapter on the moral obligations of printing, a discussion of bibliographical terms, and topical remarks on manuscripts, printing, publishers, and dealers arranged under broad chronological groupings through the Chhing period. Another is the Chung-Kuo Tiao Pan Yuan Liu Khaob by Sun Yu-Hsiu,10 published under the pseudonym Liu-An11 in 1916. This is a collection of quotations from various sources grouped under the broad topics of printing, paper, and bookbinding, without critical comments. Besides these two early monographs, information on printing is generally included in works on historical bibliography, or pan pen hsueh,8 such as Chhii Wan-Li12 and Chhang Pi-Te8 (i), Chhen Kuo-Chhing8 (i), and Mao Chhun-Hsiao19 (i) and in general histories of books or publishing such as Liu Kuo-Chhü11 (1, 2, 3). Concerning the origin and development of Chinese printing, major contributions were made by Hsiang Ta19 (i), Wang Kuo-Wei14 (3-7), and Li Shu-Hua15 (7-9) for the Thang and Five Dynasties, and by Chang Hau-Min18 (1-19), Chhang Pi-Te (1-7), and others on various subjects from the Sung to the Chhing period. As for the artistic and technical aspects of Chinese printing, numerous studies were made on movable type by Chang Hsiu-Min (7, 9-12), on woodcuts and book illustrations by Cheng Chen-Tho17 (i), Kuo Wei-Chhü18 (i), and Wang Po-Min19 (i), and on the evolution of the physical book and book-binding by Ma Heng17 (i), Li Wen-Chhi18 (i), and Li Yao-Nan18 (i). These represent the best of modern Chinese scholarship in the field.

Japanese sources for the study of Chinese printing are more numerous and important than those in any other language besides Chinese. Japan's long tradition of collecting and reprinting books in Chinese has left us with many useful descriptive catalogues of Chinese books, facsimiles of old and rare Chinese editions, and reprints of Chinese woodcuts and book illustrations. Lists of Chinese books can be traced back to the +8th or 9th centuries, when large-scale importation of Chinese Buddhist and Confucian classics commenced. During the 17th and 18th centuries, several catalogues of Chinese and Japanese movable type editions were compiled. However, systematic studies of Japanese and Chinese printing were not launched until the beginning of the 20th century, when contributions were made by such scholars as Shimada Kan4 (i) in 1905, Asakura Kameo9 (i) in 1909, and Nakayama Kyoshirō6 (i) in 1920. Their studies laid the foundation for further investigations in both China and Japan. Shimada's critical notes on old Chinese manuscripts and printing include sections on Chinese bookbinding and printing which are considered to be pioneer studies in the field, despite some shortcomings.

The work by Asakura is the first systematic study of Japanese printing and that of Nakayawa is still the most comprehensive treatise in the field, with rather full coverage of China and Japan and a brief account of Korea, although it is out of date in some respects. The most important contributions of Japanese scholars to our knowledge of Chinese and Japanese printing made in the last fifty years or so are those of two eminent scholar-bibliographers, Kawase Kazuma1 (1-5) and Nagasawa Kibuya3 (3-12). Their studies are both intensive and extensive. While Kawase's contributions are primarily in the areas of Japanese books and printing, especially movable type and Goshamban printing, Nagasawa's over two dozen monographs and numerous articles cover more aspects of the Chinese book, bibliography, and printing. His works on the history of Japanese and Chinese printing, published in 1952, and an illustrated history of Japanese and Chinese printing, published in 1976, are both resourceful and critical. His studies of Sung and Yuan block cutters have suggested a new method for the identification of old printing.

Not many Korean sources on Chinese printing are to be found, but numerous artifacts and several secondary sources are available for the study of Korean printing, especially movable-type printing. One of the modern authorities on early movable type in Korea is Kim Won-Yong10 (i), which deals with the historical evidence; see discussion on pp. 306ff. below.

8 See description under Anon. (259) in Bibliography B.
9 The only article on printing procedures was written by Lu Chhieh17 (i) in 1947. The earliest records on carving and printing were made by the Persian historian Rashid-eddein in about 1300 and the Jesuit missionary Matteo Ricci in 1600; see discussion on pp. 306ff. below.
10 For example, biographies of such bronze movable type printers as Hua Sui, Hua Chheng, and An Kuo of the 15th and 16th centuries are found in their respective family records, but this is due to their political or scholarly influence rather than their careers as printers.
11 See Nakasawa Kibuya4 (i), pp. 14ff.
12 For example, Shimada Kan insisted that printing was invented in the Sui dynasty on the basis of invalid evidence; see discussion on pp. 306ff. below.
13 The work was intended to consist of three volumes on a universal history of printing, but the last one, on Western printing, has not been published.
development of movable type and includes a table of different fonts and a summary in English. There are also collections of samples of Korean movable type printing. One by McGovern (1) includes twenty-two reproductions of original or facsimile pages, and another by Sohn Pow-Key (2) with text in Korean and English also includes samples of facsimile pages. Both of these were made by using deeply etched photo-engravings taken from original pages. Several kinds of handmade papers and water-based ink were used with metal plates in imitation of the original process. These specimens look and feel more authentic than facsimiles made by offset processes or photographic duplication.

Western scholarship on Chinese printing has focused on two major aspects of this subject, namely its beginnings and its spread westwards. Writings on these subjects by early European travellers and missionaries before the end of the 18th century will be discussed later. Detailed discussions and scholarly researches on Chinese printing began only in the 19th century. These include works on the history of printing by Isaiah Thomas (1) in 1810, Robert Curzon (2) in 1858, and Theodore De Vinne (1) in 1876; remarks on Chinese printing in general histories of China by John F. Davis (1) in 1895 and S. Wells Williams (1) in 1848; and particularly the monograph on the history of Chinese printing by Stanislas Julien (12) in 1847. Julien’s studies of Chinese block printing and movable type, despite their incorporation of quotations from inaccurate Chinese sources, laid down the foundation for all later studies by Western scholars.

With the discoveries of manuscripts and printed specimens in Tun-huang, Central Asia, and Africa around the turn of the 20th century, studies by such sinologists as Hermann Hülle (2) in 1923, Thomas F. Carter (1) in 1925, Berthold Laufer (48) in 1931, and Paul Pelliot (41), whose notes were published posthumously in 1953, have added substantially to our knowledge of the subject. Especially significant was the work by Carter, which was revised by L. Carrington Goodrich in 1955. It synthesised all previous researches and further elucidated the subject in the context of Chinese-Western contacts. This work, which has had a significant influence on Chinese and Western scholarship on printing, remains a classic in the field. More than three quarters of a century following its first appearance, no work of comparable magnitude on Chinese printing has been published. In recent years, major contributions have primarily been made by Goodrich (30-32) in his critical studies of new discoveries and his revision of Carter; Richard Rudolph (14, 15) in his translation and study of the Wu Ying Tien manual on movable type of the Ching dynasty; and K. T. Wu (6, 7, 8, 10) in his works on the development of Chinese printing from the Sung to the modern period. In the fields of woodcuts and colour printing, several monographs have been produced by Max Loehr (1), Josef Hejzlar (2), and especially Jan Tschichold (1-7) whose reproductions of a series of Chinese colour prints using modern techniques provide a new source for appreciation and study of this Chinese art.

Despite the contributions to the study of Chinese paper and printing of this band of international scholars whose specialties cover various disciplines, many gaps in this field are still open. Systematic investigations of their social, economic, and intellectual roles and influences in Chinese history are lacking; comparative studies of their origins in and impact on China and the West are especially needed, while certain questions have never been raised for discussion. For example, why were paper and printing invented early in China and not in other civilisations of the world? What effects did these inventions have on changes in Chinese society compared with those in the West?

In studies of Chinese paper, local histories of manufacture and distribution are scarce and the origins of the various uses to which it has been put have not been fully and systematically covered. For example, paper clothing and furnishing have never been mentioned in Western literature. Wallpaper and paper-folding are said to have originated in China, but further evidence is needed to substantiate this claim. On the other hand, watermarks are said to have been invented in the West in the 13th century and marbled paper in the 16th, but both artifacts and documentary sources indicate that they were made in China several centuries earlier. Also, hundreds of trade-names of paper derived from materials, methods, quality, locality, and makers or designers, for the most part incomprehensible to laymen, need to be collected and explained.

In previous studies of Chinese printing, emphasis has been placed on its origin and spread westwards, but its development and contributions have either been oversimplified or underestimated. Many technical and artistic aspects that have been ignored, especially the procedures involved in preparing and printing from both blocks and movable types, need detailed step-by-step descriptions accompanied with illustrations. Also needed are analytical studies of calligraphy, formats, materials, and methods used in printing that could lead to the establishment of new criteria for dating and authenticating old prints. Although an attempt has been made here to fill some of these gaps in the present study, many questions are still waiting for satisfactory answers.

(6) NATURE AND EVOLUTION OF PAPER

(1) PRE-PAPER MATERIALS FOR WRITING

Before paper was used for writing at the beginning of the Christian era, the Chinese selected a great variety of hard and soft materials for documents, historical records, for personal communication. These included such animal products as bones, shells, ivory, and silk; minerals such as bronze, iron, gold, silver, pewter,
inscriptions, such perishable materials as bamboo, wood, and silk were used extensively for books, documents, and other writings of daily life. The former group of materials was intended for vertical communication across generations and the latter, primarily, for communication among contemporaries.

Bone and shell are the oldest surviving materials on which the earliest known Chinese writings were inscribed. The bone primarily used was the ox scapula, which provides a wide, smooth surface for writing. The shells were the plastron and carapace of the tortoise (Fig. 1054). They were used for divination by the royal house of the Shang dynasty, and oracular messages were usually recorded on them after divination was performed. The inscribed materials so far discovered cover about 250 years from the early 14th to the late 12th century. The Chou court continued to use bones and shells for divination, but oracular inscriptions were, in general, written separately on bamboo and silk, except perhaps for the early Chou period. The inscriptions recorded such natural phenomena as eclipses, rain, wind, snow, or clear skies; forecasts of happenings during the coming evening, day, ten-day week, or year; predictions for forthcoming travel, hunting, fishing, and military campaigns; human fortunes such as birth, illness, or death, and the evidence of dreams, as well as sacrifices to ancestors, deities, and other spiritual beings. The inscriptions were carved with a stylus, but a few were written with brush and ink made of lampblack or cinnabar. The carved grooves were sometimes illuminated with pigments or inlaid with turquoise for decoration. Since very few pieces of literature transmitted from the Shang dynasty survive today, these inscriptions are the most important documents for the study of the history and institutions of ancient China.

Inscriptions were also made on various kinds of metal objects, ceramics, and clay materials. The most important and extensive inscriptions are found on bronzes dating from the Shang to the Han period. These inscribed bronzes include sacrificial vessels, musical instruments, military weapons, standards of measurement, mirrors, coins, seals, and other articles, but most of the inscriptions of historical significance were cast on ritual vessels, especially those of the Chou dynasty. These contain from a few to as many as some 500 characters each; the latter equaling in length the chapter in an ancient book. Bronze inscriptions of stone, jade, and clay; and vegetable matter like bamboo and wood. Although many of these materials were also used by the peoples of other ancient civilizations, their use in China was much more common, extensive, and refined. However, though animal skins and plant leaves were also used extensively by others, they were never adopted for writing by the Chinese. Generally speaking, writings on ceramics in China can be traced back to as early as Neolithic times; bone, shell, ivory, bronze, and bamboo to the Shang dynasty; stone, jade, silk, and several metals to the early Chou; and wood to the Han. While some of these hard and durable materials were used primarily for permanent records and monumental digs. Since very few pieces of literature transmitted from the Shang dynasty survive today, these inscriptions are the most important documents for the study of the history and institutions of ancient China.

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For detailed discussion of pre-paper materials, see Tsien (2).

A total of over 100,000 pieces were found in private diggings and official excavations from 1899 to 1937; diggings have continued since 1935, and some 5000 pieces were found near Anyang in 1937.

Individual pieces dated to the Chou were found in Hung-chao, Shansi, in 1934, Peking in 1935, and Peking in 1937, and a score of pieces from the early Chou period were found in Chih-chi, Shensi, in 1937; see WWTK, 1937, no. 9, pp. 38-39, pls. 4-7; also Wen Wu Cho Ku Kang Tsu San Shih Nien, 1939-1939, pp. 4-5, 106.

For further discussion, see Creel (1), pp. 1 ff.; Tsien (3), pp. 19 ff.; Kibbey (1), pp. 154 ff.

Liu Tho-Chih, Hiao-Chia-Ching-Ku Oxen Wen Tse Pei (1955) contains about 6500 bronzes inscriptions reproduced from rubbings; numerous inscribed objects have been found since that publication.

The most significant finds in recent years include a series of 64 bronze bells inscribed with some 8800 characters on music, found in Sui-hsien, Hupei; and two Chan-Kuo bronzes containing the longest inscriptions of that period ever discovered; a large tripod with 285 characters and a vase with 648 characters from a tomb dated to c. 1000 B.C., the date of the state of Chiang to Shan in modern Hsing-shan, Hupei, found in 1979; cf. WWTK, 1979, no. 16, p. 5; KKH, 1979, no. 9, pp. 147 ff.
the Western Chou include long narrative compositions such as records of military campaigns, covenants, treaties, appointments, rewards, ceremonial events, and other political and social affairs (Fig. 1055). Inscriptions from the later Chou are in general shorter, more apt to follow a formula, occasionally composed in rhyme, and written in ornamental style, sometimes in 'bird script'.

Mirror inscriptions appear on the inner or outer part of circular designs on the backs. The earlier ones, from the Warring States and Han periods, include expressions of human desires for spiritual and material satisfactions, greetings and good wishes, political messages, and allusions to various folk beliefs. Inscriptions of the Sui and Thang periods are mostly formulae consisting of a few characters. Numismatic inscriptions appear on almost all early and late metal coins, which were shaped like spades or knives or were round with a square hole in the centre. These inscriptions are primarily the names of places of manufacture and numerals indicating denominations of the coins. Ancient seals were of various material, including cast metal. They were used to stamp inscriptions on small lumps of clay for authentication before they were used to make impressions on silk and paper. Pottery, bricks, and tiles also bear inscriptions, while symbols and numerals are found on Neolithic pottery, with later vessels being inscribed with names of makers or owners, official titles, place and date of manufacture, and, sometimes, imperial edicts (Fig. 1056). Inscriptions on bricks consist mostly of dates, names, and

- Cf. Karlgren (18); Liang Shang-Chhun, (1), (2); Tsien, (2), pp. 47 ff.
- Cf. Wang Yu-Chhian (1); Tsien (5), pp. 90 ff.

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*Fig. 1055. Bronze kuei vessel of the Western Chou dynasty with cast inscription on inner surface, c. -11th century (diameter 27 cm.). British Museum.*

*Fig. 1056. Inscriptions on pottery vessels. (a) A measuring vessel with imperial decree of the First Emperor of Chhin, dated — 221, ordering standardisation of weights and measures. (b) Rubbing from a vessel with imperial edict of Wang Mang, ± 9.*
miscellaneous records. Decorative inscriptions or pictures on roof tiles include lucky formulae, and the names of palaces, temples, mausoleums, granaries, or other public or private buildings, to commemorate their construction.\(^8\)

Inscriptions on bronze and stone are the two major categories of material for the study of Chinese epigraphy and archaeology. While bronze inscriptions may be more ancient, those on stone are more numerous, longer, and more readily accessible. This is because stone is more abundant, more permanent, and makes possible a wider surface for inscriptions, with the result that, from the +2nd or +3rd century onwards, stone was extensively used not only for monumental and commemorative inscriptions but also as a permanent material for preserving all the canonical literature of China.

Among the earliest inscribed stones of historical significance are the ten drum-shaped boulders known as the Stone Drums (shih ku\(^1\)), dated variously from the -9th to -4th century.\(^8\) The inscriptions were written in verse and concerned hunting and fishing expeditions on certain memorable occasions; they originally comprised some 700 characters.\(^8\) In addition, during the reign of the First Emperor of Chhin, between -219 and -211, seven monumental stone tablets were inscribed to praise the achievements of his administration.\(^6\) All these earlier stones were in the form of crudely truncated rocks, but a more refined style of flat stele, known as a pei,\(^8\) was used since the Han dynasty. From that time, numerous tablets have been inscribed to commemorate historical occasions, to preserve the memory of individuals, and to standardise sacred texts in correct and permanent form.

One of the most gigantic projects for the preservation of standard texts was the engraving on stone of the entire collection of Confucian classics. No fewer than seven different editions were inscribed from the late +2nd until the end of the 18th century. The first edition, of seven classics in over 200,000 characters, was carved on both sides of forty-six steles, from +175 to +180 (Fig. 1057). The last, including all the Thirteen Classics, was made from 1791 to 1794 under the Chhing dynasty.\(^8\) Engravings of Buddhist canons on stone came later than the second century, but achieved much greater scope and size. The Buddhists selected stone because it was the best material for preservation of their sacred texts; as one devotee said: 'Silk will decay, bamboo is not permanent, metal seems hardly eternal, and skin and paper are easily destroyed.'\(^7\) A grotto library, started in +605 and continued until +1091, consisted of 105 Buddhist \textit{autars} of over four million words carved on more than 7000 steles. This collection is still preserved in the Mountain of Stone Sutra (Shih Ching Shan\(^1\)), near Fang-shan, Hopei, after well over a thousand years.\(^8\) The engraving of Taoist literature on stone was much later still. The earliest Taoist stele was erected at I-chou, Hopei, in +708, and several were engraved in the following centuries.

Not all the inscriptions engraved on hard materials are considered books. The direct ancestry of the Chinese book is in the tablets of bamboo or wood which were connected by thongs and used like the paged books of modern times. Bamboo and wood were the most popular materials for writing before paper, and their use has had a most significant and far-reaching effect on the tradition of the Chinese book and culture. Not only are the vertical arrangement of Chinese writing and its direct ancestry of the Chinese book is in the tablets of bamboo or wood which were connected by thongs and used like the paged books of modern times. Bamboo and wood were the most popular materials for writing before paper, and their use has had a most significant and far-reaching effect on the tradition of the Chinese book and culture. Not only are the vertical arrangement of Chinese writing and its movement from right to left believed to have been derived from this system, but also the format and terms for a physical book, used until today, are supposed to have originated from those for the tablets.\(^8\)

\(^8\) For further discussion, see Tsien (2), pp. 79-83.

\(1\) 聂

\(2\) 詹

\(3\) 聂

\(4\) 聂

\(5\) 聂

\(6\) 聂

\(7\) 聂

\(8\) 聂

\(9\) 聂
The succession of various book materials in China may be divided into three periods: bamboo and wood from the earliest times to the +3rd or +4th century; silk from the -7th or -6th to the +5th or +6th century; and paper from the +1st century to the present. Thus the uses of bamboo and of silk overlapped by about 1000 years, those of silk and of paper by 500 years, and those of bamboo and paper by 300 years. The old-fashioned materials were replaced by new ones only gradually, and not until after the +3rd century were bamboo and wood entirely superseded by paper.

Since the end of the 19th century, no fewer than 40,000 tablets of bamboo and wood have been unearthed from various locations in China. They cover a span of almost 1000 years of Chinese history. The important discovery sites include those in Hunan, Hupei, Honan, and Shantung in the central plain of China; Tunhuang, Chü-yen, Chi-chüan, and Wu-wei in the northwest; and the ruins of Loulan, Khotan, and Turfan in modern Sinkiang. Among these, Chiang-sha, Hsin-yang, and Yün-meng yielded the oldest bamboo tablets, dating back to the Warring States and Chin periods; Chü-yen supplied the largest quantity and the most important core of wooden tablets of the Han dynasty; and all documents from Loulan belong to the Chin dynasty. These tablets include official documents, private letters, calendars, lexicons for beginners, laws and statutes, medical prescriptions, literary texts, and miscellaneous records. The most important finds in recent years include a group of 490 wooden tablets, including seven chapters of the Lü (or Book of Rituals) (Fig. 1058), recovered from a Later Han tomb at Wu-wei, Kansu, in 1959; over 4490 bamboo tablets on military classics from a Western Han tomb at Lin-i, Shantung, in 1972; 400 bamboo tablets on taxation and economic matters from a Western Han tomb at Chiang-ling, Hupei, in 1973; 600 bamboo tablets of funerary inventories from Western Han tombs at Ma-Wang-Tui, Chiang-sha, Hunan, in 1973; 1100 bamboo tablets of legal documents of the Chin state from Yün-meng, Hupei; and some 20,000 wooden tablets dated from c. -119 to +26, from Chü-yen, Kansu, in 1972-6. Among the most interesting items found in Chü-yen are some seventy-five complete or nearly complete documents on connected tablets strung together on two or three lines of hemp threads, and in the original format.

The preparation of tablets involved several steps. The bamboo stem was first cut into cylinders of a certain length and then split into tablets of a certain width. After the external green skin was scraped off, the tablets were dried over a fire to prevent any quick decay. Writing was carried out on the outside surface and sometimes on the inner surface of the stem as well. Wood, on the other hand, was cut into large

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* See Ma Heng (1), pp. 201-3; Tsien (2), p. 91.
* These include over 10,000 pieces found from 1899 to 1930, and nearly 30,000 from 1931 to 1975; see list of finds from ancient times to 1975 in WWTK, 1978, no. 1, p. 44.
* See a checklist in WWTK, 1978, no. 1, p. 44; Loewe (14), pp. 101 ff.
* See report in WWTK, 1978, no. 1, p. 7, pl. 8, illus. 35.
slabs which were split into pieces of various sizes, and the surfaces smoothed for use as documents. Most of the wooden tablets are of pine, willow, poplar, and Chinese tamarisk, all noted for whiteness, light weight, fine texture, and absorbency. Old tablets could be re-used after the writing on them had been removed with a book knife, which was also used to erase errors. Bamboo tablets were narrow strips from eight inches to two feet four inches long, used for classics, literary compositions, and ceremonial documents. The length of wooden tablets was fixed at from five inches to two feet; they were used primarily for official documents, personal correspondence, and short messages. The tablets are almost invariably narrow, in most cases not more than an inch wide. A single bamboo tablet was called chien; and a wooden one tu. Several tablets bound together with cords to form a physical unit were called tse. Writing of a certain length which formed a literary unit comparable to a chapter was called phin. Square or rectangular wooden pieces, called fang or pan, were sometimes made with a wider surface to accommodate more than one line of characters, or for maps and illustrations. Characters were usually written with brush and lampblack ink, on one side, but in some cases on both sides. Each column of a tablet contains from a few to as many as eighty characters, but in general the average number is about thirty characters.

As we have seen, silk was first used for writing, along with bamboo, no later than the -6th or -7th century, and continued in use after the +3rd or +4th century, after paper had become popular as a writing material. Yet it could have been used much earlier, since silk cloth, brush, and ink were available as early as Shang. Silk continued in use for documents as late as the Thang, being valued for its softness, light weight, durability, and absorbency. The term chu po, bamboo and silk, was used extensively in ancient literature, to refer to written documents. Since silk was much more expensive than bamboo, but had a wider surface, it was used only where bamboo or wood did not suit the special purpose. We know that silk was employed for the final edition of a book, while bamboo tablets served for drafts. Silk was used in particular for books on divination and occultism, for illustrations appended to books of tablets, for maps, for inscriptions for sacrifice to spirits and ancestors, for recording the sayings of kings for transmission to posterity, and for commemoration of meritorious achievements of great statesmen and military heroes.

Although writing on silk is frequently mentioned in ancient literature, few specimens survive today. Until recently, only remnants of silk materials bearing long or short messages had been discovered in several sites in China and in central Asia. Two of the earliest specimens on silk came from Chihang-sha, one bearing an illustrated text and the other a drawing. The silk document consists of two paragraphs of text in about 500 characters. Each is upside down in relation to the other, and they are surrounded by strange animal and human figures in colour on all four sides of the piece. The other piece is a painting depicting a woman with wasp waist at the centre with a strange animal over her head. Both of these seem to indicate the mysterious nature of the Chhiu culture. The most significant find in recent archaeological excavations is a collection of ancient books copied on silk fabric with ink, in the small seal and li styles of calligraphy. These include more than a dozen pre-Chhin works such as the Tao Tsu (Canon of the Virtue of the Tao) (Fig. 1059), the Chan Kuo Tshe (Intrigues of the Warring States), and the I Ching (Book of Changes), several other titles, and some old maps. The total number of characters comes to over 120,000, including many parts of ancient books which have been long lost and are not included in the extant editions. The first major cache of silk documents to be discovered.

Silk used for writing is generally called su, a plain white fabric without design or dye. Its varieties included the chuan, a thin and gauze-like material used especially for painting and calligraphy; the chien, a fine and closely woven textile made of double threads and yellowish in colour; and the tseng, a thicker and darker fabric
probably made from wild silk. When they were used for books and writing, they could be cut as needed and rolled up as a physical unit called chuan (roll). This system was inherited almost entirely by paper when it was substituted for silk for writing. As the historical record says, 'silk was expensive and bamboo heavy,' and a light but less expensive material called chih (paper) was finally introduced as an ideal medium for writing.

(2) DEFINITION AND NATURE OF PAPER

Paper, as we have seen, is a matted or felted sheet of fibres formed on a fine screen from a water suspension. When the water drains away, the remaining mat of fibres must be removed from the screen and dried. This definition applies to what 'paper' is today and also to what it was yesterday. Sheets of paper were made from disintegrated fibre upon a flat mould before the time of Christ and paper is still formed in this fashion; the only difference lying in the construction of the moulds and the treatment of the fibre. Thus the fundamental principle of papermaking involves two basic factors, the fibres and the mould. These two principal elements were clearly given in a definition of paper contained in an old Chinese lexicon compiled during the time when paper was beginning to be popularly used in the early years of the Christian era.

In the Shuo Wen Chieh Tzu (Analytical Dictionary of Characters), compiled by Hsü Shen around +100, the word chih for paper is defined as 'a mat of refuse fibres' (hsü i chan yeh). Here the key words are hsi (refuse fibres) and chan (mat). According to the definitions given in the same ancient lexicon and its commentaries by later scholars, hsi means fibrous remnants obtained from rags or from boiling cocoons, and chan meant a mat made of interwoven rushes which was used for covering. Thus the fibres and the water-draining mat have been the two basic factors in papermaking since ancient times. The definition given in the old Chinese dictionary, which mentions these two basic elements, corresponds very well with what is described today.

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* See Dard Hunter (7), p. 10.
* The character chan' is written with the grass radical in the earlier editions of the Shuo Wen Chieh Tzu (see reprint of a Sung edition in the SPTK), but this was changed by later commentators to the bamboo or the bamboo plus the water radical in later editions, to suit their own interpretations; see Chhien Tshun-Hsiin (5), p. 127, n. 8.
* This translation of the definition of chan is based upon the form with the grass radical in the earlier editions; see forms reproduced in Ting Fu-Pao (2), p. 590; supplement, p. 896.

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34. PAPER AND PRINTING

Fig. 1059. Silk book of the Former Han dynasty from Ma-Wang-Tui, Changsha. One of two earliest extant versions of the Lao Tzu, c. +2nd century, written on plain silk fabric 24 cm. in height.
It has been suggested that the manufacture of paper in China originated from the process of pounding and stirring rags in water, after which the wadded fibres were collected on a mat. The treatment of rags in water was probably an old practice in China many centuries before the Christian era, for ancient literature frequently testifies to the washing, pounding, or stirring of rags in water by women. Wu Yuan (-6th to -5th century), a political refugee who fled from the Chhu to the Wu state, is said to have stopped by the Lai River where a woman who fed him with food was pounding rags (chi hua). The Chang Tzu (-3rd century) says that a family of the Sung state had a recipe for salving chapped hands and from generation to generation his family made their living by pounding and stirring rags in water (ching phi huang). Su-ma Chhien also says that Han Hsin (d. -196), Lord of Huai-ying, was fishing outside of the city where he witnessed many women washing rags in the Huai River; one of them worked continuously for several tens of days. Apparently, the treatment of refuse silk, the re-use of old fibres in quilted clothes, and the washing of rags of hemp and linen required such constant activities with fabrics in water. It is very likely that an accidental placing and drying of refuse fibres on a mat suggested the idea of making a thin sheet of paper.

Before papermaking, there were other ways of turning fibres into a sheet. It could be done by matting and pressing into a felt, by spinning and weaving into a textile, and by soaking and beating into a bark cloth or tapa. The art of felting is one of the oldest methods of making fabrics and earlier than that of weaving and spinning; felt being used for clothing and covering by the inhabitants of northern and middle Asia from very ancient times. How early felt was used in China is uncertain, but the Chou Li (-3rd century or earlier) records that felt (suan) was made of animal hair by the officials of the Chou court in charge of leather (Chang Phi). No evidence is known to suggest that the invention of papermaking in China was influenced by the method of felt making, but the techniques of both are quite similar.

There is a close relationship between textiles and paper. Not only were they made of the same kinds of raw materials at the beginning of their manufacture, but they also had a similarity of physical forms and properties. Even their uses were often interchangeable. Textiles were sometimes employed for writing and painting, while paper was substituted for textiles for clothing and furnishing. Indeed, it is generally known that silk cloth had long been used for writing before it was replaced by a thin sheet made of refuse fibres, which were obtained either from the remnants from boiling silk cocoons or by pounding rags in water. When the sources of raw materials expanded to include such new fibres as those of raw hemp and tree bark, it opened a new page of papermaking with fresh vegetable fibres for unlimited production.

While the use of raw hemp was likely to have evolved from that of rags of hemp or linen, the adoption of tree bark for papermaking could have been inspired by the prior use of bark cloth made from the paper mulberry. This tree has been cultivated extensively in China and the bark cloth is known to have been made and used for clothing in south China from very ancient times. The bark of paper mulberry, after it was beaten into a thin sheet, had also been used for clothing, covering, and hanging by primitive peoples in the temperate and tropical zones throughout the world. It has been suggested that the cradle of bark cloth was in China, and that manufacture spread perhaps from the southern part of China by way of the islands in the South China Sea eastward to the farthest regions of Pacific and Central America, and westward through the Indian Ocean to reach Central Africa, covering almost all areas along the equator.

The moistened tissue of the bark can be expanded to as much as ten times its original size, and several pieces can be joined together by gluing the overlapped edges into a very large sheet. Although it is as white, soft, and flexible as paper, its manufacture is much more laborious and time-consuming. Only one to three sheets could be made by one worker per day, while 1000 sheets of paper could be made by the same labour. It is very likely that the native people in south China, who were familiar with the making of bark cloth, made use of the same fibres for paper-making. When the beating process was replaced by maceration and felting, it was natural that the same material could be turned into a thin sheet of paper.

Besides sheets manufactured from fibres, there were other natural materials such as animal skins, leaves, and papyrus which were all used as a medium on which to write, though none were ever used in China. In Europe and the Middle East from the -2nd century onwards until after the arrival of paper, skins of sheep, goats, kids, calf and other animals were made into parchment. The most superior quality parchment, known as vellum, was especially prized for its fineness, whiteness and smoothness as a writing material. It was stronger than paper, but more expensive as the skins of some two hundred animals were needed to provide enough sheets for a single book.

Of all the materials that were used for writing, probably the earliest were leaves.
Palm leaves, which are thick, narrow, and sometimes as long as three feet, were used in India and other nations in South and Southeast Asia. They were incised by a stylus and rubbed with black ink or other pigments. The strips of leaves were then bound by stringing on to cords. Papyrus was used in Egypt as early as the third millennium before Christ, and was made from the inner bark of the papyrus plant (Cyperus papyrus). The bark was split into pieces which were placed crosswise in several layers with an adhesive between them, and then pressed and dried into a thin sheet which was polished for writing. Scholars of both East and West have sometimes taken it for granted that paper and papyrus were of the same nature; they have confused them as identical, and so have questioned the Chinese origin of papermaking. This confusion resulted partly from the derivation of the word paper, paper, or papel from papyrus and partly from ignorance about the nature of paper itself. Papyrus is made by lamination of natural plants, while paper is manufactured from fibres whose properties have been changed by maceration or disintegration.

(3) The Beginnings of Paper in the Han

A number of specimens of paper from the 2nd century onwards have recently been discovered in various parts of China, a witness to the origin and development of paper in the Han dynasty. The oldest paper extant today is probably the specimens discovered in 1957 in Pa-chhiao, near Sian in Shensi province, in a tomb dated no later than the period of Wu Ti (r. -140 to -87) of the Former Han dynasty. The specimens, including one large piece about 10 cm. square (Fig. 1060a) and many fragments found under three bronze mirrors, are said to be light yellow, thick and uneven, coarse and crude, with some textile impressions on the surface. On one of the specimens some loops of fibres are visible, and on another a small remnant of thin, two-ply hemp cord. These seem to indicate that this paper was made of rags or other previously used materials made of hemp, probably dried on a mat woven like a piece of fabric.

The existence of paper of vegetable fibres in the Former Han may be supported by several other old specimens from archaeological discoveries. One fragment, 10 by 4 cm., dated on circumstantial evidence to around -49, was found in the ruins of a watchtower in Lopnor by a member of the Mission of the Northwestern Expedition of China in 1934. Two larger pieces dated to be of the second half of the -1st century, were found in 1974 at a watchtower in Chin-kuan, near Chu-yen (Fig. 1060c). A few other pieces, mostly fragments attached to a lacquer utensil with coins of the Hsian Ti period (-73 to -49), were found in 1978 in an excavation of Institute of the History of Science, Academia Sinica, Peking.

Fig. 1060. Oldest paper specimens of the Former Han period. (a) A large piece of hemp paper, 10 x 10 cm., dated -1st century from Pa-Chhiao, Shensi province. (b) Fibres of the above enlarged 4 times. (c) Paper fragment from Chin-Kuan, 6.8 x 7.2 cm., -1st century. (d) Paper specimen from Fu-feng, Shensi, 4.0 x 3.6 cm., -1st century. Courtesy of Institute of the History of Science, Academia Sinica, Peking.

\[ \text{References:} \]
\[ \text{Figures:} \]
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underground vault in Chung-yen village, Fu-feng, Shensi province (Figs. 106d; 1064). All these pieces are of later date but are similar in quality to the Pa-chhiao paper, being made of hempen fibres, yellowish, thick, coarse, and uneven with loops of fibre visible on the surface. They provide some evidence of the beginning of the art, especially those discovered in the more precisely dated sites located in the central plain of China.

Besides the archaeological evidence, paper before Ts'ai Lun's time is mentioned in several places in the ancient literature. In one story laid in -93, an imperial guard advises a prince to cover his nose with a piece of chih (paper). Another relates that in a murder case in -12 the poisonous ‘medicine’ was wrapped in ho-ffi, which means a thin piece of chih of red colour, according to the commentator Ying Shao (c. +140-206). The official history records that, in the reorganisation of the imperial secretariat by Emperor Kuang-Wu (r. +25-56), ‘the Assistant of the Right (Yu Chhing)’ was responsible for the seals and cords of the office, and for paper, brush, and ink. It also says that a scholar was summoned to the court in 76 to give instruction to twenty students, who were each given a copy of the classic written on tablets and chih. In +102, an imperial consort, née Teng, who was a lover of literature and instrumental in Ts'ai Lun’s presumed invention, is said to have asked that chih be sent as tribute from various countries. All these stories recorded in official histories and other documents indicate that chih existed before +105, the traditional date of the invention of paper by Ts'ai Lun who, since his own time, has been credited as the inventor or sponsor of the methods of papermaking.

Ts'ai Lun (d. +121), ‘Chung-Chung, a native of Kuei-yang (modern Leiyang, Hunan), was an erudite who served at the imperial court in or before +75, and was promoted in +89 to Shang Fang Ssu, an office in charge of manufacture of instruments and weapons. He was described as a man of talent and learning, loyal and careful. His biography in the standard history says:

In ancient times writings and inscriptions were generally made on tablets of bamboo or on pieces of silk called chih. But silk being costly and bamboo heavy, they were not convenient to use. Ts’ai Lun then initiated the idea of making paper from the bark of trees, remnants of hemp, rags of cloth, and fishing nets. He submitted the process to the emperor in the first second-hand material previously used for some other purpose. As to the rags of cloth (pho pu) and fish nets (yu wong), they may still have been mentioned as common or officially approved materials for papermaking, even if they had been so used before. In any case, rags and other second-hand materials were probably used first, but their supply was limited compared with that of fresh fibres from trees or other plants, which made possible the large-scale production of paper. It is also suggested that the use of tree bark for papermaking by Ts’ai Lun may have been influenced by the bark-cloth culture which existed in China before the manufacture of paper by a process of felting.

Several recent archaeological discoveries support the literary evidence of the official records. A specimen of paper with writing contemporary with Ts’ai Lun was found under the ruins of an ancient watchtower in Tsakhortei near Ch’i-yen (Khara-khoto) by a party from the Academia Sinica in 1942. This remnant of paper, which is said to be made of vegetable fibre, is coarse and thick, with no clear screen marks, but it bears about two dozen readable characters in a style (Fig. 1061), said to be similar to that appearing on a piece of pottery dated +156. From historical evidence, this piece of paper can be dated between +109 and 110, when the watchtower was abandoned by Chinese defenders because of the rebellion of the Hsi-chhian tribe. This was the first find and the earliest sample of paper with writing on it. Other specimens of the Later Han period found in recent years include a plain piece found near a mummy in a tomb in Min-feng, Sinkiang, in 1959, and several pieces with writing, not all of which is legible, from a tomb in Han-than-pho, Wu-weii, Kansu province, in 1974. Some of the latter specimens are said to have been nailed, in three layers, with wooden strips on both sides of an ox cart when they were discovered. Made of hemp, they have proved to be more advanced than other finds, since some of them are white, much thinner than

concerning Ts’ai Lun’s paper. All provide information about the kinds of raw materials used, the date of the official presentation, and the life of Ts’ai Lun himself.

The existence of paper before Ts’ai Lun does not necessarily contradict the story of his contribution as recorded in the official history. It is possible that he was an innovator who used new raw materials in papermaking. Indeed, the term ‘tsao’ used in his biography can be read as ‘to initiate the idea’ of introducing new materials, especially tree bark (sha fa) and hemp ends (ma tho), which was not a second-hand material previously used for some other purpose. As to the rags of cloth (pho pu) and fish nets (yu wong), they may still have been mentioned as common or officially approved materials for papermaking, even if they had been so used before. In any case, rags and other second-hand materials were probably used first, but their supply was limited compared with that of fresh fibres from trees or other plants, which made possible the large-scale production of paper. It is also suggested that the use of tree bark for papermaking by Ts’ai Lun may have been influenced by the bark-cloth culture which existed in China before the manufacture of paper by a process of felting.

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The 3rd century was transcribed of paper specimens of the Han period with writing. Tso Shantung who lived at the end of the Han dynasty, is said to have made paper of brushes manufactured by other great masters. Khung Tan, a legendary figure, is reputed to have lived in the Hsian-chheng area in the late Han period, and to have discovered the value of the bark of tham wood in making the high grade paper (hsian chia) for painting and calligraphy. No other names of papermakers are recorded in early literature or on artifacts, but the methods of Chinese papermaking progressed with new materials and techniques at the advent of each new dynasty.

A great many paper fragments of Chin dynasty date, discovered in Central Asia since the turn of this century, illustrate the spread of paper outside the domain of the Chinese empire. Some of them, bearing dates from +252 to 310, were found by Sven Hedin in the Loulan region in 1900. In the same region, Aurel Stein in 1914 found hundreds of paper fragments dated +265–80, and a collection of paper documents and letters written in Sogdian in about +312–13. Some manuscript scrolls of this period were discovered in the region of Turfan and Kao-chhang by the Prussian Expedition of 1902–14, and also by the Japanese Expedition of the Nishi-Honganji in 1909–10. A great many paper books, documents, and artifacts from the +4th to the +9th century have also been found in this area by the Chinese archaeological excavations in more recent years (Fig. 1062). On the other hand, paper made in foreign lands may have been imported to China in the early Chin period. One source records that in +284 Ta Chhin application, and the more widespread use of paper. Rattan, grown primarily in southeast China was introduced as a raw material, and marked a great step forward in papermaking in this period.

The use of local raw materials for papermaking was perhaps conditioned by the political and intellectual factors of the time, especially the isolation of Eastern Chin following the move of its capital from Loyang to Nanking, and by the increasing demand for paper for writing and other uses. Although it had been used for writing as early as the +1st century, it was only from this period that Chinese books on bamboo and wooden tablets were entirely replaced by paper. We know that one of the largest discoveries of bamboo books made in the -3rd century was transcribed on paper to be kept in the imperial library. The Chin bibliography recorded all books as rolls (chian) instead of tablets (phien) as was done in earlier bibliographies. We have also found that from this time paper began to be made on a fine bamboo screen-mould, well sized, and treated with an insecticidal dye for permanence. It was made in many colours for stationery, cut into designs for embroideries and decorations, used to make rubbings from stone inscriptions, for documents and books, for painting and calligraphy, for visiting cards, and for such household articles as fans, umbrellas, lanterns, and kites; there were even sanitary and toilet papers.

A few artisans of the Han period are known to have contributed to the improvement in the quality of paper. Tao Po (+200), tzu Tzu-i, a man of Tung-lai in Shantung who lived at the end of the Han dynasty, is said to have made paper of paper specimen of the Later Han period. A fragment from Chii-Yen, dated c. +110.

The Pa-chhiao paper, and can be written on with brush and ink. It is the second find of paper specimens of the Han period with writing.

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4 The Progress of Papermaking from the Chin to the Thang Period

While the Han dynasty witnessed the beginning of papermaking, the period from Chin to Thang ( +3rd to +10th century) was probably the most important time for discovery of new raw materials, further improvement in techniques, wider application, and the more widespread use of paper. Rattan, grown primarily in southeast China was introduced as a raw material, and marked a great step forward in papermaking in this period.

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About three quarters of the books were recorded as phien in the section on literature in the Chien Han Shu, ch. 90, cf. Tsien (2), pp. 92–3. See discussions on the uses of paper and paper products on pp. 84 ff. below. Stead (4), vol. 1. p. 414; Chavannes (12a), nos. 766–9. These documents were first dated to the 3rd year of Yuan-Chia (+135) through an erroneous reading of Ying-Chia (+307–13) is generally accepted; see Henning (9), pp. 61–15. Cf. Y. T. Ichikawa (1), pp. 27–39. Some twenty-six dated documents of +346 to 907 have been scientifically analysed and studied for the raw materials and methods of their manufacture; see Phan Chi-Hung (9), pp. 23 ff.
presented 30,000 rolls of honey fragrance paper (mi hsiang chih) to the Chinese Emperor, who bestowed 10,000 rolls on Tu Yu(1) (+222–84) for writing his commentary on the Confucian classics. Scholars question that paper originated in Ta Chhin (the Roman Empire), but suppose that it was made in Indo-Wu (r. +265-90), bestowed upon Chang Hua(2) to the Emperor, who bestowed in Sinkiang. A manuscript copied by Pu Thien-Shou, 27 x 43.5 cm., on the back of an account book of the Thang period, found in Sinkiang.

Fig. 1062. Earliest extant version of the Confucian Analect with commentary of Cheng Haian, dated +716. Paper manuscript copied by Pu Tsien-Shou, 27 x 43.5 cm., on the back of an account book of the Thang period, found in Sinkiang.

Political stability, economic prosperity, and official fostering of scholarship in the Thang dynasty, all encouraged the increasing production and further improvement of paper. The government not only selected the best paper for documents and other official uses, but also ordered certain districts in the country to manufacture paper of special quality known as kung chih(1) (tribute paper). According to historical records, no fewer than eleven districts of the empire sent such tribute paper to the government from time to time. The Imperial Library at Chiang-an and later at Loyang had all its books written on the best paper, manufactured in Szechuan(2), while special official positions were established in various academic institutions at the court to dyes, mount, and treat paper for permanent preservation. The government also established many paper factories in the south along the Yangtze. More than ninety such factories were operated in the districts of modern Chiangsu, Chekiang, Anhui, Chiangsi, Hunan, and Szechuan. A standard kind of paper, in uniform sheets, known as chin chih(2) (printing paper), was made for keeping accounts by shops, monasteries, and families of officials and the gentry. Stimulated by the economic growth of the empire, paper was increasingly used in foreign trade, on ceremonial occasions, in making wearing apparel, armour, household furnishings and appliances, and for other decorative and recreational uses.

Many paper documents and books from the +4th century onwards, survive in good condition. The earliest and largest collection of such books is that of more than 30,000 paper rolls dating from the +4th to the +10th century, found in a stone cave at Tunhuang at the beginning of this century. The construction of this cave, decorated with Buddhist sculptures and fresco paintings, was begun in +466 and continued for several centuries. The paper rolls found in the cave included mostly Buddhist sutras with some Taoist and Confucian texts, government documents, business contracts, calendars, and such miscellaneous materials as anthologies, excerpts, dictionaries, glossaries, and models of letter-writing and composition, which must have been used by children of the monastic schools. The government had all its books written on the best paper, manufactured in Szechuan, while special official positions were established in various academic institutions at the court to dye, mount, and treat paper for permanent preservation. The government also established many paper factories in the south along the Yangtze.

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* See Hsin Thang Shu (ESSS TW), ch. 26, pp. 681–94.
* See Chiu Thang Shu (ESSS TW), ch. 47, p. 453.
* About 7000 rolls and 7000 fragments acquired by Aurel Stein in 1907 are in the British Museum, London; more than 3500 rolls collected in 1907 by Paul Pelliot are in the Bibliothèque Nationale, Paris; a few hundred rolls obtained by the Japanese expeditions in 1906–14 were kept in Ōrani Kōsa's house near Kobe and are said to have been transferred to the Ryojun Museum in Dairen, Liao-ning; about 10,000 rolls were removed in 1909 to the Imperial Library in Peking; over 10,000 rolls, mostly fragments, acquired by Sergei F. Oldenburg in 1914–15, are in the Institute of the Peoples of Asia, Leningrad; and certain minor collections are scattered throughout the world; see Fujieda Akira (1) and (2); Su Ying-Hui (4), pp. 71–75.
* For a summary of the content of the Tunhuang rolls, see Fujieda Akira (2); Su Ying-Hui (4), pp. 25–50; for description of these documents see catalogues of various collections listed in Tsien (10), pp. 436–41.
injury from natural or artificial causes, and have remained in perfect condition.

The commonest papers in the Tunhuang collection were made of hemp and paper mulberry, with a few of ramie and mulberry. Although literary sources indicate that bamboo and rattan also were used at this time, these materials were not found in Tunhuang, probably because both bamboo and rattan were grown in south China and not available in this border region. The papers of earlier periods, especially those made in the 7th and 8th centuries, are reported to be generally thin, of unvarying thickness, highly finished, well sized, and stained yellow or brownish. Those of later date, especially of the 10th century, show deteriorated quality. With rare exceptions, they are coarse, drab-coloured, and thick. The rolls are made of from ten to as many as twenty-eight sheets of paper, pasted together to form a long scroll, the beginning of which was covered with a piece of thick sheet that was attached to a roller at the end. The individual sheets average about one foot wide by two feet long, while some rolls are as much as twenty-three feet long. The earliest sheets of paper were narrower, but the size gradually increased in the Sui and Thang dynasties. Sizes were variously uneven in the Five Dynasties period.

As the supply of rattan was gradually exhausted, the Sung dynasty made extensive use of bamboo for papermaking. During this dynasty, the major manufacturing centres included those in Kuei-chi and Shan-chhi in modern Chekiang; Hsi-hsien, Hui-chou, and Chhi-chou in modern Anhui, Fu-chou in modern Chiangsi; and Chhengtu and Kuang-chhing in modern Szechuan, which had been a major centre for papermaking since the Thang. It was said that, in the 10th century, some of its skilful papermakers were recruited by Li Yü (937–78), ruler of the Southern Thang, to go to Nanking to make the time-honoured paper bearing the name of his palace. After the fall of the Southern Thang, however, these craftsmen migrated to other cities in the lower Yangtze valley, where new centres for papermaking were developed to compete with those in Szechuan. Fei Chu (fl. 1265) said that papers manufactured in Anhui, Chiangsu, and Chekiang were sold for as much as three times the price of those made in Szechuan, but people liked the fine, thin sheets of the imported paper better than the heavy local product.

For the various needs of the government, the levy of tribute paper continued. It is recorded that the prefecture of Hsin-an (modern Hsi-hsien, Anhui) sent some 1,500,000 sheets of paper of seven varieties to the capital as tribute each year before

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* Some fifteen documents dated +406 to +991 in the British Museum, analysed by Clapperton (1), p. 18, are reported to be dominantly paper mulberry; thirty-two specimens dated +529 to +960 in the Peking collection are mostly of hemp; see Phan Chi-Hsing (2), pp. 40–1.
* The average thickness of papers of early Thang is measured at 0.002–0.005 inch, and of later Thang at 0.008–0.012 inch; see Clapperton (1), p. 18.
* See an analytical study with tabulation in Phan Chi-Hsing (2), pp. 39–42.
* See Chien Chih Phu (TSHCC), p. 90, below.
After printing became popular in the Sung, the need for large quantities of paper for making books further stimulated the development of the paper industry. Not only did the National Academy (Kuo Tzu Chien) in K'ai-feng and later in Hangchow engage in large-scale publishing, but many private families and trade agents in Ch'eng-tu, Hangchow, and Chien-yang also engaged in printing and papermaking. Also popular in the Sung was the making of inked squeezes from stone and bronze inscriptions, since interest in traditional archaeology was developing at this time. Indeed, scholars might possess as many as several thousand rolls of such squeezes as treasures in their collections. To meet the special needs of painting and calligraphy, a kind of paper in extra large sheets, known as phi-chih, was specially made. Su I-chien (+957-96) described the making of a sheet of paper fifty feet long in Hui-chou. The hold of a ship was used as a vat, and some fifty workers joined in lifting the screen-mould in time to the beating of a drum. This paper was dried over a big brazier instead of on a wall as was usual, in order to make the sheet even. Many other varieties of paper were perfected in the Sung, including the famous Golden-Grain paper (Chin-su chien) for copying Buddhist sutras. Comments by the famous calligrapher Mi Fu (+1051-1107) indicate that papers made at this time were generally of excellent quality, white, smooth, and absorbent, most suitable for artistic purposes. It was during this time that paper was first named as one of the four treasures of a scholar's studio (wen fang su pao), on which a famous treatise was written by Su I-chien in +966.

In that year, the Emperor reduced the quota because sending extra large sheets of paper caused a heavy burden on the people. To supply its needs for paper money, exchange certificates, and other uses, the government also established many large paper factories of its own. For the printing of paper money alone, several factories were operated in Hui-chou, Ch'eng-tu, Hangchow, and An-chhi. In +1175, the Hangchow factory, for example, employed more than a thousand daily workers. Fei Chu said that in Ch'eng-tu there was a temple to Tshai Lun where he was worshipped by several hundred families engaged in papermaking, all of whom resided in a village some five miles south of the city. Farmers attracted by the profits of papermaking were leaving their fields to take employment in paper mills because of the increasing demand for paper to be burned for spirit sacrifices, and for other uses.

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The Mongols are credited with the further spread of paper and paper products westwards and elsewhere. Marco Polo was among the early European visitors to China who witnessed the wide circulation of paper money and the extravagant burning of paper effigies and replicas as offerings to the dead in the empire of Genghis Khan. An Arabian writer, Ahmed Sibab Eddin (+1245-1338), twice mentioned Chinese paper money in his book based on the eyewitness reports of others. Through intermediate steps, papermaking was introduced to Europe in the +12th century. Subsequent to this, Mongol conquests resulted in the first issues of paper money in Persia in the +13th century, and in Korea and Vietnam in the +14th century, while Japan also used paper money during this period. About this time, too, playing cards and other paper products were introduced to Europe, possibly through the Arab world.

Throughout the Ming dynasty, papermaking continued to develop to meet the demands of the government and for general use in writing, publishing, art, and daily life. Bamboo became the predominant material in Ming papermaking, especially in the wide region bordering Chekiang, Chiangsi, and Fukien, where enormous bamboo groves were grown on mountains and along streams. A Ming gazette records that no fewer than thirty paper mills were operated in the town of Shih-thang (in Chhiien-shan, Chiangsi), each with one or two thousand workers; a total of some fifty or sixty thousand people were engaged in the making of paper there in +1597. It was said that papermaking was the only profitable handicraft in Chhiien-shan, whence paper was traded to all parts of the country.

The various departments of the government requisitioned all kinds of paper for different purposes. The administrative code of the Ming dynasty records that 314,950 sheets of all varieties of paper were requisitioned by the Board of Works. Paper for legal use was acquired each season and reported at the end of each year. For the civil service examinations, 16,800 sheets of paper known as pang chih were requisitioned each year, with 1,400 additional sheets required if an intercalary moon occurred. A total of 1,200,000 sheets of such paper, specified to be 4 feet 4 inches long and 4 feet wide, were requisitioned from all provinces every ten years to be kept in storage for official use. If this were not sufficient, other kinds of paper, of irregular sizes, might be substituted. In 1537, the price of pang chih was 0.1 tael of silver per 100 sheets, and of lung hsi paper was 0.4 tael per 100.

For printing exchange certificates for tea, salt, and other commodities, a total of 1,500,000 sheets was required to be sent in by various producing provinces. The quota set in 1593 included 360,000 sheets from Chihli, 250,000 from Chekiang, 200,000 from Chiangsi, 170,000 from Hunan and Hupei, 150,000 from Shensi, 100,000 each from Shansi and Pei-pei, 55,000 each from Shantung and Honan,
and 40,000 from Fukien. When the papers were delivered they were carefully checked by the specifications and then deposited in storage until needed. In 1422, it was decreed that if the quality of paper did not meet the standards the same amount would be required for replacement. In 1424, the paper from Fukien did not meet the specifications, and the official responsible for requisitions was punished by the provincial judge.  

The first detailed description of the manufacturing process was made at the end of the Ming dynasty, when a chapter on papermaking was included in the Thien Kung Khi Wu (The Exploitation of the Works of Nature), written around 1637 by Sung Ying-Hsin. This is probably one of the most important records of the technology of papermaking ever made. At about the same time as this book, several albums of ornamental stationery with multi-coloured designs were produced. Poems, notes, private correspondence, and certain contracts were all written on such elegantly and beautifully designed note papers. All these testify to the progress toward artistic and technical excellence of papermaking in the Ming dynasty. Numerous books and documents written or printed on a great variety of paper in the Ming and Ching dynasties survive today, as well as works of painting and calligraphy, and examples of articles made of various kinds of paper. For documentary use in the Manchu court, highly decorated fancy papers were specified in detail in the administrative code of the Ching government. In 1644, when the first Manchu emperor came to the throne, it was ordered that stiff yellow paper in two layers should be used for the announcement of successful candidates in the palace examination for the chin-shih degree. Three grades of ornamental paper were used for imperial orders: golden dragon fragrant paper in four layers mixed with sandalwood sawdust; painted dragon paper with fragrant ink in three layers, and paper of dragon edge design in two layers printed with fragrant ink. For scrolls for bestowing honours to be inherited, 1000 rolls of paper were ordered in 1738. Three hundred of these were 30–40 feet long, 100 were 100 feet, and some were as long as 500 feet. The compilation and production under imperial auspices of the famous grand encyclopaedia Thu Shu Chi Chheng in 5050 volumes, presented to the emperor in 1725, and of the huge collection of four branches of literature, Suu Khu Chhua Shu in some 36,275 volumes of over two million double pages, with its subsequent duplication in seven hand-written copies in the 1780s, required extensive supplies of high-grade paper. A special kind of fine and sturdy white paper made in Khi-hua, Chekiang, was especially selected for printing the books at the Wu Ying Tien, which were known as palace editions (tien pan).

The recent discovery of some stone tablets containing regulations for the management of paper factories has revealed working conditions and wages of paper workers in the early Ching period. One tablet from Soochow, of 1794, says that some thirty-six paper factories employing more than 800 workers were operating in the three districts of Shang-yuan, Chiang-chou, and Wu-hsien in the prefecture of Soochow. Most of the workers came from nearby Chiang-ning (Nanking) and Chen-chiang. Every three to six factories in and outside the city were organised into a ward for the purpose of enforcing the regulations and inspecting the working conditions within each ward. The workers included permanent technicians, temporary employees, and apprentices, who were managed by a superintendent and foremen and watched over by inspectors. Workers received a monthly allowance of 17577 and 1.2 tael of silver in 1794, in addition to room and board. 

Wages were counted by the piece at the rate of 400 sheets per working day, not by the number of days in a month. A monthly bonus of 15 chhien was awarded to workers who put in extra hours or exceeded their quota of production. Apprentices received a stipend and were qualified after an indenture of three years. The names of all workers were registered in a factory roster, and they were not allowed to transfer to another factory if dismissed for violation of working regulations. They were required for moral reasons to stay in the factory dormitory at night. Another tablet, dated 1757, concerning an agreement by thirty-four paper factories of the same three districts in Soochow reveals that each paper dyer was paid 15 chhien per day for dyeing 700 sheets of green paper, and a bonus of 10 chhien for every additional 700 sheets. For 1000 sheets of red paper the pay was 21 chhien, with 5 chhien for every additional 1000 red sheets. The tablet records some twenty-three different rates for dyeing different kinds of paper. The time-honoured handicraft of papermaking in China suffered a rapid decline after the market was invaded by foreign papers in the middle of the 19th century. As the historian Liu Chin-Tsao remarked, production of handmade paper was slow, and its price was high; it was not suitable for machine printing and could not compete with machine-made papers from foreign countries. The greatest consumption of paper at that time was for printing newspapers and for wrapping, but handmade paper, which could not be printed on both sides, was not suitable for newspapers. Moreover, imported wrapping paper at fifteen cents a pound was cheaper than mao-pien at twenty-six cents. In Chhien-shan (in Chiangai), for example, paper production was worth half a million taels of silver each year before the end of the 19th century. After the publication of foreign papers, the business declined to less than 100,000 taels. In Shih-chheng (Chiangai), eighty to ninety per cent of the local workers were employed in the export trade of leaf paper to Fukien.

The complete text of this tablet is given in Liu Ying-Chheng (3), pp. 85–7; according to a local record of about the same period, the factory employed a team of four workers for each vat—one each to lift, pound, check, and dry. Another source records that monthly wages were 15 chhien in Fukien in 1794, 900 wen in Chiangai in 1783 and in Chiang-jiang in 1807, and 1000 wen in Shensi in 1813; see Pheng Tsh-1 (1), pp. 396–7. In the Ching dynasty, the unit chhien equalled one-twentieth of one tael (liang or Chinese ounce), and 1000 pieces of cash (su) or copper) equalled one tael of silver.

The partial text reported in WWTK, 1557, no. 5, pp. 36–67; the cost of rice was mentioned in one tablet at 1.5 taels of silver per picul in + 1716.
cent of the handmade paper mills had closed by the beginning of the twentieth century.\(^a\)

\((c)\) TECHNOLOGY AND PROCESSES OF PAPERMAKING

The technical aspects of papermaking include the materials, tools, and methods of manufacture. From ancient times Chinese papermakers had wisely selected almost all the kinds of plants known to the modern paper industry as producing the best of fibres and yet being most economical in cost. The application of chemical agents for sizing, loading, coating, colouring and dyeing was also known to them not long after paper was invented. The use of water as an inexpensive agent contributed not only to the swelling and bonding of the fibres but also to the increase of the mechanical strength of the paper. Such utensils as the vat, mould, and press used many centuries ago in China are still basic to modern papermaking, as well as the processes of maceration, washing, lifting, pressing, and drying. Historians of paper have agreed that the ancient principles and practices of papermaking are the basis upon which modern paper machines are designed and operated. The following pages will examine in detail some of these traditional materials, tools, and methods used before the coming of the machine age in Chinese papermaking.

(i) RAW MATERIALS FOR PAPERMAKING

According to studies of existing specimens and documentary evidence, a broad variety of vegetable fibres was used as raw material for papermaking in China. Almost all plants produce fibres, but only those rich in cellulose, abundant in supply, easy to treat, and cheap in cost are most suitable. Especially satisfactory are those plants containing higher yields of long cellulose but lower in binding substances, which must be eliminated in the process of maceration. These materials include the bast plants, such as hemp, jute, flax, ramie, and rattan; tree bark of mulberry and paper mulberry; grasses, such as bamboo, reeds, and stalks of rice and wheat; and such fibres as cotton. Hemp and cotton are probably the best, producing the highest yield of pure fibres, but as they were needed primarily for the textile industry, paper mulberry and bamboo became the chief raw materials for papermaking in China.

Chronologically speaking, hemp was probably the earliest material used for papermaking from the Former Han (−206–+8), followed by paper mulberry from the Later Han (+25–220), rattan from the Chin (+265–420), bamboo from the middle of the Thang (+618–906), and straw probably from before the Sung dynasty (+960–1280). Except for hemp, which was no longer used in large quantity after the Thang, and for rattan, the supply of which was exhausted since

fibres from these bast plants.

The oldest paper specimens of the Han dynasty discovered in Lop-nor, Pa-chhiao, Chi-chien, and other places were all made of hemp. Those papers from the +3rd to the +8th century found in Sinkiang consist of, besides mulberry bark, chiefly raw and fabricated fibres of hemp, flax, and China grass. The manuscripts found in Tunhuang, dating from the +4th to the +10th century, were also made chiefly of hemp, jute, and China grass.

Hemp paper, which is described as pliable but tough, fine and waterproof, was especially popular for use in calligraphy, bookmaking, and official documents. It was used for writing by noted artists and for manuscripts in the Chin dynasty. Those produced in Szechuan in different sizes and colours were especially chosen for use in calligraphy, daily instructions and orders, and other official documents. It is said that the scholars in the Academy of Assembled Worthies (Chi Hsien Shu Yüan) were provided every month by the court with 5000 sheets of hemp paper made in Szechuan. In the Khai-yüan period (+713–42), all the books in the imperial collections in the two capitals were written on hemp paper made in I-chou (modern Szechuan). No specific mention of hemp paper is found after the Thang dynasty. It is assumed that since then hemp has not been the chief material for papermaking. The reason why it was the first material used in papermaking was the discovery that a sheet of hemp and similar fibres drained on a mat gave paper. Hemp was also used for papermaking in Europe before the 19th century, when wood pulp was commercialised, though even today, many high-quality papers are still made of hemp. However, being more in demand in China as a material for textiles, ropes, and other uses, it was gradually replaced by rattan and especially bamboo since the time of the Thang dynasty.

(ii) Rattan

The climbing rattan (Calamus rotang) (Fig. 1065) is known to have been used for making paper in certain regions in China, especially in the southeastern part corresponding to modern Chekiang and Chiangsi, where paper made of this plant, known as sheng chii, was popular for almost a thousand years. The origin of the use of rattan for papermaking may be traced back to the +3rd century at Shan-chhi (modern Chheng-hsien, Chekiang), where rattan plants were said to have spread over hundreds of miles on the mountains along the Shan-chhi river. The old paper made of rattan from Shan-chhi has been called Shan theng, or rattan paper of Shan-chhi. Fan Ning (+339–401), a native of Honan and an official who served in the capital, said that locally made paper was not suitable for official documents and it was ordered that rattan and bark paper be used instead.

Rattan paper became most popular in the Thang dynasty and the area of its production was greatly extended beyond Shan-chhi to many neighbouring districts in Chekiang and Chiangsi. During the first part of the +8th century, it was recorded in official gazetteers and other documents that paper was an item of local tribute from some eleven districts, including Hangchow, Chhi-chou, Wu-chou (in modern Chekiang), and Hsin-chou (in modern Chiangsi), from where rattan paper was exclusively sent, some of the districts being said to have sent as many as 6000 sheets at one time. A special variety of rattan paper made in Yu-chhiian village of Hangchow, known as ‘Yu-chhiian paper’ was especially popular.

Rattan paper, described as smooth, durable, with fine texture, and in different colours, was selected for bookmaking, documents, calligraphy, and other uses. The administrative codes of the Thang dynasty specified that the white rattan paper be used for decrees on bestowing, requisition, and punishment; blue for sacrificial messages at the Taoist temple Thai Chhing Kung; and yellow for imperial instructions and orders. The famous calligrapher Mi Fu (+1051–1107) said:

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Footnotes:
1. See the analytical studies of Tunhuang papers by Clapperton (1), p. 18; Giles (17); Phan Chi-Hsing (2), pp. 40–1.
5. Phan Chi-Hsing (2), pp. 665ff.; Carter (1), pp. 6–7; Phan Chi-Hsing (4), pp. 54–5, reports over 90 per cent of paper specimens found in this area are made of hemp materials.
14. Yiian Hsiin Thu Chih (TSHCC), ch. 46, p. 38.
16. See the analytical studies of Tunhuang papers by Clapperton (1), p. 18; Giles (17); Phan Chi-Hsing (2), pp. 40–1.
17. See the analytical studies of Tunhuang papers by Clapperton (1), p. 18; Giles (17); Phan Chi-Hsing (2), pp. 40–1.
The back of the rattan paper from Thai-chou can be written on, since it is smooth and hairless. It is the best in the world and can never be matched. It was also used for making bags to preserve tea-leaves after roasting, because its firm texture prevented loss of flavour.

Since the rattan plant grew naturally in a limited area and its growth was slow as compared with that of hemp, which can be harvested in one year, or of paper mulberry, in three years, the supply of rattan was gradually exhausted. However, the process was gradual, and when rattan was exhausted in Shan-chhi during the Sung dynasty, the centre of production shifted from the western to the eastern part of Chekiang. Rattan paper made in Thien-thai, known as Thai theng, then became popular, as well as that of Yu-chhiian. After the Sung there followed a gradual decline of the use of rattan; this was due to several reasons. One was the growing use of bamboo which replaced rattan and hemp as the chief raw material for paper-making after the middle of the Thang dynasty. Another was simply the exhaustion of the supply of the material due to excessive cutting without proper cultivation. Many writers lamented this, and a Thang scholar-official, Shu Yuan-Yü (d. 855), satirised people who frequently wrote millions of worthless words, thus killing the growth of rattan.

(iii) Paper mulberry and paper mulberry

Paper mulberry (ku, chhu, or kou, Broussonetia papyrifera) is a shrub which grows naturally in many parts of China (see Fig. 1066). Chinese records reveal its cultivation, manufacture, trade, and use for making cloth from very early times; indeed, Ssuma Chhiien says in the Annals of Yin that ‘mulberry and paper mulberry were grown together’. Poems mentioning paper mulberry written in the 9th or 8th century are included in the Book of Poetry. In commenting on this classic, Lu Chi (<3rd century) says:

Paper mulberry was called ku sang or chu sang by people in Yu-chou (in North China); ku in Ching, Yang, Chiao, and Kuang provinces (in South China); and chu in Chung-chou (in Central China). Both mulberry and paper mulberry were grown together during the Chung-T'ung period (1637 to 1563) of the Shang dynasty. Nowadays, the people in the south of the Yangtze River use its bark to make cloth and also pound it into paper, called paper mulberry paper (ku phi chih), several tens of feet in length, pure white and shining.

The earliest reference to the use of tree bark for papermaking is found in the biography of Tshai Lun in the History of the Later Han Dynasty. It does not specify what kind of tree bark, but Tung Pa of the early +3rd century said that ‘The Eastern Capital (Loyang) has the paper of Marquis Tshai, which was the paper made by Tshai Lun; that made of used hemp is called hemp paper; that of tree bark ku chih (paper mulberry paper); and that of used nets net paper.’

The earliest literature which described the methods of planting and harvesting the shrub and the treatment of its bark is included in an ancient work on agricul-
The valley. In the autumn, when the fruits of paper mulberry are ripe, collect them abundantly, soil is ploughed, sow seeds of the tree mixed with those of flax and smooth the ground with labour. In the autumn and winter, the flax is not to be cut to keep the paper mulberry warm. [If this is not done, the tree will in most cases die of cold.] In the first month of the next year, cut the trunks close to the ground and burn them. Thus the trees will grow taller than a man after one year. [If not burnt, it grows leaner and slower.] The tree can be cut for use after three years. [If cut in less than three years, the skin will be too thin and not suitable for use.]

The method of cutting: The best time for cutting is in the twelfth month, or the next best, the fourth month. [If cut at other times, the paper mulberry usually withers and dies.] In the first month of every year, burn the ground with fire. [The dry leaves on the ground will be enough for burning. If not burnt, it will not grow luxuriantly.] In the middle of the second month, select and weed out the weak ones. [Weeding is to enrich the trees and to preserve enough strength and moisture in the ground.] Those transplanted should also be planted in the second month and cut every three years. [If not cut by three years, there will be less of money and no profit.]

If the trees are sold on the ground, labour is saved but profit will be less: selling the bark after boiling and peeling is more laborious but profitable. [The wood is useful as fuel.] If the bark can be used for making the paper by oneself, the profit will be even higher. Those who plant 50 trees can harvest 10 mui every year, thus the field can be rotated every three years and make an annual income equal to one hundred pi of silk.

This short passage points out that paper mulberry was domesticated by farmers who planted the tree primarily for producing raw materials for papermaking and that the process of boiling and peeling the tree bark was the first step in making paper. It was a highly profitable farm subsidiary to combine planting the tree and make an annual income equal to one hundred pi of silk. The wood is useful as fuel. If the bark can be used for making the paper by oneself, the profit will be even higher. Those who plant 50 trees can harvest 10 mui every year, thus the field can be rotated every three years and make an annual income equal to one hundred pi of silk.

Mulberry (sang, Morus alba) is a native of China chiefly cultivated for the culture of silkworms. Marco Polo said that Chinese paper money was made of "the bark of certain trees, in fact of the mulberry tree." Brechneider argued that "He seems to be mistaken. Paper in China is not made from mulberry-trees, but from the Broussonetia papyrifera." To prove that bark of the mulberry tree, as well as that of paper mulberry, was used as a material for papermaking, Laufer cited a number of authorities to prove that "Marco Polo is perfectly correct: not only did the Chinese actually manufacture paper from the bark of the mulberry tree (Morus alba), but also it was this paper which was preferred for the making of paper money." Chinese sources testify that the mulberry tree was and is still used for papermaking. Su I-Chien (+ 957–99) said that paper was made from the bark of the mulberry tree (sang-phi) by the people in the north. The History of the Ming Dynasty also specifies that paper money was "made of mulberry fibre (sang yang) in rectangular sheets, one foot long and six inches wide, the material being of a greenish colour," and a levy of some two million catties of mulberry bark for manufacture of paper money in 1644, apparently because of inflation, almost provoked the peasants into rebellion. Sung Ying-Hung (c. 1600–60) mentions that "mulberry fibre paper (sang yang chih), made from the bark of mulberry trees, is extremely thick and smooth; that produced in East Chekiang is necessary to the silk producers in the lower Yangtze region for repositories for silkworm eggs." Even today, the mulberry is described as "produced in all provinces in China and its bark is a very good material for papermaking.

(iv) Bamboo

This plant was extensively cultivated in China, except for the extreme northern part of the country (Fig. 1067). In ancient times it was grown probably as far north as the provinces along the Yellow River, but was later driven much farther south by change of climate or by deforestation. It is now abundantly grown in the Yangtze valley and the provinces to the south, especially Chiangsu, Chekiang, Fukien, and Kuangtung. Because of its long fibres, rapid growth, and low cost, it has been a major source of raw fibres for papermaking ever since the middle of the Thang dynasty.

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of the material must have been earlier than the recorded date, it is assumed that 'membrane paper' produced in Mu-chou of modern Chekiang. b seemed to be still in the initial stage of experiment and the product was not by then seen, was almost exhausted at the end of the Thang dynasty. c The small characters, as it would break when touched, and could not be refolded. c The book by the Thang historian Li Chao 1 (fl. +806–20), who said that 'bamboo paper' was made in Shao-chou of modern Kuangtung). 1 His contemporary Tuan Kung-lu 4 (fl. +850) also mentioned the use of 'bamboo-membrane paper' produced in Mu-chou b of modern Chekiang. b Since the first use of the material must have been earlier than the recorded date, it is assumed that bamboo was first used in papermaking not later than the middle of the Thang, or the second half of the +8th century. Apparently it was developed as a substitute for hemp, which was a chief material for textiles, and for rattan which, as we have just seen, was almost exhausted at the end of the Thang dynasty.

The use of bamboo probably originated in Kuangtung, where the plant grew abundantly in the warm and humid climate. The method had spread to Chekiang and Chiangsu by the Thang dynasty. The quality of the paper depends upon primarily in the Hsiian-chheng area and manufactured in Chin-hsien; both were under Hsiian-chou in the Thang dynasty. The quality of the paper depends upon under Hsiian-chou in the Thang dynasty. The quality of the paper depends upon

Fig. 1067. Bamboo and its fibres (×50). Painting by courtesy of Mr N. H. Chang, Thaipei.

The earliest reference to the use of bamboo for making paper in China is found in a book by the Thang historian Li Chao 1 (fl. +806–20), who said that 'bamboo paper' (chu chien) 2 was made in Shao-chou 3 of modern Kuangtung). 1 His contemporary Tuan Kung-lu 4 (fl. +850) also mentioned the use of 'bamboo-membrane paper' produced in Mu-chou b of modern Chekiang. b Since the first use of the material must have been earlier than the recorded date, it is assumed that bamboo was first used in papermaking not later than the middle of the Thang, or the second half of the +8th century. Apparently it was developed as a substitute for hemp, which was a chief material for textiles, and for rattan which, as we have just seen, was almost exhausted at the end of the Thang dynasty.

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From the literary records, we may conclude that bamboo paper was invented in the latter part of the +8th century and not yet perfected in the 10th century, but the product from Shan-chhi, with many different varieties and colours, became popular, especially with artists, toward the end of the 12th or beginning of the 13th century. It is still not clear, however, how bamboo paper was developed during the long period between its initiation in the 8th and its perfection in the 12th century. But the description in the gazetteer suggests that the method of preparing the bamboo fibres was apparently borrowed through the long experience in the use of rattan.

(v) Other materials

Besides the major materials discussed above, many other plants were used. The most common fibres were from the stalks of rice and wheat. The process of making straw paper (thao chih) 4 was much simpler than that for other materials. Since these fibres are tender, less time was required for beating in preparation. A Sung author said straw was used in Chekiang, and produced the best paper if mixed with rattan. a Sung Ying-Hsing mentions the mixing of rice stalks with bamboo fibres to make wrapping paper. a It is said that the straw first receives a preliminary pounding and then, after saturation in a lime solution, is buried in a trench. When properly disintegrated, the straw is removed and placed in porous cloth bags, which in turn are suspended in a running stream so that the fibres may be cleansed of all particles of lime. a Straw is still one of the raw materials most used for making paper for wrapping, burning, and sanitary purposes.

The blue sandalwood (Pteroceltis tartarinowii, Maxim.), known in Chinese as chhing than (v) (Fig. 1068), was the major material for making the famous Fesian chih 6 for printing and calligraphy. It is made from the bark of the than tree grown primarily in the Hsiian-chheng area and manufactured in Chin-haien; both were under Hsiian-chou in the Thang dynasty. The quality of the paper depends upon

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1. Thang Kuo Shih Pa (CTPS), ch. 3, p. 184.
2. Hu Lu (HPIS), ch. 3, p. 76.
5. Chia Hsiu Tai-shih (HCT), ch. 1, p. 32.
the proportion of the raw material, which may either be pure bark or contain one-half or seven-tenths bark, with rice stalks making up the remainder. The more the bark the better the paper. A legend of the present-day Chin-hsien area, where Hsien-chih was made, relates that a certain Khung Tan of the Later Han dynasty found by accident the bark of a than tree which had turned rotten and white after being soaked in a stream. Since no older specimen is known of than bark and no earlier record mentions its use, it seems unlikely that the than bark was used in that early period.

Another fibre often mentioned as raw material for papermaking is the bark of the hibiscus (Hibiscus mutabilis), known in Chinese as fa jung phi. It is generally believed that the famous stationery designed by the courtier Hsieh Thao ( + 768–831) of Szechuan was made of hibiscus bark. Sung Ying-Hsing reports that ‘The bark of the hibiscus is cooked to a pulp, and aqueous extract of powdered hibiscus flower petals is added. This process was probably first devised by Hsieh Thao and has been known by that name down to the present day. This paper is famous for its beauty, not for the quality of its material.’

The use of seaweed (Algae marina) for making intricate filament paper, known as tho' li chih, appears frequently in early Chinese literature. Wang Chia of the +4th century said: ‘When Chang Hua (+ 252–300) presented his work Po Wu Chih to the emperor, he was granted ten thousand pieces of tho’ li paper, which was sent as a tribute from Nan-Yüeh (modern Vietnam). The Chinese pronounced chih li as tho’ li by error. Since the people in the south used seaweed (hai thai) in the making of paper with intricate and crooked lines, it was so called.’ Many other authors of later times continued to make reference to the use of seaweed in papermaking. Su I-Chien ( + 557–95) said that paper was made from thai in the south, and since seaweed contains long, strong, viscous filaments, it is possible that this material was used for making paper. It is also possible that it was used for sizing, and thus the intricate hairy filaments appeared on the surface of the paper as a decorative pattern.

Although cotton produces the best fibre of all, it has not been used as a major material for paper, and even modern paper manufacturers abstain from using raw cotton, probably because of its importance in the textile industry. A certain variety called cotton paper (mien chih) was not actually made of cotton but of paper mulberry. Sung Ying-Hsing said: ‘Torn lengthwise, the strong, hard-sized bark paper will show ragged edges resembling cotton fibres, hence it is called “cotton paper”.’ Cotton stems have been used more recently for papermaking, but ‘cotton paper’ is certainly not made from raw cotton.

Whether silk has ever been used as a raw material for papermaking is uncertain. Mention of the use of silk fibres is based primarily upon philological speculation without sufficient evidence. It was thought that, since the character chih for paper began with the silk radical at its left, chih before Tshai Lun’s time must have been made of silk fibre. It is true that silk cloth was written on before the invention of paper, and the word chih is thought to be derived from one for silk, but the material of chih was not necessarily made of silk fibres. Technically, as many experts have said, silk fibres do not possess the colloidal properties which contribute so essentially to the entanglement and binding of the vegetable fibres. At present, no actual paper made of pure silk fibres is known to exist, nor is their use documented in literature.

It is possible, however, that silk fibres have been used in a mixture with other fibres, or that floss silk from silk cocoons has been used. Several references have been made to the use of silk cocoon paper (tshan chien chih): one mention, in the early +8th century, says that the famous calligrapher Wang Hsi-Chih (+ 321–79) used silk cocoon paper in writing. The Chin-su paper made in Soochow from

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**Fig. 1068. Blue sandalwood and its fibres (× 50).**

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1. See Shi I Chi (HWTS), ch. 9, p. 79; also quoted in TYPF, ch. 505, p. 79.
2. See statements by Thao Hung-Ching (+ 451–556), Su Ching (+ 715 century), and others in Wen Fang Su Pín, p. 52; also Bretschneider (1), pt 3, pp. 359–70.
4. Seaweed was among the raw materials used by European papermakers in the 18th century; see Hunter (9), p. 316.
7. *Armin Renker (1), doubted the feasibility of using silk fibre for papermaking, and Henri Alibaux (1), President of the Chambre Syndicale du Papier de Lyon, agreed with Renker."
8. *See Luu Thi Chinh* of the Chine Dynasty, cited in *Luu Thi Chinh (CPTC)*, ch. 9, p. 96. A Sung scholar commented: "The so-called "silk cocoon paper" is actually silk cloth"; see *Pu Huan Yeh Lu (CPTC)*, ch. 1, p. 44.
silk was used to make silk paper, since cocoons contain a gum which would serve to bind the fibres, but which is removed when pure silk is reeled.

The use of fresh plant fibres as raw material was apparently unknown to European papermakers when the craft of papermaking was introduced to Europe in the middle of the +12th century. For over five hundred years after the introduction, all paper of occidental origin was made from linen and cotton rags or a mixture of these second-hand fibres. After the beginning of the 18th century, as rags gradually became less plentiful and no longer economic material, European scientists looked for substitutes in order to meet the increasing need of the paper industry. A great variety of vegetation, including hemp, bark, wood, straw, vines, seaweed, and grain husks, was tested and examined, even though such materials had already been in use in China for many centuries. Finally, wood pulp was widely adopted and has become, since the beginning of the 19th century, the chief raw material of the modern paper industry. Because of limitations of forest resources in China, where most wood had to be used for construction, it was little utilized for paper, and even today, use of other materials than wood is encouraged.

(2) The Invention of the Screen Mould

(i) Functions of the mould

When the disintegrated fibres are floating in water, they can be lifted up from it in a thin layer or sheet. The formation of such a layer of fibres supported on a piece of cloth or a mat was the very invention of the whole idea of papermaking, and the invention of an implement capable of picking up these matted fibres and yet permitting the water to escape was the key to the whole process. Subsequent improvements with specially designed screens resulted in an advancement of the technique, for the mould has remained throughout the centuries the essential tool in making of paper by hand, and the very principle upon which the modern paper-machine is founded. Indeed, the entire development of papermaking is so closely connected with mould construction that it is only through a careful examination of moulds that the origin and evolution of paper can be understood.

The mould could have been used in two distinct ways. In one, it was dipped perpendicularly into the water upon which the macerated fibres floated, and was brought up horizontally under them, lifting the matted fibres as in a sieve, allowing the water to drain through the cloth. The other way was to hold the mould flat and then pour the floating fibres on it. The woven material retained the fibres in a moist sheet and at the same time allowed the water to drain through its interstices. In this case the thin deposit of matted and felted fibres adhering to the mould was placed in the sun to dry.

(ii) Floating type of screen

It is generally believed that the floating or woven type of mould was the earliest form used by the ancient Chinese, and that the technique used was the one of pouring the disintegrated fibres on to the mould. During his travels in China in the 1930’s, Dard Hunter found that this kind of woven mould was still in use in Kuangtung province (Fig. 1069). The woven screen is said to have been composed of silk but of plant fibres.

Fig. 1069. Floating or woven type of mould for papermaking. A primitive type of mould found in Fu-Shan, Kuangtung province in the 1930’s. Dard Hunter Paper Museum.
of ramie or China grass fastened to a square bamboo frame and stitched with slender bamboo strings which ran through the cloth and around the frame bars. After the moisture had evaporated from the sheet, the paper was easily stripped from the mould. The warp and woof of the mould and the stitches could have left impressions in the paper, in the same way as watermarks are formed in handmade paper today. There is some evidence to justify this assumption, derived from observation of such primitive moulds in modern south China.

Chinese sources are silent about the construction of the mould in ancient times, but the old definition of chihs (paper) throws some light on the mould's form and the material of which it was made. As we have mentioned earlier, the character chan (mat), in the Shuo Wén Chhih Tzu, includes the radical for grass and, according to the early commentators, means a kind of cloth for covering (kai) made of woven rushes (p'ien maot). It is possible that this early mat used in Han times was made of some kind of grass woven into a cloth which would support the macerated fibres and yet let the water escape through its meshes; such an appliance could have retained the primitive form without much change in its basic construction. Hunter noted with special interest that the locality where these woven moulds were found is not more than 200 miles from Lei-yang, where Ts'ai Lun was born.\(^2\)

When Hunter made this statement he said that no +2nd century paper of the woven type, showing the impressions of the woven fabric upon which it had been formed, had ever been discovered in Asia.\(^3\) It is true that no specimens found before that time bear clear screen marks, but the Pa-chhiao mould discovered in 1957 and other old specimens found in recent years, are reported to have fabric impressions on the surface. If this be true, it may very well support this theory of the earliest form of mould used in Han times.

\((iii)\) Dipping type of screen

On the other hand, all those specimens of later periods examined show that another type of mould was used. The so-called dipping or laid type of mould, dipped into the vat of suspended fibres (Fig. 1070), must be a later invention. The idea of a mould from which the sheet of paper could be removed while still moist was a most important advance in papermaking, but the transfer of the wet substance from the mould to a board without damage required the construction of a very smooth and firm screen from which the moist sheet could be easily freed. For this purpose the screen was made of thin strips of rounded bamboo side by side, horizontally or vertically, and fastened together at regular intervals with strings of silk, flax, or hair from animal tail.

\(^{\ast}\) See discussion on pp. 35 ff. above.

\(^{\dagger}\) Cf. Hunter (9), p. 83. It is said that fibres from the stems of the day lily are still used for making the screen mould in the Hopei area; see Phan Cha-Hoa (4), p. 45, n. 3.

\(^{\ddagger}\) Cf. Hunter (7), p. 89.

\(^{\ast\ast}\) See discussion on pp. 35 ff. above.

\(^{\dagger\dagger}\) Cf. Hunter (9), p. 83. It is said that fibres from the stems of the day lily are still used for making the screen mould in the Hopei area; see Phan Cha-Hoa (4), p. 45, n. 3.

\(^{\ast\ast}\) See discussion on pp. 35 ff. above.

\(^{\dagger\dagger}\) Cf. Hunter (9), p. 83. It is said that fibres from the stems of the day lily are still used for making the screen mould in the Hopei area; see Phan Cha-Hoa (4), p. 45, n. 3.
32. PAPER AND PRINTING

Tunhuang are reported to have two distinct types of screen marks. Those of the Chin and Six Dynasties (+265–581), as well as those of the Five Dynasties (+907–60), have broad horizontal marks, while papers of the Sui and Thang periods (+581–907) show fine, close screen lines. Hunter reports of some of the Thang papers he examined that there were twenty-three impressions of bamboo strips to every inch, and the hair stitchings of the mould were spaced at intervals of approximately one and one-sixteenth inches. The construction of the bamboo screen may have varied in different localities. One source from the Sung dynasty indicates that the screen was transversely laid in north China, so that the northern paper showed a horizontal grain, while in south China the matting was vertically laid, so that southern paper showed a longitudinal grain. This theory has been used as a guideline for examination of old papers by artists and collectors since then, but recent analysis of surviving specimens of this period shows it is not necessarily true. There is no such record for later times, though actual specimens exist for examination, showing that almost all papers from the +4th century are horizontally marked.

One may conclude that the woven type of mould made of cloth was used before the +3rd century, while the laid type of screen mould made of bamboo strips was introduced in the +4th century. In the former case, paper was dried directly on the woven mould and no couching was needed. For the laid mould, sheets were formed and dropped on the board without interleaving cloths between them, as has been the practice of Western papermakers. Since the damp fibres did not stick to the smooth bamboo screen-mould as they did to the coarse cloth, the new appliance made possible the continuous use of the same mould to make unlimited numbers of sheets without waiting for each one to dry on it. This was certainly the most significant step in the technique of papermaking.

(3) Processes of Papermaking

Paper was made mostly by hand with the aid of natural resources, tools, utensils, and chemical agents. The workshop was usually operated in a site near a mountain, where the supply of raw materials and fuels was most convenient, and by a stream so as to make use of the water necessary for soaking, pounding, and washing the materials. The methods of papermaking varied slightly according to materials, periods, and locations, but the basic processes were more or less the same throughout the centuries.

Much of the earlier literature describes the quality and format of the paper for various uses, but none of it discloses details of how paper was manufactured, until the early +17th century when Sung Ying-Hsiung (c. 1600–60) wrote the *Thien Kung Khi Wu* (The Exploitation of the Works of Nature). He devoted one entire chapter to the technical description and illustration of making paper with bamboo and paper mulberry. In Chapter 13, on 'Killing the Green', he gives step-by-step processes of the manufacture of paper, including preparation of raw materials by soaking, pounding, boiling, washing and bleaching the fibres; lifting the pulp with the screen; pressing the sheets to squeeze out the water; and finally drying on a heated wall (see Fig. 1071). His detailed account is given as follows:

(i) Preparation of raw materials

The making of bamboo paper is a craft of the south, especially popular in Fukien province. After the bamboo shoots have started to grow, the topography of the mountain area should be surveyed. The best material for papermaking is the shoots that are about to put forth branches and leaves. During the season of *mang-chung* the bamboo on the mountains are cut into pieces from five to seven feet long. A pool is dug right there in the mountain and filled with water in which the bamboo stems are soaked [Fig. 1071a]. Water is constantly led into it by means of bamboo pipes to prevent the drying up of the pool. After soaking for more than one hundred days, the bamboo fibres are carefully pounded and washed to remove the coarse husk and green bark. [This is called 'killing the green' (*sha chhing*).] The inner fibres of the bamboo, with a hemp-like appearance, are mixed with high-grade lime in a thick fluid and put into a pot to be boiled over a fire for eight days and nights. The pot for boiling bamboo, four feet in diameter, is enclosed in a wooden cask, measuring fifteen feet in circumference and more than four feet in diameter (Fig. 1071b). The pot is attached to the cask with the aid of mud and lime and has a capacity of some ten catties of water. The cask is covered for boiling for eight days. After the fire has been put out for one day, the bamboo fibres are taken from the cask and thoroughly washed in a pool with clean water. The bottom and four sides of the pool are lined securely with wooden boards to keep out dirt. [This is not necessary in making coarse paper.] When the fibres have been washed clean, they are soaked in a solution of wood ashes and put again into a pot, pressed to flatten the top, and covered with about an inch of rice straw ashes. When the water in the pot is heated to boiling, it is poured into another cask and strained with the solution of wood ash. If the water cools off, it is boiled again to repeat the straining. After some ten days of such treatment, the bamboo pulp naturally becomes odorous and decayed. It is then taken out to be pounded in a mortar (water-powered pestles are available in mountain regions) until it has the appearance of clay or dough, and the pulp is then poured into a vat for use.

  a Phan Chi-Haing (x), p. 45.
  b Hunter (9), p. 86.
  c Phan Chi-Haing (x), p. 65.
  d See Phan Chi-Haing (x), p. 65.

A solar term, 'Grain in Ear', about the sixth day of the sixth month.

* This is an old term for removing the green skin of bamboo in preparing tablets for writing. Apparently this term was borrowed for this purpose since in both cases the process was part of the preparation of material for writing.

1 蔡題 2 天工開物 3 芒種 4 植青

1 采題 2 天工開物 3 芒種 4 植青

See Phan Chi-Haing (x), p. 45.

* Hunter (9), p. 86.

See Phan Chi-Haing (x), p. 65.
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Fig. 1071. Chinese papermaking as illustrated in a 17th-century book on technology. The panels above show various steps of the process. (a) Cutting and soaking bamboo twigs. (b) Cooking inner mass of bamboo in a pot. (c) Dipping the mould and lifting pulp from a vat. (d) Pressing moist paper sheets to release water. (e, f) Drying paper sheets on a heated wall. From Thien Kung Khai Wu, +1637 ed.

(ii) Operations in forming sheets

The pulp vat is a box-shaped tank, the size of which is determined by that of the screen-mould, which in turn is determined by the size of the paper to be made. When the fibres are ready and floating in the water of the vat, a solution for treating the paper is added as the fibrous mass gradually settles about three inches below the surface of the water. [The solution is made from a material similar to the leaves of the peach-bamboo and has no definite name as it varies locally.] When the paper is dried, it will turn brilliant white.

The screen is made of a mat woven of finely split and polished bamboo strips. When it is open it is supported by a rectangular frame. The screen is held with both hands and submerged in the vat to stir up the suspended fibres [Fig. 1071e]. When it is lifted up, the fibres are caught on top of the screen. The thickness of the paper depends on the way in which the screen is manipulated. Shallow submerging results in a thin sheet, while a deeper dip produces a thick one. Water from the pulp drains off around the screen's edges and back into the vat. The screen is then inverted and the paper is dropped onto a wooden board until many such sheets have been piled together.

When the number is sufficient, the sheets are covered with another board and the boards are tied with rope with the aid of a pole placed over the top board, as in a wine press, and all the water is thoroughly squeezed from the sheets [Fig. 1071f]. Then each sheet is lifted by means of a small pair of tweezers.

To dry the paper, a double wall of earthen bricks is erected, with the ground between the two rows covered with bricks. Holes in the lower part of the wall are left by the spaced omission of bricks. A fire is lighted at the first hole and the heat travels through the apertures and spreads to the wall surfaces where the bricks become hot. The wet sheets of paper are spread on to the wall one by one, baked dry, and then taken off as finished sheets [Fig. 1071e].

(iii) Steps in making bamboo paper

About two centuries after Sung Ying-Hsing, an eyewitness description of the processes of making bamboo paper was again given by a scholar, Yang Chung-Hsi1 (1850–1900), in a supplement to his collected notes. His description is somewhat similar to that of Sung Ying-Hsing, except for a few remarks which may be useful to supplement Sung's account. Yang said that from the cutting of twigs to the drying by heat, the raw paper material changes hands seventy-two times before it becomes paper. A proverb in the paper trade says: 'A sheet of paper does not come easily; it takes seventy-two steps to make.' * Yang also said that a man named Huang Hsing-San2 of Chhien-thang visited Chhang-shan3 (in modern Chekiang), where people on the mountain told him that the craft of papermaking required twelve major steps. The following is Yang's record of the processes according to the twelve steps given by Huang:

1) Cutting the shoots. The young and tender bamboo that has not yet sprouted twigs is selected. Its shoots are snapped off and, over a month, chopped into short pieces.

2) Refining the fibres. They are thoroughly soaked in lime until the bark and husk are sloughed off completely and only the fibres remain, tangled up like hemp. This is the stuff for papermaking. *

3) Steaming. The fibres are broken in two, arranged in bundles, and again soaked. Then they are put into a pot and subjected to very hot steaming.

* See Yang Chung-Hsi (1), ch. 5, pp. 39a–40b.
* This process is to extract the fibres and to remove impurities from the material.

1 張煒義 2 黃興三 3 常山
A similar method of making bark paper is given by Dard Hunter from his personal observation of the method of papermaking in China. He says that before the bark pulp can be moulded into paper, a mucilaginous gum made from the leaves of deciduous trees is added. In general, the treatment of tree bark is a more arduous and painstaking process than that of preparing bamboo for papermaking.

(4) Treatment of Paper

Before the formation of a sheet of paper, an adhesive solution and certain insoluble materials were usually added to the pulp, in order to improve the physical and chemical qualities of the finished product. After the paper was manufactured, it was sometimes treated with special ingredients to protect it against injury from insects or for artistic purposes. The processes included sizing, loading, dyeing, colouring, and coating. Different kinds of vegetable, animal, and mineral substances were used as ingredients for such treatment and sometimes prepared and applied by elaborate procedures. All these were essential steps in the technical and artistic advancement in papermaking.

(i) Sizing and loading

Sizing is essential to make the paper suitable for writing with ink, to prevent undue absorption and running of the ink. It is necessary not only for artistic purposes in painting or calligraphy, but also for technical reasons. It helps to keep the fibres floating in the tank, thus making the sheet even and uniform, and also adds to the bonding strength of the fibres. Especially important, when the sheets are transferred from the screen to the board to be pressed and dried, is the fact that the sizing prevents the sheets from sticking together. Loading with certain finely powdered materials improves the opacity, texture, and weight of the finished paper.

The earliest papers were sheets of fibres without sizing or loading, but these additions are believed to have been introduced as early, probably, as before the +3rd century. The specimens of the Chin dynasty (+265–420) found in Sinkiang are well sized and loaded. These papers were first coated with gum and later sized with gum or glue made of lichen. Subsequently starch flour was used to make paper much stronger and harder. Recent studies of ancient papers by Chinese scientists have found that specimens of the late +4th and early 5th centuries are coated with starch on the front side and smoothed with a stone. Those of early 5th century from Tunhuang and Sinkiang are sized with starch in the pulp. Paper sizing in modern Kuangtung is made by boiling the leaves and twigs of an evergreen shrub called *ku yeh tung chhing* (Hex pubescens), or from shavings of the

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* See Hunter (2), pp. 15–16.
* Phan Chi-Hsing (9), pp. 61–9.
* Hunter (2), p. 15–16.
* Phan Chi-Hsing (9), pp. 61–9.
* Phan Chi-Hsing (9), pp. 61–9.
* Phan Chi-Hsing (9), pp. 61–9.
* Phan Chi-Hsing (9), pp. 61–9.
cedar (Machilus thunbergii) known as *tsiu hau*, which has a mucilaginous substance that was used by Chinese women as a pomade for the hair.\(^a\)

Another formula is found in a modern work on methods of making bamboo paper,\(^b\) where it is said that both plant and animal materials are used in sizing and loading. The animal glue is a gelatin extracted from cowhide, which is dissolved in hot water and added together with the fine talc powder to the prepared fibres. About two or three ounces of cowhide and one or two ounces of powder are needed for every twenty catties of pulp. The plant materials, from a kind of hibiscus known in Chinese as *huang chi khus*\(^c\) or *chhui chiu*\(^d\) (*Hibiscus abelmoschus*), is preferred because it is cheaper than animal glue. Its root, after being washed clean and sliced, is soaked in cold water for one night. The sticky juice is rubbed out with the hands, and strained through a fine cloth; it is then mixed with the pulp to soften the fibres. Other plants used for sizing are the leaves of the peach-bamboo (*tsiu cha*\(^e\)) and *ma-chih*\(^f\) (*Hibiscus syriacus*), as mentioned by other authorities.

For loading in Chinese papermaking, the soya bean (*huang tou*) was used. The beans were soaked in water for five to six hours and then ground into a liquid starch which was separated by draining the water through a fine cloth. After several washings, the starch was poured over the raw fibres packed tightly into a tank about one foot deep. Additional piles of fibres mixed with starch could be added if necessary. This resulted in softening the fibres and facilitated their sticking together. After washing with clean water, the fibres were stamped with bare feet or pounded using water power.\(^g\)

(ii) Dyeing

The process of dyeing paper to a yellowish colour, known as *jan huang*,\(^7\) was apparently used very early and was common when paper began to be extensively used for books in the +2nd or 3rd century. In the old dictionary *shih Ming*\(^8\) (Explanation of Names), compiled by Liu Hsi\(^9\) about *+200*, the word *huang* was already defined as 'dyeing paper', while Meng Khang\(^10\) of the +3rd century mentioned that paper was dyed yellow in his time.\(^6\) In a letter to his brother Lu Chi\(^11\) (+*261*–303), the noted writer Lu Yün\(^12\) (+*262*–303) said: 'Of the first series of your work in twenty rolls, ten have just been completed [copied] and will be set for dyeing.'\(^13\) Apparently it was a general practice at that time to have ordinary paper dyed to prevent damage from insects and to obtain a glossy surface, before or after it was used for writing. The ingredient was a liquid obtained from the Amur cork tree, known as *huang po*\(^13\) (*Phellodendrum amurense*), which has a fragrance and a

toxic effect in keeping insects away.\(^8\) It was prepared by soaking its inner bark, which is yellow and bitter, to produce a liquid used for dyeing.

The methods of preparation and application of this liquid are described by Chia Su-Hsiieh\(^1 ( +5th century):

The paper to be treated should be unsized, for it is tough and thick, and especially suitable for dyeing. When the whiteness is diminished through the treatment, it should not be dyed too deeply, or its colour will turn dark in the course of time.

When the *huang po* is thoroughly soaked, if one throws away the dregs and uses the pure liquid only, it is wasteful. After soaking the *huang po*, the dregs should be pounded and boiled, pressed in a cloth sack, and again pounded and boiled, three times. The liquid is then added to and mixed with the pure juice. Thus four times as much liquid is saved, and the paper so dyed will be bright and clear.

Writing on a book should be treated after the lapse of one summer, then the seams will not be loosened. Those newly written should have the seams pressed with a flat iron; only thereafter may they be dyed. Otherwise, the seams will become loose.\(^b\)

Many papers dyed with this liquid are found among the manuscripts from Tunhhuang surviving today. The earliest example of known date is a *sutra* written in +*500*, which is about twenty-six feet long and dyed yellow, except at the very end, where the original whitish colour remains.\(^6\) Other examples of such dyed paper are found among the manuscripts especially of the +7th and 8th centuries some of which, treated by this process, are said to have been preserved in better condition than others which were not. In some cases, the name of the dyer is given in the colophon, indicating the importance of such artisans in producing books.

Some twenty *sutras* written in +*671*–7 name the dyers as Hsieh Shan-Chi\(^3\), Wang Kung\(^4\), Hsi Chih\(^4\), and Fu Wen-Khai\(^4\). A few mention the dyer, but omit his name.\(^a\) The dyers, known as *huang huang chiang*,\(^6\) also served in various departments of the court, along with such other artisans as scribes, makers of inked rubbings, and brush-makers. The Thang administrative codes of +*723*–38 and the *History of the Thang Dynasty* both record that official positions for paper mounter-dyer and paper-sizer existed in various academic agencies, including nine in the Chancellery (Men Hsia Sheng\(^7\)), six in the Palace of Assembled Worthies (Chi Hsien Tien\(^8\)), three in the Academy of Respecting Literature (Chihhun Wen Yüan\(^9\)) and ten in the Imperial Library (Pi Shu Sheng\(^10\)), for duties connected with the treatment of paper for documents.\(^11\) A decree of +*675* said: 'Since the issuing of decrees and orders is a permanent institution and since white paper has generally been dam-

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\(^a\) Hunter (17), p. 94.  
\(^b\) Lo Chi (1), pp. 89–94.  
\(^c\) Lo Chi (1), pp. 77–81.  
\(^d\) Chihch Hsü Shu (ESSI/TW), ch. 97b, p. 156.  
\(^e\) Lo Shih-Lung Wen Chih (SPTK), ch. 8, p. 51.  
\(^f\) Chihch Hsü Shu (ESSI/TW), ch. 97b, p. 156.  
\(^g\) Lo Chi (1), pp. 80–94.  
\(^h\) See chemical formula in Phan Chi-Hsung (2), p. 46.  
\(^i\) Chi Hsin Shu (TSUCC), ch. 3, p. 37; also discussion in Phan (2), p. 46.  
\(^j\) Glin (15), p. 81; no. S. 9106.  
\(^k\) See the list of colophons in Glin (15), p. 129; and discussion in Phan (2), p. 46.  
\(^l\) Thang Liu Tien, ch. 8, p. 45; ch. 9, p. 35; ch. 10, p. 24; ch. 26, p. 44. Chih Hsien Tien (2), p. 2a; Chiu Hsien Tien (2), p. 46.  
\(^m\) Hunter (17), p. 94.  
\(^n\) Phan Chi-Hsung (2), p. 46.  
\(^o\) See chemical formula in Chihch Hsü Shu (ESSI/TW), ch. 97b, p. 156.  
\(^p\) See chemical formula in Phan Chi-Hsung (2), p. 46.  
\(^q\) See chemical formula in Glin (15), p. 81; no. S. 9106.  
\(^r\) See chemical formula in Phan Chi-Hsung (2), p. 46.  
\(^s\) See chemical formula in Glin (15), p. 129; and discussion in Phan (2), p. 46.  
\(^t\) Chihch Hsü Shu (ESSI/TW), ch. 97b, p. 156.  
\(^u\) See chemical formula in Phan Chi-Hsung (2), p. 46.
aged by insects, hereafter let the Grand Secretariat be instructed to order that yellow paper be used by the various government offices and all the districts and prefectures. This practice of dyeing paper was continued until some time in the Sung dynasty, when book format was changed.

Another method of treating the paper with insecticide was the use of litharge or red lead (hung tan or chien tan), which is a mixture of lead, sulphur, and saltpetre. Paper treated with a solution of these chemicals turns a bright orange colour called wun nien hung (ten-thousand-years red) and is toxic to bookworms. Many books printed in the Kuangtung area in the Ming and Ch'ing period and bound with such papers have been preserved in perfect condition without being damaged by insects. The manufacture of the red lead is described by Sung Ying-Hsing of the 17th century, as follows:

The ingredients for making lead litharge are: ten ounces of native sulphur, one ounce of nitre and a catty of lead. Melt the lead first. While it is in the molten state, add some drops of vinegar, then add a piece of sulphur while the molten mass is steaming. Shortly afterward, a small bit of nitre is added. When the steaming subsides, more vinegar is added and the process is repeated with the nitre and sulphur being added little by little. Litharge is obtained when the mass turns into powder. This powder was mixed with water and vegetable glue and heated into a solution, which was then applied over the white paper. After drying, the treated sheets were used as endpapers inside the covers for the protection of the untreated paper from damage by bookworms. After the book was changed from the roll to the flat format, it was impossible to dye the entire book in the former way. The use of paper treated with red lead solved this problem and proved to be much simpler, easier, and more effective than the old method.

(iii) Colouring

While dyeing of paper was primarily for insecticidal reasons and permanence, colour was also added for artistic purposes. The earliest known coloured paper was probably the ho-thi of the Han dynasty, which was described by Meng K'ang of the +3rd century as a kind of 'silk-paper dyed red for writing, as it is dyed yellow today'. If this is correct, red paper must already have been used as early as the 1st century, and yellow came into vogue in the +3rd. At the court of the Later Han (+25–220), the princes were given 100 sheets each of maroon and bright red hemp papers when they were invested. The use of yellow paper continued in the following centuries and probably reached a peak in the Thang, as official documents were ordered to be written on such papers. Other writings intended for permanence, such as Buddhist sutras, were written on them.

Paper in various other colours also was used early and became plentiful and popular in the Thang dynasty. In the +4th or 5th century, 'peach-blossom paper', in bright green, blue, and red, was used in Szechuan, and in the Thang, the stationery papers of Szechuan were dyed in ten different colours: maroon, pink, apricot pink, bright yellow, dark blue, light blue, dark green, light green, bluish green (verdigris), and 'light clouds'. Besides these, there were fancy varieties of artistic papers in different colours and patterns, specially made for writing and decorations on various occasions. Also, a small notepaper known as 'Hsiueh Thao paper', dyed red, was designed in the Thang and continued to be imitated for many centuries.

Some papers apparently were coloured by adding pigments in the pulp, but many were dyed after the paper was manufactured. One source indicates that ten sheets were piled in a stack, with a bamboo clip attached to one end of each sheet. Then the liquids of various colours were applied for dyeing on each sheet. When they dried, the papers looked lustrous and beautiful.

To imitate aged paper, especially for making forgeries of old paintings or calligraphy, paper might be dyed or smoked. Sometimes incense ashes were scattered over the surface of paper, then brushed off with a stiff-haired brush, or water mixed with dust was used. Thus the paper obtained a yellowish or greyish tinge, and looked as if it had aged in the course of centuries. However, the colour of paper artificially aged by dyeing also appeared on the reverse side; thus it might be distinguished from the true aged paper which was discoloured only on the surface. The Sung connoisseur Chao Hsi-Ku (+1200) says: 'Those who sell calligraphy often produce fakes by dyeing old paper so as to give it a dark colour. But they are entirely unaware of the fact that water mixed with dust will penetrate both the face and the back of the paper. Genuine darkened paper is discoloured only on the face, while the reverse is as new.' Mi Fu (+1051–1107) also commented that scrolls 'aged by exposing them to smoke will retain an odour. The dark tinge of all genuine scrolls will be deep on the obverse, but shallow on the reverse. Moreover, genuine old paper or silk has a peculiar fragrance of its own.'

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2. For a study of the litharge-treated paper, its chemical analysis, and bookworms, see a report by Chou Pao-Chung and others (1), pp. 194–206.
5. Chien Han Shu, ch. 97, p. 134.
6. 紅丹  墨丹  高年紅
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3. See discussion of ornamental stationery on pp. 91 ff. below.
5. Tung Tsia Chang Lu (MSTS), ch. 8, p. 937; cf. van Gulik (g), pp. 100–1.
To make the paper glossy, stiff, and translucent, a kind of yellow wax was applied to its surface. The wax was called "ying huang" (stiff and yellow), or by some scholars "huang ying." After the application of the wax to the surface with a hot iron, the paper became smooth, stiff, and translucent, and could be used for tracing paintings or calligraphy. The process was also used to brighten paper material if darkened by age. It was commonly used from the Thang through several dynasties for these purposes; thus Chang Yen-Yüan (c. +840) mentioned that "art lovers should keep a hundred sheets of Hsuan paper to be prepared and coated with wax for making traced copies." Later, Chang Shih-Nan (+13th century) said that paper could be evenly coated with beeswax by means of a hot iron. Although the paper became somewhat stiff, it was glossy, smooth, and translucent like "ming-chi'eh" (translucent horn) so that the slightest particles could be seen through it. A Ming scholar, Li Jih-Hua (+1565 to 1635) wrote:

"Ying huang paper is made because people dislike the opacity and rough surface of ordinary paper. Therefore they heat paper over a hot flat iron, and then wax it evenly with yellow wax. Although the paper then becomes slightly stiff, it is glossy and translucent, resembling flakes of fish bone or sheets of transparent horn. If one lays a sheet of this paper over something, even the smallest details of such an object will be perfectly discernible. Generally antique autographs from the Wei and Chin periods, left by calligraphers like Chang Yu (+151-293), So Chihng (+239-303), or Wang Hsi-Chih (+311-379), are treated in this way, because in the course of the centuries they have grown dark."

Apparently there were two kinds of stiff yellow paper. One was dyed with a yellowish insecticidal substance and used for writing, the other was coated with wax for making traced copies. A Ming scholar, Li Jih-Hua (+1565 to 1635) wrote:

"Besides ying huang, the term tschu huang should be mentioned. As used in early writings it meant a mineral (As₂S₃), similar to "ksiang huang" or orpiment (As₂S₃), poisonous and insecticidal. It is insoluble in water, and was prepared by grinding into powder and mixing with gum to form a solid stick. For use, tschu huang was ground with water into a liquid, as solid ink is ground, and applied to paper to protect it from bookworms. Chia Ssu-lai (5th century) gives a recipe for treating book rolls with tschu huang, which was also used to correct errors in writing. Since most documents were written on yellow paper one could easily obliterate erroneous characters by painting them over with orpiment. Shi Kua (+1030-94) said: 'If mistakes occurred in the clean copies in the official palaces, they could be deleted by painting them over with orpiment.' Thus tschu huang was generally used for the purpose of erasing.

(5) Preservation of Paper

Chinese paper is usually very thin, and only one side is used for writing or printing. Various methods have been used to increase its durability. Paper bearing artwork is usually mounted by attaching an additional piece or pieces of paper to its back to increase its weight, eliminate wrinkles, and especially to improve its artistic quality. When the paper becomes old, it can be remounted to freshen its appearance. If a sheet of paper is worn or torn, the damage can be patched, and another sheet of paper can be inserted between the folded leaves of a book for reinforcement. To protect paper from damage by insects and to increase its permanency, it may be exposed to light during certain seasons of the year to adjust its dryness and temperature. Special warnings were given by many early book collectors concerning careful handling of books and scrolls in order to prolong their life. Many examples of painting or calligraphy on paper, or of books made a thousand years ago are still in very good condition, and their survival is largely due to the work of preservation through mounting, restoration, and special care given to them.

(i) Mounting

The earliest known reference to the mounting of paper dates back to the +4th or 5th century when paper was extensively used for writing and bookmaking. The Thang connoisseur Chang Huai-Huan wrote in +760 that up to the Chin dynasty mounting on the back of the paper was not satisfactory because the paper used for backing developed creases. However, Fan Yeh (+398-445), author of the "Hou Han Shu," made some progress in mounting, and the Emperor Hsiao-Wu (+451-64) of the Sung was able to charge Hsu Yuan with re-mounting scrolls with ten sheets of paper in one roll, limiting each roll to twenty feet. Gradually the
technique was improved, and mounting became one of the most important processes in the decorating and preservation of works of art on paper. In the preface to a work on mounting, the Ming scholar Chang Chhao¹ says: 'Mounting is to a scroll what make-up is to a woman.' Without it, 'although this will not detract from her charm, yet it will make her insignificant.'³

Mounting is a very specialised technique that requires skill and a knowledge of art to handle different varieties of material—mounting of new paper stock, remounting of old works on paper, or restoring an antique work of art. In any case, it involves many steps of careful study of the work and days or weeks of working time to complete a piece of mounting. It is generally agreed that the quality of workmanship determines the length of life of a picture on paper, and the mounter is said to be 'the arbiter of the destiny of scrolls.'³

For mounting, a new piece of paper is usually treated with a thin alum solution first, to prevent the ink or pigments from running. The crystals of alum are first dissolved in cold water, then the solution is brushed over the coloured portion of the paper, on the right side. When this is thoroughly dried, the treatment is repeated on the reverse. Next, a thin but tough piece of backing paper is spread out and moistened with a large, soft-haired brush dipped in clean water, and placed over the original paper. A very thin layer of paste is applied with a broad pasting brush to attach the two sheets of paper, and they are made to adhere by softly tapping with a stiff-haired brush (Fig. 107).⁴ If one sheet of backing is insufficient, a second or more may be added in the same way. When the paste has had time to penetrate well into the paper but has not yet dried thoroughly, the scroll must be taken from the table, transferred to the boards on the wall, and left to dry for a week or longer. When this is done, a last sheet of backing may be added before the stave, roller, and suspension loop are attached to complete the scroll.

When an antique piece of art on paper is remounted, the scroll is spread face down on the table and thoroughly soaked by going over it repeatedly with a large, soft-haired brush dipped in clear water. After a while, the old backings are peeled off one by one with a bamboo spatula and tweezers while the scroll is still moist. Holes and tears in the paper are patched by pasting thin strips of paper of matching colour on the reverse. If the surface of the paper has accumulated dust in the course of years, this is washed off with a pure extract of acacia pods or of loquat seeds (Gleditschia sinensis), both of which contain detergent.⁵ When the dust is thus removed, a fresh and bright surface will be obtained without fading of its colours. After the paper has dried thoroughly, new backing is added as is done with new paper, and additional work such as re-touching is done.

For mounting sheets of inked squeezes, there are different methods: depending on whether the original is cut or uncut, and is to be rolled in a sheet or album, or folded. Mounting of an uncut piece is primarily to strengthen the sheet by backing with a thin layer of bark paper. A large sheet can be folded to be kept in a box, or made into a scroll with rollers, like a painting for hanging. Mounting of a cut piece requires a special technique. A sheet of inked squeezes from a large tablet may be cut into long vertical strips like the columns of a traditional book and then mounted in book form as an album. The technique depends on the skill with which the strips are cut. Vertical cutting should be done in such a way that all pages neatly fit to each other in an unbroken row, while the horizontal cutting should result in a perfectly straight top and bottom; if this is expertly done, the work is as good as finished.⁶

(ii) Preparation of the paste

The success of mounting depends largely upon the proper preparation of paste, especially its viscosity and its insecticidal effect. The basic ingredient is flour or rice

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¹ Introduction to Chou Chia-Chou (c. 1500–1660), Chuang Huang Chih (TSHCC); see text and translation in van Gulik (9), p. 295.
² Cf. van Gulik (9), p. 8.
³ Washing with acacia pods is as early as the Thang dynasty, when Chang Yen-Yuan mentioned it in his Li Tai Ming Hua Chi (TSHCC), ch. 3, p. 107. The use of the loquat seeds is mentioned in the Chuang Huang Chih (TSHCC), pp. 5–7; see van Gulik (9), pp. 114, 293–4.
⁴ Fig. 107. Picture mounting in operation at Jung Pao Chai, Peking.
⁵ For mounting of inked squeezes, see Chuang Huang Chih (TSHCC), p. 7; cf. van Gulik (9), p. 305.
starch, but the addition of a plant root called po-chi³ (Bletilla striata) is said to be best for increasing viscosity. Thao Tsung-I⁹ (+ 1320–99) cites in his Cha Kung Lu⁴ a conversation between a scholar, Wang Ku-Hsin,⁴ and an 83-year-old monk, Yung-Kuang,⁵ the custodian of old sutras in a Buddhist temple. When he visited Wang's studio, the monk was asked: 'How is it possible that the sutra rolls of former dynasties, although their seams are as narrow as a thread, have after so many years not become loose?' He answered: 'The old method was to use sap of paper mulberry, fine flour, and a powder of po-chi. When the three are mixed into a paste and used to fasten the sheets of paper together, they will never become loose, for this paste is as sticky as glue or varnish.'

The po-chi is an orchidaceous plant, which tastes bitter and contains a large proportion of mucilaginous substance. The sap of its root has been used in pharmacy as well as in preparing paste, as is mentioned in the Pao Phu Tzu by Ko Hung (+ 4th century), who said in a chapter on medicine for immortality that 'the po-chi is for making paste.' Sometimes other ingredients such as pepper, incense, and alum were added for fragrance, preservation, and an insecticidal effect. The recipe by Chou Chia-Chou says that the paste is made of po-chi and white alum, to which is added a little frankincense, yellow wax, and also hua-chiao⁶ (Xanthoxylum pipertum) and po-pu⁷ (Stemona tuberosa), which were put into boiled water. Both hua-chiao and po-pu have the effect of keeping insects away, because the paste is never eaten by insects, while the paste itself will never allow the sheets to become loose or be subject to other deficiencies.

(iii) Restoration

The methods of repairing and restoring the torn pieces of paper of a traditional book are similar in part to those for remounting antique art pieces. The paper of Chinese traditional books has usually been damaged by insects attracted by the rice starch paste, by fungi caused by heat and moisture, and other hazards such as water, dust, and smoke. Insects perforate the paper, while fungi leave discoloured spots, and also weaken the paper. To repair insect perforations or tears and other worn places, a piece of thin but strong bast paper may be pasted on the reverse. If the paper to be restored is yellowed, the discoloured patches may be dyed with an infusion of tea to which a disinfectant is added, while if the perforations are minuscule, they may be repaired individually. The page is placed face down on a waxed board and paste is applied to the edges of the perforation, and the patch is applied. After drying, the page is carefully peeled off the board. If the perforations are complicated, the patch may be placed on the board and the damaged page placed over it, face up. Then the edges of the perforations are placed in their correct positions on the pasted patch with a pair of tweezers. The page is worked into perfect contact with the patch, and is left to dry on the board (Fig. 1073), from which it is carefully peeled away when completely dry.

If the paper is weak and brittle, or extensively damaged, it is necessary to mount the pages on sheets of thin, strong bast paper, as described earlier for mounting pieces of artwork. An extra, usually longer, sheet of paper is inserted inside the fold of the double leaf. If a white paper is inserted into a yellow one, it is known as chin hsiang yi⁸, 'gold inlaid with jade.' Apparently restoration of paper was practised very soon after paper became used extensively for writing. Chia Ssu-Hsieh (+ 5th century) said that when book rolls were damaged, if thick paper were used to patch them, these patches would become hard like a scab or scar, which would in turn damage the book itself, but if a
piece of paper as thin as a scallion leaf were used, the patch could hardly be seen unless it were looked at against the light. If the damaged spot was curved, the patch should be cut to fit, but if too large a piece were used, and not cut to the shape of the damaged area, the torn parts of the paper would twist and shrink.

(iv) Conservation

For preservation of the paper, Chia suggested that musk and quince (Cydonia sinensis) be placed in bookcases to prevent insects from breeding there. During the humid and hot season of the fifth month, bookworms are hatched. If the books are not unrolled during summer, there are sure to be insects in them. Between the fifteenth of the fifth month and the twentieth of the seventh month, book rolls must be unrolled and rolled three times. This should be done on a clear day in a spacious house which is aired and cool, and books should not be exposed directly to the sun, for it will turn the paper brownish. Rolls heated by the sun quickly attract insects, and rainy and humid days should especially be avoided. If books were cared for in this way, they would last for several hundred years.

Chia also warned readers against carelessness in handling paper rolls. He suggested opening and closing the books slowly and protecting the roll with extra wrappings. He said:

When a book is unrolled for reading, the extending paper at the beginning of the roll should not be opened in haste; if it is it will be creased, which in turn will cause tears. If a ribbon is wrapped around the extending paper of the roll, it is certain to become damaged. If a few sheets of paper are added before the ribbon is wrapped around the upper and lower parts of the roll, the roll will be kept tight and will suffer no damage.

These are some of the external factors which influenced the permanence of paper. While the best fibres were used to ensure its durability, all the physical, biological, and atmospheric factors to enhance the longevity of paper were taken into consideration rather early in China, especially for artistic work and for graphic records.

(d) USES OF PAPER AND PAPER PRODUCTS

Paper has always been a cheap and convenient substitute for more expensive materials or more clumsy objects which have other uses, and it is sometimes suitable for uses in which other materials will not serve. Paper was apparently not invented for writing, but as time went on writing on paper developed into a special branch of art, and for both calligraphy and painting, paper turned out to be the best medium for artistic expression. The use of paper made further progress where

it became available in fancy colours and delicate designs as stationery and for decorative purposes. Being cheap and light, it has been used as a medium of exchange in place of heavy valuable metals, or as a substitute material for personal furnishings, household articles, and recreational objects. Paper has also been chosen for the craft of making replicas or models of treasured objects for ceremonial and festive occasions. Today, paper and paper products have hundreds of uses in communication, business, industry, and household operations; they are found everywhere in daily life. Yet many of these uses can be traced back to centuries ago when paper was used as extensively and variously in China as it is elsewhere in the world today.

Generally speaking, paper was probably used for wrapping from the moment of its invention in the Western Han; for writing from the Later Han; for cutting into designs, making stationery, fans, and umbrellas from the third or fourth century onwards; for clothing, furnishings, visiting-cards, kites, lanterns, napkins, and toilet purposes no later than the fifth or sixth century; for family ceremonies in the seventh; for state sacrifices and making replicas of real objects from the eighth; and for playing cards and in lieu of metal as a medium of exchange from the ninth century. In other words, all these uses for the graphic and decorative arts, for commercial and ceremonial occasions, and for household and recreational purposes existed in China before paper was known to the West.

The progress of papermaking is reflected in the increasing varieties of and names for paper, which have many different origins. Some of the names denote the raw materials from which paper was made; others refer to places where it was manufactured; and still others are the names of designers or of the studios which the product has made famous. Papers are also named for methods of treatment, as sizing, coating, dyeing, or treating with spices; for their appearance or size; and for the use for which a variety is particularly made. The following pages will trace the origin and development of some special kinds of paper and paper products used for different purposes as recorded in literature or found in existing specimens or artifacts.

(1) PAPER FOR GRAPHIC ARTS AND STATIONERY

Paper was used very early as a substitute for bamboo and silk as writing material. No written characters, however, are found on the earliest paper specimens so far discovered, and no reference to the use of paper for writing was made in the Former Han period, though paper was certainly used for books and writing from the Later Han. It is recorded that paper was used together with brush and ink at the court during the reign of Hsian Ti (+25–56), and that a copy of the Chihun Chhiu Tao Chiuan on paper was given to students who studied the classic at the Han court in

* Chhi Min Tao Shu (TSHCC), p. 57; cf. van Gulik (9), p. 132.
* Chhi Min Tao Shu (TSHCC), p. 39.
* Chhi Min Tao Shu (TSHCC), p. 57; cf. van Gulik (9), p. 141.
* See the discussion on the factors influencing the durability or permanence of paper in Browning (1), pp. 31–3.

* Hou Hw Shu (ESSS)/TW, ch. 36, p. 7a.
* 奉誥左傳
Numerous paper documents discovered in Chinese Turkestan bear dates from the +3rd century onwards, while Hsün Hsi (+231-89), custodian of the imperial library of the Chin dynasty, wrote that the bamboo books discovered in the Wei tomb in +280 were copied on paper and kept in three separate collections. The increasing use of paper for books is also reflected in the records in earlier historical bibliographies. From such evidence, it may be concluded that paper was adopted for writing from the +1st century, but not extensively used for books and documents until the late +2nd or +3rd century.

The earliest extant example of a complete book on paper is probably the Phi Tü Ching (Parable sutra) written in +256 on liu ho chih (Fig. 1074), which is said to be a paper made of six different materials or in Liu-ho in northern Chiangsu. This kind of paper may have continued in use in the Sung dynasty, for the noted artist Mi Fu (+1051-1107) remarked that the liu ho paper had been used since the Chin dynasty. Other early book rolls extant today are generally written on papers of hemp, paper mulberry, ramie, or a mixture of these materials. Some of them survive in excellent condition (Fig. 1075).

The most common papers used in the Thang dynasty were made of hemp, paper mulberry, and rattan, as is testified by both analytical studies of the paper specimens and literary records. Some sixty pieces of paper from Tunhuang and made between the +5th and the +8th century, were photomicrographically examined by Clapperton, who says that the earliest papers are all thin, transparent, and almost without exception made from carefully prepared and well beaten materials, while the sheets themselves are even and free from 'pinholes' or thick or thin patches. They generally exhibit a high degree of skill on the part of the vatman or papermaker. In addition, most are well sized and can be written on with modern ink and a steel pen. But after the middle of the +8th century the quality of the paper rapidly deteriorated, becoming thick, flabby, uneven in texture, with poor resistance to ink. This change is generally attributed to the political and economic chaos during the later period of the Thang dynasty.

The papers used during the Thang for copying sutras and other books were of two kinds, both made chiefly from hemp. The white kind, called pai chung chien (white sutra paper), is in small sheets but made heavy by loading or coating. The yellow, ying huang chih (stiff yellow paper), was treated with an insecticidal liquid which gave a glossy surface and a strong, close texture. The thicker kind of paper was made in Szechuan and the thinner in Chhang-an, Loyang, and Anhui. The same sort of paper continued to be manufactured in the Sung dynasty, when Chiu-tu
contains an insecticidal substance with a spicy flavour. This paper is strong, with a scent which is said to last several hundred years, and books printed on it survive today. Other papers popular for book printing in the Sung dynasty included *pei chiao chih*, a lustrous white kind made probably from the creeping plant *pei hish* (Discorea quinquefolia) in Fu-chou, Chiangsi; *Phu-chhi chih*, a medium heavy paper made in Phu-chhi, Hupeh; *Kuang-tu chih*, a product of the paper mulberry from Kuang-tu, Szechuan; *Tu-chhuan chih*, a rattan paper made in Yu-chhuan village of Hangchow, Chekiang; and *Chi-lin chih*, a very smooth and heavy paper made in Korea.

From the Sung dynasty on, printing became popular and papermaking made further progress. Publications by the National Academy and various local government agencies, monasteries, private families, and trade publishers greatly increased in such places as K'ai-feng, Chhengtu, Hsüan-cheng, Hangchow, and Ch'ien-yang, which were also known as centres for papermaking. A close examination of the extant Sung, Yuan, Ming, and Ch'ing editions printed on various kinds of paper shows the high quality of the paper used for printing, which was, generally speaking, thin, soft, light, and fine. The raw materials were mostly bamboo and paper mulberry, with sometimes a mixture of rice stalks and other substances. In the Yuan and Ming dynasties, a kind of extra wide paper was made of bamboo for writing, and was known as *ta su lien* (large fourfold), whilst in some districts, fine bamboo was made into an especially heavy and sturdy paper called *kung tu chih* (official document paper); it was kept primarily for official documents. Of the paper used for books during the Ming, the best is said to have been the white, sturdy *mien chih* (cotton paper), which was actually made of bamboo from Yung-feng, Chiangsi; next was the soft, heavy *chen chih* (stationery paper) from Chiang-shan, Chekiang; then came the less expensive *shu chih* (book paper) from Shun-chang, Fukien, and last was the *chu chih* (book paper) from Fukien, which was short, narrow, dark, and brittle, and lowest in quality and price. The *Kha-hua chih*, a paper of extraordinary quality made in K'ai-hua, Chekiang, was especially selected by the Chhing court for the printing at the Wu Ying Tien of the *tien pen*, the Palace editions.

Most popular among the many kinds of paper for artistic uses, especially printing and calligraphy, has been and still is the *Hsüan chih*, a fine, white soft paper made in Hsüan-chou (modern Hsüan-cheng, Anhui). This paper was first mentioned in the Thang documents as an article of tribute from Hsüan-chou; since then it has been continuously used and praised by artists. Not all papers made in the Hsüan-chou area, however, were of high grade and suitable for artistic use.

* The *Chin-sy paper* is said to have been made of silk fibres, but a recent analysis indicates that it contains mulberry and hemp but no silk; see Phu Chi-Hsing (9), p. 57.
* See Chieh-se Chin Shue by Ching Yen-Chiang (1798-1844), a native of near by Hai-yen, who was among many collectors of this paper. The book gives well-documented sources and reproductions of the seals impressed on the front and back of the paper.
* A sample of a modern imitation is given in van Gulik (9), Appendix v, no. 19.

Fig. 1075. Old manuscript of the *Bhadrakālia sūtra*, transcribed in the Sui dynasty and preserved at Shō-o-in, Nara, showing waterlines of the paper using light from behind.

chih (paper from the Chin-su Mountain) was specially made for copying the *Tripitaka* in the Kuang-hui Temple at the foot of Chin-su Mountain, Hai-yen, on the coast of Chekiang province. This paper, made in Soochow in the latter part of the 4th century, is strong and sturdy, with no watermarks but a surface made very smooth and glossy by waxing both sides. Each sheet bears a red seal with the inscription *Chin-su shan tsang* and some fifteen sheets of paper were joined into a roll, the *Tripitaka* itself containing a total of over ten thousand rolls. This paper has become a collector's item and has been imitated throughout the centuries. The imitation, known as *tang ching chien*, is still being used most commonly by calligraphers or for title labels of books and scrolls.

A similar well-treated, golden yellow paper, known as *chiao chih* (pepper paper), was made in Chien-yang, Fukien, in the Southern Sung dynasty. It was dyed in a liquid prepared from the seeds of the pepper tree (*Zanthoxylan piperitum*), which contains an insecticidal substance with a spicy flavour. This paper is strong, with a scent which is said to last several hundred years, and books printed on it survive today. Other papers popular for book printing in the Sung dynasty included *pei chiao chih*, a lustrous white kind made probably from the creeper plant *pei hish* (Discorea quinquefolia) in Fu-chou, Chiangsi; *Phu-chhi chih*, a medium heavy paper made in Phu-chhi, Hupeh; *Kuang-tu chih*, a product of the paper mulberry from Kuang-tu, Szechuan; *Tu-chhuan chih*, a rattan paper made in Yu-chhuan village of Hangchow, Chekiang; and *Chi-lin chih*, a very smooth and heavy paper made in Korea.

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Many other kinds were made of bamboo or straw, and used for wrapping, burning, or such handicrafts as making umbrellas; only those of pure bark or bark and straw are suitable for calligraphy and painting. These high-grade papers include yu pan (jade tablet), a very large sheet of white, heavy paper; hua hsin (picture heart), one of the artists’ treasures; and lo wen (silk stripes) which apparently was made with textile patterns. Unlike writing or printing, works of art sometimes require very large sheets of paper, and the Hsüan chih is especially noted for its extraordinary size, normally twelve by eight feet, with one to three layers in one sheet. Some of the sheets, known as phi chih, were as long as fifty feet. A sheet of one layer is made by lifting the screen once from the vat of pulp, of two layers by lifting twice, and of three layers by lifting three times, by two or more vatmen operating the large screen. These sheets are soft, absorbent, smooth, strong, and elastic, suitable for books, documents, stationery, rubbings, and especially for calligraphy and painting.

Another time-honoured paper for artists is the Chheng-Hsin-Thang chih (paper from the Pure Heart Hall), especially made in Nanking for the royal poet Li Yü (+937–78), the last ruler of the Southern Thang dynasty. The name of this paper is apparently derived from that of his royal palace. Its raw material was paper mulberry, but its fibres were made extremely pure and fine through additional processing. Its surface was polished and waxed after manufacture to increase its quality and beauty, and was described as fine, thin, glossy, smooth, and absorbent; it was considered the best kind of paper at that time. The Ming connoisseur Chang Ying-Wen (16th century) said ‘the paper is thin like the membrane of an egg, tough and clean as jade, and covered with a fine and brilliant coat’. Another Ming collector, Thu Lung (1542–1605) claimed that the paper was so extremely good that many famous calligraphers and painters of the Sung dynasty used it, and Ouyang Hsiu (+1007–72) is supposed to have used it for his draft of the History of the Five Dynasties. Apparently the formula for making this paper was still used in the Sung and later times, even though the royal studio was no longer extant by then.

Paper was certainly the most popular medium for artistic use by the Chinese as well as peoples in other nations in East Asia from very early times. They adopted it not only for painting and calligraphy, but also for making rubbings from inscriptions and engraved designs and for many different kinds of decorative arts. One example was its use for reproduction of painting and calligraphy by weaving very fine paper strips in colour or in black and white into a sheet as if it were made in fabric with other fibres. A set of forty-six pictures of the Keng Chih Thu, showing the processes of tilling and weaving, accompanied by handwritten poems of the

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* The making of the extra-large paper sheets is described in Hsiao-an Hsin Chih (1888 ed.), ch. 10, p. 176; Hsüan chih is produced in many other places today.
* Ching Pi Tshang (MSTS), p. 216.
* Chih Mo Pi Tsh Chien (MSTS), p. 156.
* See discussion on pp. 361 ff. below.
* This set of pictures, measuring 9 3/4 in. x 11 3/8 in., was acquired by a collector in Stockholm; see E. A. Strehlneek (1), pp. 238–37.

ments. These papers were dyed a single colour, printed with multicoloured paintings (Fig. 1077), embossed in patterns, or sprinkled with gold or silver dust, in order to make them as elegant and pleasing as possible. The making of such papers was an art in itself, and many artists and poets contributed to the advancement of techniques for such ornamentation. For example, violet notepaper was used by the famous calligrapher Wang Hsi-Chih (+ 321-79), and notepapers decorated with a peach blossom pattern in bright green, blue, and red were designed by Huan Hsian ² (d. + 404) in Szechuan, a centre especially distinguished over many centuries for its decorative notepapers.

According to early records, stationery papers in ten different colours were made by a Thang official, Hsieh Shih-Hou ³ of Szechuan. There were also fancy varieties of paper called by such names as pine flower, golden sand, bright sand, rosy clouds, golden powder, dragon and phoenix (red with gold), peach-pink with golden spots. However, the most famous notepaper throughout the centuries was probably the small reddish note sheets designed by Hsieh Thao ⁴ (+ 768-831), a courtesan well versed in poetry who exchanged poems on notepaper of her own design (Fig. 1078) with such well-known poets as Yuan Chen ⁵ (+ 779-813) and Po Chi-¹⁸

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* Wen Fong Sue Phe (THOC), ch. 4, p. 49.
* Glenn Chih Phe (THOC), p. 2.
* 王執之
* 何玄
* 謝師厚
* 蘇濤
* 元輅
* 自居易
The earliest notepaper with multi-coloured pictures was probably developed before the Sung dynasty. The family of Yao Chhi1 (fl. +940) made lustrous letter papers in beautiful coloured designs of mountains, rivers, forests, trees, flowers, fruits, lions, phoenixes, insects, fishes, 'old father', 'the Eight Immortals', and ancient seal characters. A poem written about this time describes the designs of a landscape painting of wild geese, reeds, and a setting sun on letter paper.3 Apparently, paper with embossed designs, with watermarks, and even a marbled paper were also developed at this time or earlier. Su I-Chien (+957-95) said that the people of Szechuan made stationery papers with decorations by pressing them on wooden blocks to make such designs as flowers, trees, unicorns, and phoenixes in numerous styles. He also described a 'fish-eggs notepaper' (yi-tzu chien), made with starch on a piece of closely-woven cloth from which a hidden design like fish eggs resulted,2 and in fact many specimens of paper with hidden or translucent designs survive from the +10th century, including one example used by the noted calligrapher Li Chien-Chung3 (+945-1108). These translucent designs are considered forerunners of the watermark.4 Another kind was 'drifting sand notepaper' (liu sha chien), the design of which was printed from a flour paste sprinkled with various colours, over which the paper was placed to become stained; thus the design was free and irregular. Sometimes, paste was prepared from honey locust pods (Gleditschia sinensis) mixed with croton oil and water, with black and coloured inks on its surface. Colours were scattered when ginger was added and gathered if dandruff was applied with a hair brush. The various designs which looked like human figures, clouds, or flying birds were transferred from the surface of the liquid to the paper, and in this way a marbled paper was made.4 Western authorities have set the origin of watermarks in +1282 in Europe, and of marbled paper in 1550 as 'a Persian invention',6 but the literary record as well as existing specimens show that the Chinese made such papers at least three to five hundred years earlier.

A close relationship between the manufacture of writing paper and the art of colour prints developed in the late Ming dynasty. The most famous example is the manual of ornamental letter papers designed at the Ten Bamboo Studio, known as the Shih-Chu-Chai Chien Phu, published by Hu Cheng-Yen about 1645.5 The manual included various designs printed in multicolour or by embossing without colour from wood blocks. The earliest extant designs can be seen in the Tin Shih Phu and the Lo Hsien Pien Ku Chien Phu, published in the early 17th century.5 They also include similar but simpler ones which make it apparent that both the techniques and the artistic schemes of Hu Cheng-yen were influenced by similar works which had appeared earlier.

Besides letters, ornamental stationery was also used for commercial papers, in which case it is commonly known as chien thieh.3 These specially designed papers were created by block-printers of Huichow (in Anhui) during the late Ming and early Chhing dynasties. Contracts were probably first written on ordinary note paper, but later a special kind of stationery was manufactured with designs more in folk style instead of the landscapes of archaic paintings preferred by the literati.8

* Chien I Lu (HITTS), ch. 2, p. 34k.
* Shih Chunk Phu (TSHCC), p. 53.
* See examples at the Palace Museum, Peking examined by Phan Chi-Hsing (9), pp. 38-9; also Shih Tao-Kang (2), pp. 51-8.
* Wen Fang Ssu Phu, p. 53.
* The preface of the manual is dated +1644, but one orchid design, in chue 5, bears the date +1645. The work was reprinted in facsimile by the Peking Society of Woodcuts in 1935; see also below, p. 408 ff.

1 Yao Chhi
2 fish eggs
3 Li Chien-Chung
4 embossed designs
5 marbled paper
6 paper with embossed designs
7 watermarks
8 Hu Cheng-Yen
9 Shih-Tao-Kang
10 Chi Hsing
11 Labarre
12 Hunter
13 examples
14 reprinted in facsimile
15 dated
16 printed in facsimile
17 Peking Society of Woodcuts
18 printed
19 written
20 reprinted
A piece of paper used to present the visitor's name when calling was known as ming tzu¹ (name card) or pai thiêh² (visiting-card). This custom was derived from the use in the Han dynasty of a strip of wood on which the personal name was written. The wood was replaced by paper probably in the +5th or 6th century, when such information as the visitor's name, native town, and official title was included. The card, about two to three inches wide, was white, but was replaced by a red one in the Thang, when the price of red paper is said to have increased over ten times. Also during this time, a custom was introduced of writing a note about the visitor's business on the card when calling on high officials in their offices or private residences. An endorsement was made on the back of the card before the visitor was admitted.a

In the middle of the Ming dynasty, the visiting-card was enlarged, with the name written in big characters for a Han-lin scholar, who was privileged to use a red card, while the common people used white. Sung Ying-Hsing says: 'The highest grade of stationery paper made in Chhien-shan (Chiangsi), known as kuan chien³ (official stationery), was used for calling cards by high officials and members of the wealthy class. It is thick and smooth without any fibrous ribs on the surface. When used on ceremonial occasions, it was dyed red with the red flower [Hibiscus rosa-sinensis] after being treated with alum.'b

(2) Paper as a Medium of Exchange

The use of paper to represent money originated probably in the early +9th century, when increasing needs of business and government transactions encouraged the institution of 'flying money' (fei chhien) as a convenient way to obviate carrying heavy metal coins from one place to another.c Provincial merchants who sold their commodities in the capital could deposit their proceeds at an office in Chchang-an and receive a certificate for cash in the designated provinces. This institution was originally a private arrangement by the merchants but was taken over by the government in +812 as a method of forwarding local taxes and revenues to the capital. Since the 'flying money' was primarily a draft, it is generally considered a credit medium rather than a true money.d

The system continued in the following dynasties and gradually evolved into a true paper currency. The inconvenience of clumsy iron coins, which weighed twenty-five catties per thousand led, during the period of the Five Dynasties and early Sung, to people depositing cash in deposit houses and using their receipts for financial transactions in the Szechuan area. In the early +11th century, sixteen private houses were authorised by the government to issue notes called 'exchange media' (chiao tzu)² (Fig. 1080). This also began as a private arrangement, but in +1023 the government established an official agency in I-chou (modern Chchengtu) to issue such notes in various denominations. A cash reserve was established and a period of three years, as well as a ceiling, was set for circulation. In +1107, a new note called a 'money voucher' (chhien yin)² was issued and printed with six blocks of elaborate designs in blue colours.² By the end of the Northern Sung period, notes worth a total of about seventy million strings² had been issued.

The paper money of the Southern Sung period had various names and circulated in a wider area of the country. Although the chiao tzu and chhien yin were used for a while, the most popular of the notes was the 'check media' (hui tzu³). It

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a See Kui Yü Ta-sheng Khao (1750 ed.), ch. 30, pp. 244-5.
b See Thien Kung H'm Wu (KHC), pp. 316-19; cf. u. Sun & Sun (1), p. 293.
c Sources are silent about the material for the 'flying money', but it is believed that it must have been made of paper since imitation money of paper for offering to spirits was already used in the +8th century, and the word fei, 'flying', implies a light material such as paper.
d Yang Lien-Sheng (1), pp. 31-5; Segabe Shizuo (I), pp. 5-7; Pheng Hsin-Wei (1), p. 280.
a The earliest known copper plate for printing the paper note of +1024 to +1108 survives; cf. Pheng Hsin-Wei (1), p. 280.
b One string equalled 1000 pieces of cash.
also originated as a private enterprise in the capital, Lin-an (modern Hangchow), but was taken over by the Board of Revenue in 1160, with a similar period of circulation and a fixed ceiling for the amount to be issued for each period. The area of circulation was extended from Szechuan to provinces along the sea coast and the lower Yangtze, as well as in the Huai River valley. As had happened before, frightening inflation because of the unlimited issue of paper notes beyond the original quota and period of circulation. 

Besides the circulation of paper money during the two Sung periods, other credit media made of paper were also used. There was a kind of ‘exchange certificate’ called chiao yin\(^1\) issued by a special government bureau for salt, tea, and certain other commodities; it was handled by the appropriate merchants, could be exchanged for cash, and was transferable and redeemable in the provinces where the commodities were produced. In the Southern Sung, certificates issued by the Chiao Yin Khu\(^2\) were made of special paper and were printed in the Treasury, which was located in the capital, Lin-an, and supervised by an assistant of the bureau.\(^3\)

The paper notes issued from 1167 to 1179 were described as printed in colour on specially made paper with very elaborate designs. There were characters to indicate the installment number of the issue, the year issued, the time limit for circulation, and the ceiling for the amount to be issued during the period. Patterned seals were stamped in blue, red, and black on both sides of the paper.\(^4\)

Paper for printing the notes was at first acquired from private paper mills, but as the need grew and counterfeiting increased, the government established its own factories in Hui-chou and Chhengtu for manufacturing special paper for the notes. The material used was paper-mulberry bark, and the paper money was originally called chhu ph\(^5\) or chhu chhao (paper-mulberry money). Silk or other fibres and other ingredients were probably mixed in to make it difficult to counterfeit. The Chhentgu factory, established from 1168, was reported to have employed sixty-one paper-makers and thirty-one other workers in 1194,\(^6\) but because the shipment of Szechuan paper to Hangchow was inconvenient, a government factory was established in 1168 incorporating one already existing at An-Ohhi,\(^7\) near Hangchow, where some 1200 workers were employed in 1175. The printing was done at the Treasury, called the Hui Tzu Khu,\(^8\) where 204 daily workers were employed,\(^9\) and besides wood-blocks, copper plates are known to have been used.\(^10\)

The complexity of designs with additional signatures and seals printed or stamped in colours on specially made paper, plus heavy penalties for counterfeiting, must all have tended to discourage such a crime, yet cases often occurred. One in 1183, memorialised by Chu Hsi\(^11\) (+1130–1200), involved a professional wood-block cutter, Chiang Hui,\(^12\) who had repeatedly counterfeited paper money. He was quoted as saying that he cut a block of pear wood from a traced master copy of the hui tzu note for one string of cash. The imitation note, including a picture of a legendary figure, was printed with serial character and number in blue and seals in red on special paper made in the countryside of Wu-chow (in Chekiang). It took him ten days to complete the cutting. In a six-month period in 1183, some 2600 sheets were printed on about twenty occasions, 100 to 200 sheets at a time.\(^13\)

In the north, the Chin Tartars also used paper money called ‘exchange notes’ (chiao chhao\(^4\)), first issued in 1153. The idea must have been borrowed from the Sung. They had large and small bills in various denominations, and spoiled notes could be exchanged for new ones with a charge for the printing cost. At first, the circulation rules were carefully observed, but towards the end of the 12th century and early in the 13th, excessive military expenditure caused inevitable inflation, and the value of the depreciated notes dropped to as little as one per cent of their original value.

After the Mongol conquest of China, the Yuan dynasty issued several kinds of paper money. It was the ‘silk note’ (tsu chhao\(^4\)) issued from 1260 which was backed by silk yarns as reserve, and later the notes of the Chung-thung era (Chung-thung chhao\(^4\)), which unified the currency system of China. Two specimens of this paper money were discovered in Shanyang, Shensi in 1965.\(^14\) Old notes issued earlier were exchanged for this new note, which not only circulated universally within the empire but also spread to other parts of the world. It reached the Uighur regions in 1280, Persia in 1294, and was introduced to many other nations in the following centuries. Paper currency arrived at Korea in 1296 and was used for circulation there in 1332. The Japanese first issued the do cho\(^6\) (paper of copper coins) in 1332, the Vietnamese printed paper money in 1396, but the use of bank notes was not begun in Western countries until the later part of the 17th century.\(^15\) It is probable that certain European systems of banking and accounting, as well as vouchers for deposited money, were also influenced by Chinese examples obtained by merchants and travellers to China.\(^16\)

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\(^2\) Both are printed with Chinese characters of the Chih-Yuan reign (+1264–94), denomination, and issuing agency with seal impressions in Mongolian in red colour; see a report of the Shanyang Museum in KKWW, 1980 (no. 3), pp. 70 ff.

\(^3\) Paper money was first issued in Sweden in 1661; America, 1690; France, 1700; Russia, 1768; England, 1797; and Germany, 1806.

\(^4\) See Hsien-Shun Lin-An (1890 ed.), ch. 9, p. 8a; Meng Liang Lu (TSHCC), p. 77.

\(^5\) A kind of ‘exchange certificate’ called chiao yin issued by a special government bureau for salt, tea, and certain other commodities; it was handled by the appropriate merchants, could be exchanged for cash, and was transferable and redeemable in the provinces where the commodities were produced. In the Southern Sung, certificates issued by the Chiao Yin Khu were made of special paper and were printed in the Treasury, which was located in the capital, Lin-an, and supervised by an assistant of the bureau.

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Paper currency was a subject of great interest described by many early European writers, who were impressed by its ingenuity as a substitute for heavy and valuable media of exchange. The most detailed observation was made by Marco Polo: 'The Khan causes every year to be made such a vast quantity of this money, which costs him nothing, that it must equal in amount all the treasure in the world.' He further remarked:

All these pieces of paper are issued with as much solemnity and authority as if they were of pure gold or silver; and on every piece a variety of officials, whose duty it is, have to write their names and to put their seals. And when all is duly prepared, the chief officer deputed by the Khan smears the Seal entrusted to him with vermilion, and impresses it on the paper, so that the form of the Seal remains printed upon it in red; the Money is then authentic. Anyone forging it would be punished with death.

The Mongols certainly used paper money most effectively and circulated it on a vast scale in a broad area, but its name and issuance changed frequently within a short period. The Ming government, on the other hand, had a less effective operation but issued only one kind of note during the entire dynasty. In 1375, a new note called 'Precious note of Great Ming' (Ta Ming pao chhao) was issued, with the Hung-wu reign title printed on the note without further change. From the very beginning, the Ming note was inconvertible; but copper coins circulated along with the paper money. Throughout some 200 years this note was the only paper money in circulation, but as it gradually lost value, silver became the major medium of exchange, and the circulation of paper money was almost suspended after the end of the 15th century. Along with paper notes, exchange certificates for tea, salt, and other commodities were also issued during the Ming. Paper needed for such certificates was requisitioned from various producing provinces.

The revival of paper currency was attempted at the end of Ming, but it failed, apparently because of inflation. However, a memorial by a Ming official in +1643 enumerated its many advantages. It could be manufactured at low cost, circulated widely, carried with ease, and kept in concealment; it was not liable to suffer impurity like silver, did not need weighing whenever it was used in transactions, it could not be clipped, was not exposed to thieves' rapacity and, finally, saved metals for other uses. It appears, however, that the levy of some two million catties of mulberry bark for manufacture of paper money in +1644 almost provoked the peasants into rebellion.

The Manchu rulers preferred to use hard money and did not issue any paper currency on a large scale, except as an emergency measure. However, printed paper documents for commercial transactions were frequent (Fig. 1081), and in

* Tr. Yuile (1), vol. 1, p. 474.
* See Ta Ming Hui Tien (1589 ed.), ch. 155, pp. 43-45.
* See Ming Chi Pui Loo (KHP), ch. 19, pp. 15-16.
* See Ni Wen-Chung Kung Nian Piu (TSHCC), p. 60; Jih Chih Lu (TSHCC), ch. 4, p. 103.
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+1853, the military cost of suppressing the Thai-phing rebellion resulted in the issue by the Chhing government of paper notes called 'Official Note' (kuan chhao) and 'Precious Note' (pao chhao). Since these were not convertible, their value dropped rapidly and the notes ceased to be used after a short period. It was not until the later part of the 19th century that a Chinese bank issued a new bank note, which was inspired primarily by Western influence.

(3) Ceremonial Uses of Paper

Paper has played a significant part in many Chinese ceremonies and festivities in connection with ancestor worship, folk religion and, to some extent, the cult of scholarship. Ordinary or specially made papers were cut, folded, or decorated to represent various objects to be used or to be burned on such occasions as family ceremonies and state sacrifices. This symbolic use of paper served as an economical substitute for real but expensive objects. The objects most commonly substituted for were money, garments, utensils, vehicles, servants, animals, and buildings; they were used at funerals, festivals, and in ancestor worship. Effigies of paper were made and burned as a symbol of offerings to the spirits in the other world.

The original ceremonial use of paper was probably in substitution for metallic coins at a burial. In ancient times, rich deposits of treasures as well as human and animal sacrifices were buried with the dead, though by the time of the Han dynasty, metal coins were placed in tombs as a substitute for the valuable treasures and living beings. Later, for economic or other reasons, among them the discouragement of grave robberies, paper imitations for money and real objects were used.

The paper money for the spirits consisted of imitations either of metal coins or of real paper money, but the latter had different sets of inscriptions and patterns to distinguish it from counterfeit money. Coins were usually imitated by a sheet of plain paper with designs of coins cut into it, or a small sheet of paper coated with tinfoil, folded in the form of silver or gold ingots. This was sometimes dyed yellow with a liquid from seaweed, or from the flower of the pagoda tree (sophora japonica). The plain tin symbolised silver and the yellow represented gold. This is similar to what is described in a 7th-century Buddhist work, which says: 'When sacrifice is offered by people, the ghosts will get silver coins if we cut the coins from white paper, and gold coins if we use yellow paper.' The custom of burning paper money seems to have begun with imitations of metal money; only at a later date, when real paper money was in circulation, was mock paper money used with imitation coins in making offerings (Fig. 1082). Nevertheless, offerings of paper money for the spirits existed, apparently, before real paper money was adopted in the early 9th century. An artifact of paper cut into a continuous string of cash has been found in an early Thang tomb dated +667 in Sinkiang (see Fig. 1086f), while the Thang scholar-official Feng Yen (+725–905) said: 'In the past silk was buried and now the paper money is burnt. This shows people do not understand what the spirits really need.'

Fig. 1082. Printed messages on paper bag containing ghost money for one’s ancestors with prayers on four sides, address above, and a treasure pot at the lower centre. Dard Hunter Paper Museum.
The burning of paper money was formally introduced to the imperial sacrifice in +738 by Wang Yü, who served as Commissioner of Imperial Sacrifices and Associate Censor, and was in charge of sacrifice at the ancestral temple. The adoption of this practice for state sacrifices was a subject of controversy among many officials and scholars at the time and thereafter. Some of them condemned it as absurd and others were in favour of the use of paper money as a substitute for actual silver and copper coins. This not only made the tombs less attractive to grave robbers, but also kept the actual money in circulation.

In the Sung dynasty, a minister named Liao Yung-Chung (c. 1101–25) memorialised the emperor to abolish the burning of paper money. He considered such vulgarised tradition an absurd delusion and an insult to the spirits. And in commenting on the family sacrifice, the noted philosopher Chu Hsi (1130–1200) said that the Rituals of the T'ang recorded that certain officials did not originally burn paper money as offerings to their ancestors, and this practice was followed by the gentry (i kuan, literally, clothes and caps). At the beginning of our dynasty, it was said, those who studied the rituals misunderstood the passage and used paper clothes and caps instead of paper money in the sacrifice. Whether the burning of paper objects other than money was the result of misreading the ritual is not certain, but Chu Hsi's statement here seems to tell us that the burning of paper money was practised in Thang, and of paper replicas of other objects was introduced early in the Sung dynasty. Since paper clothing and paper caps are known to have been worn by men at this time, it would have been natural to offer them to the spirits in lieu of silk or other textile materials (Fig. 1089). Even though the intention of the offerings was questioned by many scholars, the use of paper replicas for funeral objects was still customary in sacrifice for many centuries after that.

Meng Yuan-Lao (fl. 1126–47) recalled that paper money and paper objects were offered to spirits during various festivals in the Northern Sung capital, Kaifeng. He said that in the spring festival, shops selling replica paper used paper to make pavilions and buildings on the street. He also claimed that on the fifteenth day of the seventh month, during the All Souls Festival (chung yuan), numerous paper offerings such as boots and shoes, head-dresses, hats, belts with decorations, and colourful garments, as well as Buddhist Maudgalyāyana sutras (mu lien ching), were sold in the market. A bamboo tripod was made, about three to five feet high, with a basin on top. This was called yia lan phen; in it paper clothes and paper money were burned as offerings to needy spirits. This was probably one of the reasons why many Confucian scholars objected to the burning of paper substitutes to their ancestors, because such offerings had some association with Buddhist ceremonies.

The burning of paper effigies in connection with cremation of the dead was witnessed by Marco Polo:

They take representations of things cut out of cotton-paper, such as caparisoned horses, male and female servants, camels, Armour, suits of cloth of gold (and money), in great quantities, and these things they put on the fire along with the corpse, so that they are all burnt with it. And they tell you that the dead man shall have all these slaves and animals of which the effigies are burnt, alive in flesh and blood, and the money in gold, at his disposal in the next world.

The paper used for spirits, generally known as huo chi (burnt-offering paper), was made of bamboo, the fibres of which were cooked and strained with a solution of ashes and washed with water. The process was generally the same as in making other paper, except that they were not baked dry but dried in the sun. The Ming writer Sung Ying-Hsing says:

* See Chu Thang Shu (ESSS/TW), ch. 140, pp. 1-3.  
* For the use of paper clothes and paper caps, see discussion on pp. 109 ff. below.  
* Yang Ching Meng Hua Lu (TSHNC), pp. 146, 161-4.  
* Yia lan phen is apparently a transliteration from the Sanskrit allakane and refers to a Buddhist ceremony concerning Buddha and the hungry mother of his disciple Maudgalyāyana; cf. Bodde (13, ch. 15), pp. 61-4.

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Fig. 1089. Paper robe for offering to spirits at a funeral, +10th century. From Ecke (2).
During the high Thang period, sacrifices to ghosts and spirits were frequent and paper money was used to substitute for burning silk fabrics, thus the particular kind of paper called hou-chih was made. According to recent custom in Hupei and Hunan, as much as 1000 catties of this paper was burnt for spirits on one single occasion. Actually, about seventy per cent of this kind of paper that is produced is used for burnt offerings, and thirty per cent for daily use.

During the early part of this century, the manufacture of such ceremonial paper constituted a large portion of the handmade paper industry in China, while the tradition of burning paper to communicate with the spirits is probably still practised in certain parts of China and the Chinese communities overseas. Indeed, the manufacture of the paper replicas has become a special handcraft by which almost every kind of object can be exactly and finely imitated.

Paper printed or painted with colourful images of folk gods or national heroes has played a prominent part in many Chinese households and shops. The pictures of these gods which might be hung or pasted on walls or doors of a house were used primarily for worship or for protection from evil spirits. Included among them were images of the gods of the kitchen, doors, and gates, which were among the five household spirits to be worshipped. The picture of the kitchen god was hung on a kitchen wall and was sacrificed to with confectionary and paper money on the twenty-third day of the twelfth month each year. After the sacrifice, the picture was burnt to send the god to heaven. Then, on the New Year’s eve, he was invited back and a new picture was put up.

The most common household pictures represented the gate gods. These were pasted on both sides of the double gate at the entrance of the house. The figures were supposed to represent two military generals of the Thang dynasty, Chhin Chhiung and Wei-Chihh Ching-Te, who wear armour and helmet and hold weapons (Fig. 1084). Other figures chosen for human satisfaction, such as the god of longevity, the god of wealth, and sometimes three gods standing together for happiness, prosperity, and longevity, were also painted or printed on paper to be pasted on walls or hung in the house.

Many other gods or national heroes were worshipped in shops or handicraft factories in honour of their contribution to the profession. Thus, the drinking poet Li Po became the saint of wine shops; the legendary butcher Chang Fei was worshipped in meat shops; the hero of the Three Kingdoms, Kuan Yu, the god of war who warded off calamities, was the most popular tutelary god in many houses.

The most interesting god for our discussion here is Tshai Lun, the supposed inventor of paper, who has become the patron saint of the profession of papermaking and has been worshipped by papermakers and others since his own day. Legends related that a stone mortar used by Tshai Lun for papermaking still exists beside a pool near his home in Lei-Yang (in modern Hunan), where numerous people made papermaking their profession. Temples to him were built in his home town as well as in Lung-Thing (in modern Yang-hsien, Shensi), where he was buried and received the honorific title Marquis of Lung-Thing, as well as other papermaking centres as in Chchengtu. His image painted or printed on paper was hung on the walls of many paper mills and paper shops in both China and Japan. A typical example is a block-print of Tshai Lun’s image, dated to the 18th century (Fig. 1085). The picture, printed in six colours (green, red, yellow, pink, mauve, black), shows the hero sitting in the centre. In his hand he holds a ju-i, a sword-like weapon (Fig. 1084). Door guards on paper printed in colour, depicting two Thang military generals, Chhin Chhiung and Wei-Chihh Ching-Te, with armour and weapons, 19th century. Field Museum of Natural History.
Fig. 1085. Paper image of Tshai Lun as patron saint of papermaking, c. 17th century. Picture printed in five colours with inscription at top, reading 'Patron Saint Tshai Lun'. Tshai with a black beard holding a jade is surrounded by four attendants with brushes and writing tools before him as well as a pig and a chicken for sacrifice. Legend says these two animals were the first to separate the wet paper sheets with their snout or beak. From Tschichold (2).

While the worship of gods drawn on paper was primarily under Buddhist influence, the Taoists for their part multiplied their potent charms with messages of good luck, written or painted on paper smeared with cinnabar to invoke protection. Sometimes large charm seals were used to impress the message on clay and later on paper with red ink to indicate authority. It seems that paper was also used by Taoists as a symbol of their magic power.

Confucians also paid respect to paper on which characters had been written. As Confucian scholars enjoyed high prestige in society, what they wrote represented the sacred words of sages, worthy of respect and preservation; thus every scrap of paper bearing written or printed characters was to be revered. The phrase ching hsi tzu chih (revered spare paper bearing characters) became a pious motto in Chinese society, where written paper was supposed to be trampled upon or put to any indelible use. We do not know how early this tradition developed, though it was undoubtedly suggested by Confucian scholars themselves to enhance their prestige, but one early reference was made in the +6th century. Then the noted scholar Yen Chih-Thui (+530-91) wrote in his family instructions that 'paper on which there are quotations or commentaries from the Five Classics or the names of sages should not be used for toilet purposes.' The same tradition was also held in Chinese society by Buddhists, who taught that rewards will be given to those who care for and respect paper with sacred messages on it.

In order to dispose of the written characters reverently, brick furnaces were built at street corners or in courtyards of temples, where scraps of written paper could be collected and placed for burning. The ashes were kept in jars and finally deposited in a river. Similar instructions were given on roads leading to sacred mountains. This practice may have been a way to avoid having litter lying about, but there is no doubt that it also had a definite connection with Confucianism and the cult of scholarship.

(4) Paper Clothing and Furnishing

Paper is mentioned in Chinese literature as having been used for various kinds of garments, bed furnishings, and other household articles in place of woven fabric, but whether these items were all made of true paper or bark cloth is uncertain.

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4. Cf. Hunter (9) pp. 78-9; for illustration of a +15th-century furnace for burning papers with characters on them, see Hunter (1), p. 213.
5. The craft of making tapa, a beaten bark paper, was almost universal throughout the Pacific, but it was used only for clothing and not normally for writing; see Hunter (9), pp. 47-47; cf. above, pp. 37, 56.
Early Chinese records reveal the existence of a material made of bark, known as *tha pu* or *ku pu*, which may have some affinity with *tapa*. Since *tapa* was made from a variety of paper-mulberry bark by a process of beating and was used for clothing, it has been called bark cloth instead of paper. The Chinese terms *tha pu* which may mean 'beaten cloth', and *ku pu*, 'paper-mulberry cloth', very probably referred to a sort of bark cloth or *tapa*.

The earliest reference to this material is found in the *Shih Chi*, in which Su-ma Chhien (c. -145 to -86) mentioned that a merchant in the town managed in a year to sell 'a thousand piculs of *tha pu*'. The same material, called *ku pu*, appears in several other sources as early as the +3rd century. Lu Chi (+3rd cent.) said that people south of the Yangtze River used the bark of *ku* (paper-mulberry) to make cloth and also pounded it to make paper, called *ku phi ehih* (paper-mulberry bark paper). Apparently, the inner bark of paper-mulberry can be prepared in different ways and used for different purposes. Since all these items for wearing and bedding are described in Chinese records as made of *ehih* (paper), we may assume that they were made of bark paper.

There are in Han literature several references to the use of paper-mulberry for hats and headaddress. Han Ying of the -3rd century mentioned that a disciple of Confucius named Yüan Hsien (-6th century) of the Lu State wore a paper-mulberry hat (*chhu kuan*), which may not, of course, have been of true paper, and in the Later Han, it was fashionable for men to wear headbands called *haiio-thou* or *chhiao-thou*, made of paper-mulberry bark in red or other colours. During the Thang and Sung dynasties, paper-mulberry hats were worn by Taoist priests and were fashionable among scholars and poets; indeed a poem titled 'Taoist Fashion' by Wang Yü-Chheng (+954-1001) says: 'Paper-mulberry hat, serge coat, and black gauze kerchief', and Lu Yu (+1125-1210) mentions in his poems that he has newly had made two paper-mulberry hats, 'emphatically imitating the Taoist fashion'. Many other poems testify to this Taoist habit of wearing of paper-mulberry hats at this time, while several hats of stiff paper covered with plain black silk were found in a Thang tomb in modern Sinkiang. Another hat, a paper belt, and a paper shoe dated +418, made of hemp fibre, yellowish and thick with a textile pattern, were among the objects recently discovered at Turfan (Fig. 1086).

Paper was also widely used as lining in cloth shoes.

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* Shih Chi (ESSS/TW), ch. 129, p. 155. Earlier commentators called the *pu* a coarse or foreign cloth; B. Watson (1), p. 404, translates the term as 'fabric made of vegetable fiber'; Ling Shun-Sheng (7), p. 30, calls it 'bark cloth'; see also detailed discussion in Pelliot (47), 1, pp. 445-7.
* See Han Shih Wai Chuan (SPTK), p. 4.
* See Han Han Shu (ESSS/TW), ch. 71, p. 324; ch. 73, p. 72.
* See Hsiao Chi Chih (SPTK), ch. 8, p. 22.
* See Chien Nan Chi (SPTK), ch. 37, p. 2.
* See Stein (2), iv, pl. XCVI.

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Fig. 1086. Paper articles of the Thang dynasty found in Sinkiang. (a, b, c) Paper hat or crown; (d) Paper shoe; (e) Paper coffin; (f) Paper money for spirits; and (g) Rolled paper flag with black stripes. (a, d, f, g) from Stein (2), (b, e) from the Institute of History of Science, Academia Sinica, Peking.
The most common paper apparel included the paper clothing (chih'1 or chih ao2), used as early as the Han dynasty. The History of the Later Han Dynasty reports that the native tribes at Wu-ling (in modern Hunan) made bark into cloth and dyed it with grass seeds, such bark cloth being a local product presented to the court as a tribute by the non-Chinese tribes who lived in the south and southwest regions of the empire. P'ai Yi'an3 (+3rd century), author of the Kuang Chou Chi, and Thao Hung-Ching5 (+456-540), a noted physician, also mentioned that the bark of paper-mulberry was used by the people in Wu-ling for clothing which was very durable and fine. In the Ta-Li period (+766-79) of the Thang dynasty, a Zen Buddhist monk wore no silk or fabric other than paper and was called Zen Master of Paper Cloth, while testimony by many poets of the Sung dynasty indicates that paper clothing was worn not only in summer but during all seasons by poor people as well as by Buddhists.8

One Sung writer, Su I-Chien6 (+933-96), said that those who lived in the mountains (i.e. Buddhist and Taoist priests) often wore paper clothing, probably because of the Buddhist tradition against wearing silk. The clothing was very warm but, he claimed, was bad for the health because it did not allow circulation of air. His description of its manufacture describes how the material was boiled with one ounce of walnut and frankincense (gum bibanum) for every 100 sheets, or steamed with an occasional sprinkling of frankincense or other liquid. When cooked and ready to be dried, it was rolled up horizontally on a stick, and then pressed vertically into wrinkles, apparently to give it some elasticity to prevent it being easily broken. Su also said that in his time some people of the I and Hsi districts (in modern Anhwei) made sheets of clothing paper as large as the size of one door of the main gates, and that this had been worn by many scholar-officials during their travels as a protection against the cold. Marco Polo remarked that 'they manufacture stuffs of the bark of certain trees which form very fine summer clothing.'9 No specimen of old paper clothes is known to have survived in China, but many are in Japan (Fig. 1087).

Personal outfits and household articles were also made of paper, and paper furnishings, including screens, curtains, bed-nets, and blankets, were frequently mentioned in Thang and Sung poems as well as in other writings. Su I-Chien mentioned that Yang Hsi7 (+2nd century), who set an example of thrift to his subordinates, used paper curtains (chih wei8) and cloth blankets when he was prefect of Nan-yang (in modern Honan). And in a poem written in +1085, the noted poet Su Shih9 (+1036 to +1101) said that an old monk of Chin-shan enjoyed the warmth of a paper curtain when he was on board a ship travelling on the Yangtze River between the Chin and Chiao mountains. A Ming author, Thu Lung10 (+1542-1605), related that 'paper bed-curtains (chih chang2) are made by fastening rattan skin and cocoons paper on wooden sticks and tightening them with a string. The paper is wrinkled and then sewn together with thread without the use of paste. The curtain top is made of loosely woven cloth instead of paper for ventilation. The curtains may be painted with plum blossoms or butterflies, appearing extremely elegant and delightful.'12 Generally, paper curtains were used for warmth in winter and to keep out mosquitoes in summer.
Paper blankets (chih pei) and paper mattresses (chih ju) were used primarily by Buddhist and Taoist monks, as well as by some scholars, to keep them warm in winter. Apparently they were cheap but not common, for acknowledgment of gifts of paper blankets is occasionally found in literature. Thus, the monk Hui-Hung of the Northern Sung dynasty wrote a poem to acknowledge the gift of a paper blanket from the Zen master Yu-Chih, describing it as white as snow, soft as cotton, and better than a blanket made of exquisite white cloth (po tiah) or one of purple fox felt (tsa jung chan).

In thanking the philosopher Chu Hsi for a gift of a paper blanket, the poet Lu Yu (+1125-1210) wrote:

'I passed the day of snow by covering me with a paper blanket. It is whiter than fox fur and softer than cotton. He enjoyed its warmth and softness, and on several occasions said he had slept comfortably and soundly under a paper blanket. Both blankets and mattresses are said to have been produced in Fukien, Yunnan, as well as many other localities.

A defensive covering made of paper, known as chih chia or chih khai, was used to protect the body and arms in battle. It was light, convenient, and especially suitable for foot soldiers in the south, where the terrain prevented the use of such heavy armour as was normally worn by soldiers on horseback or on ships. Since paper armour is not mentioned among the thirteen kinds of armour listed in the Thang administrative codes, Thang Liu Tien, compiled in +722-78, it is believed that its use began after this time. It was probably adopted from the late Thang dynasty, for when Hsi Shang (fl. +847-94) was appointed governor of Ho-tung (in modern Shanxi), he organised and kept an expeditionary army of one thousand troops in a state of readiness; they were clothed with pleated paper armour which could not be pierced by strong arrows. Later, when Li Thao (d. +698), a captain in the imperial army of the Sung dynasty, attacked the city of Ho-tung, he found the defenders were dressed in yellow paper armour, which appeared white in the light of bright flames. While paper armour was primarily for foot soldiers, it was also used by the navy, and Hung Kua (+1117-84), a commissioner of military affairs, mentioned in a memorial on the annunciation of pirates, that no less than 110 sets of paper armour were found alongside the weapons in two ships surrendered by the enemy.

In another memorial, Chen Te-Hsiu (+1178-1235), a magistrate of Chhiian-chou, said that weapons at his fort were sufficient for the defence of the coast, except that fifty sets of paper armour were needed for his navy, for which he would exchange one half of the 100 sets of iron armour in his possession.

Armour is the basic equipment of soldiers, with which they are able to endure without suffering defeat before sharp weapons. The terrain in the south is dangerous and low, and where foot soldiers are generally employed they cannot take heavy loads on their backs when travelling swiftly. If the ground is wet or there is rain, iron armour easily rusts and becomes useless. Japanese pirates and local bandits frequently employ guns and firearms, and even though armour made of rattan or of horn may be used, the bullets can nevertheless pierce it. Moreover, it is heavy and cannot be worn for too long. The best choice for foot soldiers is paper armour, mixed with a variety of silk and cloth. If both paper and cloth are thin, even arrows can pierce them, not to say bullets; the armour should, therefore, be lined with cotton, one inch thick, fully pleated, at knee length. It would be inconvenient to use in muddy fields if too long and cannot cover the body if too short. Heavy armour can only be used on ships, since there soldiers do not walk on muddy fields. But since the enemy can reach the object with bullets, it could not be defended without the use of heavy armour.

Fig. 1088. Paper armour of the Ming dynasty, c. +17th century. (a) Paper body outfit. (b) Paper arm guard.

However, the best description and illustration of paper armour (Fig. 1088) are found in the Ming work recording armaments, written in 1621 by Mao Yuan-I (d. 1629), in which he says:
The same work says that for the protection of arms and hands a paper arm-and-hand cover (chih pei shou) was also used. Each pair of these covers used four layers of cloth of a certain length on both outer and inner sides, plus a certain amount of cotton, cocoon paper, and silk thread. The paper armour was similar to the iron armour made in the north, but was flexible and convenient, light and ingenious. A whole sleeve was generally made, thicker in the upper part and thinner in the lower, with a very thin place in the middle to facilitate movement of the elbow joint.\(^a\) Paper armour continued to be used by some of the native tribes in Yunnan, Kweichow, and Kwangsi as late as in the Chhing dynasty.\(^b\)

(5) Wallpaper and Household Use of Paper

It is generally believed that wallpaper was first brought from China to Europe by French missionaries in the 16th century, then later from Canton by Dutch, English, and French traders, and that it was imitated in Europe in the 17th century.\(^c\) Certainly, the colourful papers from China with hand-painted designs of flowers and birds, landscapes, and scenes of domestic life were especially fashionable in Europe from the 17th to the 19th century (Fig. 1089). It was introduced to America in 1735 and manufactured there some fifty years later. Before the use around the middle of the 19th century of machinery for printing wallpaper, it was all made according to Chinese fashion in small sheets with unit designs printed successively either by stencils or by woodblocks to give a continuous pattern. As Laufer says: ‘We owe to China in particular also our paper-hangings or wallpaper.’\(^d\)

The earliest mention of Chinese wallpaper was a reference in 1693 in England to Queen Mary’s Chinese and Indian cabinets, screens, and hangings, the last of which is believed to refer to Chinese painted papers.\(^e\) Then, in about 1772, John Macky described the Palace of Wanstead as ‘finely adorned with China paper [showing] the figures of men, women, birds and flowers the liveliest [the author] ever saw come from that country’. Some of these papers were so accurately drawn that ‘a man need go no further to study the Chinese than the Chinese paper. Some of the plants which are common in China and Java as bamboo, are better figured there in the best botanical authors that I have seen.’\(^f\) Even in this century, the Chinese hand-painted wallpapers are still considered the most excellent and beautiful of all, and a leading British architect has said: ‘No experience could be more delightful than to waken in a bedroom hung with “painted paper of Pekin”.’\(^g\)

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\(^a\) 柯菲時, ch. 105, p. 194\(^a\)
\(^b\) See Kuang-Hsi Thung Chih (1801 ed.), ch. 278, p. 22\(^b\)
\(^c\) See Ackerman (1), pp. 11-20; Entwisle (1), pp. 43-8; Sanborn (1), pp. 14-20; for a chronological development of the art, see Entwisle (2), pp. 11 ff.
\(^d\) Cf. Laufer (48), p. 19.
\(^e\) Cf. Entwisle (1), pp. 24, 45-4.
\(^f\) C. Entwisle (1), pp. 44, 45-4.
\(^g\) See Sitwell (1), p. 196.
The history of wallpaper in China is not as clear as that in Europe or America. All writings about wallpaper by Western authors indicate that it originated in China, but no clear trace can be found in Chinese sources earlier than the 17th century. Both wallpaper historians and sinologists agree that the so-called 'flock paper' made by a French printer in Rouen in 1630 and by the English at about the same time, was inspired by coloured papers imported from China. Some accounts from later European visitors mention the use of wallpaper in North China from the beginning of the 17th century, when the Ching emperors, especially Khang-Hsi (r. 1662-1722), showed a great deal of interest in developing the decorative arts, including wallpaper. Certainly, many Chinese wallpaper designs were similar to the patterns of the Chinese porcelain that came to Europe, perhaps made by the same group of artist craftsmen who specialised in this style primarily for the foreign trade, and later on, unit patterns (Fig. 1090) were used to print decorative designs continuously on one large sheet of paper (Fig. 1091).

* See quotations on wall paintings in Thu Shu Oi Chheng (Thpei, 1964), ch. 98, p. 56; 80; painting on ceilings and walls in a Ming house of a Wu family was recently recovered in Hui-chou (modern Hsiu-nIng, Anhui); cf. Chang Chung-I (1), p. 39, figs. 75-80.

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Fig. 1090. Carved block with unit design for printing wallpaper. Dard Hunter Paper Museum.

Fig. 1091. Printed wallpaper in continuous pattern of design made with unit block. Dard Hunter Paper Museum.
not liked by people of good taste. Wen Cheng-Heng1 (1585–1645), a noted
tandscape artist and calligrapher, said: 'Small rooms should not be partitioned in
the middle', and 'Walls should not be pasted with paper': his opinion was that
neither painting nor writing directly on them could be compared with plain walls.2
Li Yu3 (1611–80), another noted author and the owner of the Mustard Seed
Garden, opposed the use of white paper for covering walls. He suggested that
brown paper might be used as a basic wall covering, and then green writing paper
frames but were later pasted on walls instead of being hung.3 The origin of wallpaper may possibly
be traced to such Chinese decoration of walls with hanging scrolls of various
subjects, such as landscapes or flowers and birds. Indeed, what the early mis-
sionaries brought to Europe may have been such pictures, which were at first in
frames but were later pasted on walls instead of being hung. One early European
reference to applying wallpaper says that the old method was to fasten a wooden
framework over the surface of the bare walls; this was fixed to wooden wedges
driven into the brick or stone, thus leaving an air space between. On these frames
canvas was stretched, and on the canvas the wallpapers were fixed, and it is for
this reason that, in many cases, it has been possible to remove them.4 These wallpapers
may have been hanging scrolls of paintings such as were often used to decorate
Chinese houses.

The paper screen used as a movable partition of the room has been a very
important item for interior decoration in Chinese houses since Thang times. There
were two major forms of such screens, folding and stiff, both of which were
originally made of wooden board and painted sometimes on lacquered surfaces.
When paper became popular, the wooden panels were replaced with paper and
decorated with calligraphy, the screens thus made known as shu ping5 (calligraphy
screen) or, with painting, hua ping6 (painting screen). Panels with works by
celebrated artists are said to have been extremely expensive; a Thang work
mentions that a single panel of a folding screen cost as much as 15,000: One
Paper used to cover windows in the imperial palaces was detailed in the
administrative codes of the Ching government from the beginning of the
dynasty.4 It was specified that tributary paper sent from Korea be used for the
windows of four palaces (Thai-ho, Pao-ho, Chung-ho, and Wen-hua) every year,
and that yellow silk fabric be used to mend the seams every two years. Requisitions
of paper for the windows and lanterns of the imperial altars and temples were made

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1. See Chiang Wu Chih (MSTS), p. 5. This information was supplied by Dr Hsia Nai, Director of the Institute of
3. Ibid. p. 2538; cf. also tr. by van Gulik (9), pp. 258–9.
4. See discussion in Chhien Chhuang Chih (THHC), ch. 2, p. 81.
5. See Ishida Mosaku & Wada Gunishi (1) (ed.), Shiho: an Eighth Century Treasure House (Tokyo, 1954), vol. 1,
Northern Section, pp. xvi, 36. Room partitions with paper screens have been popularly used in Japanese and
Korean houses.
6. See Chiang Wu Chih (MSTS), p. 5. This information was supplied by Dr Hsia Nai, Director of the Institute of
made of bamboo fibres mixed with rice straw. During modern times the same raw materials have been used and wrapping paper makes up more than twenty per cent of the total production.

The use of paper for toilet purposes must have been practised no later than the +6th century. Although Chinese sources are generally silent about the use of paper for cleaning the body after elimination, one reference dated as early as the +6th century refers to the prohibition of paper with characters being used for such purposes. Indeed, the noted scholar-official Yen Chih-Thui (+531–91) said in his family instructions, written about +589, 'Paper on which there are quotations or comments from Five Classics or the names of sages, I dare not use for toilet purposes,' and an early Arab traveller to China, who was obliged by his religion to perform purifying ablutions, commented curiously upon this use of paper. In his report of +851, he says: 'They (the Chinese) are not careful about cleanliness, and they do not wash themselves with water when they have done their necessities; but they only wipe themselves with paper.'

Toilet paper (tshao chih) was made from rice straw, the fibres of which are tende and required less time and labour to process; it thus cost less than any other kind of paper. Great quantities of such paper were needed for daily use, and for the imperial court alone, it was specified in +1393 that the Bureau of Imperial Supplies (Pao Chhao Su) manufactured 720,000 sheets, two by three feet in size, for the general use of the court and 15,000 sheets, three inches square, light yellow, thick but soft, and perfumed, for special supply to the imperial family. The quantity manufactured every year was so great that the refuse of straw and lime which accumulated in the imperial factory formed a mound that was called Elephant Mountain (Hsiang Shan).

Even early in this century, the annual production of paper for toilet use in Chekiang alone amounted to ten million packages of 1000 to 10,000 sheets each.

(6) Papercraft and Recreational Use of Paper

Paper has great potential as a creative material for recreational purposes. It may be cut into designs to be pasted on windows, doors, lamps, and other surfaces, and on clothing and shoes in place of embroidery. It may be folded into flat or three-dimensional forms for art or entertainment; and making paper flowers by folding, cutting, and pasting is a popular amusement. Because of its lightness, paper is also especially suitable for making kites. Numerous articles for popular use were origi-
PAPER AND PRINTING

nally made of far expensive materials such as silk, leather, horn, or ivory, but later these were replaced with paper. Sturdy paper or papier-maché was also substituted for many more expensive materials for games, toys, and other objects for enjoyment. Paper was used in China for some of these purposes as early as the +3rd or 4th century, and for all of them by the +6th or 7th.

Cutting paper into various designs with scissors and knives, for making decorations at festivals or on other occasions, is a folk art of China with a history of many centuries. It probably derives from the custom of cutting out human figures, flowers, or landscapes in silk at the spring festival. Tsung Lin (+6th century) says: "On the seventh day of the first moon, which is called the man's day, seven kinds of vegetables are used for soup, and sheets of silk or gold foil are cut into human figures to paste on screens or hang in women's hair at the sides." It has been said that this custom derived from Madame Li, wife of Chi a Chhung (+217-82) of the Chin dynasty (+265-420). A similar custom of cutting paper into small banners, butterflies, or pieces of money, to place on women's heads or on flowers at the beginning of spring, was popular in the Thang, and a beautiful geometric design cut out of a round sheet of paper, from the +5th or +6th century, was recently found in Sinkiang (Fig. 1093a). Again, silhouettes of shrines cut out of buff paper and pasted on a blackened sheet, and several artificial flowers made of paper cut into various shapes to form the petals, etc., were found in Tunhuang, while the noted poet Tu Fu mentioned in one of his poems: "Cutting paper to summon my souls." These, then, are some of the earliest examples of, or references to, paper-cutting known to us today. Many stories concern the skill of artists in paper-cutting and the excellence of their work. The Sung scholar Chou Mi (+1232-98) mentioned several paper-cutters who cut paper with scissors into a great variety of designs and characters in different styles, and a young man who could even cut characters and flowers inside his sleeve. But though most of the stories tell of male artists, many of the cutters were women who did this in their leisure time on farms.

The subjects of paper-cutting included scenes from farm life: tilling land, weaving, fishing (Fig. 1093d), or tending cattle; symbols of good luck or blessings; legendary stories and theatrical figures; and flowers and plants, birds and animals. The design might be one independent picture, a symmetrical pair, or multiple sets of from four to as many as twenty-four. If to be used in corners, a set of four triangular designs was usually made; and for a ceiling a multiple design round in shape was used. Unlike paintings, the composition of paper cuts was generally symmetrical, well balanced, with intricate designs covering an entire space; they had a strong local flavour.

The process of cutting paper involved several steps. A master design was first cut and fastened over a piece of white paper upon a wooden board. The paper was then moistened with water and blackened with smoke, and when the master design was taken off, a white design appeared on the paper against a black background. A pile of sheets of white paper was then laid under the design, and fastened with paper thread at the corners and the centre before cutting. For symmetrical designs, the paper was folded and cut with scissors to duplicate the design, but only a few sheets
can be cut in this way at a time. Independent designs were usually cut with a knife through as many as sixty or seventy sheets of paper at once. Lines could be cut out to make a positive impression, or left between cuts to make a negative impression, simple lines being cut with an ordinary blade, but delicate ones with a specially sharp, small, round knife. The inside lines were cut first and then the outside ones. After cutting was completed, the paper could be dyed with colours mixed with white wine or arsenic, with as many as forty sheets being coloured at a time. Multiple colours were applied separately, a fresh colour being added when the previous one had dried. For decoration of houses, red and multiple colours were usually used for auspicious occasions and blue for mourning.

A flat piece of paper can be folded into various shapes and forms such as figurines, animals, flowers, garments, furniture, buildings, and numerous other objects (Fig. 1094). Paper-folding (che-chih, origami) is probably one of the most interesting folk arts. It helps train nimble fingers, cultivates a sense of balance and symmetry, and can be used to provide visual illustrations to explain modern physics and geometry. Indeed, many mathematicians have demonstrated their scientific interest in paper-folding, especially in dealing with three-dimensional problems and to show the geometric construction of regular polygons and spheres.

Although paper-folding probably flourished in China for many centuries before it spread worldwide, there is no clear indication of how early it began. From all available evidence, its origin probably was not later than early in the Thang dynasty, for several artificial flowers of folded and cut paper have been found in Tunhuang (Fig. 1095), and they show highly sophisticated techniques in paper-craft. Today, paper-folding is one of the most popular crafts and pastimes for teaching children in classrooms, and among adults throughout the world; it is especially popular in Japan, Europe, and America, with extensive literature in different languages.

Flying paper kites (chihüan) is a somewhat athletic pastime enjoyed by children in spring and autumn. It was said that when their kites flew in the sky, children lifted their heads, opened their mouths, and breathed deeply, which was good for their health, and the ninth day of the ninth month of each year, or the 'double ninth' festival, was especially devoted to this amusement. The paper kite, consisting of a light bamboo frame covered with sturdy paper, and with a string attached, was made in the forms of butterflies, men, birds, or other animals, often in colour. Kites were, perhaps, originally made of light wood or silk before paper became common, and how early paper was used for making them is unknown. However, a story about sending a message to a rescue mission by flying a paper kite, in c. +549, indicates that it must have been earlier than this date.

Other Chinese literary sources frequently tell of the use of kites for measuring distances, testing the wind, lifting men, signalling, and communicating for military purposes. The earliest known reference to their use for amusement or pleasure tells of someone in a palace in the +10th century fastening a bamboo whistle to a kite, 

\[1\] Che-chih (origami) is mentioned in a poem by Tu Fu, but the original reference has been found to be a mistake. One poem by Tu Fu does mention 'paper-cutting' (chieh chih), but not 'paper-folding' (che-chih), see p. 124 ff. above.

\[2\] Stein (q), ll, p. 967; iv, pl. XCIII.

\[3\] Some 200 entries are included in Legman (1), pp. 3–8.

\[4\] Kai T Tshung Kuo (1750 ed.), ch. 40, p. 254.

\[5\] A. Ying (3), pp. 1–9.

\[6\] Dr. Shen, an expert in paper-folding, has provided much information on its worldwide popularity.

\[7\] Robinson (1), pp. 7–8. Dr. Shen is completely devoted to the use of folding in geometry; see also Cooper Union Museum, Plane Geometry and Fancy Figures: an Exhibition of Paper Folding (Philadelphia, 1959), introduction by Edward Kallop.

\[8\] Stein (q), ll, p. 967; iv, pl. XCIII.

\[9\] Some 200 entries are included in Legman (1), pp. 3–8.

\[10\] Kai T Tshung Kuo (1750 ed.), ch. 40, p. 254.

\[11\] Che-chih (origami) is mentioned in a poem by Tu Fu, but the original reference has been found to be a mistake. One poem by Tu Fu does mention 'paper-cutting' (chieh chih), but not 'paper-folding' (che-chih), see p. 124 ff. above.
so that it made a musical sound in the wind. From this the term for the aeolian harp 
(seng chong) was derived. Kite-flying diffused very early to all other nations of East 
and Southeast Asia, especially Korea, Japan, Indo-China, and Malaysia, and was 
sometimes associated with religious practices. It was introduced to Europe as a 
Chinese contrivance at the end of the 16th century.

Lanterns in China generally consisted of wooden or bamboo frames covered 
with a variety of such translucent materials as horn, silk, or skin, but those of paper 
are said to have been especially elegant and skilfully made. They were lighted with 
candles, and were hung indoors or outdoors as decorations, or carried as aids for 
walking at night. Especially interesting was the massive display of lanterns at the 
annual lantern festival around the fifteenth of the first moon each year (Fig. 1096), 
a festival which was not instituted until the Thang dynasty, although poems about 
lanterns were written in China as early as the 6th century.

How early paper was employed for lanterns is not clear, but it was certainly used 
in the Thang, for an account book of the time from a monastery and found at 
Khotan records that 'two sheets of white paper were bought, each sheet fifty cash, 
for mounting lanterns.' Chou Mi (+1232–98) said that in the Hsiao-Tsung period (+1163–1189) there was great variety of lanterns at the lantern festival in Hangchow, and that the best came from Soochow and Fuchow, while the latest 
fashions from Hsin-an were extremely extravagant. There were such varieties as 
‘boneless’ lanterns without skeletons, lanterns of fish-egg and pearl designs, 
lanterns of deernkin and of silk fabrics, and lanterns of coloured waxed paper with 
revolving figures on horseback, spun swiftly by the heat of a candle; some of the 
figures cut from paper by skilful ladies were especially graceful. In his memoirs, 
Meng Yuan-Lao (fl. +1126–47) recalls annual customs in the Northern Sung 
capital, Khai-feng, saying that several tens of thousands of lanterns in a great 
variety of forms were displayed along the main street. Long poles, installed in an 
area enclosed with a thorny fence, were wrapped with colourful silk. Numerous 
paper figures of dramatic personages were hung on the poles, moving in the wind 
like flying fairies.

A similar custom existed in the Ming dynasty, when the festival extended from 
two days before to five days after the fifteenth of the first moon. Starting on the 
thirteenth night, bamboo awnings erected from house to house were decorated 
with numerous lanterns hanging over the streets; those made of paper are said to 
have been especially attractive and well made.

Fans were frequently used in daily life as a shield against dust and the sun; they 
were first made of feathers but, later, silk, bamboo, ivory, bone, sandalwood, and

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32. PAPER AND PRINTING

Fig. 1096. Paper articles were sold by peddlers on the street. (a) Rubbing of calligraphic models to a young scholar. 
(b) Paper lanterns at the lantern festival on the 15th day of the first moon. (c) Paper umbrellas on the back of a 
pedlar. (d) Folded paper fans in the basket. Drawings by Chin Te-Yü, The Pien Hsun Lo Tsao (Pictures of Happy 
Occasions in a Peaceful World), printed by lithography in Shanghai, 1888.
palm leaves were all used. It is believed that paper fans first appeared in the
Western Chin. Later, when for economic reasons silk was banned for such purposes
by Emperor Hsiao-Wu (r. +373-97) and again by Emperor An (+397-418) of
the Eastern Chin period, this use of paper increased, and two scrolls of calligraphy
on fans by Wang Hsi-Chih (+321-79) and his son were among their writings in
the imperial collections. Fans were usually bestowed upon officials following
lectures at the imperial court, and Emperor Che-Tsung (r. +1086-1100) is said to
have been praised by his officials for his thrift because he used a fan made of paper.

Circular fans of paper were popular in the Sung dynasty. The folding fan made
of durable paper with various kinds of frames and designs was introduced to China
from Japan via Korea in the +11th century. Su Shih (+1036-1101) said that a
kind of white pine fan from Korea could be opened to over a foot and yet folded into
a space of only two fingers. Many poems were written on these folding fans by Sung
authors, and calligraphy and painting also adorned them. Emperor Chang-Tsung
(r. +1190-1200) of the Chin dynasty is known to have composed verses on folding
fans, but the practice was probably not popular until the 15th century when
Emperor Hsién-Tsung (r. +1465-88) wrote maxims on folding fans to bestow on
his subordinates. The practice was most common among the literati, and fans
decorated with calligraphy and painting became a form of art during the Ming and
Chhing dynasties (Fig. 1097). Small sheets of a special kind of strong, hard-sized
bark paper were used in the Ming dynasty for the manufacture of oiled-paper fans;
such fans usually bear no artistic decoration but were used by the common people
in summer (Fig. 1096d).

The same kind of oiled paper was also used for the manufacture of umbrellas
(Fig. 1096c) in the Ming dynasty. The origin of umbrellas derived from the use in
very ancient times of a chariot cover called kai. For protection against rain, a piece
of silk called san was spread above, but the use of paper umbrellas is believed to
have been introduced in the late +4th or early +5th century, when the Toba tribe
established its Wei dynasty (+386-532) in north China. Red and yellow ones were
used by the emperor, and blue by commoners. It was decreed in +1368 that silk
umbrellas were reserved for the imperial family, while oiled-paper ones for rain
were allowed to the common people, and they were not only used for protection
from rain or sun, but were also taken on ceremonial occasions. Umbrellas called lo
san or chyang were carried in official processions; and ‘umbrellas of ten thousand
names’ (wan ming san) were presented to specially honoured officials, inscribed
with the donors’ names.

* Fa Shu Tao Lu (TSHCC), p. 64.  
- See poems quoted in Ko Yk Tshao Khoa (1750 ed.), ch. 33, pp. 13a-14a; pictures in Sin Tshai ThuHui (1609 ed.) ch. 21, p. 42; for painting and calligraphy on paper fans, see such exhibit catalogues as Chinese Fan Paintings (Rochester, 1972), Fan Paintings by Late Chhing Shanghai Masters (Hong Kong Museum of Art, 1972).
- See Stein (4), IV, pl. XCIII.

Paper flags must have been used early. Several were found in Thang tombs in
Sinkiang, one of several thicknesses of paper manuscripts pasted together, and
painted with horizontal stripes of black and white; it was pasted on one side to a
stick (Fig. 1086g).

Playing cards made of paper, written or printed with designs, probably existed
no later than the +9th century, when the relatives of a princess are said to have

* See Stein (4), iv, pl. XCIII.
played the ‘leaf-game’ (yeh tsu hsi1). A similar date of origin is suggested by several other sources, including the noted scholar Ouyang Hsiu (+ 1007–72), who said that the card-game had been popular since the middle of the Thang dynasty, and related its origin to the change of book format from paper rolls to sheets or pages. A book on the game, titled Yeh Tzu Ko Hsi, was supposed to have been written by a woman toward the end of the Thang dynasty, while it was mentioned by authors of successive dynasties, and numerous works on it have been written in later times.

The form of playing cards was described in a Ming work, titled Yun Chang Ching, as about one inch wide, two inches high, and several tenths of a finger thick (Figs. 1098, 1099). It enumerated the numerous advantages of playing cards: they were convenient to carry, could stimulate thinking, could be played by a group of four without annoying conversation, and without the difficulties which accompanied playing chess or meditation. The game could be played in almost any circumstances without restriction of time, place, weather, or qualification of partners. The fictional persons in the Chinese novel Water Margin were represented on the cards and were extremely popular toward the end of the Ming dynasty, and such characters, painted by the famous artist Chhen Hung-Shou (1598–1652) are still available on playing cards today. Apparently because of the popularity of gambling, punishment was specified in penal codes of the Chhing dynasty for the manufacture or sale of more than 1000 paper cards, and for engaging in gambling by officials.

Many other items made of paper for household, recreation and enjoyment are occasionally recorded in art and literature (Fig. 1096). Such articles as paper chessmen (chih chi5), were substituted for those of Yunnan stone; paper flutes, played transversely (chih ti6) and vertically (chih hsiao7), the sound of which was said to be better than that of those made of bamboo; shadow puppets; fireworks and firecrackers; and numerous kinds of toys like the paper tiger (chih lao hu8) (Fig. 1099) were some of the notable objects made of paper.

(c) ORIGIN AND DEVELOPMENT OF PRINTING IN CHINA

(1) PRE-HISTORY OF PRINTING

Printing is a process of reproduction with ink on paper or other surfaces from a reverse or negative image. It contains at least three essential elements: a flat surface, originally cut in relief, containing a mirror image of whatever is to be printed; the preparation of the mirror image; and the transfer of the impression of this image on to the surface to be printed. In brief, the invention of printing required the development of necessary techniques for creating a proper vehicle to transfer an image on to an acceptable medium, in addition to meeting the large-scale demand for multiple copies. Before printing was used in China, many techniques for making reproductions existed. At first, of course, texts were copied by hand, but later mechanical devices were devised. These included seals for stamping on clay and, in due course, on silk and paper; the casting and engraving of inscriptions on metal and stone, the taking of inked impressions from stone inscriptions and, finally, using stencils to duplicate designs on textiles and paper. All these processes paved the way for the use of woodblock printing and later printing from movable type.
The desire to make a duplication of a certain image or text was probably a natural and common practice from very early times. The characters erh for two or double, and fu for second or duplicate which appear in many ancient documents, testify to the nature of duplication and the existence of multiple copies; indeed the two-stroke character erh was used as a ditto sign in the inscriptions on the stone drums dated variously from the -8th to -4th century. Treaties among feudal states in the Chou dynasty were usually made in triplicate, with one copy for each of the parties and another to be filed with the spirits. Then, during the Former Han dynasty, the original copy of meritorious records of marquises appointed by Empress Kao in - 186 was held in the imperial ancestral hall, with a duplicate (fu) kept in the government office.

Even before copies were made by hand, duplicate images were formed by impression from finger tips or from the palm in very early times in China. These prints have been found on pottery and clay articles as well as on documents, and are recorded in early literature. The use of fingerprints for identification and authentication by the illiterate was probably a substitute for the seals of the literati, since both were intended to be unique and private; duplicates could be made only with specific authorisation.

Before printing was adopted popularly, and even after its extensive use for book production, manuscripts made by hand-copying were still common. This was because it was not only cheaper but also more convenient than printing for making single copies or a limited number of reproductions. Classics are said to have been copied by the father of Thao Hung-ching (r. +536), the famous alchemist and physician, for sale at forty cash per leaf in the +5th century; and the famous woman Thang Tshai-lun of the early +9th century is said in many tales to have made hand-copies of rhymed books in fine calligraphy for civil service candidates, for 5000 cash per copy. Many Buddhist manuscripts from Tunhuang were also copied by professional scribes with a good standard style of calligraphy, for sale to those who wished to fulfil their vows to spread the sutras (Fig. 1099).

Official scribes were to be found at court to copy books into the imperial collections. As early as the +3rd century, the Chin Imperial Library had official scribes able to write the standard khai style of calligraphy for copying books on silk and paper. In the Sui dynasty, it is recorded that during the reign of Emperor Yang (r. +605-17), a choice collection of 37,000 chuan was selected for the Imperial Library and fifty manuscript copies were made of each book to be kept in

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Fig. 1099. A paper tiger. Paper Museum, Tokyo.

[i] Fingerprints and hand copying

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two new buildings at the court. Because so much could be done by hand, printing was not necessary unless a very large number of copies was in demand.

(ii) Impression of seal inscriptions

The carving and impressing of seals is considered one of the technical precursors of the invention of printing in China. The technique of carving a mirror image of characters in relief on stone, wood, or other materials in making a seal is almost the same as that of engraving characters on wood blocks or making individual types for printing. The only difference is probably the size and purpose of the carvings, and the method of casting metal seals is little different from that of casting metal types from a matrix. The stamping of seal inscriptions on clay and later on silk and paper was probably the earliest attempt to reduplicate writings by a mechanical process. Seals were made of almost any kind of hard-surfaced material. They were cast of bronze, gold, silver, and iron; or carved of stone, jade, clay, ivory, horn, and wood. They were usually square, though some were rectangular or round, about one or two inches in diameter. Inscriptions were carved or cast on one or more sides of the block, which was sometimes decorated with a knob on top, and with a string attached. They usually bore an inscription of a few characters to give a personal name, official title, and name of studio, or other indication of ownership, authentication, or authority. The use of seals in China can be traced back to the Shang dynasty. Three old square seals, cast in relief on a flat surface of bronze, are said to have been found at Anyang, while later seals made of bronze, gold, jade, turquoise, and soapstone in various shapes and sizes, dating from the Chou, Chhin, and Han dynasties, have been discovered at various sites in China. Most of the Chou seals of bronze were cast in moulds with inscriptions mostly in relief, and only a small number of surviving specimens have intaglio inscriptions. The seals of Chhin are similar to those of Chou except for the creation in -213 of a large imperial seal with eight characters carved on jade, to display the authority of the First Emperor. This piece was used by the successive Han emperors as the seal of inheritance of the empire, though Han seals were mostly made of metal with inscriptions cast in intaglio. After the Han, however, all official seals were made with inscriptions in relief, and their size was gradually increased more or less in proportion to the rank of the officers using them.

Seal inscriptions were at first stamped on clay and later impressed on silk and paper. For secrecy and authentication, documents of bamboo and wood, when ready for transmission, were covered with a board and bound with string on which a small piece of clay was affixed and impressed with a seal. After bamboo and wood ceased to be used as writing materials, seal impressions were made on soft materials, and the earliest known example with black ink is found on a piece of silk from Tunhuang dating from the +1st century (Fig. 1102). Since the +5th century, seals were generally applied to paper with vermilion ink, one early reference to such impressions dating from +517, when they were stamped in red on lists of officials addressed to the court. Since paper written with black ink had been commonly used for documents and books since the +2nd or 3rd century, the use of red ink for stamps in order to distinguish the seal impression from the black text may, perhaps, be earlier than the +6th century.

* See Wen Hsin Thang Kus (ST), ch. 174, pp. 1566–7. The source also indicates that the Imperial Library was furnished with mechanical devices to open and close the doors and curtains in the reading room. The text says: Fourteen rooms in front of Kuang-Wen Court served as imperial reading-rooms. The doors, windows, beds, mattresses, bookcases and curtains in these rooms were all lavishly ornamented. For every three rooms, there was a square opening with brocade curtains hanging down and two figures of flying fairies atop. A mechanical device was placed on the ground outside of the rooms. When the Emperor visited these reading-rooms, a servant holding a censer would precede. As he stepped on the device, the flying fairies would come down and pull open the curtains up to the top of the doors. The doors of the bookcases would also open automatically. When the Emperor left, the doors would close and the curtains come down again.

* The character ‘印’, which was used for ‘seal’ in the Han, was adopted to mean printing when that began in China; cf. pp. 5 ff.


Seals were also carved on wood, and these had a much larger surface than those of metal and other materials. As Ko Hung (284–363) mentioned, in ancient times a seal of the Yellow God, four inches in breadth and bearing 120 characters, was used to make impressions on clay along the routes taken by travellers to keep away fierce animals and evil spirits. Another source says that Taoist priests cut seals of jujube heartwood, four inches square, apparently to duplicate charms on clay and then, later, on paper in vermilion ink. It is also recorded that at the court of Northern Chhi (+550–77), a large wooden seal one foot two inches long and two and a half inches wide, bearing four characters, was used to stamp the joining sheets of documents. All this evidence indicates that seal-cutting on wood with mirror-image characters in relief and bearing a text of as many as over a hundred characters, can truly be considered as a forerunner of woodblock printing.

Other techniques which contributed directly or indirectly to the invention of printing include bronze casting and engraving on stone. Two methods are known to have been used in casting bronze vessels and their inscriptions in ancient times, namely: clay moulds and the lost-wax process. The latter, which involved the construction of a mould with characters originally traced in wax which was later to be melted and replaced with metal, may have suggested the carving of writing in reverse to obtain a positive position on the object to be cast, as was later to be done in printing.

Some of the techniques of early casting may even have suggested the use of movable type to compose a long text, for it was not uncommon to use separate moulds, each with a single character or a group of characters, to make one vessel or one inscription. One of the most interesting examples still in existence is the inscription on a kuei vessel of Chhin (Chhin kung kuei), probably of the 7th century, each character of which can be seen to have been cast from a separate unit, because the edges of the individual units are visible between the characters (Fig. 1103). Another example is the inscription on a bronze bell of the late Chou period, with ornamental archaic characters (Chhi tzu chung), each separately cast from an individual mould. There are also examples of individual moulds bearing a group of characters instead of a single one, and a pottery container of the Chhin dynasty (Chhin wa hiang) had an inscription of forty characters made from ten separate moulds, each with four characters. It would seem that this technique of using...
Inscription on a kuei vessel of Chhin cast from separate units, c. 7th century. From Jung Keng (4), fig. 35.

Separate units in the composition of one text may be considered as the forerunner of typography. Carving inscriptions on stone is another technique which is considered as a prerequisite for engraving on wood for printing, for not only the technique of cutting, but also the change of material from stone to wood is significant for the development of printing. Cutting inscriptions on stone for commemorative and monumental purposes developed early in China. The oldest inscriptions on stone still surviving are those on ten drum-shaped boulders known as the Stone Drums of the Chhin State. They were carved with ten verses, originally with some 700 characters, although less than half of them are still extant. After the unification of the empire, the First Emperor of Chhin erected seven stone inscriptions throughout the country between -219 and -211; these were in praise of the achievements of his administration, especially his role in the standardisation of measures and of the style of writing.

From the +2nd or 3rd century, stone was extensively used not only for commemorative purposes but also as a permanent material for preserving canonical literature by Confucians, Buddhists, and Taoists. A complete collection of seven Confucian classics, amounting to over 200,000 characters, was engraved on some forty-six stone tablets between +175 and 183. Since then there have been no less than six additional major engravings of standard texts of Confucian classics on stone; the last one was made at the end of the 18th century. And a complete set of the Thang engravings, made between +893 and 897, still survives in the Forest of Stone Tablets (Pei Lin) in Sian. The Buddhists also selected stone as a permanent material for preservation of their sutras, with the aim of avoiding destruction during periods of suppression of that religion. The most gigantic of all their stone inscriptions is probably that of 7000 stone tablets preserved in a grotto library in a mountain near Fang-shan, Hopei; all the tablets having been cut successively over many generations from the +6th to the 11th century (Fig. 1104). Though the engraving of Taoist literature on stone came later, at least eight engravings of the Tao Te Ching are known to have been made during the Thang dynasty; in both scope and quantity, however, they are much inferior to both Buddhist and Confucian inscriptions.

Stone inscriptions were occasionally cut in relief or in a mirror image, like wood blocks for printing. They were also sometimes cut in mirror image in intaglio.

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Fig. 1103. Inscription on a kuei vessel of Chhin cast from separate units, c. 7th century. From Jung Keng (4), fig. 35.

Fig. 1104. One of the 7000 stone tablets of Buddhist scriptures preserved in the grotto library of Fang-Shan, Hopei province, engraved since +330, each 30 metres in height. From Tsien (1), pl. XIV.

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For detailed discussion of the Confucian, Buddhist, and Taoist canons on stone, see Tsien (2), pp. 73-83.
contrary to the general practice of cutting stele inscriptions in the normally direct or positive way. A few examples of this are known or are still extant, one being on the back of a sculpture at Lung-men, dating between +477 and 499, and another dating between +570 and 575; both are positive images cut in relief (Fig. 1105). A stone stele with negative or mirror image inscriptions cut in relief is located near Nanking. There is also a pair of stone pillars, one cut in positive characters, reading from right to left, and the other in reverse, reading from left to right, apparently to balance the pair (Fig. 1106). It is especially significant that this text was cut in relief with mirror images in the same manner as wood blocks for printing, because it was made at about the same period as wood-block printing began.

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(iv) Inked squeezes and stencil duplication

Rubbing is a process of making inked squeezes on paper from inscriptions on stone, metal, bone, or other hard-surfaced materials. The process of stone rubbing is very similar to that of block printing; the difference lies only in the methods of engraving and of duplicating. Except for very few cases, inscriptions on stone are always cut into the surface in intaglio with characters in the normal positive form. When a rubbing is made, the paper is laid on the stone and squeezed against the surface. Ink is applied to the surface of the paper, thus producing a white text on black background. The wood block, on the other hand, is always cut in relief with characters as a mirror image. When a print is made, ink is applied to the block, the paper is placed on it, and the back of the paper is brushed to obtain a black text on white background. Although the basic materials for engraving and the end products are different, the purpose of making duplications and the use of ink and paper as media are the same.

The technique of rubbing involves the processes of laying the paper on stone, tamping the paper into the intaglio, applying ink to the paper, and removing the paper from the surface after completion. The whole process is much more complicated and slower than that of printing. Usually the soft paper was first folded

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*a* See Su Ying-Hui (*3*), p. 49.
*b* See Liu Chiao Ching Ma Ts'an Chou Pao Kao (Nanking, 1935), plate 11, fig. 20-6; also Liu Chiao I Shu (Peking, 1938), plates 263-3.
and then moistened, plain water or rice water sometimes being used, though the most common liquid was made by steeping slices of the dried root of pai chi (Bletilla byacinthina), a tropical orchid, in water. A solution of glue and alum was also adopted on occasions, but since alum injures the stone and makes the paper fragile, it was not recommended by those experienced in making rubbings.

After the paper was properly placed, it was pressed lightly into every depression by a brush of natural fibre, usually that of the coir palm. When the paper was tight against the surface and about to dry, ink was applied with a pad, the inked pad being first struck lightly over the paper before the final application of dark ink. If the surface was plain and smooth, a light inking was sufficient and produced an inked copy considered as light as the cicada’s wings; it was called tshan i tha (cicada wing rubbing). If a dark ink was added and brushed on after the application of the light ink, the brushing action gave a dark and shining rubbing called wu chin tha (black-golden rubbing). When the desired intensity of ink had been achieved, the rubbing was peeled off the hard surface and pressed flat, but this had to be done carefully, because distortions of the inscription resulted if the paper was stretched during peeling. The quality and thickness of the paper determined the ease or difficulty of the peeling procedure.

Rubbings were sometimes made from three-dimensional objects such as round or square bronze vessels, which were copied in perspective with a photographic effect known as chhilan hsing tha or whole-shape rubbing (Fig. 1107). Before making such a rubbing, careful observation and study of the object was normally required, and the shape of the vessel, the curve of its surface, the distance between its front and rear, and other details being sketched. This sketch was then transferred to the paper to be moistened with the orchid liquid and placed on the vessel’s surface. When the paper was almost dry, dark ink was applied to the relief portions and light ink to the intaglio parts of the design. Sometimes separate pieces of paper were used on different parts of a vessel and then pieced together to make a composite rubbing, though a single piece covering the entire vessel was sometimes used. The key technique in making whole-shape rubbings was primarily the application of the ink in the correct gradations of light and dark in accordance to the perspective sketch.

The technique of rubbing is believed to have been first used in China before the +6th century, and it became well established in the following centuries. Technicians in charge of rubbing, known as tha shu shou, were employed in the Thang dynasty, in academic institutions and imperial libraries, along with such skilled workers as scribes, paper-dyers, and brush-makers. A few specimens of inked rubbings from the Thang period were found in Tunhuang, including the earliest known piece extant of the inscription of the pagoda of the Hua-tu Temple, dated +632. Others include the Wen Chhilan Ming (Fig. 1108), an inscription on the Hot Spring written by Thai-tsung of Thang, dated before +654, and a rubbing of the Diamond Sutra, written in +824. Since the time of the Sung dynasty, the technique of rubbing was broadened to include inscriptions on bronze vessels and later on pottery, bone, and other inscribed objects. It became a refined and sophisticated art for making reproductions, even excelling photography in skillfully and faithfully reproducing the exactness of inscriptions and designs on a great variety of materials.

The use of stencils was another pre-printing method for duplication. The stencil was usually made of a sheet of thick paper perforated with needles to form the designs to be reproduced. The stencil was laid on the surface and the design was transferred by applying ink to the perforations. The date of the earliest use of the stencil is unknown, but the recent discovery of silk fabrics printed in coloured patterns from the Han tomb at Ma-Wang-Tui, Chhangsha, indicates that the
Fig. 1108. One of the earliest extant inked rubbings of a stone inscription on a hot spring, dated c. AD 654, from Tunhuang. Cut and mounted on buff paper and now preserved at the Bibliothèque Nationale, Paris.

technique can be traced back to the 2nd century. Animal skin or thin silk fabric treated with varnish or some other tree sap may have been used at this time, and certainly such a use of skin and paper was common in the Thang and Sung. Several paper stencils with perforated designs of Buddhist figures have been found in Tunhuang, together with finished stencilled pictures on paper, silk and on plastered walls (Fig. 1109); other paper stencils of later dates already in museums were used for the reproduction of designs on textiles.

(2) BEGINNINGS OF WOODBLOCK PRINTING

Numerous dates have been suggested for the earliest use of woodblock printing in China, varying from the middle of the 6th to the end of the 9th century. No

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* Cf. Stein (4), IV, pl. XCV.
* A buff paper stencil coated with oil, collected by the late Berthold Laufer, is in the Field Museum of Natural History in Chicago.
* Some two dozen theories are summarised and discussed in Shimada Kan (1), Sun Yu-Hsia (2), Pelliot (41), Carter (1), Li Shu-Hua (71), and Chang Hsu-Min (3).
fact that the dating of the book has an element of controversy. Another text, this time by the pilgrim I-Ching (+634–713) reported in +692 that Indian Buddhists printed (yin) Buddhist images on silk and paper; however, there is a suspicion that the word yin may have meant impression with image blocks rather than real printing. On the other hand, a more recent opinion suggests that monk Hui-Ching (fl. +600–50), who arrived at Chhangan in 600, and defended Buddhism by saying that sutras were written and engraved (shan kho) to assure their existence, was clearly implying that printing was used at the end of the Sui dynasty. Since Buddhist texts preserved on stone had been a common practice, this word kho could refer to engraving on stone instead of on wood, and thus this statement may not in fact be taken as definitive evidence for printing at this time.

Finally, yet another document mentions that a woman’s code compiled by the Empress Chihang-sun was ordered to be carved on wood blocks for distribution (tsu hsing) at her death in +696, which may imply printing in that year. This story is due to the Ming historian Shao Ching-Pang (+1421–1565), but the passage containing the term tsu hsing does not appear in the two Thang standard histories or in other documents which include the same story. Thus certain evidence is lacking in support of this statement from a secondary source.

As for +8th-century printing, several specimens are extant. The earliest of these is a dharani sutra scroll (Fig. 1110) which was discovered in +790 in a stone stupa in the Buddhist temple Pulguk-sa, Kyongju, in southeast Korea. The scroll bears no date, but it includes certain special forms of characters created and used when Empress Wu (+680–704) was ruling in China. It is believed that this charm must have been printed no earlier than +704, when the translation of the dharani was finished, and no later than +751, when the building of the temple and stupa was completed.

Another piece of old printing, chapter 17 of the Lotus sutra, is said to have been found in Turfan and to be preserved in Japan. It is printed on yellowish hemp paper with nineteen characters per line in the text, which contains also some of the peculiar characters commanded by Empress Wu. If this is evidence of

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2. 輯 3. 繪 4. 筆 5. 印 6. 見
7. 画 8. 蓮 9. 大陸 10. 田
11. 烏 12. 木 13. 墨 14. 藝
15. 錦 16. 木 17. 金 18. 大陸 19. 銀
20. 金 21. 銀 22. 銀 23. 銀
24. 金 25. 銀 26. 銀 27. 銀
28. 金 29. 銀 30. 銀 31. 銀
32. PAPER AND PRINTING
printing during her reign, it could be another specimen contemporary with the one found in Korea.

The specimen found in Korea predates the dhārani charm from Japan printed c. +764–70, and which until recently was considered to be the world’s oldest extant example of printing.8 That there were a million copies of the charm in Japan is recorded in several contemporary documents, which also relate that in +764 a copy of one of the four versions of the dhārani was placed in everyone of a million tiny wooden pagodas (Fig. 1215) ordered by the Empress Shōtoku to be distributed and stored among ten different temples. Although the records do not say that the charm was printed,9 not only do many printed specimens of it survive, but it seems certain that such a multitude of copies could not have been made without the aid of printing. The text is from the same sutra as the one recently discovered in Korea, but the latter consists only of the prayers in Chinese characters transliterated from the Sanskrit, while the scroll from Korea is much longer, including the story as well as the prayers of the sutra.

Since both of these examples were found outside China, it may, of course, be questioned whether they are, in fact, Chinese printing. While the dhārani found in Japan is believed to have been produced there, as it is documented in Japanese records, the single piece of dhārani found in Korea is very likely to have been printed in China. The fact that there were frequent pilgrimages of Korean monks and students to the Thang capital, that the Silla Kingdom in Korea was zealous in adopting Chinese culture and practices, together with the presence of special writing forms of Empress Wu, and also the lack of any collateral evidence of early printing in Korea, suggests that this printed sutra originated in China and was perhaps brought to Korea for ceremonial use when the temple was built. In any case, the use of printing in China must have begun some time before the date of the examples found in Japan and Korea.4

The two charms just mentioned are both miniature examples of printing, unlike the usual size of a Chinese book. The first complete printed book is probably the famous Diamond Sutra of +868, discovered in Tunhuang by Stein during his second expedition in 1907.9 This book, in roll form, is made of seven sheets of white paper pasted together to form a scroll with a total length of 17 feet. Each sheet is 2 feet long and 10 inches wide. The text is the complete work of Chin Kang Po Po Lo Mi Ching10, translated into Chinese from the Sanskrit Vajracchedikā Prajñā Paramitā by Kumārājiva (b. +544) in the +4th century. Both the picture on the frontispiece (Fig. 1167) and the calligraphy in the text show a highly advanced technique in cutting and printing, more refined than those found in Japan and Korea, or in Europe of pre-Gutenberg date. At the end of the roll a colophon says: ‘On the fifteenth day of the fourth month of the ninth year of Hsien-thung (+868), Wang Chieh reverently made this for blessings to his parents, for universal distribution’ (Fig. 1111). This is the earliest clearly dated printing in complete book format extant today.

Among printed materials of the Thang dynasty, several other examples may be mentioned. These include the printed versions of the dhārani (Fig. 1112), of Buddhist verses, and the two oldest printed calendars, all discovered at Tunhuang.8 One calendar, for the year +877 (Fig. 1113), is a fragment printed with minute drawings and diagrams, solar terms, and pictures of the animals corresponding to the twelve branches, very similar to those used on calendars even in modern times. The other, for +882, is printed with a line of very heavy characters as the heading, which reads: ‘Family calendar of Fan Shang6 of Chchengu-fu in Hsi-chhuan,4 province of Chhien-nan’. Apparently the private printing of family calendars was very popular in Szechuan and all along the Yangtze valley; indeed, a memorial of +885, submitted by Feng Su4 (+767–836), a regional commandant of Szechuan, requested that the private woodblock printing of calendars be forbidden, because large numbers of unauthorised calendars were being printed and sold in markets before the Board of Astronomers had submitted the approved calendar for the new year to the emperor.6

Besides Buddhist sutras and calendars, many books on various subjects were also printed and sold in bookstores. A Thang official, Liu Phiên6, who was in Szechuan with the refugee emperor in +883, said in his family instructions that during his

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8 For a fuller description of this charm, see Carter (1), ch. 7; Hunter (9), ch. 9; Nagasawa Kikuya (3), pp. 6–8; cf. below, pp. 336 ff.

9 Chang Hsiu-Min (5), p. 134, questions this because of the absence of mention of printing in all the documents and the fact that no other printing earlier than +1176 in Japan is mentioned or has survived.

4 Despite the findings of earliest printing specimens outside China, there is little doubt that these printings followed the exact model and method of Chinese printing. As Goodrich (32), p. 576, says ‘everything still points, in my opinion, to the beginnings of the invention in China and its spread outward from there’.

5 Preserved in perfect condition at the British Museum; cf. Giles (17), pp. 190–1; Carter (1), ch. 8.


stay in Szechuan he saw a number of books on astrology, the divination of dreams, and geomancy, as well as dictionaries and other lexicographical works, being printed on paper from engraved wood blocks; but he commented that the ink was smeared and could not be read clearly. Another Thang official, Ho-kan Chi (fl. +847–+59), a regional supervisory commandant in Chiangsi, is said to have spent much time in the study of Taoist alchemy and to have composed a biography of Liu Hung, several thousand copies of which were printed between +847 and +851 and distributed to interested alchemists. 

Among the books brought back by the Japanese monk Shuyei on his return from China in +865 were two rhymed dictionaries, Thang Yün and Yü Phien, 

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* See Ai Jih Chai Tshung Chhao (SSKTS), ch. 1, p. 3a.  
* See Yün Chhi Yu I (BH), ch. 10, pp. 8a, 8b.  
1 乾千 2 金千 3 宗敘 4 佐弘 5 王闇
which were recorded as 'printed in Hsi-chhuan (modern Szechuan)', along with other titles apparently referring to manuscript calendars, medical prescriptions, and other secular works, besides Buddhist sutras. A Thang official, Ssu-khung Thu¹ (+837–908), wrote, probably in +871–9, that the printed copy of the *Sūtra* in the Ching-ai Temple of Loyang, which had been destroyed, probably in +845, should be reprinted. Therefore, a printed copy of the *sutra* must have existed before the date of destruction.

Also, a *dhāranī* charm printed by the Pien family in Chhengtu is reported to have been found within a hollow bracelet in a Thang tomb in Chhengtu in 1944. This piece, about a foot square, was printed on very thin but strong paper, which was probably made of mixed fibres of silk, mulberry bark, hemp, and *tham*² wood (*Pteroceltis tartaromorini*, Maxim.) It bears a line of Chinese characters, from which a few are missing, indicating the place and name of the printer at the right, with Buddhist figures on the four sides and also at the centre, surrounded by the Sanskrit text forming a square in seventeen lines (Fig. 1114). The Chinese text says: 'This charm is printed for sale by Pien ... near ... Lung-chhiih-fang, Chheng-tu hsien, Chheng-tu fu.' It has no date, but the tomb has been dated as c. +850–600 in the late Thang. This adds another specimen of early printing preserved in China.

By the early part of the +10th century, under the Five Dynasties (+907–60), the application of printing seems to have been much wider both in subject-matter and in geographical distribution. Printed materials include, for the first time, the Taoist canon and Confucian classics, literary anthologies, historical criticism, and encyclopaedic works, besides the Buddhist *sutra* and calendars. Printing centres included Loyang and also Khaifeng in modern Honan; most of the works being prepared by the National Academy (Kuo Tzu Chien)³ throughout the Northern dynasties (+907–60) were printed there. In the Southern Kingdoms, a few books are known to have been printed in the Shu state in Szechuan, in Nanking under the Southern Thang, and in Hangchow under the Wu-Yüeh state.

The first work of the Taoist canon to be printed was a study by the Taoist monk Tu Kuang-thing⁴ of the commentary on the Lao Tzu by Emperor Hsüan Tsung (r. +713–55), entitled *Tao Te Ching Kuang Sheng 1.* It was privately printed at the monk's expense from some 460 blocks, in +913, twelve years after he had completed writing it. Also printed in Shu was a collection of one thousand poems by the monk Kuan-hsü¹ (+842–923), upon whom the King of the Shu state bestowed the honorific title Master Chhan-yüeh.⁶ Publication of this book, *Chhan Yüeh Chi²*, by a disciple of the author's in +923, marked the beginning of the printing of individual literary collections which has proliferated among Chinese publications ever since. In the Northern Dynasties, the Taoist canon was printed by a Taoist priest under the auspices of Emperor Kao-Tsu of the Chin in +940. A new preface was written by the scholar Ho Ning³ (+898–955), who printed several hundred copies of his own poems and songs in 100 *ch'uan* for distribution.

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¹ Li Shu-Hua (21), pp. 142–3.
² Yeh Te-Hsi (2), pl. 22; the book is reprinted in the *SPTK* from a Sung manuscript copy.
³ Chi Wu Tai Shih (ESSS/TW), ch. 127, p. 74.
⁴ 符休
⁵ 千巌
⁶ 司空圖

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Fig. 1114. A *dhāranī* printed in Lung-Chhiih-Fang, Chhengtu-fu, c. late +4th century, 31 × 34 cm., discovered in Chhengtu in 1944. From Chheng Ku Pan Kuo Thu Lu, 1961.
However, the most important printing of this period consisted of two separate publications of the Confucian classics. In order to standardise the text, these had been engraved on stone at least three times since the end of the +2nd century, long before they were ever printed. It was, it seems, the economy and wide distribution made possible by printing, as exemplified by the many religious and secular works available at this time, that inspired the prime minister Feng Tao (d. +882-954) and his associate Li Yu (d. +935) to undertake publication of the Confucian classics. Despite the disturbances of civil wars during this period, Feng Tao was able to remain in high position in the government through ten reigns of five different dynasties, and this enabled him to carry out this task. It began in +932 when the chief counsellor recommended the recruiting of learned scholars from the National Academy to make a collation of the text based on the version of the chief counsellor recommended. The task took some twenty-two years; the collection was completed and printed in 130 volumes in +953. This was the first time that the Confucian classics were printed, and the beginning of official publications for sale by the National Academy.

Two years later, in +955, a lexicon of classical terms, Ching Tien Shih Wen, was entrusted to Thien Min for printing. Four years later (+959), the Shan Shu Shih Wen, a section of the above, was prepared for printing by Kuo Chung-Shu (+918-77). It was revised and reprinted in 979 and in 999. At the time of printing, the Confucian classics were completed in Khaifeng, in +953, another project for printing them was started in the state of Later Shu (modern Szechuan) under the private sponsorship of its minister Wu Chao-I (d. +967). Wu first entered the Shu administration in +953 and was promoted to minister in +944. It was said that in his youth he was poor, and when he wanted to borrow certain books from friends, they showed reluctance to lend them; he thereupon made a vow that if he should be prosperous one day, he would print the work for scholars. It was when he became minister of Shu that he fulfilled his pledge. After the conquest of Shu by the Sung, all the powerful families which had served the Shu state were punished and their property confiscated, except for the Wu family. Emperor Tai-tsu (r. +960-76) was fond of books and had discovered the stories about Wu Chao-I seem to have been derived from his disciple Sun Feng-Chih (not to be confused with Sun Feng-Chi of Sung), who was first quoted by Chih Chii-Sun (+10th century) in his book Chi I Lu, which was quoted repeatedly by Ming and Chih Ching authors, with factual discrepancies; see Li Shu-Hua (11), pp. 145-50; Wang Sung-Wen (3), pp. 27-58. Another copy is reported to have been found under a pagoda in 1971 in Wu-wei, Sweden, with plates of the full text. Only two copies of this version are known. One copy, in the Royal Library of Sweden, was acquired from a private collector in New York. Another copy is reported to have been found under a Sung pagoda in 1971 in Wu-wei, Anhui, which was out of the jurisdiction of the Wu-Yueh Kingdom, indicating the circulation beyond its border; see Ching Hsien-Min (7), p. 74.

Wu's name in his publications. He therefore ordered that all the wood blocks be returned to the Wu's, and Wu Chiao-I's descendants were supported from the large profit made by printing them; moreover, Wu's son, Wu Shou-Su, served in high positions both under the Shu ruler and later at the Sung court. Not much information exists about the actual printing of the Confucian classics by Wu Chao-I who is said also to have printed other works. These included the Wen Hsuan, Chiu Hsueh Chi, and Po Shih Liu Thieh, the last two being collections of literary quotations used by students in preparing for the civil service examination. The story of Wu Chao-I is probably the first used by Confucian scholars to exemplify the reward of the virtue of printing books, and similar stories were repeated in many later works concerned with books and printing.

Other works printed during this period include the first book on historiography: Shih Thung by Liu Chih-Chih (+661-721), and the first collection of regulated verses: Tu T'ao Hsin Tien, compiled by Hau Ling (+907-82). None of the printed works mentioned in various sources now survive, except for a few Buddhist scrolls and pictures printed toward the end of the tenth century. Of these the best known are the invocation sutras, titled Pao Chih Yen Te Lo Ni, printed by Chih Shu (i.e. Chih Hsiung-Shu, +929-88), prince of the Wu-Yueh state (modern Chekiang together with parts of Chiang and Fukien, with its capital of what is modern Hangchow). At least three versions printed with different dates are known to have survived. One, printed in +956, two and a half inches wide and about twenty inches long, was found in a pagoda in the Thien-ning Temple in Huchow in 1917. Its text consists of some 341 lines of characters, with eight or nine characters to each line, preceded by an illustration of human figures, while a colophon says: 'The generalissimo of the empire and prince of the Kingdom of Wu and Yüeh, Chih Hsiung-Shu, has printed the Pao Chih Yen Sutra in 84,000 rolls, and presented them for safe-keeping in precious pagodas. Recorded in the third year of Hsien-Te, ping ch'ien (+956).

Another version, dated i chhou (+965), was contained in a red wooden box, 10cm long, within a gilded stupa when discovered in 1971 at Shao-hsing, Chekiang. This copy consists of line of eleven to twelve characters each, preceded by a frontispiece and colophon similar to but not identical with those of the other...
two. It is better cut with fine lines and printed on white rattan paper, while the other two are on yellowish paper.\textsuperscript{4}

The third scroll, 6 feet 3 1/2 inches long and 1 1/2 inches wide, was found in 1934 when the Thunder Peak Pagoda in Hangchow collapsed during a storm. This text consists of 271 lines of ten or eleven characters each, preceded by a picture showing the consort of the prince with attendants making votive offerings (Fig. 1115). A colophon only slightly different from the others gives the name Chhien Shu and date hsi ( +975), which was three years before the kingdom was absorbed by the Sung empire.\textsuperscript{5}

Chhien Shu was not the only sponsor of printing at this time. A Buddhist monk named Yen-Shou\textsuperscript{6} (+904-75), a chief priest at the famous Ling-Yin Temple\textsuperscript{7} in Hangchow, printed probably more than a dozen titles of sutras, charms, and pictures of which over 400,000 copies are known to us, ranging from 20,000 of a Kuan-yin portrait on silk to 140,000 of a picture of a Maitreya pagoda, actually printed by him.\textsuperscript{8} In addition, three versions of 84,000 copies each were printed by Chhien Shu, making a total in this area alone within the short period of thirty-six years, from +939 to 975, that is extremely impressive. It was not only the most extensive printing known to us at this time, but also there is no doubt that it had a tremendous impact on printing during the early Sung dynasty. Some of the cutters and printers of this period may either have participated in some of the early Sung printing or trained apprentices for the profession, but whichever they did, the result was that Hangchow became the most prosperous printing centre for the next three to four hundred years.

\textsuperscript{4} This new discovery is reported in Chang Hsiu-Min (14), p. 75.
\textsuperscript{5} Chhien Shu, Library, University of Chicago.
\textsuperscript{6} See the Sung edition of Hsin Pu Chi, written with commentary by Yen-Shou and printed in Hangchow in +9160, Chang Hsiu-Min (14), p. 75.
\textsuperscript{7} See descriptions by Wang Kuo-Wei (4); Chuang Yen Shu-Hua (7), pp. 150-5; within some of the bricks, a picture of a pagoda was accompanied by the charm; see Chang Hsiu-Min (14), p. 74.
\textsuperscript{8} This version is more common; see descriptions by Wang Kuo-Wei (4); Chuang Yen (7); Carter (1), pp. 73, 80-1; Giles (13), pp. 513-15; Li Shu-Hua (7), pp. 150-5; within some of the bricks, a picture of a pagoda was accompanied by the charm; see Chang Hsiu-Min (14), p. 74.

Besides the printed scrolls from eastern China, a number of printed fragments and single sheets from this period have been found in Tunhuang.\textsuperscript{9} Many of these are undated, though a few bear exact dates and the names of donor and block cutter, and duplicate copies of some of them seem to have been printed from the same block. Some have been coloured by hand on both sides.\textsuperscript{9} Two, printed in +947, depict Kuan-yin or some other divinity on the upper half, with an inscription of praise in about 100 characters on the lower half (Fig. 1116). One print, from +950, is a fragment in eight sheets of the Diamond sutra, and this is probably one of the earliest specimens of paged paper books still surviving. An undated rhyme book, Chhi-yin\textsuperscript{10}, also in paged format, is believed also to have been printed during this period.\textsuperscript{10}

\textbf{(3) Incunabula of the Sung and Printing under Four Extraneous Dynasties}

From its modest beginnings, printing became a fully developed and advanced art in the Sung dynasty (+960-1279). Techniques were improved, new devices introduced, and the scope of printing was widened further still. The methods spread not only to many neighbouring nations in the east, west, and south, which had been in contact with Chinese culture for many centuries, but for the first time also to several non-Chinese peoples in the north. From there, printing began to cross the Chinese border and move westwards. The excellent block printing of the Sung period became a model to be emulated by later printers, while the invention of movable type was one of the most important developments in history. This was the golden age of Chinese printing, and books printed at this time equal in importance the incunabula produced in Europe three or four centuries later.

At the beginning of the Sung dynasty, the Buddhists began the gigantic project of printing the Tripitaka, which was followed by the government-sponsored printing of the Confucian classics, the standard histories, and other literatures. The Taoists also began to print their canon, comparable in scope and quantity to the Buddhist collection. Many government offices, schools, monasteries, private families, and bookshops participated in the printing business; in fact publishing proliferated in almost every field of knowledge, extending from the canonical literature to include history, geography, philosophy, poetry and prose, novels and dramas, divination and occultism, and scientific and technical writings, especially on medicine. The centres of printing were in Khiang-feng in the north and Hangchou in the south, the two capitals of the Sung, and Mei-shan in Szechuan, where literary tradition can be traced back to the Thang and Five Dynasties, was the
Throughout the three centuries of the Sung, at least six different editions of the Buddhist Tripitaka had been printed, and so this proved to be the most productive period for the printing of that comprehensive collection of Buddhist literature. The six editions were the Khai-pao printed in I-chou (modern Chengtu) in +971-83 (Fig. 1117a), the Chhung-ning in Fuchow in +1080-1112, the Chi-sha edition in Phing-chiang (modern Soochow) in +1231-1321 (Fig. 1117b). All but one of them consisted of from 5000 to almost 7000 chüan (rolls) bound in the continuously folded form known as sutra binding; the exception was the Khai-pao edition which was in roll form. Supposing that an average of fifteen blocks were needed for one chüan, a

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1. Not counting the two editions produced under the Liao and Chin dynasties during the same period, and four more, including one in the Hu-hua script, under the Yuan dynasty, as described below.

2. All the volumes of these editions have been lost except for the Chi-sha edition and a few fragments of other editions; for details of the various editions see Yeh Kung-Chhao (1); Kenneth Chhen (8).

3. A few volumes of the Khai-pao edition printed in Khai-feng (Honan) have been discovered, but it is not known whether this edition was printed in both Chengtu and Khai-feng, or whether part of the blocks were transferred from Szechuan to Honan.
The printing of the seventeen standard histories started in 994 and was completed in 1061, taking two-thirds of a century of careful collation, copying, proof-reading, block-cutting, and printing. This was the first time that standard histories were printed collectively under imperial auspices. At about the same time, the printing began of several Taoist works, including the collection of the 'Taoist canon, the \textit{Wan Shou Tao Tsang}^{b}, 5481 chuan in 540 cases, which was cut in Fukien and printed in 1116–17.\textsuperscript{b} Included in the collection were two books of the Manichaean scriptures, which may have been first printed before 1000 or earlier.\textsuperscript{a} Also, under official sponsorship, printing was carried out of several rhymed dictionaries, classified encyclopaedias of quotations, anthologies of literature, as well as other selected books.

Aside from the orthodox literature, a good number of scientific and technical works were also printed at the beginning of the Sung dynasty. These included the famous +6th-century work on agriculture and farming, the \textit{Chi Ku Min Tao Shu}, printed in 1018, and a series of ten works on arithmetic, including the \textit{Chou Pei Suan Ching} (Fig. 1118) and the \textit{Chiua Chang Suan Shu}, which were printed in 1074.\textsuperscript{b} Most important, however, was the extensive printing and distribution of medical books, including the famous Khai-pao edition of the herbal \textit{Pen Tsan} printed in 973, with a revised and enlarged edition in 974, and yet another edition with additional commentaries and illustrations in 1044. A collection of specialist studies was also printed; these included the \textit{Chu Ping Yuan Hou Lan} on the origin of diseases (+1027); the \textit{Me Ching} on the principles of the pulse (+1068); the \textit{Shang Han Lan} on typhoid fever (+1065) and the \textit{Thung Jen Chun Chiua Thu Ching} on acupuncture and moxibustion in 1026. Furthermore, no fewer than ten different collections of medical prescriptions, including the most popular work \textit{Thai Phing Shung Hai Fang},\textsuperscript{b} were printed and distributed before 1100. Besides these editions in large characters, the printing of a small-character edition of the prescriptions and other medical classics was ordered in 1068 by the Office of Medical Administration (Thai I Yuan), to be sold at the cost of the paper, ink, and labour by local government offices in order to meet the demand of local physicians.\textsuperscript{d}

After the fall of Khai-feng to the Jurchens in 1126, all the printing blocks in the National Academy were looted and removed to the north. However, when the Sung capital was resettled in Lin-an (modern Hangchow), many of the lost books were engraved anew, copying the original editions put out by the former National Academy.

\textsuperscript{a} See the documented discussion of titles in Wang Kuo-Wei (3); a few remnants of the Shih Chi, Hou Shu, and Hou Han Shu exist.
\textsuperscript{b} Cf. Carter (1), pp. 93-4; Chavannes & Pelliot (1), pp. 300-2.
\textsuperscript{c} See memorial quoted in Wang Kuo-Wei (5).
\textsuperscript{d} Cf. Liu Tshun-Jen (9), p. 113; Chang Hsiu-Min (6), p. 15.
\textsuperscript{e} Cf. Carter (1), pp. 93-4; Chavannes & Pelliot (1), pp. 300-2.
\textsuperscript{f} See memorial quoted in Wang Kuo-Wei (3).
Academy. Numerous works in all branches of knowledge were also printed by various local government agencies, private families, and bookshops in almost all parts of the empire, and of these three types of local government agencies were extremely active in printing and publishing. First, various local government offices of different departments printed a great variety of histories, literary collections, and scientific and medical works, including the annalistic general history \textit{Tzu Chih Thang Chien} by Sau-ma Kuang (1019-865), printed by the Chekiang Office of Tea and Salt Revenue in 1133; and a collection of medical prescriptions, the \textit{Thai Phang Sheng Hui Fang}, reprinted by the Fukien Office of Financial Administration in 1147. Second, the local governments of such prefectures and sub-prefectures as Chiang-ning and Phing-chiang in modern Chiangsu, Lin-an, Yu-yao, and Yen-chou in modern Chechiang, and Mei-shan in modern Szechuan, also played their part. The most famous of their publications were the Mei-shan edition of the seven standard histories of the Southern and Northern Dynasties printed in +144 and the Phing-chiang-fu edition of the classical work on architecture, the \textit{Ying Tao Fa Shih} by Li Chieh, printed in 1145. Third, public and private schools, Confucian temples, and ancestral halls of various localities printed various kinds of books, including five medical works by the Huan Chhi Shu Yuan in 1264 and the beginning's textbook \textit{Thiang Meng Hsiu} by the ancestral hall of the Lü family in Ching-hua in 1215. Such local and provincial agencies as these provided standard texts and any specially needed books as their responsibility.

Some of the most popular books printed and published in the Sung dynasty were associated with private families, of which the most outstanding was the Yü family of Chien-yang, Fukien, which had a tradition of continuous operation in the book business for over 500 years. As early as the +11th century the Yü family was already engaged in printing in Chien-yang, which became a famous centre of the book trade and printing from then on. Books engraved by them were still very popular in the +15th and 16th centuries, and a bookshop owned by one of the family was still operated at the original site in Chien-yang as late as the eighteenth century. The most prominent printer of this family known to us in the Sung dynasty was Yü Jen-chun (†1130), who was still printing and publishing in the 12th century. Such local and provincial agencies as these provided standard texts and any specially needed books as their responsibility.

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\* See details on titles and printing agencies given in Yeh Te-Hui (功, pp. 60-85.

\* The book was first published in 1105 and reprinted in 1145. The original edition is no longer extant, except for the fragments of 1145 edition which were found in 1936. A reconstructed edition of the work based on manuscripts was published with colour illustrations in 1928.

\* This unbroken tradition of the Yü family's interest in the book business prompted an inquiry by the Chih-lung emperor in 1775; see the decree and report quoted in Yeh Te-Hui (功, pp. 42-9.
Fig. 1119. Yuan edition of Thai Phing Hui Min Ho Chi Fang, the Great Peace People’s Welfare Pharmacies, written in +1311.

Another noted Fukien printing house was the Shih Taih Thang (Hall of Colourful Generations) of Liao Ying-chung (+1200-75), a scholar-official from Shao-wu (in Fukien), who published a de luxe edition of the Nine Classics and Three Commentaries around +1270. This edition was noted for its careful collation, refined execution, its excellent ink and paper, and its rich decoration; unfortunately it was soon destroyed by the Mongol invasion of southern China. However, a facsimile of this edition was reprinted in about +1300, together with a manual of collation and printing, the Chiu Ching San Chuan Ten Ko Li (Manual for the Transmission of the Nine Classics and Three Commentaries), which provided specifications for the selection of editions, the style of calligraphy, its emendation, pronunciation, punctuation, and collation. This work has been praised as a classic model of textual criticism and printing ever since.

Competing with the many private printers of Fukien were those of the two Sung capitals, Kaifeng and Lin-an (modern Hangchow), where numerous bookshops flourished. The area around the Hsiang Kuo Ssu monastery in Kaifeng was the centre of a book market, and the famous painting of the Spring Festival on the Pien River in Kaifeng, Chhing Ming Shang Ho Thu, depicts one bookshop (Fig. 1120) together with many other shops along the river front. The prosperity of the book industry in Hangchow is testified by a cluster of bookshops in the city; at least a dozen bookshops with precise addresses can be identified from the colophons of the printed editions. One of them had two or three branches, while many bookshops specialised in publications on particular subjects.

The most noted family printers in the Southern Sung capital was Chhen Chhi (fl. +1167-1225), a poet and publisher, and his son, Chhen Chieh-Yiian (fl. +1225-64), who stood first in the provincial examination. Together with other members of the family, they operated bookshops known as shu pheng, and printed no fewer than a hundred works, especially anthologies of poetry by almost all the

* For titles printed by the Yu family, see Yeh To-Hui (2), pp. 45-7.

* The printing of this edition and authorship of the manual have traditionally been attributed to Yieh Kho (+1183-1242?), of Hsiang-thai (modern Ta-hsiang, Honan), a grandson of the Sung general Yieh Fei (+1209), but are now attributed to Yieh Chiin, possibly a distant descendant of Yieh Fei of I-hsin, Chiangsu; see Weng Thung-Wen (1), pp. 429-49; (2), pp. 199-204; Achilles Fang (3), pp. 65 ff. Also notes in Hervouet (3), p. 58.

* See Tung Ching Meng Ho Lü (TSOHC), ch. 3, p. 19.

* See names and addresses of bookshops and their distribution in Hangchow in tables and maps in M. Finegan (3), pp. 374 ff.
Other family printers were the Yin of Lin-an, the Huang of Chien-an, the Liu of Ma-sha town in Chien-an, the Juan of Min-shan (Fukien), as well as many others in Szechuan, Shansi, and the Chiang-Huai and Hu-Kuang regions (modern Chiangsu, Anhui, Chiangpei, and Huanan). Their publications cover a great variety of subjects, including classics, histories, poetry, individual literary collections, and medicine.

Contemporary with Sung China, four nomadic tribes—the Khitan, Tangut, Jurchen, and Mongol—established kingdoms along its northern border and gradually expanded into Chinese territory. Being unlettered and less civilised, they adopted Chinese culture and made use of printing as soon as they conquered and came to rule the Chinese. Early in the +10th century the Khitan kingdom or Liao dynasty (+907–1125) created a form of writing of some 3000 characters, based on the Chinese system, in which to express its own language, and many Chinese classics, histories, and medical works were translated into Khitan and printed, though their circulation was prohibited outside Khitan territory. None of this Liao printing survives, though there is a Sung reproduction of a Liao printed glossary in Chinese, the Lung Khan Shou Chian, with prefaces dated +997 and 1034. The most extensive Liao publication known to us is the Chhitan edition of the Tripitaka in Chinese, in some 6000 chian in 579 cases, printed with Korean paper and ink in Peking in 1031–64; but nothing of it survives today.

The Tangut or Hsi-hsia kingdom (+990–1227) in northwest Manchuria and Mongolia proclaimed itself an empire in 1031, with its capital in what is now Ning-hsia. A system of writing its language, based on Chinese and Khitan, was created in 1036, and many Chinese books were translated and then printed in this script. Gifts and exchanges of books were arranged with the Sung court from time to time; Buddhist sutras were donated no fewer than six times and some of them were translated and printed. After the Mongol conquest of Tangut and China, a Tangut edition of the Tripitaka in the Hsi-hsia script, in more than 3620 chian, was printed in Hangchow and completed in 1302, and about a hundred copies were distributed to monasteries in the former Tangut region. Many fragments of books in Tangut and Chinese were discovered at the beginning of this century, including two editions of the Diamond sutra printed in 1016 and 1189, and two bilingual glossaries, the Hsi-Hsia Tzu Shu Yen Thang (+1132), and the Fan Han Ho Shih Chang Chung Cha (+1190). Apparently many books in their native tongue were also printed under the Tangut rulers.

The Jurchen or Chin dynasty (+1114–1234) originated in Manchuria and
occupied the northern part of China after the defeat of the Chhitan in 1125 and the Sung in 1126, when the capital, Kai-feng, was captured. Immediately, all the books and printing blocks in the National Academy were moved to the north, and a government printing office was established in Phing-yang, which soon afterwards, while an Institute for the Promotion of Literature (Hsing Wen Yiian) was established in 1194. Many books of classics, history, philosophy, poetry, and science were then printed by various government and private agencies. These included the Institute of Compilation (Pien Hsiu So) in Peking, the Institute of Literature (Ching Chi So) in Phing-yang, Shansi, the Office for the Promotion of Literature (Hsing Wen Shu), and the Bureau of Publications (Pi Shu Chien), which last was reported in 1273 to have a staff of 106 members, including forty woodcutters, thirty-nine workmen, and sixteen printers. A particularly interesting aspect of Yuan publication was the practice of joint enterprises in printing by local schools. Typical examples were the projects to print the seventeen standard histories jointly by nine circuit schools of the Chhien-khang Region in 1305 (nine were actually completed), and the collection of eleven classics by schools of the Chiang-hsi Region at an earlier date. A local history of Nanking, Chhing Ling Hsin Chi, in fifteen chiaian and thirteen volumes, was co-operatively printed from 1217 blocks contributed by several local schools and government agencies. Funds were raised in the same way for the cutting of some 5688 blocks to print the encyclopaedia Yu Hsi, and thirty other works by Wang Ying-Lin (+1223–96).

Remarks on the joint printing ventures appear in many books printed by similar co-operative efforts, some of which still survive.

The Mongols continued to print several more editions of the Tripitaka, including the Hung-fa edition, 718a chiaian, printed in Peking in 1277–94, and the Phu-nung edition, 501a chiaian, in Hangchow in 1278–94. The Chi-sha edition, 696a chiaian, was begun in Phing-chiang (Soochow) in 1231 under the Sung but not completed until 1322 at the time of the Yuan dynasty. The Khitan edition in Hsi-lia script mentioned earlier was completed in 1302, the Chin edition of the Taoist collection, the Hsüan Tu Pao Tsang, was reprinted in some 7800 chiaian in 1237–44, but it was destroyed under the Mangu emperor in 1258, when Taoism was persecuted. Despite the imperial order, however, some of the blocks were saved by being hidden, and no fewer than six or seven sets of the blocks for printing this Taoist collection were still preserved in Taoist monasteries in north China around 1281.

Because so many skilled cutters and printers had been trained in Chekiang and...
Fukien under the Sung, the printing centres in these two regions continued to prosper under the Yuan and no fewer than 220 titles are known to have been printed by 107 family firms, mostly in the fields of classics, history, individual literary collections, dictionaries, encyclopaedias, and medicine (Fig. 1122). Among the medical works, at least five editions of the herbal and more than twenty collections of prescriptions are known to have been printed by such families as the Kao, Liang, Liu, Ssu, Tshao, Tuan, and Hsü of Phing-yang (in Shansi), Chien-an (in Fukien), and other places. Though they did not call themselves book dealers, the private printing of such technical works was, it seems, for profit.

Phing-yang in the north and Chien-an in the south were the two most flourishing commercial printing centres under the Yuan. In Chien-an alone there were forty-eight commercial firms which are known to have published during this period, the most active being the Jih Hsin Thang of Liu Chin-Wen and the Chhin Yu Thang of Yü Chih-an. Each of them printed nearly two score works, the Jih Hsin Thang publishing an average of one work each year from 1335 to 1357, and the Chhin Yu Thang one every two years in 1304-45. Both the Chhin Yu Thang and the Chhing Wen Shu Yuan of Cheng Thien-Tse flourished for many generations, the former operating from the 11th century and the latter from the 14th, and both continued active until the 16th century. While most publishers printed a variety of books, a few concentrated on certain subjects only. For instance, the Yuan Sha Shu Yuan in Chien-yang published at least four large sets of encyclopaedias in 1315-25 and the Ku Lin Shu Thang in Lu-ling (in modern Chiangsi), the Huo Chi Thang of Yen-shan (in modern Hopei), and the Kuang Chhin Thang of Chien-an, all specialised in printing medical books. Also important in this period was the publication of popular stories and dramatic texts which flourished during the Yuan dynasty, though few of them exist now.

(4) NEW DIMENSIONS OF MING PRINTING

Ming printing was distinguished by the extended scope of its subject-matter and by its technical innovations and artistic refinement. In contrast to that of previous periods, the printing under the Ming included not only the traditional works in classics, history, religion, and literary collections, but also such new subject-fields as popular novels, music, industrial arts, accounts of ocean voyages, shipbuilding, and scientific treatises from the West, which had never before been seen in print in China. Significant increases were also noted in printing of dramatic texts, medical...
which inherited the books of the former imperial collections of the Sung, Chin, and Yüan dynasties, consisted in +1441 of 7530 titles in some 43,200 volumes (tseh) containing one million chüan. Thirty per cent of the materials were in print and seventy per cent in manuscript. 8

The period after 1500 turned out to be the most productive era for the development of literature, art, and technology in China. The popular novels written in the colloquial language at this time set the standard style of Chinese traditional fiction for the following centuries, while after 1600, the development of fiction and dramatic texts, in turn, encouraged the refinement of woodcut book illustrations in popular literature. At the same time, illustrated works on the industrial arts, on the design of inkcakes, and manuals of painting and stationery, were also produced at a high standard of excellence. Multi-colour processes with wood blocks were developed from two to more than five colours in the printing of texts with commentaries, maps, letter papers, and other artistic works. 9

The arrival of Jesuit missionaries in China at the end of the sixteenth century marked the beginning of the introduction of Western knowledge to Chinese intellectual circles. As a result, during the next two centuries, more than four hundred writings and translations added to Chinese scholarship in such new fields of knowledge as Christianity, Western humanities and institutions, and scientific literature. Among the earliest printed works from the West were Michele Ruggieri’s catechism of Christianity, Sheng Chiao Shih Lu¹⁰, printed in Canton in 1582; Matteo Ricci’s map of the world, Kuan Yu Wan Kuo Chhian Thua¹¹(1584) and his translation, in collaboration with Hsi Kuang-Chih¹², of Clavius’ Euclidis Elementorum, Chi Ho Yuan Pen¹³(1607). Many other works on mathematics, astronomy, physics, geology, biology, psychology, medicine, and world geography and history, besides those on the Christian religion, were included in the late Ming and early Ching printing.¹⁴

Many official agencies in both the central and local governments engaged in printing various kinds of books for different readers. The printing facilities at the imperial palace, known in general as Nei Fu, were in charge of the Supervisorate of Ceremonies (Ssu Li Chien), which was one of the twelve supervisory offices established early in the Ming. Three printing shops (Ching Chiang¹⁵), including those for the Confucian classics, Buddhist sutras, and Taoist canons, were operated under this agency. The shop for the Confucian classics printed many prestigious editions of the Five Classics and Four Books, and a collection of neo-Confucian philosophy called Hsing Li Ta Chhian Shua, printed in 1415.¹⁶ Although the physical

writing, records of foreign countries, especially of south and southeast Asia, local gazetteers, and such large compilations as collectanea and encyclopedias. In technique, the Ming printers introduced metal typography, improved the multi-colour process of block printing, refined the woodcut for book illustrations, and used xylography for facsimile reproductions of old editions. In both content and technology, then, printing in the Ming was distinguished in many respects. Its development during the dynasty can be divided into two distinctive periods with 1500 as roughly the dividing line. For more than a century before that date, Ming printing generally inherited the tradition of Yüan in both techniques and format, and the continuation of the civil service examinations resulted in the printing by the National Academy and other official agencies of Confucian classics, standard histories, and works of reference for reading by the candidates. Commercial printers also primarily busied themselves in printing such materials as textbooks.

Under the Ming, the fifteenth century witnessed political stabilisation, economic expansion, and increasing contacts with foreign countries, especially southwards over the sea. Numerous writings on the Western Oceans (ktj^-yang), on navigation, and naval architecture were produced as a result of the increasing marine activity, and particularly the seven expeditions of Cheng Ho¹⁷ that he made between 1405 and 1431. At the same time, great intellectual development was manifested by the enrichment of the imperial library, the establishment of numerous private collections, and by the compilation of the Yung-Lo Ta Tien, an encyclopedia of scope and size unprecedented in history. This gigantic work consisted of 22,937 chüan of passages extracted from over 7000 titles from the classics, history, philosophy, literature, religion, drama, fiction, industrial arts, and agriculture, all of them grouped by subject and arranged according to the order of the rhymes. Compiled and copied by a task force of some 3000 scholars between +1403 and +1408, the work contained fifty million characters and was bound in yellow brocade in 11,095 volumes, each sixteen inches in height and ten inches in width.¹⁸ The main text was written in black ink, with headings and sources in vermilion, on white paper ruled with red vertical lines. A plan for printing this work did not materialise, except perhaps for a small portion,¹⁹ primarily, it seems, because the cost would have been prohibitive. Only one additional set was made by hand.²⁰

The original copy of this work was first deposited in the imperial library, Wen Yüan Ko²¹, in Nanking, and was removed to Peking in 1421. The library there, ²²

¹ Cf. K. T. Wu (6); Chien-Tsun-Hsien (9).
² Cf. Kuo Po-Kung (1); Wu (2), pp. 46 ff.; Giles (1); Goodrich (46); these figures are based on the account given by the publisher of the Peking reprint of 1906; different sources give varying figures.
³ Paul Pelliot is reported to have been told by the official-collector Tsan-Fang¹¹ (+1861 to +1911) that he had seen some 100 titles of this work in printed form; see Goodrich (34), p. 18.
⁴ The texts of 398 works in 4,866 chariae were extracted for the Ssu Li Chhian Shua. The original set and part of the duplicate were destroyed at the end of the Ming and many of the remaining volumes were destroyed during the Boxer uprising in 1900. Only some 800 chariae are known to have survived today in various libraries throughout the world. A reprint of 700 chariae in 200 vols was made in Peking in 1926, and another of 720 chariae in 100 volumes in Taipei in 1962.
⁵ 西洋
⁶ 鄭和
⁷ 永樂大典
⁸ 楊方
⁹ 鄭文焯
more types were cut for the frequently used characters than for those that were less used.

Various branches of the government such as the Board of Rites, Board of War, Board of Works, Censorate, Imperial Observatory, National Academy, and Bureau of Physicians are all known to have printed books. For instance, the Board of Rites printed a collection of documents concerning the bestowing of posthumous imperial honours, Ta Li Chi, in four chüan, compiled under imperial auspices and printed in early 1526. The Board of War printed an illustrated work with maps on the defence organisation of the northern border regions, titled Chiu Pien Thu Shuo, presented to the throne in 1538. The Bureau of Physicians published several works on medicine, including an illustrated book on acupuncture and moxibustion, Thung Jen Chen Chiu Thu Ching, in three chüan, printed from a Sung text on stone, with illustrations from a bronze model, under imperial auspices, in 1443. But though most of the publications of government agencies related to their respective fields of administration, a fair number of them did not. For example, many works for enjoyment and amusement were printed by the Ming Censorate, the Tu Chha Yüan, among some thirty of their titles there were two popular novels, the San Kuo Chih Yen-I, (Romance of Three Kingdoms) and the Shui Hu Chüan, three works on the game of chess, and two on music and songs.

The most productive among the government agencies was the National Academy, Kuo Tzu Chien, which, between its southern and northern branches, printed no fewer than three hundred works including classics, histories, local gazetteers, imperial documents, manuals of calligraphy, classified encyclopedias, as well as works on medicine, agriculture, and technology. The most notable of these were the Thirteen Classics and the Twenty-One Standard Histories, which were first printed from old blocks accumulated from previous dynasties during the previous seven centuries, and later from new blocks called between 1530 and 1596. The teachers and students of the academy were responsible for the collation, revision, printing, and custody of blocks, and their names often appear on the blocks themselves.

The distinguished contributions of Ming printing include the publications of various local officials such as governors, provincial judges, princes, and certain lower administrative units. Many of the books were printed by the offices of prefectures of almost all the provinces in the empire, including such border and interior regions as Kuangtung, Kwangsi, Yunnan, and Kueichow, where printing was scarcely known in previous dynasties, and especially significant was the compilation and publication of local gazetteers, which began to proliferate to cover all

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Fig. 1123. National Geography of the Ming Dynasty, Ta Ming I Thung Chih, printed by the Imperial Palace in 1461. Far Eastern Library, University of Chicago.
Among the many local official printers, most interesting were the various enfeoffed princes, who had the wealth, leisure, and the opportunity for book collecting and printing. Their libraries contained many rarities of Sung and Yuan editions bestowed upon them by the emperors, while quite a few were prominent authors, collectors, and printers of fine editions, and they constituted one of the distinguished features of Ming scholarship; more than thirty of them are known to have engaged in writing and printing; one Prince of Ning printed as many as 137 titles. Their publications included works on medicine, longevity, meditation, amusement, music, games, instruction, and conduct of princes, and textbooks for women, besides traditional subjects. The most notable among these publications included the collected works on music and acoustics, *Yüeh Lü Chhüan Shu*, in thirty-eight *chüan*, by the Prince of Cheng, Chu Tsai-Yü (+1536-1611), printed about 1606 (Fig. 1124); a collection of medical prescriptions, *Hsin Khan Hsiu Chen Fang Ta Chhüan*, printed by the Prince of Hui in 1553; a treatise on incense and perfumes, *Hsiang Phu*, and on tea, *Chha Phu*, both printed by the Prince of I in 1649; and a cookbook, *Yin Shan Cheng Yao*, reprinted by the Prince of Chhing. All the books they produced are known to have been well collated, based on the best editions, and printed with excellent workmanship on good paper, while wooden movable type is also known to have been employed by the princes of Shu and I in the 16th century.

Under the Ming, private printing was not common before 1500, but became very popular during the 16th and 17th centuries. Many of the private printers, including scholars, families, book collectors, local schools, and monasteries, were motivated by altruism toward the spread of literature, and did not act for profit or because of official obligations. Thus the privately printed editions were usually carefully collated and high in quality and workmanship. Works by individual authors were normally published after their deaths and sponsored by their descendants, friends, or families, though in some cases works were printed during their lifetimes, a witness to their own sponsorship. The famous work on technology,
Thien Kung Khai Wu⁴ by Sung Ying-Hsing⁵, was printed by the author in 1637, the illustrated encyclopedia, San Tshai Thu Hui⁶, (Illustrations of the Three Powers), in 168 chian, compiled by Wang Chhi⁷ (chin shih, 1565) of Shanghai, in collaboration with his son Wang Su-i⁸, was printed by his friends in 1609 (Fig. 1125). In the case of the noted scholar-official Hsi Kuang-Chhi⁹ (+1562–1633), also of Shanghai, his illustrated encyclopedia on agriculture, the Nung Cheng Chhian Shu, in sixty chian, was edited after the author’s death by one of his disciples, Chihen Tzu-Lung⁴, and printed at the Phing Lu Thang in 1640.

Most of the reprints of earlier works or fine editions were usually made by book collectors who, with careful collation, reproduced rare or unique editions from their own libraries, primarily for the diffusion or preservation of the original works for the scholarly world, or as a hobby to spend the wealth accumulated from their businesses. One of the many Ming collector-printers was An Ku⁸ (1481–1534), of Wuhsi, who printed no fewer than two dozen titles known to us, one half of them in his illustrated encyclopedia on agriculture, the San Tshai Thu Hui⁶, which consists of 140 titles. At one time, during its early stage, Mao employed some twenty cutters and printers in his workshop and accumulated as many as 100,000 blocks for the printing of various works in his studio Chi Ku Ko⁵, a name for both his private library and his printing shop. His work had a great impact on printing in the early Chhing period.

Many private schools printed textbooks for their students and other titles of scholarly importance. The Chhing Cheng Shu Yuan⁶ of Kuangtung printed the collected commentaries of the Four Books in 1535 and part of the Standard Histories in 1537, while the famous Tung-lin shu-yiian⁶ and other private academies printed many individual literary collections. Certain officials also printed books in their private capacity. Local scholars serving in the capital usually printed a special kind of gift book, the shu pha pe⁶, to be presented as a souvenir to their colleagues on their return to the capital from their native provinces. Because the contents of such editions were not carefully collated, they were usually not considered of scholarly value.

As for religious works, at least three and perhaps four editions of the Buddhist Tripitaka and one edition of the Taoist canons were printed under the Ming. The most famous of these is the southern edition of the Tripitaka, Nan Tsang⁶, including 1610 works in 6331 chian, printed in Nanking in 1372, and the northern edition, Pai Tsaeng⁷, including 1615 works in 6361 chian, produced in Peking in 1401. Both were printed under imperial auspices and bound in the folded format. A third edition of the Tripitaka, known as the Ching-shan Tsang⁸, was printed in Wu-thai and Chingshan as well as several other places in Chiangsu and Chekiang between 1589 and 1677; it was the first Tripitaka to be bound with thread stitching in the flat style. Another edition is said to have been printed in Hangchow in the Chia-ching period (+1522–66), but it may not have been completed, and no such work is now known to exist. As for the Taoist collection, the Tao Tsang⁹, the original set included 3505 chian, compiled under imperial auspices, was completed in 1443 and a sequel in 1607. The two series were later printed together and distributed to Taoist temples as an imperial favour.¹⁰

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¹ Numbers of folios of these volumes are given in Wang Ming-Sheng (+1722–97), I Shu Pin (1847), ch. 14, p. 14; these figures equal the number of blocks.
³ 天工开物
４ 宋应星
５ 三才图会
６ 王圻
７ 王思义
８ 卧游
９ 小窗快语
— 按原书

Fig. 1125. Soum-pointer as illustrated in the Ming encyclopedia, San Tshai Thu Hui, +1620 ed. Far Eastern Library, University of Chicago.
Ming commercial printers inherited the tradition of the previous dynasties of the Sung and Yuan with publishing centres in Fukien, Chekiang, and Szechuan. Such bookshops as Chhin Yu Thang, which had operated in Chien-yang since the Sung, and the Tu Shen Chai, had a history of over a hundred years. The latter, owned by Liu Hung, printed numerous titles of histories, literary collections, encyclopedias, and medical works. Especially notable were such large multi-volume sets as the Wen Hsien Thung Khaoh, an encyclopedia of institutions in 348 chiau; the Shan Thang Chihin Shu Khaoh of Shi, an encyclopedia of quotations in 212 chiau; and the Ta Ming I Thung Chi, a national geography of the Ming dynasty, in ninety chiau. As might be expected, certain printers specialised in medical books.

The Chung Te Thang of Hsiung Chung-Li of Ao-feng printed at least eight medical classics, including a collection of pediatric prescriptions, Hsiao Erh Fang Chih, in ten chiau (1440); prescriptions for smallpox, Cheng Chih Shih Hsiao Eno To Chen Fang Lan in two chiau (1448), a complete work on surgery, Wai Kho Pei Yao, in three chiau (1568); and a supplement to the glynaecological treatise, Hsin Pin Fu Jen Liang Fang Fu I Ta Chihuan, in twenty-four chiau, also printed in 1568.

After 1500 Huchow in Chekiang and She-hsien in Anhui were among the best printing centres, and from the late 16th and early 17th centuries, many skilful cutters moved to the area south of the Yangtze, where such cities as Nanking, Soochow, Chhangshu, and Wuhsi became very prosperous in printing and book production.

Generally speaking, Ming printing, especially during the later part of the period, significantly influenced the format of Chinese books in the next four or five hundred years. Ming books printed before 1500 inherited the traditional format of the Yuan (Fig. 1123); their calligraphy was in the soft style, with a black folding line in the block, and the volumes were bound in a wrapped back binding. After 1500, the Sung traditional format was generally followed, where the calligraphy was more rigid and straight, lacking free and swift movement (Fig. 1124). The folding line was white or blank, and names of calligraphers and cutters and numbers of characters appeared on the blocks, similar to Sung practice. From the middle of the 16th century, calligraphy became more stereotyped in style (Fig. 1126), and this has remained the standard form of Chinese printing to the present time. Unbleached yellow bamboo paper was generally used in early Ming, bleached white paper around 1500, and yellow paper again toward the end of the 16th century, at which time binding also underwent a transformation, from the wrapped back style to the stitched binding which remains in use.
Prosperity and Decline of Traditional Printing in the Ch'ing Period

China under the Ch'ing dynasty (+1644–1912) inherited a great cultural tradition and, although under the alien Manchu rule, in general enjoyed a period of intellectual development and prosperity. Activities in literature, classical research, and the compilation, collecting, and production of books and documents were especially remarkable and abundant. During the first half of the dynasty, from the latter part of the 17th and through most of the 18th century, government leadership in academic pursuits resulted in widespread printing. Numerous distinguished scholars and officials were recruited by the imperial court to engage in the compilation of books, and publication of the results of their research followed naturally.

In both official and private sectors, and it was during this period that traditional printing proved insufficient to meet modern needs and gradually gave way to the new technology of the West.

Since the imperial palace was active in printing and compilation, Peking naturally acquired central importance in publishing. Printing and publishing also flourished in places like Nanking, Soochow, Hangchow, and Yangchow. While these centres emerged, Fukien was no longer as influential and its editions were less widely circulated than before. Publishing in battle-stricken Szechuan was also declining. Throughout the Ch'ing dynasty, Chekiang and Chiangsu remained centres of book-collecting and publishing because of their favourable geographic locations, natural resources, and commercial prosperity. As time went on, Hunan and Hupei came on the scene, while Shanghai, the chief entrance for Western influence, became the main publishing city at the turn of the 19th century.

Not unlike previous dynasties, the Ch'ing saw active imperial patronage of compilation and publication, but with even greater vigour. The Manchu rulers actually started printing before establishing control over China proper, though their early imprints consisted mainly of Manchu translations of Chinese works. After their ascent to the throne, the publishing policy common to all previous dynasties was continued, the body chiefly responsible for central government printing being the Imperial Printing Office at the Wu Ying Palace (Wu Ying Tien Hsiu Chhu), a division of the Imperial Household (Nei Wu Fu) and located within the imperial compound. The publications of this office were generally known as Palace editions (tien pen) and were noted for careful collation, good paper and ink, elegant calligraphy, and excellent execution and binding (Fig. 1127).

The palace publications included a variety of books and documents produced by different methods. Manuscripts copied by hand included imperial admonitions, authentic records, and such huge collections as the Ssu Khu Chhuan Shu (Complete Library of Four Treasures).

Block-printed editions included the collected administrative regulations, penal codes, and records of imperial birthdays, tours, and military campaigns, as well as all works on classics, philosophical and literary writings, dictionaries (Fig. 1128), and a miniature "sleeve edition" (hsiu chen pen) of selected titles. Also, bronze and wooden movable type was used for printing such large sets as encyclopaedias, collectanea, and scientific compendia. At least 382 individual titles are registered as having been printed in one way or another at the Imperial Printing Office at the Wu Ying Palace between 1644 and 1865.

Among the huge sets was the gigantic compilation Thu Chi Chu Chhing (Grand Encyclopaedia of Ancient and Modern Knowledge) in 5000 volumes, printed with bronze movable type in +1708 (Fig. 1147). It consists of 6105 topical headings grouped into thirty-two sections under six major divisions: Heaven, Earth, Man, Science, Literature, and Government. Direct quotations with occasional illustrations are further classified by types of materials under each heading, with a total of over 100 million words in the work. Another large set was the Wu Ying Tien Chi Chen Pan Ts'hung Shu (Collection of Assembled Gem Editions of the Wu Ying Palace), which included 138 titles printed with wooden movable type from 1773 to around 1800. One Buddhist collection, Lung Ching (The Dragon Tripitaka), was also printed in Peking. Among some of the fifteen tripitakas printed in China, this set of 1662 works in 7168 chuan was the second largest, and was completed in the remarkably short time of three years from 1733 to 1738 through the use of some of the old blocks carved during the Ming period.

As in previous dynasties, central government printing in the Ch'ing was followed by local agencies, and the central government actually encouraged such activity. In 1776, for example, copies of the Palace edition of the Wu Ying Tien Chi Chen Pan Ts'hung Shu were given to southeastern provinces with permission to

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* Cf. Yeh Te-Hui (4), pp. 333–4; see also distribution of eighty bookshops which produced popular fiction during the Ming-Ch'ing period in Liu Takun-Jen (4), pp. 36–44.
Fig. 1127. Imperial writings of Emperor Khang-Hsi printed by the Wu Ying-Tien palace printing shop in 1771.
From Yu Chih Wen Chih, Far Eastern Library, University of Chicago.

Fig. 1128. Original block edition of the most popular dictionary, Khang-Hsi Ten Tien, with some 49,000 characters, printed c. 1716. Far Eastern Library, University of Chicago.
and before long, several local editions were printed with wood blocks at Nanking, Chekiang, Chiangsu, and Fukien. After the Thai-Phing uprising, local government printing was especially prosperous and provincial printing bureaus were established to restore books lost in the turmoil. Numerous printing works were set up in Nanking, Yangchow, Soochow, Hangchow, Wuchang, Chhingpha, Nanchang, Chhengtu, Tainan, Thaiyuan, Foochow, Canton, Kunming, and other cities; all were renowned for careful execution and for mutual co-operation. 3

Under the Manchu rule, many private persons engaged in scholarly activities for a variety of reasons. Some, loyal to the Ming court, became recluses seeking refuge in books, scholar-officials who retired from office found in books their ultimate companions while certain other scholars under threat of persecution diverted their energy to the politically safe pursuit of the critical study of the ancient Classics and history. Whatever the motivation—vanity, a wish to preserve literature, or to propagate scholarship—their scholastic achievements contributed greatly to the printing of new books and, even more frequently, to the reprinting of old ones. Again, there were schools and academies which went beyond the printing of texts for instruction to the production of more general publications, but the audiences at which they aimed differed, as did the contents and qualities of their publications.

Individual scholars who served in government offices sometimes also sponsored printing, using either government or private funds, and their eminent positions enabled them to secure assistance of outstanding scholars for works of excellent quality. Another group, mostly learned men and writers, printed books primarily to disseminate the results of their study. But books that survived the passage of time were often loaded with alterations and omissions, and textual errors were particularly common in late Ming imprints. However, a group of Chhing researchers who were interested in securing the best texts of standard works, applied their entire lives to textual criticism, and printing the collated texts became their favourite vocation. There were also bibliophiles, or bibliomaniacs, who strove to build up sizable private libraries, sometimes even idolised the rare editions they possessed, though when they printed their choicest items it was probably to broaden their circulation and preserve them from loss or destruction.

A final group consisted of booksellers or trade printers; they dealt in books for profit. On account of their experience of the trade and knowledge of the public demand, their publications reflect more truly the general reading interest of the time. One list records 246 titles put out by sixty-two bookshops in Peking's Liu-li chhing district, one of which produced as many as forty-nine works. Some of them specialised in what they published; for example, the San Hui Thang and Hung Yuan Thang (Fig. 1129) in Chinese-Manchu bilingual works; the Chi Chen Thang in movable-type publications, and the Ts'ao Ku Chai in art and archaeological works. At least one bookshop, the Sui Ya Chai, edited and printed its

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* This list covers imprints from mid-Chhing to early Republic; see Sun Tien-Chhi (1), pp. 127-56.

Fig. 1129. Chinese-Manchu bi-lingual text of the Shu Ching printed by the Hung Yuan Thang in Peking in 1798. Far Eastern Library, University of Chicago.
own collections. The Liu Li Chhang district, where over 300 bookshops were in
business at one time or another, was the centre of Peking's book trade from the late
Khang-Hsi period (+ 1662–1722) and has been an important site for many
intellectual activities until today. a

The combined efforts of the Chhing printers resulted in such a surge of printing
in several major categories that the products of no previous period can be com-
pared with it for quantity and the magnitude of the works produced. First, local
histories (ti fang chi)? were compiled under the auspices of individual local ad-
ministrations of provinces, prefectures, sub-prefectures, counties, villages, and
sometimes mountains, passes, rivers, dykes, bridges, salt wells, temples, academies,
tombs, gardens or guilds. Of over 7000 such works known to exist, no less than
eighty per cent were compiled and published in the Chhing dynasty. b Clan
registers (tsang phu? or chia phu?) form another category of materials printed mainly
during this period, and of them, at least 4000 titles are known to exist in public
collections throughout the world. Of them, the source of 1550 is known, and of this
number 1214 were compiled under the Chhing (see Fig. 1190). c Individual literary
collections (tsang chi?) are still another category of literature that was largely printed
in Chhing times; indeed, it is estimated that 144,000 literary writers of the Chhing
period, many of whom had individual collections, are recorded in five anthologies
of the Chhing authors. d Finally, collectanea (tshung shu?) probably compose the
most extensive class of works ever printed. A tshung shu consists of a variety of
literary works published or reprinted under one general title and uniformly bound,
following a prescribed plan, in order to facilitate preservation, wider circulation,
and collecting. Of some 3000 such collections containing 70,000 individual works,
the great majority were either produced or reprinted in the Chhing dynasty. e In
fact, of the quarter of a million titles of Chinese publications known to have
accumulated throughout the dynasties, no less than one half were produced during
this period, the greatest amount in all history. f

Because of the prevalence of block printing, problems in printed communication
arose when China met the West. Before the 19th century, Chinese characters
included in Western publications were often printed separately as an appendix,
though a few works such as those produced by the Jesuits in the 16th and 17th

a For a history and description of the Liu-Li-Chhang district in Peking, see Sung Tien-Chhi (1), Wang Yeh-Chhin (?).

b Of 5832 titles listed in Chu Shih-Chia (3), 1955 ed., 4655 were printed in the Chhing; the 1958 ed. added 1381
titles, but no breakdown is given.

c Only fourteen are known to have been produced in Yüan and Ming, and 324 in the Republican period; see

d For sources of the estimate, see Yang Chia-lo (2), pp. 2–5.

e The most complete catalogue of the collectanea, Chung Kuo Tshung Shu Tung Lu, vol. 1, registers 9757 works by
subject classification; certain classes are arranged by periods.

f It is estimated that 255,055 titles are registered in various dynastic and other bibliographies from Han to the
1930's; 106,493 were produced under the Chhing; see Yang Chia-lo (2), p. 27.

1 地方志 2 宗譜 3 家譜 4 別集 5 蕃書

Fig. 1190. Genealogical record of the Hua clan, printed with wooden movable type in +1872, listing names of
Ming printers with Hua Shui in the fourth column and his nephew Hua Chien in the fifth column. From Hua Shih
Tang Pin, 1872 ed., Columbia University Library.
centuries were printed from blocks. As early as 1555 or 1570, European printers began to make experiments to accommodate Chinese characters printed on their presses, while later, in the 19th century, Protestant missionaries tried to cut punches for making metal type for Chinese characters. Robert Morrison of the London Missionary Society established a printing house in Malacca in 1814 to print his Chinese-English dictionary (Fig. 113) and a translation of the New Testament with metal type cut by a Chinese engraver, Tshai Kao, and his assistants. In the following year, the first monthly periodical in Chinese, Chha Shih Su Mei Yi Tu Thang Chi Chuan, was started. This enterprise soon found many followers.

By the middle of the 19th century, fonts of Chinese type were made in Europe and America for missionary and other printers in the Far East. At first, these types were used primarily for printing bilingual texts, though gradually they found their place in purely Chinese printing. A Mr Tong created two fonts containing over 150,000 types cast in moulds at Canton in 1850, and nine years later, the electrotype process was introduced by William Gamble to make a large set of Chinese type in Shanghai. But in Chinese circles block printing and wooden type were still more popular, and modern methods were not generally accepted by Chinese printers until early in the 20th century.

In contrast to typography, lithography catered better to the needs of Chinese books and successfully affected literary and artistic life in China. Printers in the past had usually reproduced fine editions in facsimile by the laborious and difficult process of re-engraving, so they naturally found great attraction in this new process which permitted them to reproduce handwriting and art work directly, or to make exact replicas of treasured editions with great speed. Books to prepare readers for the civil service examination were also conveniently printed in reduced format by photolithography in the late 19th century. Reproduction of pictures and book illustrations was especially successful with this new method (Fig. 113).

Photolithography was first introduced by the Catholic Thu-se-wei Press in Shanghai to print Christian literature. The Tien Shih Chai, also established in Shanghai in 1874, produced editions with such small characters that a magnifying glass was sometimes provided along with a purchase, while the Thung Wen Shu Chu, founded in 1881, published more facsimiles of old imprints. Besides monochrome pictures, multi-colour photolithography was employed by Fu

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* A catechism and a Latin-Chinese vocabulary prepared by Father Michele Ruggiero were printed from blocks in Macao in 1585; a German chronology printed in Berlin in 1686 and Bayeyer's Monument Sinicum printed in 1730 were also from blocks; Cf. Lach (5), 1, pp. 486-97; Hirth (38), p. 165.
* For the development of typography in modern China, see K. T. Wu (8).
* Ching Yü (2), 545-55, Hirth (38), p. 106.
* Method of making type and a sample page are given in Chinese Repository, 19 (1890), pp. 547-78.
* Walter Medhurst (1) says that he began to use lithography in Batavia in 1814 or 1815. In a dozen years from 1823, he printed thirty works in Chinese, nineteen with blocks and eleven with lithography.

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The small size of fonts, 1.75 inches in height, limits the use of the dictionary, especially for dictionary use. This is a common problem with Chinese dictionaries, as the characters are much smaller than English ones. The dictionary is arranged in alphabetical order, with Chinese characters listed first and their English equivalents following. The text is printed in two columns, with Chinese characters on the left and English on the right. The dictionary covers a wide range of topics, from general vocabulary to specific concepts and phrases.

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**DICTIONARY OF THE CHINESE LANGUAGE, IN THREE PARTS.**

**PART THE FIRST.**

CHINESE AND ENGLISH, ARRANGED ACCORDING TO THE RADICALS.

**PART THE SECOND.**

CHINESE AND ENGLISH ARRANGED ALPHABETICALLY, AND PART THE THIRD.

ENGLISH AND CHINESE.

**BY THE REV. ROBERT MORRISON.**

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**Fig. 113.** First Chinese-English dictionary printed with metal type in Macao, 1815.

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University of Chicago Library.
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Fig. 1132. Foreign envoys in Peking paying tribute to Empress Dowager Tzu-Hsi on her sixtieth birthday, received by the Emperor Kuang-Hsu at the Imperial court in 1894. Drawing by Ho Yuan-Chun and printed by lithography.

Wen Ko, Tsao Wen Shu Chü, and the Commercial Press, all in Shanghai, whence the process of photolithography spread to many other cities. Founded in 1897, the Commercial Press grew into the largest printing house in the Far East, and has been a landmark for the intellectual and educational development of modern China.

(§) TECHNIQUES AND PROCEDURES OF CHINESE PRINTING

Unlike papermaking, the technical procedures of printing have scarcely been documented in Chinese literature. No information on how printing blocks were made nor on how many copies were printed from each block in earlier times is available, except for occasional remarks made by a few foreign observers and writers. On the other hand, some of the movable type methods were recorded. Details of materials, tools, and the methods used for preparing block printing can only be deduced from an interpretation of related terms, by examination of printed editions, and from the oral testimony of a few surviving craftsmen or observers of the work of carving and printing since its gradual disappearance in the early part of the 20th century. Only recently an article describing the methods of block printing gave some details of the technical procedures, yet even so, many questions still cannot be fully answered.

While traditional terms for printing such as tsai li (to spoil pear wood), chhiem tsao (to incise jujube wood), or fu tzu (to send for engraving on catalpa wood) refer to the kinds of materials used, such modern terms as yin shua (to print and brush) or hau tzu (movable characters) are concerned with the methods used, and some of

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2 For its history and development, see Florence Chien (1).
3 See an article written in 1947 by Lu Chhien (3), based on the information supplied to him by a surviving block printer.
these are often found in printers' colophons or elsewhere in books. Based on available information and interviews with block cutters, the following accounts are accompanied with figures to illustrate how traditional printing was done.

(1) MATERIALS, TOOLS, AND PREPARATION FOR PRINTING FROM WOODBLOCKS

Woods most commonly chosen for printing blocks included pear, jujube, catalpa, and sometimes apple, apricot, or the wood of other fruit trees with similar qualities. Boxwood, gingko, and Chinese honey locust were also used. Pear (Pyrus sinensis, Ldl.) has a smooth and even texture with a medium hardness that is ideal for carving in any direction. Jujube (Ziziphus vulgaris, Lam.) has a straight, even grain with fine pores and is harder than pear. While its fruit bears a superficial resemblance to a date, the jujube is unrelated to the palm family and does not resemble it in any way. Catalpa (Tzu, Lindera tsu-ma, Hems.) is a hard wood with a straight but coarse grain. It is commonly considered to be the best material for coffins. Boxwood (Buxus sempervirens, L.) is the softest and is often used for carving regular text; gingko (Ginkgo biloba, L.) is very absorbent, and the Chinese honey locust (Achnatherum). is a very hard wood, useful for cutting delicate lines in illustrations.

These woods from deciduous trees were chosen, it seems, because they were both abundant as well as suitable. The wood of coniferous trees, while soft and straight-grained, is impregnated with resin which would probably affect the evenness of the ink coating and so is unsuitable for printing blocks; such wood is also valuable for other uses. For printing paper money and articles in large quantities, copper plates and other materials were sometimes used.

There are two methods of cutting wood into blocks for carving. One is to cut with the grain, making a block with a straight or an irregular grain. The other is to cut across the grain. For best results in carving and inking, Chinese craftsmen usually chose the former method, preferring blocks with a straight and close grain. This not only made possible a larger area for the text, but also avoided having to use the heart of the wood. The wood had, of course, to be free of knots and spots, since these would interfere with both carving and printing. After the blocks have been cut, they are usually soaked in water for about a month before use but, if they are needed for immediate use, they can be boiled instead; they are then left to dry in a shaded place before being planed on both sides. Vegetable oil may be spread over the block surface, which is then polished with the stems of polishing grass (oli chi tscha, Achnatherum). The size of a block depends upon that of the sheet to be printed; normally it is rectangular, averaging twelve inches wide, eight inches high, and half an inch thick. Both sides are usually carved to enable the printing of two pages, or one leaf, on each side (Fig. 1134).

In the preparation for engraving and printing, the manuscript is transcribed on thin sheets of paper by a professional calligrapher. To do this a blank sheet is ruled into columns and spaces with a centre line in each column known as a variegated space (hao ka); this is used as a guide for writing the characters within each space in a balanced arrangement. The paper is waxed lightly and smoothed with a stone burnisher to make the surface easier to write on with a brush. The transcript is placed, written side down, on a block over which a thin layer of rice paste has been evenly spread (Fig. 1136a). The back of the paper is then rubbed with a flat palm-fibre brush (Fig. 1137a) so that a clear impression of the inked area is transferred to the block. When the paper has dried, its upper layer is rubbed away with finger tips and brush to expose a fine mirror image of the characters or designs which have been applied to the block, looking as if they had been inscribed directly on it. The block is then ready for carving.

The engraving of the woodblocks requires a set of sharp-edged tools of different shapes (Fig. 1135). The cutting knife (ke tao), is a steel graver with a sharp blade, and is the most important tool for cutting the main lines along the edges of inked areas. A double-edged chisel (tsao) is then applied to cut away surfaces of the block not covered with ink. Next a gouge (cho) scoops out the space from the surface, sometimes leaving a groove in the columns and, finally, a pick with two sharp ends (liang tho mang) is used for work too fine for other tools.

The general practice in engraving is to leave all black lines in the mirror image in relief. A cut is first made narrowly bordering each character; this process is called fa tao, or starting cut (Fig. 1136b). The knife is held like a dagger in the right hand, steadied and guided by the middle finger of the left hand, and is usually drawn towards, not pushed away from, the cutter. This ensures that a close cut is made along the very edge of the black line. All the vertical lines are cut first, in one direction, and then the block is turned round for the cutting of the horizontal or slanting strokes as well as the dots. When this has been done, the blank space between the outer and inner lines is cut away in a step known as tiao tao, or close cut leaving the characters with a relief of about one-eighth an inch. The gauge with a semi-circular edge is used to cut away all the blank surfaces, known as ta khang, or chiselling blanks. (Fig. 1136c), and a wooden hammer (pao tao) (Fig. 1135f) is
Fig. 1134. Carved woodblocks ready for printing. Above is the text and commentaries of the Confucian Analects with reverse characters in relief; below is an illustration of the Dream of Red Chamber, both were carved on two sides. Far Eastern Library, University of Chicago.

Fig. 1135. Tools for woodblock carving. (a) Cutting knives. (b) Double-edged chisels. (c) Gouge with semi-circular edge. (d) Flat edge chisel. (e) Scraper. (f) Wood mallet. Original photos from Jung Pao Chai, Peking and To Yün Hsien, Shanghai.

Fig. 1136. Preparation of block for printing. (a) Transferring text to block. (b) Starting cut. (c) Chiseling blanks. (d) Cutting lines. Drawings by staff of Shanghai Library.
used to strike lightly on the tools to aid in clearing away the remnants of wood. The black lines of the columns and edges of the block are carefully trimmed with a small straight-edged knife to make all the lines sharp and clear; this process is called ts hien, or cutting lines (Fig. 1.136d). Finally, the four edges of the block are sown off and smoothed with a plane. The carving and preparation of the block is then complete (see Fig. 1.134).

Four proof-readings are normally required in the engraving process: one when the transcript is written, another after corrections have been made on the sheets, the third when the first sample sheets are printed from the blocks, and the fourth after any repairs are carried out on the block. When a mistake is discovered or a line chipped off, a block can be repaired; a small error being excised with one edge of the chisel (ting chho) by making a notch into which a wedge-shaped piece of wood is hammered, but if area is involved, a suitable piece of wood is inlaid. In either case, the new surface is smoothed and carved as if it were the original.

After the carving is complete, the surface is cleaned of any remaining wood refuse or paper tissue and washed. The block is then held firmly on a table with paper, ink, and applies it to the raised surface of the block. A sheet of paper is immediately lightly over the back of the paper. A positive image of the characters or illustrations is thus transferred to the paper, which is peeled off the block and laid aside to dry.

The process is repeated until the necessary number of copies is obtained. Sample copies were sometimes made in red or blue, but final copies were always printed in black, and it is said that a skilled printer could print as many as 1500 to 2000 double-page sheets in a day. Fifteen thousand prints can be taken from the original block, and another 10,000 after slight touching up. Blocks can be stored and used again and again when additional copies are needed.

(2) Varieties and Methods of Movable Type Printing

Movable type printing was invented as an alternative to the cumbersome process of block printing. For economy and efficiency, experiments were naturally made from time to time with movable type, even though it was not entirely satisfactory for printing Chinese. The principle of assembling individual characters to compose a piece of text can be traced back many centuries before Christ, as inscriptions on bronze vessels, pottery objects and cast metal seals have made evident, but the use of movable type for printing was not begun until the middle of the +11th century.

(i) Earthenware type

At the present time, the only known authoritative account of the invention of movable type by a commoner named Pi Sheng (c. 990–1051) is the contemporary record of Shen Kua (+1031–95), which says:

During the reign of Chhing-li (+1041–48) Pi Sheng, a man of unofficial position, made moveable type. His method was as follows: he took sticky clay and cut in it characters as thin as the edge of a coin. Each character formed, as it were, a single type. He baked them in the fire to make them hard. He had previously prepared an iron plate and he had covered his plate with a mixture of pine resin, wax, and paper ashes. When he wished to print, he took an iron frame and set it on the iron plate. In this he placed the types, set close together. When the frame was full, the whole made one solid block of type. He then placed it near the fire to warm it. When the paste [at the back] was slightly melted, he took a smooth board and pressed it over the surface, so that the block of type became as even as a whetstone. If one were to print only two or three copies, this method would be neither simple nor easy. But for printing hundreds or thousands of copies, it was marvelously quick. As a rule he kept two formes going. While the impression was being made from the one forme, the other was then ready. In this way the two formes alternated and the printing was done with great rapidity.

For each character there were several types, and for certain common characters there were twenty or more types each, in order to be prepared for the repetition of characters on...
The account, concise as it is, contains full technical details of type-making, type-setting, printing, and the breaking up of type, discussing also its advantages, and the disadvantages of using unsuitable materials (Fig. 1138). Unfortunately, we know of no other information about Pi Sheng or books printed with his movable type. Although the process went into eclipse after its inception, it was a complete invention and fully four hundred years ahead of Gutenberg. In the six hundred years following Pi Sheng, two occasions of the use of earthenware type are recorded. Yao Shu1 (1201–78), a councillor of Kublai Khan, persuaded his disciple, Yang Ku,4 to print philological primers and works by Sung neo-Confucianists with 'movable type of Shen Kua,'4 Wang Chen (fl. 1200–1333), before describing his wooden movable type in Nung Shu, mentioned an alternative method by others of baking earthenware type together with an earthenware frame and filling it so as to make whole blocks. Both of these statements are rather obscure, but at least they indicate that earthenware type was probably employed again during the middle of the 13th century. There is no evidence that earthenware movable type was used in the Ming period, and not until the mid-Ching dynasty was its use as well as that of enamelware type revived. In 1718, Hsu Chi-Ting5 (chi jen 1723), studio name Chen Ho Chai6), a scholar in Thai-an, Shantung, developed a printing process with enamelware type (izuh pan)7 and printed at least two books known to us, Chien I Shao Lueh,8 a commentary on the Book of Changes, printed in 1719 (Fig. 1139), and Hsiao-An Huia Hun,9 miscellaneous notes compiled by Chang Erh-Chhi,9 and printed about 1730.10 Another record says that a certain scholar in Thai-an printed with earthenware movable type in 1718 or 1719, and though the name of the printer is not mentioned, it is most likely to have been Hsu Chi-Ting.11

Once again Shen Kua's record inspired scholars to try the use of movable type. Chai Chin-Sheng12 (b. 1784), a teacher in Chiang-hsien, Anhwei, spent thirty years in making a font of earthenware movable type, utilizing every available hand in his family. By +1844 he had made over 100,000 sets in five sizes, and it was with these that he printed at least three books. The first of these was his own collected poems, entitled Ni Pan Shih Tse Chi Shu Pien13 (First Experimental Edition with Earthenware Type), in which five poems concern his own work of writing, editing, cutting, setting, and printing (Fig. 1140a), and he was certainly the earliest and perhaps the only author-printer in China known to us. Chai also used his type to print 400

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Fig. 1138. Earliest extant edition of the Meng Chi Pi Than, printed in the +14th century. The passage rearranged into one double-page leaf records the first use of earthenware movable type printing by Pi Sheng in the middle of the +11th century. Copy preserved at the National Library of China.

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1. Meng Chi Pi Than (TSZHC), ch. 16, pp. 117–18; cf. Carter (1), pp. 212–13. Part of the original text was cited in Huang Chi Shih Shih Lo Yan (SPYK), compiled by Chiang Shiao-Yu in 1149.
2. Chai Chin-Sheng (1784).
5. Wang Shih-Chen (1694–1711), Chi Po Ou Than (1701 ed.), ch. 23, p. 72, says a certain official in Chao-chi, surnamed Chai7 and a little shih of 1072, compiled an edition of T Ching with enamel plates after making several experiments, but he does not say whether it was printed with enamelled plates or enamelled type.

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* It has been suggested that Pi Sheng died in the reign of Huang-yu (+1049–53), only a few years after this experiment, so was unable to pass on this ingenious device to a fellow printer. This would explain the eclipse of the process and the scarcity of information about it. It has further been deduced that Shen Kua's relatives collected the font in Hangchow, the leading centre of Sung printing and the logical place for movable type printing to be invented; see Huo Tai-Ching (2), pp. 61–2.

* Johann Gutenberg (1400–68) printed the 42-line Bible in c. 1455.

* See Hu Tao-Ching (1), ch. 15, p. 49.

* See Yung Shu (Fching, 1935), p. 531.

* Wang Shih-Chen (1694–1711), Chi Po Ou Than (1701 ed.), ch. 23, p. 72, says a certain official in Chao-chi, surnamed Chai7 and a little shih of 1072, compiled an edition of T Ching with enamel plates after making several experiments, but he does not say whether it was printed with enamelled plates or enamelled type.


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* Meng Chi Pi Than (TSZHC), ch. 16, p. 117; cf. Carter (1), pp. 212–13. Part of the original text was cited in Huang Chi Shih Shih Lo Yan (SPYK), compiled by Chiang Shiao-Yu in 1149.

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* Yang Ku (SCHC). ch. 15, p. 49.

* See Yung Shu (Fching, 1935), p. 531.

* Wang Shih-Chen (1694–1711), Chi Po Ou Than (1701 ed.), ch. 23, p. 72, says a certain official in Chao-chi, surnamed Chai7 and a little shih of 1072, compiled an edition of T Ching with enamel plates after making several experiments, but he does not say whether it was printed with enamelled plates or enamelled type.


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* Meng Chi Pi Than (TSZHC), ch. 16, p. 117; cf. Carter (1), pp. 212–13. Part of the original text was cited in Huang Chi Shih Shih Lo Yan (SPYK), compiled by Chiang Shiao-Yu in 1149.
copies of poetry by one of his friends in 1847-8, and his family register in 1857 (Fig. 1140b); a set of the types, clay moulds, and blanks used for his printing has recently been found in Hui-chou, Anhui. These types have been found to agree exactly with the style of calligraphy in the text of the printed editions (Fig. 1141). b

Apart from the above occasions, earthenware movable-type printing is known to have been employed also in Chhangchow and by Wu-hsi of Chiangsu and I-huang of Chiangsi during the Chhing dynasty. c The earthenware type printers of Chhangchow were noted for their method of typesetting, in which they spread a layer of clay in the frame and arranged the type in it, the clay holding the type firmly. Books printed in this way were so esteemed for their typographic quality that printing orders were sent to Chhangchow from distant parts of the country. Wooden type was invariably engraved individually, and earthenware and enamelware type seems to have been made in the same way, although the earthenware type of Chai Chin-Sheng is said to have been cast with copper moulds before being baked to harden. d

Some scholars have doubted the feasibility of making movable type of earthenware, but the extant copies of books printed by Hsü Chih-Ting and Chai Chin-Sheng are sufficient to prove the existence of such type. In fact, enamelware movable type was considered even 'tougher and more durable than wood', e while earthenware movable type were 'as hard as stone and horn', and had a further advantage over wooden type in that the latter would become 'swollen and muddled' after printing about two hundred copies. f

(ii) Wooden type

Wooden movable type had been tried by or before Pi Sheng, but it was discarded because the material was found unsuitable for printing, though the technical

a See an article on Chai Chin-Sheng and his printing in Chang Hsiu-Min (7), pp. 90-2.

b This list, which includes types in four different sizes measuring 9 mm. to 4 mm. in length, 8.5 to 3.5 mm. in width, and all 12 mm. in height, was discovered in 1962 and is kept in the Institute of the History of Natural Science, Academia Sinica, Peking; see report of Chang Pin-Lun (1), pp. 90-2.


d See Chang Hsiu-Min (7), p. 31. However, it is uncertain whether the moulds were made of copper or clay, as those discovered in Hui-chou in 1962 are said to have been made of earthenware; see Chang Pin-Lun (1), p. 92.


difficulties must have been overcome later as wood was used again after a lapse of some three centuries. The credit for the first practical wooden movable type must be given to Wang Chen1 (fl. + 1290–1333), whose treatise on agriculture, Nung Shu,2 contains the first detailed record of its use. Wang Chen was a magistrate of Ching-te in Anhuei in 1290–1301, and wooden type was made in the two years 1297 and 1298 of his administration. He first summarised his process as follows:

Fig. 1142. Drawing of Wang Chen’s wooden movable-type printing process, c. + 1300, showing, at right, typesetting with characters in compartments arranged by rhymes and, on the left, brushing on the back of paper from the type frames. From Liu Kuo-Chin (1), 1955 ed.

Now, however, there is another method that is both more exact and more convenient. A compositor’s forme is made of wood, strips of bamboo are used to mark the lines and a block is engraved with characters. The block is then cut into squares with a small fine saw till each character forms a separate piece. These separate characters are finished off with a knife on all four sides, and compared and tested till they are exactly the same height and size. Then the types are placed in the columns [of the forme] and bamboo strips which have been prepared are pressed in between them. After the types have all been set in the forme, the spaces are filled in with wooden plugs, so that the type is perfectly firm and will not move. When the type is absolutely firm, the ink is smeared on and printing begins.*

He then proceeded to describe each step in greater detail, covering type cutting and finishing, making the type case and revolving table, and typesetting and printing. First, all characters were divided according to the five tones and the rhyme sections according to the official book of rhymes. A calligrapher wrote the characters for the types, which were then pasted on the wooden blocks to be engraved, with spaces left between them for sawing. For common words, a large number of types were made and in all, more than thirty thousand types were needed. After engraving the characters on the wooden black, each single character was cut out with a small fine-toothed saw, and all were finished off with a small knife for exact uniformity in size and height. The types were then arranged in wooden cases, held in rows with bamboo strips, and kept in place with wooden plugs. They were arranged upon a revolving table according to the five tones and rhymes, with large characters used for labels.

The revolving table, about seven feet in diameter, was supported by a central leg about three feet high (Fig. 1142). Upon the table was a round bamboo frame in which the movable types were kept, each section being numbered from top to

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Two such tables were provided: one for the types from the official book of rhymes and the other for the special types of most-used characters. The typesetter could then select types as needed, and put them back into their proper rhyme compartments after they had been used. A special list of characters was prepared according to the book of rhymes, and the characters were all numbered. A man holding the list called for the types by number, while another took them from the compartments on the table and placed them directly in the forme. Unusual characters that were not found in the book of rhymes were made by the wood-cutter as needed.

Wang Chen's method of printing included estimating the dimensions of the book to be printed and making a wooden edging about the four sides of the block. The right-hand edge was left open until the forme was full, then the edging was mounted and fastened tightly with wooden plugs. The types within the columns of the forme must be so fixed that they were exactly even and correct, with bamboo slivers of various sizes wedged in. When the types stood absolutely even and firm, printing began. The inking of the forme was done with a brush moving vertically down the columns, never across. In taking an impression on paper the columns had likewise to be rubbed with the brush from the top down.

The incentive underlying Wang Chen's enterprise was his voluminous work on agriculture, Yang Shu, although that work finally came out in block-printed form. However, his set of wooden movable type was used to print a local gazetteer of Ching-te, Anhui, which is said to have contained 60,000 characters; one hundred copies of this are claimed to have been printed in less than a month in 1298. The chief contributions of Wang Chen to Chinese printing were that he improved the speed of typesetting by simple mechanical devices, and that he left us a record of the systematic arrangement of wooden movable types, although none of the books printed with his type survive.

About two decades after Wang Chen's enterprise, Ma Chheng-Te, a magistrate of Feng-hua, Chekiang, printed a classical commentary, Ta Hsiu N T'ien 2, in twenty t'ai, and other books in 1322 with his set of 100,000 movable characters. Although the material used for his type is not mentioned in the record, it is assumed that it was wood.

We have little record of Ming government printing with wooden type, but the device was fairly well received by local feudatory princes and other printers. At least two princes printed several movable-type editions with large and small sizes of characters, the prince of Shu bringing out a literary collection of the Sung poet Su Chhe in Chhengju in 1541, and the prince of T' on a book of superstition by a

Yuan author, with a supplement, in 1541; the latter also printed a rhyming dictionary earlier. Other users of wooden type included local academies, local government offices, families, and commercial printers in Nanking, Soochow, Chhingchow, Hsangchow, Wenchow, and Foochow, as well as in Szzechuan and Yunnan. Subject coverage widened in Ming wooden-type editions, which included novels, art, science and technology, and especially family registers and the official gazette.

Wooden type was used on a much wider scale in the Chhing. Not only was it employed officially by the imperial court, but it was also widespread among private printers. Sometimes, too a font of movable type was made as an investment, which could later be pawned, sold, or presented as a gift. A plan for printing a collection of Confucian classics (ju-tang) using wooden type—a project comparable to printing the vast Buddhist Tripitaka or the Taoist canon—was suggested but not realised. When, however, the Shu Chu Chhuan Shu was compiled, it was planned to print the lost books recovered from the Yang-Lo Ta Tien, but the bronze type previously made was found to have been destroyed. On the suggestion of Chin Chien (d. 1794), an official in charge of printing at the Wu-yang Palace, the emperor in 1753 ordered the making of 253,000 wooden types, a great task, yet completed in only one year.

The incentive underlying Wang Chen's enterprise was his voluminous work on agriculture, Yang Shu, although that work finally came out in block-printed form. Using this font, a series called the Wu Ying Tien Chh Chen Pan Tschang-shu, 134 titles in more than 2500 ch'ian, was printed. About five to twenty copies of each title were printed on white paper to be deposited in the palaces, and about 300 copies on bamboo paper for sale and distribution in the provinces. Chin Chien then wrote a manual titled Wu Ying Tien Chh Chen Pan Chheng Shih (Imperial Printing Office Manual for Movable Type), summarising his experience in this printing project. This illustrated account includes nineteen sections on such steps as making the type body, cutting the type, making type cases, forme trays, strips in variable thickness, blanks, centre columns, sorting trays, page and column rule forms, setting the text, making ready, proofing, printing, distributing the type, and a schedule for rotation (see Fig. 1143).

Chin Chien's method began with cutting pieces of jujube wood into boards from which rectangular strips were prepared, dried in the open air, and planed smooth. Then they were cut into blocks for the type. These blocks were planed in grooves precisely cut in pieces of hardwood until they were just level with the lip of the groove, so that the proper breadth, thickness, and length were obtained. Thus each large type block was 0.28 inch thick, 0.3 inch wide, and 0.7 inch long. For small type the dimensions for length and thickness were the same, but the breadth was

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2. Thing Lin Wen Chi (SPTK), ch. 3, p. 154; see also pp. 179 ff. above.
4. Many of the copies of this collection now extant are woodblock reprints by various local government offices.
5. *néi* 查大業　*四庫全書*　*永樂大典* 　*金蘭* 　*武英殿聚珍版叢書* 　*楷式*
Printing with wooden types differed somewhat in the two processes recorded in great detail by Wang Chen and Chin Chien. First of all, in making the types Wang carved the characters on wooden blocks and then sawed them apart, while Chin first prepared type bodies before the characters were cut individually to make them into types. Second, in setting type, Wang employed a method whereby the type came to the workers, while Chin’s workers went to the type. Third, Wang’s frame was added after the type was set, while Chin printed the ruled sheets and the text separately on the same paper.

Wooden movable type was also used during the Chhing by local governments and local academies, and even more widely by private printers. One interesting feature of this printing from wooden type was the production of clan records or family registers by travelling printers, who carried thefacilities to the customers and were most active in the Chiangsu and Chekiang regions. After the autumn harvests they travelled in groups of five to ten, bringing with them some 20,000 types (including large and small sets) made of pear wood, and with cooperative effort, were able to print one family register in anything from one to six months. For characters which they did not carry and where pear wood was not available, they made new types of earthenware. As a side line, they also printed works other than family registers.

(iii) **Bronze and other metal type**

Printing with bronze movable type began to be widely applied in China in the late 15th century. The enterprise was sponsored by wealthy families in southern
Chiangsu, a region of affluence, and was continued by commercial printers in Fukien. Most notable among the Ming bronze-type printers were the Hua and An families, both of Wu-hsi, Chiangsu, who like many who accumulated sizable

Fig. 1144. First book printed with metal type in China, Chu Chhen Tsoh I, by Hua Sui in + 1490 in large and small character editions. National Central Library, Taipeii.

His first experiment, on a collection of memorials, Chu Chheng I1 was printed in two editions, using large type for one and small type for the other (Fig. 1144). Hua Chheng3 (1438–1514), a distant relative of Hua Sui, was an antiquarian and

1] Pham Thieng-Cheng (1) argues that the movable type of the Hua family was made of tin with bronze frames and was not the bronze type it is generally considered to have been.

a book-collector who named his studio Shang Ku Chai1 (Studio for Esteeming Antiquities), and many of the rare books he obtained appeared in printed form within a short time, as the result of his using bronze type. These included one of the earliest collections, Pai Chhuan Hsiieh Hai,2 in 160 chhian, printed in +1501. Hua Chhen9 (fl. 1513–16), a nephew of Hua Sui, was another bronze-type printer of the Hua family. He used the signature Lan Hsiieh Thang4 (Hall of Orchid and Snow), and his printing included the Thang encyclopaedia, I Wen Lei Chii, in 100 chhian, (1515). Some other relations simply signed 'the Hua family', with no personal name, and altogether, about two dozen titles in over 1500 chhian are known to have been printed with bronze movable type by family members in less than three decades between 1490 and 1516.

An Kuo6 (+1481–1534), also of Wu-hsi, a wealthy merchant with a vast financial empire, continued the enterprise of printing with bronze type. He is known to have issued at least ten titles from 1516 until the time of his death; all bear his studio name, Kuei Pho Kuan7 (House of the Cassia Slope). His books included local histories, works on water conservancy, literary collections, and two encyclopaedias which are noted both for their craftsmanship and their careful collation.

Bronze-type publications printed in Chhangchow, Soochow, and Nanking apparently belong to the same category as those of the Hua and An families; the sponsors were described as enterprising people or big families. On the other hand, bronze-type books produced by Fukien printers in Chih-chheng (i.e. Chien-ning) and Chien-yang were commercial in nature. Sometimes a font was jointly owned by more than one printer, and a distinguished example produced from such cooperation is an edition of Mo Tzun,8 which was excellently printed in blue ink from bronze type (Fig. 1145). Some fifty titles of poetry by individual Thang poets were also very nicely printed (Fig. 1146) in this way.

Since An Kuo participated in bronze-type printing in the same district at a later date than the Hua family,4 it seems that he was inspired by the Huaos. But where did the bronze movable type of the Hua family come from? It was said that Ming use of movable type in southern Chiangsu was inspired by Shen Kua's description in Meng Chhi Pi Than.4 But given the marked technical differences between earthenware and bronze types, such a transition involved many technical problems of engraving, casting, type-setting, inking, and printing, and so a creative mind was required for such an innovation. The first Ming printer to use bronze type, Hua Sui, appears

8 See bibliography in Chhien Tshun-Hsiin (2), pp. 11–14, and his article on Hua Sui in Goodrich (30), pp. 647–9.
10 Some scholars mistakenly believed that the Hua family followed the An family in movable-type printing, but the reverse is true; see Chhien Tshun-Hsiin (2), p. 6.
13 Some scholars mistakenly believed that the Hua family followed the An family in movable-type printing, but the reverse is true; see Chhien Tshun-Hsiin (2), p. 6.
to have been a pedantic scholar of some wealth who claimed only 'mastery and comprehension' of this method; his hobby of studying and printing began only after middle age, and nowhere in the prefaces of his publications did he claim that he invented bronze type. Though Korean influence has been suggested, no concrete evidence can be found to support this theory.*

Since the practicability of metallic movable type had been amply demonstrated by Ming printers, large-scale production of some 250,000 bronze characters was undertaken by the imperial court early in the Ch'ing dynasty, ostensibly to print the Grand Encyclopaedia Thu Shu Chi Chheng 1 around 1725 (Fig. 1147), although

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* Cf. Ch'ien Tshun-Hsün (功, PP.7-8.

1 Thu Shu Chi Chheng, Volume 1.
Still earlier Chhing attempts have been recorded. Sixty-six copies of the encyclopedia, each comprising 5020 volumes, were printed, but then being deposited in the Wu-Ying palace but later, in 1744, it was melted down to make coins. Apart from the imperial palace, bronze type was employed by a number of private printers. These included the Chhui-Li-Kol in Chhau-shu who printed a literary collection in 1686; a Manchu general, Wu-Lung-A, who printed a collection of imperial edicts in Taiwan around 1807; Lin Chhun-Chhi in Foochow in 1846-53; Wu Chung-Chiin in Hangchow in 1852; a Chhangchow printer who printed a Hsii family register in 1858; and officials of the Thai-Phing Kingdom in 1862. Especially interesting was a font made by Lin Chhun-Chhi (b. 1808), who spent twenty-one years from 1825 to 1846 in cutting some 400,000 individual characters in large and small sizes for a font known as Fu Thien Shu H'ai; this cost him over 200,000 silver taels. In regular style calligraphy and well executed, it was used for a number of books on phonology, medicine, and military strategy, and it was possibly used, too, in 1852 by Wu Chung-Chiin of Hangchow to print two other works.

Because of its low melting point, tin is a good material for casting movable type in matrices. In fact, tin was used for that purpose as early as the late 13th century. Wang Chen said:

In more recent times, type has also been made of tin by casting. It is strung on an iron wire, and thus made fast in the columns of the form, in order to print books with it. But none of this type took ink readily, and it made untidy printing in most cases. For that reason they were not used long.

Thus the reason for rejecting tin for type was its incompatibility with Chinese ink. This deficiency was apparently overcome by the middle of the 19th century, when a fount of tin type was known to have been successfully made by a Mr Tong in Kuantung (Fig. 1148). Among the chief materials for modern movable type, lead was never extensively used by traditional Chinese printers. Lu Shen (1477–1544) vaguely reported that printers in Chhangchow in the early 16th century made movable type in bronze and lead (thung chhien tzu), but this term here may mean an alloy of bronze and lead rather than two separate metal types. The material for the ‘bronze’ movable type was, in all probability, an alloy because pure copper is too soft to be serviceable. Copper must be combined with tin or lead to increase its hardness, as was done in the manufacture of all ancient bronze weapons and vessels.

A question that remains unanswered is whether metal movable type for traditional printing in China was cast from moulds or engraved individually. There are no surviving specimens for examination, nor any existing detailed records to answer the question; our conjectures have to depend upon comparing the style of writing and calligraphy of different editions, and on our interpretation of such literary records as are still in existence. Examination of Ming imprints of bronze movable type reveals that they are markedly irregular in the shaping of characters and writing styles. The characters are not rounded but wedge-shaped, and even on the same leaf, the writing style of the same character is still not uniform; it is as if they were individually carved and not cast from matrices. However, this alone cannot be considered definitive evidence for engraving, because it is not necessary...
Fig. 1149. Variation of same characters appearing on a page in the Thu Shu Chi Chheng, showing the types might have been cut by hand instead of cast from matrix.

Because a set of metal type might comprise two to four hundred thousand characters, we can readily comprehend the magnitude of the work and cost involved in printing with movable type. Very often two sets of type, large and small, had to be made to print, for example, text and commentaries; this was the case with the bronze type of both the Hua and An families and with that of Lin Chhun-Chhi. The tin types of Fo-shan even included three sets.

Printing with movable type involved, in addition to applying ink to the plate and then rubbing paper on it as was the case in block-printing, there was also the labour of assembling and setting the type and redistributing it after printing. Such steps were, it seems, carried out by division of labour, for some of the metal movable-type editions give lists of workers testifying to this. For example, the bronze-type edition of the Sung encyclopaedia Thai Phing rü Lan, printed in Chien-yang in 1574, indicates that two persons were in charge of typesetting and another two of the printing.

Since metal is impervious, there were obvious difficulties in obtaining even inking and uniform printing required continuous efforts to improve techniques. In the first few Ming bronze-type editions to have only one mould for each character, and the types may have been retouched individually after being cast.8

However, to exploit fully the advantages of movable-type printing, casting seems the logical method, because it is much harder to cut characters in bronze than in wood, and since each font includes tens or hundreds of thousands of characters, to cut them individually by hand would be against the very economic principle which dictated the use of movable type. Yet things do not always happen according to principle, and the engraving of individual type is still a possibility. Indeed, in the case of the bronze type for the Grand Encyclopaedia Thu Shu Chi Chheng, the evidence seems to favour engraving. Certainly, the wage for engraving on bronze is said in an official record to be many times that for carving characters on wood, implying that bronze is much harder to cut, and after examining the copies, experts have concluded that it seems practically certain that the types were cut, not cast in matrices (Fig. 1149).9

* The Korean bronze movable types were all cast from matrices yet the shapes of their characters are often irregular and the strokes not uniform, showing that this problem was not peculiar to Ming types alone.

8 See item 7 in Chhien Tshun-Hsün (2), p. 53.
9 Giles (2), p. xvii, says that Alfred Pollard of the British Museum and Émile Blochet of the Bibliothèque Nationale at Paris were both inclined to believe that the type was not cast with the font.
produced by Hua Sui, the type face is uneven and the ink colour is often cloudy. They cannot compare either in uniformity of columns or in evenness of ink with the work of Hua Chien, An Kuo, and other later printers, for many of these later bronze-type editions surpass even block-printed books in aesthetic value.

Sometimes it is possible to recognise at once if a book was printed from movable type, especially if it was one of the experimental editions or was not very carefully executed. Misprints, misalignment of characters, and uneven spacing are distinct marks of movable-type editions, though with prints made after a high typographical standard had been achieved, differentiation may not be easy. Generally speaking, the style of calligraphy was not different from that of woodblock printing prints of the same period, and it is not unusual for a book to be considered a movable-type print by one scholar, and a block printing by another. Likewise, it is difficult, if not impossible, to know whether a book was printed from bronze or from wooden type. The printer's statement in the book, if any, seems to be the only reliable evidence.

(iv) Disadvantages of movable type in Chinese printing

Until the advent of modern typography, woodblock printing had always been the principal vehicle of traditional Chinese printing, and it is natural to ask why printing with movable type, although invented as early as the mid-eleventh century, was not more widely used in China. The most important and obvious reason is, of course, the nature of written Chinese. It is composed of thousands of ideograms which are needed in any extensive writing, and since several types are needed for each character, and for the commoner ones twenty or more, a font of at least 200,000 Chinese types is not unusual. The contrast with an alphabetical language becomes clear when it is realised that a complete font containing upper- and lower-case letters, numerals and other signs, consists of no more than a hundred different symbols. So it seems that the need for such great numbers in an ideographic language reduced the practicability of movable-type printing in China.

Another significant factor has been indicated in quoting Shen Kua, who said that for only two or three copies the movable-type method would be neither simple nor easy, though for printing hundreds or thousands it was marvellously quick. The technique of inking and rubbing is only a minor part of the whole process of using movable type, while the major use of labour is in assembling the type and, after use, distributing it for future service. Thus movable-type printing is desirable only for large-quantity production, because only then is the average time for each copy reduced to a practical and economic level.

Unlike plates of set type, printing blocks can be preserved indefinitely and used over and over again, with only occasional retouching or repairing. Block printing and movable-type printing therefore serve different needs: the former, recurrent demands for small quantities over relatively long periods; the latter, large quantities at one printing. The former was precisely the pattern of book demand and supply in traditional Chinese society; therefore movable type could not replace the printing block. Printers in old China made tens of copies at a time, and stored the printing blocks, which could be taken out at any later date for additional copies. They avoided the unnecessary holding of printed books in stock and of tying up capital. Block printing was therefore predominant in traditional Chinese publication.

As far as capital investment was concerned, movable-type printing posed much greater financial burdens on printers. Costs of paper and ink were relatively constant, but for the movable-type itself a tremendous initial investment was needed for making the vast number of characters needed, and compared very unfavourably with the small cost of wood blocks and of the labour of engraving them. In the long run, the fact that movable types could be re-used was an advantage, but very few printers could afford such a long-term investment, while the fact that block-engravers were plentiful and inexpensive made printers the more reluctant to change a well-established process.

Furthermore, scholars required that the printed page be free of textual errors and that the calligraphy be artistic. Movable type, especially in the early stages of its development, did not always fulfil these requirements, while printing from wood-blocks made possible a great variety of typographical effects, and lent a distinction and an individuality to the printed page which fonts of uniform type could not equal. Moreover, the rigidity of the one-piece block made for a better appearance of the printed page than did movable type, and when, as sometimes, the text was curved directly from the author's copy, errors which occur with typesetting and proof-reading were eliminated.

It has been mentioned that metal type did not hold Chinese water-inks well. This was also true of earthenware and enamel type, which had the additional disadvantage that uneven changes in size sometimes occurred during the necessary baking process, resulting in uneven matching of the type. All these factors contributed to an aesthetic inferiority which prevented movable-type printing from becoming popular.

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1 For example, the bronze-type edition of A Bo Yan in blue ink, and the several collected works of Tang authors printed in Chih-cheng (Chien-nung).
2 More than 200,000 bronze characters were made by the imperial palace printing shop of the Chhing dynasty for printing the Ta Shu Chi Hsiang around 1725 and over 50,000 wooden characters for printing the Wu Ying Tien Chi Chen Pei Tien Shu in 1739. Some 400,000 bronze characters were also made by a private printer in the early 19th century.
3 Reprinting of movable-type editions was not easy. Many books are known to have been printed first from movable type and later from blocks. Apparently it would not have been economical to reset the types for another edition.
4 For instance, in the 1574 edition of the Sung encyclopaedia Thu Phing Yen Lan we find the statement, 'Over one hundred copies were printed with bronze movable type.' An edition of 400 copies was printed by Chai Chin-Sheng with earthenware type in 1487.
5 There are numerous records in Chinese documents of the transmission of printing blocks from generation to generation. Some editions, known as san chu, were printed with blocks cut in Sung, repaired in Yuan, and reused in Ming, through three dynasties.
From the technological point of view, the production of a hundred movable types was much more difficult than engraving a printing block with a hundred characters. Grouping the types into retrievable order posed another problem, and to deal with it very skilled labour, usually involving considerable linguistic knowledge, had to be employed. The collective effect of all these factors therefore produced a situation very unfavourable for the development of movable-type printing in the very culture where it was invented.

(3) FORMAT AND BINDING OF CHINESE BOOKS

(i) Signs, columns, and scripts

Chinese books in the traditional style have always been printed on one side of paper. Each leaf of the paper is folded double at the centre of the sheet, making a double-leaf page, and each part of the leaf consists of special signs or lines, the name of which would help in explaining their nature and functions on the page (see Fig. 1150). The printed portion of the leaf, which is the actual size of the block, is called the block face (pan mien) and the centre fold the heart of the block (pan hsin). At the centre of the leaf there may appear such signs as the elephant trunk (hâng pj) — a light or heavy line used to mark the centre for folding — and the fish tail (yü) — a pair of sharp-angled spots at the upper and lower parts of the centre used to indicate the level for folding. A running title, leaf number, and sometimes the number and heading of the chapter, or the number of characters on the leaf and the name of the cutter, may be given in a narrow column at the fold. A square sign with the chapter number occasionally appears in some of the Sung editions on the upper left side of the margin, called the book ear (shu erh), serving as a thumb index for the book, and is especially useful for the butterfly binding.

The upper and lower margins of the leaf are called respectively the book eyebrow (shu mei) or heavenly head (ti chüeh), which is usually wider, than the lower margin or the earthly foot (ti chüeh). The page on each side of the leaf is ruled into columns and spaces (hang ko) with border lines (chien ko) to divide individual columns and marginal lines (pîen lan), single or double, on four sides. The characters of the text are usually arranged in one vertical line within a column, and notes or commentaries in smaller characters in two lines. Each page may contain from five to ten columns, with from ten to thirty characters in each column. This basic format of the printed sheet and some of the bibliographical terms used for referring to the traditional format of the Chinese book, have been continued into modern times.

The most important part of the book is certainly the text, which is normally printed in different styles of the standard script (khat shu). Since books printed in different periods and in various locations show variation of calligraphic styles, this has become one of the special features not only for judging a book’s artistic qualities but also for dating the printed editions. The different styles of Chinese calligraphy are primarily derived from models created by prominent calligraphers at successive periods, but the standard script, which was developed from the clerical script (li shu) in or around the Later Han, and stabilised into the standardised form in the Thang dynasty, has been used for printing ever since its original invention.

Fig. 1150. Typical format of a printed leaf, showing (a) elephant trunk, (b) fish tail, (c) borderline, (d) marginal line, (e) book eyebrow or heavenly head, (f) earthly foot, and (g) book ear.
At least three very popular styles of the standard script were adopted by the block printers from the Sung period. These included those of Ou-yang Hsün \((+557-641)\), Yen Chen-Chhing \((+709-85)\), and Liu Kung-Chhüan \((+778-865)\) (Fig. 1151). The Ou-yang style is very well balanced in composition with elegant, slender, and even lines. The Yen style, on the other hand, is muscular, rigid, and broad with thick and heavy strokes. The Liu style is something of a compromise between the two with neat and forceful strokes in elongated or perpendicular shapes. Generally speaking, the Northern Sung editions follow closely the Yen style (Fig. 1152) and those of Southern Sung imitated the Ou-yang style if produced in the Hangchow area and the Yen and Liu styles if produced in Fukien. While Yen and Liu styles were also prevalent in Szechwan, they show some influence of the 'slender gold style' \(\text{shou chin thi}\) of Emperor Kao-tsung \((r. +1127-62)\).

The early Yuan editions continued the Southern Sung tradition of Yen-Liu style, but later shifted to that of the contemporary calligrapher Chao Meng-Fu \((+1254-1322)\), whose style is particularly soft, feminine, and charming (Fig. 1153). The earlier Ming editions continued the Sung and Yuan tradition of the Chao and Ou-yang styles, but from the middle of the 16th century, the style of characters gradually changed to the craftsmen script \(\text{chiang thi}\), or so-called Sung style \(\text{Sung thi}\), which is more rigid and square in construction with heavy lines for vertical strokes, lighter lines for horizontal strokes, and a heavy tail at the end of the strokes (Fig. 1154). This stereotyped form has been followed by printers ever since, though with slight variations from time to time. The modern metal types have adopted this style for all printed matter, and two other styles called imitated Sung script \(\text{fang Sung thi}\) and regular script \(\text{cheng kai}\) are used primarily for headings and other special purposes (Fig. 1155).

In some cases, the text was not prepared by the craftsmen, but was written by the author himself using specially appointed calligraphers, or by a member of the family whose handwriting was considered exceptional. Even when the text was copied in the printing style by professionals the preface of the book was often made in an extraordinary fine calligraphy either by the author of the preface or by a noted calligrapher on his behalf (Fig. 1154b). In a visual sense, these fine

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1 Ou-yang Hsün
2 Yen Chen-Chhing
3 Liu Kung-Chhüan
4 Emperor Kao-tsung
5 Chao Meng-Fu
6 Sung style
7 Sung thi
8 Chao calligraphic style
9 Sung thi
10 Cheng kai

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calligraphic specimens not only serve as examples of Chinese art, but frequently also represent the most aesthetic part of the book. Another special feature of the printed style is that of the taboo characters (hui tzu) in the personal names of reigning emperors and sometimes their ancestors, which were not permitted to be used in print. The problem posed by this prohibition was generally dealt with either by omitting certain strokes of a taboo character or by substituting a homonym or synonym for it. Similar taboos were sometimes observed by the printers with regard to the personal names of their own ancestors. The appearance or absence of taboo characters in a text is another criterion used for dating printed editions.

Close to the time when the printed sheet was first being adopted for books, there was a gradual change in the way books were bound. Up until the 9th century, in the middle of the Thang, the units of material that made up Chinese books were bound into long continuous sections. Bamboo and wooden tablets and silk and paper rolls exemplify this style of binding. Even the pleated book (che pen), which came into use just prior to the appearance of individual printed sheets, remained one extended piece of material. But as soon as printing began to be mentioned in literature, the new format of the folded leaves also appeared; it was more compact and made the different parts of the text more immediately accessible than had been possible with the rolls. Folded leaves developed in various stages from the ‘butterfly’ binding of the Sung, through the wrapped back binding of Yuan and Ming times, to the stitched binding of the Ming and Chhing periods. Then in the early 20th century the stitched binding began to be superseded by Western-style binding as the modern printing press came into general use in China.

Originally, bamboo and wooden tablets were fastened together with silk and hemp cords; a series of tablets so fastened was then either rolled up on itself or had succeeding tablets folded against each other like accordion pleats. To make such a book the cord used to bind the tablets was doubled or sometimes tripled and the first tablet was placed in the bend. The cord was knotted to fit tightly in a notch on the edge of the tablet to prevent the cord's movement along the tablet when the book was read. The notch made in a second tablet was placed against the same knot and one open strand of the cord went under, the other over, the tablet. The two

\[\text{(ii) Evolution of the format of Chinese books}\]

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strands were then half twisted around each other. The third tablet was set into this twist and the cords were pulled over and under this tablet and again half twisted, this continuing until the last tablet was tied into place with a final knot. Enough of the cord was left free, so that it could be used to tie the entire book together when it was rolled or closed by folding (Fig. 1156). When the bound documents were dispatched, they were sealed in silk or cloth bags of various colours, which indicated the methods of delivery.

Rolls of silk and paper gradually replaced the books of bamboo and wooden tablets, silk rolls being known to have existed from the 7th to the 5th century, while paper rolls came into use during the early centuries of this millennium. The length of a silk roll depended upon the length of text, the silk being cut at the end of the composition, but if a text required more than forty feet of silk, more pieces were sewn on. Paper sheets, made in two-foot lengths, were pasted together until the necessary length was attained, and this is the only difference between the two. The other components of silk and paper rolls were identical because paper rolls, which came to be substituted for the more expensive silk books, continued to be made in the same way. For example, both kinds of rolls were fastened at the end to wooden rollers that had their tips made of precious materials like porcelain, ivory, tortoise shell, coral, gold, and red sandalwood. And at the outer, unattached end of the roll, there was an extension of silk gauze, brocade, or paper that protected the outermost section of text from damage. To this extension a ribbon was attached with which the roll was tightened and fastened (Fig. 1157a). The colour of this ribbon was used sometimes to denote the class of literature to which the text belonged, and this form of colour coding was used also on the labels fixed to the end of the roller to identify the particular work in the roll (Fig. 1157b). The rolls were protected by wrappers, called book cloth (shu 1 or t1), made of silk or bamboo.
matting that had borders of white or coloured silk (Fig. 1158), thin gauze, or some other cloth. A protective wrapper held about ten rolls' which were placed on shelves with identifying labels attached to one end of each roller.\textsuperscript{a}

(iii) Folded, wrapped back, and stitched binding

A transitional format of bookbinding is associated closely with Buddhism. The Buddhist sutras came to China from India on the long, narrow, single leaves of palm-leaf books. This format is believed to have suggested the sutra binding (ching che chuang\textsuperscript{1}), in which the long continuous span of joined paper sheets that made the roll book was folded over into accordion pleat-like leaves (Fig. 1157c).\textsuperscript{2} These accordion-fold books were easier to handle than rolls when the Buddhist clergy and lay recited the sutras, and to enable the reading and rereading of a sutra without stopping, the first page and the last page of a sutra binding were pasted on to a sheet twice their size; thus the reader could turn from the last page directly back to the first page. This modified sutra binding was called 'whirlwind binding' (hsüan feng chuang\textsuperscript{3}) (Fig. 1157d).\textsuperscript{4}

The increasing use of reference books and textbooks, which were easily worn out along the folded lines, together with the new means of rapid reproduction of books by printing, spurred the creation of the binding style known as 'butterfly binding' (hu tieh chuang\textsuperscript{4}) in the 9th and 10th centuries (Fig. 1157e). Here, the large printed leaves were folded down the centre and gathered into a pile, and a stiff paper cover was pasted against the spine which was made up by the folded centres of the leaves. When the book was opened, the leaves suggested the wings of a butterfly. The spine itself was relatively safe from damage, and if the outer edges on the three sides away from it suffered injury, the parts affected were trimmed away without any loss of the text.\textsuperscript{5} Some time in the 13th or 14th century, during the Yuan dynasty, the format changed again. Although, as with the butterfly binding, this new style had a pasted spine and a stiff cover, the two edges of the leaves in the volume were pasted into the spine and the folded centers were brought to the mouth of the book. However, volumes made with this kind of 'wrapped back binding' (pao pei chuang\textsuperscript{5}) presented a problem when set on shelves with the spine above and the mouth resting on the shelf as the butterfly binding had been; they frequently and readily split into two half-leaves at centre folds of the leaves. To prevent this the volume was laid on its side on the shelf, thereby rendering the stiff book covers unnecessary (Fig. 1157f). Another innovation was the use of paper twists, that is squares of paper twisted into long threads that were passed through two holes pierced near the spine of the fascicle and pasted there. These twists helped to prevent the pasted spine from breaking away from the cover.\textsuperscript{6}

The wrapped back binding was difficult to repair properly once the fascicle had come apart, and it was particularly difficult to replace the paper twists without running the risk of doing more damage. As a result, silk or cotton thread was stap-stitched at the spine to reinforce the twists and finally, some time in the 16th or 17th century,\textsuperscript{7} pasting the covers to the spine was replaced by the stitched thread binding format (hsien chuang\textsuperscript{8}) (Fig. 1157g). This format was very durable compared with the butterfly and wrapped back styles of binding, and was quick and simple to do. The printed sheets were folded singly and gathered into a fascicle rather than into signatures, and the next step, the alignment of the sheets, was almost always done using folding signs at the center or the bottom frame line of the sheets. With the fascicle aligned, the flyleaf and sometimes the inner half of the double-leaved

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\textsuperscript{a} The word i\textsuperscript{3} sometimes meaning 'ten', is derived from the system of book wrapping.
\textsuperscript{b} Cf. Tsien (2), pp. 155-6.
\textsuperscript{c} Cf. Li Yao-Nan (1), p. 212; Chhang Pi-Te (3), p. 3, believed that separate flat sheets of paper, known as leaves (yeh\textsuperscript{2}), existed before they were bound together and that the use of word yan to denote a leaf or page of a book was derived from this meaning.
\textsuperscript{d} Li Yao-Nan (1), p. 216.
cover paper was attached to the book with two paper twists. Next, the edges (except the edge at the book mouth where the leaves were folded) were trimmed with a knife and polished with a pumice stone, and it was at this time that the holes for the thread were pierced. These holes were placed farther from the spine than the holes into which the paper twists had been inserted so that the area encircled by the thread would include the twists. Usually only four holes were pierced, being placed at points where the thread would minimize any stress placed on the spine when the fascicle was opened, though two more holes might be pierced at the corners of oversized books to counteract the extra strain put there by the weight and size of the volume (Fig. 1159).

There were many variations of the order in which a volume was stitched. Usually the thread was passed in to one of the outer holes, brought back over the spine into the same hole to form a spine ring, and was then passed over the top or bottom edge of the book and back into the hole, closing another ring. All the other rings were made similarly until the thread returned to the first hole where it was tied and the knot pulled out of sight into the middle of the fascicle. The upper and lower corners on the back of the book were sometimes reinforced by wrapping with brocade to prevent them from being damaged easily.

Fig. 1159. Thread-stitched binding and diagram showing steps of stitching. From Nostrand (1).

(iv) Protective cases and covers

A suitable number of fascicles of the same work were placed together in a detached protective case (han) made exclusively for them out of wood or paper-board. Such cases began to be used in the +9th century, during the Thang, and coincided with the first use of flat sheets. They were made in various designs, but all covered the sides, mouths, and spines of the fascicles, and very often the tops and bottoms too. The measurements of the height, width, and depth of the set of fascicles to be encased together were used to make the boards for the case, then linen, brocade, or some other fabric was covered with paste and the boards were placed down on it so that, after the paste had dried, the fabric would fold over into the shape of the protective case (Fig. 1160). Wooden chests specially made to hold books were fashioned from wood like Chiangsi cedar (Phoebe nanmu or machilus nanmu) that was decay resistant and insect repellent. In Southern China wooden boards called pressing boards (chia pan) were used as book covers, and tightened to the fascicles by cloth straps. The woods preferred for making these boards were the catalpa, Chinese rosewood, and jujube.

Unlike its counterpart in the West, the stitch-bound Chinese book could be separated from its protective case. It therefore was much lighter and free from the strains that had to be sustained by Western books hanging by a cumbersome mechanism of tapes, thread, and mull to their heavy protective covers. Moreover, the compactness of the Western book together with its heavy paper, increased the strain on its covers considerably. Yet by trading off compactness and permanent union to its protective shields, the Chinese book with its simple and easily repaired binding and its leaves printed on one side only, was superior in its ability to remain in a good state to books bound in the Western style.

(4) Development of Ink Making in China

Chinese ink underwent a long process of development, commencing perhaps as early as three millennia ago, and played an important role, together with paper

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and printing, in the progress of Chinese civilization. The prominence of ink in Chinese culture is evident not only in its extensive use in writing but also in the fact that it has been featured as an object of art and a subject of scholarship; while few names of Chinese papermakers and printers are known to us today, hundreds of inkmakers are extensively recorded in literature, including numerous works devoted exclusively to the study and lore of ink. The value placed on it is evident both in China, where a prized piece might literally be worth its weight in gold, and outside China, where it was borrowed or imitated in both the eastern and western hemispheres.

The earliest samples of Chinese ink are to be found in traces of writings and drawings in black or colour on bone, stone, clay, bamboo, wood, silk, and paper documents dating from the -14th to the +4th centuries. A few specimens of solid ink dating from the -3rd to the +3rd or +4th century have recently been discovered, and a number of artifacts from later times still survive. Since they have not been exhaustively analysed, documentary sources are needed for the study of their nature, composition, and manufacture, but unfortunately, ancient literature is not very informative for the period preceding the Han dynasty.

From the time of the Han until the Sung dynasty, most ink appears to have been made from a combination of pine soot, glue, and miscellaneous additives. Lacquer might have been used to write short inscriptions on certain hard-surfaced objects prior to this time, but it was not used for general writing. 'Stone ink', possibly a form of graphite, was also in use at this time, probably to a much more limited extent. From the Sung period on, lampblack, made from animal, vegetable, or mineral oils, was often substituted for pine soot, but the pigments, binding agents, and additives, remained much the same in spite of the passage of time, though their proportions tended to vary with individual inkmakers.

Ink was probably first decorated with designs and calligraphy after it came to be manufactured in a prismatic shape with flat surfaces, a development which may have occurred before the Thang dynasty. Such decoration of ink evolved into an elaborate enterprise, and large sets of ink-sticks, decorated with associated designs, were produced for a collector's market. Eventually, connoisseurs of ink in China probably attached as much importance to the decoration of the ink as to its writing qualities.

(i) Role of ink in Chinese and other cultures

Writing in China was something more than just a functional means of recording. From times at least as early as the Han dynasty, calligraphy was considered a major art form, and eventually all objects associated with it came to share in the general aesthetic of writing and were themselves elevated to the status of forms of art. Consequently, paper, ink, the writing brush, and the inkstone (Fig. 1161), the basic equipment used in writing known as the 'four treasures of the scholar's studio' (wen
The earliest use of ink in India may have been retarded by an early prohibition against recording religious works in writing, for in the Mahabharata it is remarked that anyone who sells, forges, or writes the Veda is condemned to hell. The earliest use of ink in India probably occurred with the development of prepared cotton-stuffs and birch bark as writing materials, and first reported by Greek writers in the 4th century. Later, in the 1st century another Greek writer notes that 'Indian ink' (Indikon milani) was exported from the Indian port of Barbarikon, and Pliny |

compared this to some of the best ink made in Rome in his day. However, it is possible that this Indian ink in fact originated in China, as suggested by Berthold Laufer, since many other valuable articles of trade, such as silk, regularly made their way from China to Europe by way of India from as early as the Former Han period.

Japanese and Korean inks, made either from pine soot or lampblack, were apparently borrowed from those of China, since the manufacturing processes are almost the same, while inkmaking, papermaking, and brush-making were crafts that foreign students at the Thang court were required to learn. Tibet also appears to have learned the use of ink from the Chinese, although their ink was kept in a liquid rather than a solid form.

Without samples of all these inks, it is difficult to make meaningful comparisons between them and Chinese ink, but we know that the special qualities of Chinese ink caused it to be actively sought after and imitated in many areas of the world, including Europe. Louis LeComte in the 17th century said of Chinese ink that ‘it is most excellent; and they have hitherto vainly tried in France to imitate it’. Du Halde also wrote in 1735 that ‘the Europeans have endeavored to counterfeit this ink, but without success’. In commenting on the general characteristics of Chinese ink which have probably been responsible for its popularity, Laufer said:

It produces, first of all, a deep and true black; and second, it is permanent, unchangeable in color, and almost indestructible. Chinese written documents may be soaked in water for several weeks without washing out. In documents written as far back as the Han dynasty — the ink is as bright and well preserved as though it had been applied but yesterday. The same holds good of the productions of the printer's art. Books of the Yuan, Ming, and Ch'ing dynasties have come down to us with paper and type in a perfect state of composition.

These distinguishing qualities were due, of course, to various ingredients in the composition and to the elaborate methods used in the manufacture of Chinese ink, which will be discussed below.

(ii) Origin and early specimens of Chinese ink

Traditionally, the invention of ink in China has been attributed to the calligrapher Wei Tan (+179–233) early in the +3rd century. Archaeological and literary evidence, however, attest to the widespread use of various kinds of ink, or pigments which functioned like ink, well before this time. The early symbols and signs appearing on painted pottery found in Pan-pho, Shen-sh, indicate the use of red and
black pigments as early as the neolithic period, and a considerable number of late Shang oracle bones bear traces of red and black pigments used in conjunction with characters either before or after they were incised into the surface. The red pigment has been identified as cinnabar and the black pigment as a carbonaceous material variously identified as ink or dried blood. Characters written in black fluid have also been found on the surfaces of stone objects, jade, and pottery of the Shang period.

The earliest form of the character for ink (mo) was used in Western Chou bronze inscriptions, and apparently refers to a punishment of blackening or tattooing the face rather than to use of a writing fluid. The earliest textual reference to mo as a fluid used in writing appears in the Chuang Tzu of the Warring States period, which mentions that when Prince Yinian of Sung expressed a desire to have his picture painted, all the court scribes stood up and started "licking their brushes and mixing their ink." Two later works refer to the use of ink as a writing medium in the Spring and Autumn period. A minister of the state of Chin is quoted as remarking to his master: "I wish I could be your critical subordinate, handling tablets with brush and ink and watching over you to record whatever faults you have." And Duke Huan of Ch'i asked the officials to record his orders on a wooden board with brush and ink. All three references imply that brushes were used to apply ink to a writing or painting surface, while the Chuang Tzu passage implies that ink was kept in a solid form prior to use.

Archaeological excavations have turned up numerous documents of various kinds from the Spring and Autumn, Warring States, and Chin periods written in ink on precious stones and on bamboo or wooden tablets. Since the 1950s, archaeology has also yielded several artifacts of Chinese ink. The oldest is a small piece of ink found in a group of twelve Chin graves dating back to the -3rd century, in the late Warring States or Chin dynastic period, excavated at Shui-hu-ti, Yün-meng hsien, Hupeí in late 1975 and early 1976. It is reported that this ink (M4:12) is cylindrical in shape and of pure black colour, with a diameter of 2.1 cm. and height of 1.2 cm. In the same grave there was also found an inkstone and a small piece of stone apparently used for grinding on the inkstone, for both items bear traces of grinding and remnants of ink.

Again, five specimens of ancient ink were discovered in several Later Han graves located at Líu-chái-chü, Shan-hsien, Honan province in 1965. In the site report, three of these specimens (B:56, 37:45, and 102:9) are said to be relatively well preserved and are described as cylindrical in shape; they were formed by moulding with the hands, and either one or both ends had been used for grinding. Their sizes vary from 1·5 cm. to 2·4 cm. in diameter and from 1·8 cm. to 3·5 cm. in height; one of them has a wood base. Two specimens of ink were also found in two Chin period graves, M2 and M3, located at Lao-hu-shan, Nanking in 1958. According to the site report, the M2 specimen, which is bar-shaped, is approximately 6 cm. in length and 2·5 cm. in width, but the M3 specimen has crumbled, and consequently its measurements are not given. Both these specimens were analysed by Chhiu Chia-Kuei of Nanking University, who concluded that the M2 specimen was not ink but a kind of earth with organic material present in it. His analysis of the M3 specimen yielded markedly different results:

The ink is black in colour and light in weight. There are small yellow grains in it which appear to be loosen impurities. When this sample is placed under the microscope and compared with contemporary ink, the particles seen are very similar. They form clusters and are combustible when heat is applied, leaving behind a small amount of ash. It is evident that this sample is also very comparable to contemporary ink in this respect. Thus I conclude that this is ink.

On the basis of this study, it has been conjectured that the M3 specimen was similar in composition to the "stone ink" mentioned in early records and that the M3 specimen was representative of a more advanced ink.

(iii) Pigmentation and composition of Chinese ink

From the +13th century, scholars have suggested that Chinese ink was first made from lacquer, then minerals, and finally pine soot and lampblack. There has been a controversy among modern scholars, however, about whether Chinese ink was ever made from lacquer. The earliest surviving literary references to lacquer writing, appearing in the Hou Han Shu and Chin Shu, compiled in the +5th and +6th centuries, are made in connection with texts that were probably written on bamboo or wooden tablets prior to the Han dynasty. The meaning of the term lacquer writing (shih shih) in these references, however, has been frequently questioned and the subject of different interpretations.

From recent discoveries, it seems entirely possible that hard, non-absorbent surfaces may have necessitated the use of a more adhesive ink than was used eventually on silk and paper, and that lacquer may have suited this requirement. The text of a collection of bamboo tablet documents discovered in one of the previously mentioned Chin graves found at Shui-hu-ti, indicates that lacquer and cinnabar were used in writing the names of official units on the surfaces of government tools, armour, and weapons when these did not lend themselves to

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* See excavation report of the Shui-hu-ti site in WWT, 1976, no. 9, p. 53, and illustration in plate 7, fig. 5.
incising. These tablets also cite regulations for lacquer orchards and testing the quality of lacquer. The references indicate that lacquer was used at an early date for writing on certain kinds of materials such as metals, which do not absorb watery ink. But it seems certain that lacquer was not a major vehicle for writing, since there is no archaeological evidence that it was used on more conventional hard-surfaced writing media, such as bamboo or wooden tablets. However, lacquer was possibly present as a minor ingredient in some inks.

Silk was used as a writing medium at least as early as the -5th century, and silk documents, dating from the Warring States through to the Han period, have been found at many sites in China and Central Asia. Paper was also used for writing beginning in the Later Han dynasty. Specimens of writing with black ink from the +2nd century have been found at Chi'i-yen, Tun-huang, Lou-lan, and other sites, but since the ink on these early silk and paper documents has never been chemically analysed, it is difficult to say what its composition is.

Pine soot, traditionally the favourite pigment in ink, was used in ink manufacture in the time of Wei Tan, as is attested in a poem by Tahao Chih (192-224). An inkmaking formula appearing in a +5th-century work and attributed to Wei Tan calls for the use of fine and pure soot, pounded and strained to remove any adhering vegetable substance. Although the source of this soot is not indicated, it seems likely, in view of the fact that there is a procedure to remove 'adhering vegetable substance', that it was made from wood, perhaps pine. Recent studies carried out with a scanning electron microscope have shown that the sizes of carbon particles found in 14th-century Chinese ink made from pine soot are remarkably small and uniform, superior in these respects to a sample of modern ink also made with soot.

The method of making ink from pine soot is given by the Ming author Sung Ying-Hsing (+1500-60) as follows:

Ordinary ink is made from pine wood after all the resin has been eliminated. The least amount of resin left in the wood will result in a non-free-flowing quality in the ink produced. To get rid of the resin, a small hole is cut near the root of the tree, into which a lamp is placed and allowed to burn slowly. The resin in the entire tree will gather at the warm spot and flow out.

For making pine wood soot, the tree is felled and sawn into pieces. A rounded chamber of bamboo is built, resembling in appearance the curved rain-shield on small boats and constructed in sections; it has a total length of more than 100 feet. The external and internal surfaces of this chamber and the connecting joints are all securely pasted with paper and matting, but small holes are made at certain intervals for the emission of smoke. The floor of the chamber is constructed of brick and mud with channels for the smoke built in. After the pine wood has burned for several days, the chamber is allowed to cool and the soot is scraped out the root of the tree and scraping out the soot from the end of the cover. From Thien Kung Khai Wu, c. 9167.

Although pine soot probably remained the most popular pigment used in making ink, it was soon rivalled from the Sung dynasty onwards by lampblack made from combustion in lamps with wicks, of animal, vegetable, and mineral oils such as fish oil, rapeseed oil, bean oil, hemp oil, sesame oil, tung oil, and petroleum. In Ming times, it is said that nine-tenths of all ink was made from pine soot and one-tenth from oil lampblack. In 1738 Du Halde described a lampblack inkmaking operation as follows:

Fig. 1162. Inkmaking with pine soot by gathering resin from a pine tree and scraping out the soot from the end of the cover. From Thien Kung Khai Wu, c. 9167.
They put five or six lighted wicks into a vessel full of oil, and lay upon this vessel a iron cover, made in the shape of a funnel, which must be set at a certain distance, so as to receive all the smoke. When it has received enough, they take it off, and with a goose feather gently brush the bottom, letting the soot fall upon a dry sheet of strong paper. It is this that makes their fine and shining ink. The best oil also gives a lustre to the black, and by consequence makes the ink more esteemed and dearer. The lampblack which is not fetched off with the feather, and which sticks very fast to the cover, is coarser, and they use it to make an ordinary sort of ink, after they have scraped it off into a dish.*

Another kind of ink mentioned in early Chinese sources is 'stone ink' (shih mol). This appears to have been a mineral substance of some sort which was either used as found or was prepared by grinding. It was possibly a form of coal, petroleum, or graphite, for the discovery sites specified in early records are all located in areas where graphite is produced at the present time.*

Pine soot and lampblack consist principally of carbon, which, in its free state, does not combine readily with other materials; consequently, the use of carbon in ink necessitates the use also of an agent that will bind the carbon pigment to the writing surface. Binding agents also play another role in Chinese ink in holding the carbon particles together in the solid form.

The binding agents used in Chinese ink were traditionally glues made from a variety of animal remains, including raw hides or leather, muscles, bones, shells, horns, fish skin, fish scales, and fish maw; the quality of the water used was also important. After one of these substances was boiled, the resulting hot viscous fluid was strained through a silk gauze or cotton filter to remove lumps and then allowed to condense into solid form until needed for use.* The solid glue was then dissolved before use in inkmaking with solvents such as the juice of the bark of the chinab tree (Fraxinus bungeana, D.C. var. Pubinervis tag.). The ratio of glue to pigment probably varied with the nature of the materials used and the stickiness of the ink desired, the latter probably being dictated by the quality of the writing surface to be employed. We know, for instance, that equal weights of lampblack and glue are specified in an inkmaking formula contained in an encyclopedia compiled in the early 18th century.*

In addition to the essential pigments and binding agents, other materials were often added, especially in periods prior to the Ming dynasty, to improve consistency, colour, and aroma. As many as 1100 miscellaneous additives were sometimes used.* These included egg whites, gambage, raw lacquer sap, soap tree pods, and croton seeds to improve consistency; cinnamon, chinab tree bark, purple herb, madder root, yellow reed, black beans, copper vitriol, gall nuts, *ni yu* (*Sanguinaria officinalis*), curled pine (*Selaginella involvens*), walnut, peony rind, pig and carp gall, pearls, tonka beans, pomegranate skins, and vermillion to improve colour and gloss; and cloves, sandalwood, sweet pine (*Nardostachys jatamansi* D.C.), camphor, and musk to improve scent.*

(iv) Technical processes of inkmaking

It seems likely that inkmaking formulae were usually kept secret to guard against competition; consequently, the formulae which were recorded and survive to the present day probably represent only a very small fraction of those actually used. Although the ingredients used in making any ink are generally not very numerous, the exact composition, preparation, and quantity of each ingredient were subject to considerable variation. According to early works on inkmaking by such authors as Li Hsiao-Mei† (fl. +1095), Chao Kuan-Chih‡ (c. +1100), and Shen Chi-Sun§ (fl. +1598), the steps involved in making ink consist of gathering soot or lampblack, straining and then mixing with pre-dissolved glue and miscellaneous additives, kneading, pounding, steaming, moulding, covering with ashes, drying, waxing, storing, and testing (Fig. 1163).

The earliest known formula for inkmaking in China, often attributed to Wei Tan (+179–253), appears in a work on agriculture and manufacture written by Chia Ssu-hih in the +5th century.

Fine and pure soot is to be pounded and strained into a jar through a sieve of thin silk. This process is to free the soot of any adhering vegetable substance so that it becomes like fine sand or dust. It is very light in weight, and great care should be taken to prevent it from being scattered around by not exposing it to the air after straining. To make one catty of ink, five ounces of the best glue must be dissolved in the juice of the bark of the chinab tree which is called fao-chê wood in the southern part of the Yangtze Valley. The juice of this bark is green in colour; it dissolves the glue and improves the colour of the ink.

Add five egg whites, one ounce of crushed pearl, and the same amount of musk, after they have been separately treated and well strained. All these ingredients are mixed in an iron mortar; a paste, preferably dry rather than damp, is obtained after pounding thirty thousand times, or pounding more for better quality.

The best time for mixing ink is before the second and after the ninth month in a year. It will decay and produce a bad odour if the weather is too warm, or will be hard to dry and melt if too cold, which causes breakage when exposed to air. The weight of each piece of ink cake should not exceed two or three ounces. The secret of an ink is as described; keeping the pieces small rather than large.*

All the main ingredients used in manufacturing ink in later times, even in the present day, are to be found in this early formula: a pigment (soot), a binding agent...
Methods of making lampblack ink in the 16th century.

(a) Burning oil in enclosed room with paper curtain.
(b) Gathering and sieving the lampblack.
(c) Pounding and beating the ink paste.
(d) Moulding the paste into different shapes. From Mo Fa Chi rao, c. 1598.

Another formula of Master Chi⁵ of the Liang dynasty (452-77) specified that:

Two ounces of pine soot are added with small amounts of cloves, musk, and dried lacquer and mixed with glue to form a stick, which is then dried over the fire. The ink will be ready for use in a month. The colour turns purplish when the purple herb [tsu tshao, Lathospermum erythrorhizon] is put in and bluish if the chin barks powder is added. Both colours are pleasant.⁶

Still another formula is ascribed to Li Thing-Kuei of the 10th century in the Southern Thang period:

Wash, clean and shred three ounces of cow horn, soaked in 10 catties of water for seven days. Boil three honey locust pods [tsao chiao, Gleditschia sinensis] for one day to get three catties of juice, soak in the juice one ounce each of gardenia kernel [chih tzu, Gardenia floribunda], the bark of the amur cork tree [huang po, Phellodendron amurense], bark of the ash [chin phi, Fraxinus buangane] and sappan wood [tsu ma, Casilpinia sappan], half an ounce of white sandalwood, and one piece of sour pomegranate skin, for another three days. Bubble up the mixture to get one catty of juice and mix the juice with two and a half catties of fish glue; soak overnight. Cook again, add a little green vitriol, and it will be ready to mix with one catty of sieved soot.⁷

A later formula attributed to Shen Chi-Sun (fl. 1398) used lampblack in place of soot for pigmentation: ten ounces of tung oil lampblack mixed with four and one-half ounces of cowhide glue, one-half ounce of fish glue, and one-half ounce each of the bark of the ash and of sappanwood.⁸ The formulae of the Ming and Chhing period were probably somewhat simpler on the whole than those given here, for it appears that ink makers of these periods did not use the many additives as freely as before, because they were considered to reduce the quality of the ink. Economic considerations may also have been a factor.

The qualities sought in Chinese ink are often reflected in remarks made concerning the ink of noted ink makers. The ink of Wei Tan (+179-233), the earliest ink maker of fame, was described by Hsiao Tzu-Liang,⁹ a prince of the Southern Chihi dynasty, as so black that "each drop looks like lacquer." The ink of Chang Yung,⁰ an ink maker during the period of the Northern and Southern Dynasties, was also compared with lacquer. From the late Thang period on, the names of numerous distinguished ink makers have been recorded in history. The most famous is perhaps Li Thing-Kuei¹¹ (fl. 950-80) a member of a prominent family

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References:

2. Mo Fa Chi rao (TSHCC), p. 22.
4. See Ko Chih Ching (1735 ed.), ch. 37, p. 214.
6. See Lu Yu (c. 1330) in his Mo Shih and Ma San-Heng (fl. +1637) in his Mo Chih list a total of 448 ink makers from ancient times to +1657.
7. Lu Yu (c. 1330) in his Mo Shih and Ma San-Heng (fl. +1637) in his Mo Chih list a total of 448 ink makers from ancient times to +1657.
10. See Ko Chih Ching (1735 ed.), ch. 37, p. 214.
of inkmakers. After his father, Li Chhao (fl. +907-36), also a noted inmaker originally from a Haixia family at I-shui, Hopei, moved to She-hsien, Anhui, Li Ting-Kuei served as an official in charge of inkmaking at the Southern Thang court of Prince Li Yu (fl. +937-78), who granted the royal surname of Li to Thi'ng-kuo, originally from a Hsi family at I-shui, Hopei, moved to She-hsien, Anhui, Li Ting-Kuei served as an official in charge of inkmaking at the Southern Thang court in honour of his distinguished services. The ink made by him and his father is especially famous for its qualities of hardness and insolubility in water.a

In the Sung period, Chang Yu (fl. +1068-85) was known for an ink made from oil lampblack, musk, camphor, and gold flakes, and which appeared in the form of small round coin shapes. b Phan Ku (fl. +1086) was noted for making ink with very small amounts of glue, only five to ten ounces per pound of soot, and for pounding his ink dough ten thousand times. Ink made by the Sung Emperor Hui-tsung (r. +1101-25) was also highly sought after; the ingredients included a special su-ho (Liquidambar orientalis) resin. Chu Wan-Chhu (fl. +1288-90) of the Yuan period is remembered for using only soot from pine trees.c

The inkmakers of the Ming and Ch'ing periods were known primarily for the forms and styles of their inks, often produced in elaborate sets, although quality of composition was no doubt still important. Wu Shu-Ta was famous for his ink of lacquer-like blackness and stone-like hardness; its ingredients included tung oil, glue, powdered gold, and musk, and the dough was beaten ten thousand times.d Hu Khai-Wen in the early 19th century was noted for an ink made from lard, lampblack, antler glue, and twelve miscellaneous additives, including pearl powder and musk.e

Although Chinese ink was generally produced in a solid form, some liquid ink was also made. It was sometimes prepared in quantity and stored in bamboo tubes by persons who wished to avoid the labour of mixing their own ink prior to use. Special liquid inks were also made for commercial applications, like printing, where the volume of ink required tended to prohibit grinding each time it was to be used. Printing ink, for instance, was first prepared as a paste made of coarse soot taken from the far end of a smoke chamber and mixed with glue and wine, and then preserved in jars or vats for later use. It had to be kept for three or four summers, for its bad odour to disappear, and in fact the longer the period of preservation, the better it became; printing done using freshly prepared ink was easily smeared. When needed, water was added to the paste and it was mixed thoroughly and strained through a sieve made of hair from horse's tails.f

The best ink for printing in red was a mixture of vermillion and red lead boiled in water with the mucilaginous root of a plant called po ch'i (Bletilla striata). Next best was the liquid obtained from boiling the red-stem amaranth ( hsien tshai, Amaranthus trioclor, L.), but this easily turns purple and does not give as fresh a colour as the vermilion and red lead mixture. Blue ink was made from indigo (tien, or mu lan, Indigofera tinctoria), a Chinese native blue dye with a permanent colour used for dyeing textiles. Prussian blue is not suitable for printing, as the colour runs when paper is wet.g

Invisible ink was already known to the Chinese perhaps no later than the +12th century. A story of the early Southern Sung says that the son of a military official Wang Shu (fl. +1090-1155), but during his banishment met a magician who could write invisible characters with a liquid on paper. When it was treated with water the characters appeared. So for fun Wang's son wrote the four characters 'death to Chhin Kuei', applied water to test the technique. The magician then went away intending to show the paper to the government, and was only prevented by being bribed with much money. h Although the process was called magic, the characters were apparently written with chemicals, perhaps alum, on paper; they appeared when treated with some kind of solution.

Ink was also commonly used in medicine as early as the +10th century. Ink mixed with wine was given to the daughter-in-law of the Sung prince to relieve bleeding stemming from childbirth, i and Li Shih-Chen mentioned in his materia medica a number of prescriptions in which ink was administered. Ink made from fine pine soot, roasted, ground, and mixed with water, vinegar, and other ingredients such as turpentine, onion, foxglove juice, bile, wine, and dried ginger, was also used as a cure for bleeding following childbirth, dysentery, ulcers and sores, nose-bleeds, swelling, and eye irritations, among other disorders. j Depending on the nature of the disorder, the ink mixture was taken either orally or applied externally. Its curative effects were due, it was said, to its alkaline nature absorbing acid humour and sweetening the acrimony of the blood; it was also claimed that the glue from animal skins was a supreme remedy for a haemorrhage. k Li also reminded readers that ink made of lampblack from other materials such as oil, petroleum, or straw should not be used for medical purposes.

(v) Art and connoisseurship of Chinese ink

An early shape of Chinese ink in solid form can be discerned in a Han tomb mural discovered in the vicinity of Wang-tu, Hopei, in 1933. The painting depicts a

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a See Mo Shih (TSHCC), pp. 10 f.

b See inkmakers cited in Keckes (i), pp. 57-9.


d See the description of Chinese printing ink in Lu Chhien (j), pp. 632-3, which is probably the only account of its preparation in Chinese literature.

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(1) Mo Chih (TSHCC), p. 2.

(2) Cf. Mo Hsiao-Thien (1), p. 68.


(4) See the description of Chinese printing ink in Lu Chhien (j), pp. 632-3, which is probably the only account of its preparation in Chinese literature.
scholar seated on a low platform and beside him an inkstick standing on a round three-legged inkstone and a cup, presumably filled with water, for grinding the ink. The inkstick is standing on end and this suggests that it is probably paraboloidal in shape. Literary sources of the Han and Chin periods generally refer to ink in units of wan⁴ or mei⁵, but they contain no full descriptions of the actual shapes of these units, though wan generally refers to something round in shape and mei to something flat and thin. There are references to ink in a lo⁶ (conch) shape used after the Chin dynasty, but the use of this word as a unit defies precise definition.⁶

Chinese ink is generally said to have been first manufactured in a prismatic shape during the Thang period.⁴ The discovery of a bar-shaped piece of ink in a Chin grave may indicate that this shape was actually developed somewhat earlier, for another bar-shaped specimen attributed to the Thang period was discovered by Aurel Stein in Chinese Turkestan.⁶

Prismatic shapes, of course, feature flat surfaces. The development of such ink surfaces may have been due to their capacity for facilitating design, which became increasingly prevalent as ink was transformed from a simple object of utility to an objet d’art. The earliest known decorative elements used on ink surfaces, dating from the Thang period, consisted of propitious animals, such as the dragon and the carp, as well as calligraphy. During the Ming and Chhing periods, many inksticks were decorated with a pictorial design on one side and calligraphy on the other. The pictorial designs, often symbolic in nature, included dragons, lions, carp, deer, pine trees, cranes, tortoises, gourds, plum flowers, pomegranates, bamboo shoots, landscapes, scenes from everyday life, inventions, religious personages and symbols, as well as others. The inscriptions, which are sometimes gilded, include details of manufacture, explanations of the pictorial design on the reverse side, moralisations, religious sayings, auspicious phrases, poems, and examples of calligraphy. Ink was also made in a variety of special shapes, often in imitation of different artistic objects such as jade pendants, bronze mirrors, and ancient knife-shaped coins.

The various shapes and designs of the inkstick were conditioned by the construction and engraving of the mould, which was made of either copper or wood. Copper moulds produced sharp and clear images of the design but were hard to engrave. Wood was easier to carve but sometimes showed its grain on the surface of the ink. The designs into which the ink paste was pressed were cut intaglio into the mould, resulting in their appearance in relief on the surface of the inkstick. Shen Chi-Sun (fl. +1398) provides in his work an illustration of a six-piece mould for the six sides of an inkstick, in addition to a base into which the six-piece mould would be assembled and fitted (Fig. 1164).⁴

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32. PAPER AND PRINTING

Fig. 1164. Mould for inkmaking. The six-piece set with designs and inscriptions was assembled and fitted into the base. From Mo Fa Chi Tao, r. +1598.

Decorated sets of inksticks were also quite popular in the Chhing period and are still sold today. Usually a set was organised around a common theme, such as different kinds of animals, the eight trigrams, views of the imperial palace, landscapes of scenic splendours, etc. Each set was usually encased in a specially made ornate box which could be opened to show its contents to best advantage. The largest set of inkcakes ever made in China was perhaps a group of sixty-four pieces entitled ‘Pictorial Inks Commemorating the Gardens’ (Fig. 1165) made by the Chien Ku Chai⁴ by imperial order of the Chia-ching emperor (r. +1796–1821).⁴

Ink was probably collected in China almost as soon as it was noticed that two different specimens could differ widely in quality, but extant records do not reveal much about the art of collecting before the +10th century, in the Southern Thang and Sung periods. The poet Su Shi⁴ (+1036–1101) was an avid ink collector who amassed a collection of five hundred pieces, and his contemporary, Lu Hsin-Fu,⁷ was also a noted collector. The imperial collections of the Ming and Chhing dynasties featured numerous inks which still survive.

Many catalogues of ink collections have been published since the late 16th

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4 See Wang-Tu Han Mu Pi Hua, pp. 13–14; also Tsien (1), p. 169, Plate XXVII.
7 See illustration and explanation of the ink mould in Mo Fa Chi Tao (TSHCC), pp. 64–5.
8 The set is kept in the collection of the Metropolitan Museum of Art in New York City; see Wang Chi-Chen (1), p. 139.
9 中文
century by inkmakers, ink dealers, and ink collectors, primarily for appreciation and connoisseurship of the artistic aspects of ink tablets. The earliest and most influential examples are two collections of ink designs reproduced by woodcuts. One titled Fang Shih Mo Phu (Fang's Album of Ink Designs) by Fang Yu-Lu (c. +1580), containing more than 380 illustrations, arranged by the form and subject-matter of the designs under six categories, as well as a number of laudatory essays, was published in She-hsien, Anhui in +1588. Eighteen years later, his professional competitor Chheng Ta-Yüeh published another collection called Chheng Shih Mo Yilan (Chheng's Album of Ink Designs), which contains some 500 designs printed in colour together with essays, poems, eulogies, and testimonials from his friends. The two works are similar in nature and content and many of their designs are even identical, but the latter surpassed the former not only in the number of illustrations it provided but also in artistic excellence; furthermore, it included some special features such as the Western alphabets and biblical pictures copied from European engravings given to Chheng by Matteo Ricci (1552–1610) in +1606 (Fig. 166). It is perhaps the first Chinese book which includes illustrations of an occidental origin.

Another kind of ink catalogue, produced by ink dealers, includes among other things the prices at which the items featured were apparently offered for sale. One early example is the Mo Shih (History of Ink) by Chheng J6 published in 1670, and the Man Thang Mo Phin (Ink Collections of the Boundless Pavilion) by Sung Lo published in 1684. Both list the names of inkmakers, ink titles, designs, dates of manufacture, forms, number of pieces, and weights, all of them standard items described in such catalogues.

Interest in ink collecting and connoisseurship has continued up to the present time, and an album of rubbings and descriptions of eighty-three old specimens of Ming-Chhing ink kept in four private collections in Peking, titled Ssu Chia Tshang Mo Thu (Illustrated Catalogue of Four Ink Collections), was published in about 1956.

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Fig. 1165. Pictorial ink-cakes in various shapes and designs, depicting views of imperial palaces or villas in and around Peking, c. +1800. Metropolitan Museum of Art, New York City.
AESTHETIC ASPECTS OF CHINESE PRINTING

BLOCK PRINTING not only involves various procedures of a technical nature, but also consists of many elements that are of artistic significance, while the text itself can display different styles of writing and so represents a piece of calligraphy which can be read for its aesthetic appreciation. Illustrations using woodcuts and other methods are forms of graphic art; they supplement and adorn the text, aid interpretation, assist the memory, and can also provide additional understanding to supplement the written word. Without illustrations, the text may even lack a sustaining interest or, in some cases, be quite unintelligible. Book illustration is nearly as old as the earliest books, but its practical development began with the application of printing.

In the course of its development, the woodcut became a highly sophisticated art not only in the way it depicted the subject-matter, but also in the techniques and styles of its design and engraving, which depend entirely on the skill and vision of individual artists and craftsmen. This is especially true in the case of Chinese colour prints, which require the exactness of the originals in line, in colour, in gradation, and even in the texture and expression of the brushwork. It is perhaps the only kind of graphic art which depends completely on the mutual artistic understanding of the designer, cutter, and printer. Consequently, the woodcut and the subject of book illustration serve a double purpose in their utilitarian and aesthetic qualities. Their contents may represent the thoughts, ideas, events, and personalities of a period. The picture may be at the same time a work of art and the only surviving evidence of an element of the culture of its time.

(1) BEGINNINGS OF CHINESE GRAPHIC ART IN PRINT

Pictorial representation in Chinese documents can be traced back to the beginnings of writing itself. The pictographic nature of Chinese characters indicates the use in ancient times of drawings as a means of communication; the majority of the Shang characters were, in fact, pictograms or combinations of pictograms to indicate ideas. Symbols of birds or beasts were used in ancient seal carvings, and either decorative bird signs were appended to ordinary characters, or individual strokes of a character were written with a motif of bird feathers. Scenes of battle, hunting, and daily life were cast on bronzes or rendered on clay or on lacquered objects, and in particular illustrations on silk cloth were appended to books of bamboo tablets since the narrow tablets themselves were not suitable for drawings. Pictorial representations on stone were very common before any recorded use of wood for carving, and the techniques of relief or intaglio stone carving, the use of decorative designs and the line structure, may have exerted some direct influence on the woodcuts of later times. The close relationship between calligraphy and painting also may have influenced the trends of illustrated books, since a picture sometimes needs written description to tell the otherwise unintelligible story of the painting—the very reverse of the dependence of text on pictures for clarification.

The earliest woodcut illustration in a printed book known to us is that in the Diamond sutra of +868, discovered in Tunhuang at the turn of the 20th century. It has a frontispiece (fei hua) at the beginning of the roll depicting a scene with the Buddha sitting in the centre, in discourse with his disciple Subhuti who kneels on the ground, and attended by divine beings, monks, and officials in Chinese attire (Fig. 1167). The picture is carefully executed, displays complicated details, lifelike facial expressions, delicate lines to the costumes, and decorative effects in the background, all of which show the artistic and technical maturity of woodcuts at that time. There is no question that the art of woodcut illustration had developed much earlier than the production of this picture, though no other printed illustrated specimens of the +9th century or earlier are extant; however, quite a few survive from the +10th century. These include a number of Buddhist pictures from Tunhuang, each on a single sheet with the illustration above and the text below, some undated and others dated. Buddhist images also appear on individual blocks.

4 Cf. the development of decorative inscriptions described in Tsien (1), pp. 24-5, 68-9, 94-5.
5 Reproduced in Steinhauer (5), pp. 14-5, plate C.
printed together in red or black; as well as drawings on calendars; and several other printed texts with illustrations.\(^a\)

While the specimens mentioned are all from the northwestern region, woodcut pictures are also known to have been produced in the southeastern part of the country. The most prominent of these are the three different versions of the invocation sutra, *Pao Chieh Yin Tho Lo Ni Ching*,\(^1\) printed by Prince Chhien Shu\(^2\) (+929-88) of the Wu-Yueh Kingdom, dated 956, 965, and 975.\(^3\) The frontispieces of the three versions are similar though slightly different in design, depicting the prince's consort, Nee Huang, kneeling before an altar and praying for blessings (Fig. 1115). The technique of engraving is not so refined as in the frontispiece of the *Diamond Sutra*, but its appearance at the beginning of the sutra shows that 84,000 copies of each version were illustrated. Indeed, it seems that all the Buddhist works were printed in great quantities, as the Buddhist religious outlook required, and it is recorded that 140,000 copies of a picture of a Maitreya pagoda were printed by the monk Yen-Shou\(^4\) (+904-75); in addition, 20,000 copies of a Kuan-Yin portrait were printed on silk, and 70,000 copies of the *Fa Chieh Hsin Thu*.\(^5\) Although none of these woodcuts survive, the large quantities indicate a significant printing power at this early stage.

Further advances in the art of the woodcut were made during the Sung, Chin, and Yuan periods. Not only were standards of artistic and technical skills improved, but the scope of illustrations was extended from the religious to such secular fields as art, archaeology, scientific works, and Confucian classics, subject-matter being widened to include designs, landscapes, portraits, pictures of daily happenings and amusements, all reflecting the Chinese life of the time.\(^6\) Religious pictures continued, of course, and among the Buddhist sutras, a few surviving items include the drawing of a Bodhisattva with eight arms in the *Ta Sui chih*\(^7\) dharani printed in +980 and found in Tunhuang; a picture of Maitreya seated on a lotus throne under a canopy, painted by an academician artist, Kao Wen-chin,\(^8\) in Yuh-chou (Shao-hsing, Chekiang), and printed in +984 (Fig. 1168);\(^a\) a life of Wen-Shu or Manjushri, God of Wisdom, printed during the Southern Sung by the Chia family in Lin-an (Hangchow), and frontispieces to different editions of individual works of the *Tripitaka* depicting the Buddha and his disciples; these were printed from +971 onward. The most unusual illustration in the Buddhist texts is a set of four landscape woodcuts from chapter 13 of the *Ya Chih Pi Tsung Chhien*,\(^9\) one of the imperial prefaces to the K'ai-Pao illustrated edition of the *Tripitaka*, printed in +984-91.\(^a\) Showing an affinity to Sung landscape paintings, the woodcut prints are excellently composed and executed with meticulous care (Fig. 1169).

Confucian classics began to be printed in the +10th century, but illustrations were not included until the +12th, when a special edition having illustrations with the text below them, known as *tshuan thu hu ChU*,\(^10\) was printed for the use of students preparing for the civil service examinations. Noted works of this type included the *Liu Ching Thu*,\(^11\) an illustrated lexicon of classical

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\(^1\) Chang Hui-Min (1958), p. 76.
\(^2\) For a full discussion of Sung illustration, see K. T. Wu (1964), pp. 173 ff.
\(^3\) Cf. *Arthos Asiat.*, vol. 19, no. 11, Chi Shu-Ying (3), pp. 31-39.
\(^4\) See an analytical study of this landscape woodcut by Max Loehr (1).
\(^a\) One woodblock edition followed rubbings from a stone carved at Hsing-chou; two others mentioned in the Sung dynastic history are no longer extant.

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\(^1\) 延壽 \(^2\) 法界心圖 \(^3\) 大藏求 \(^4\) 真玄弗 \(^5\) 市輸密藏
\(^6\) 藤原法節 \(^7\) 六庭園 \(^8\) 詩百間 \(^9\) 美術品
32. PAPER AND PRINTING

Fig. 1168. Woodcut pictures of Northern Sung, depicting Maitreya seated on the lotus throne, painted by court artist Kao Wen-Chin and printed in 1984. From *Artibus Asiae*, vol. 15, no. 1.
terms on various objects and activities. Historical events were another popular subject for illustration, and one of the best works of the kind from this early period is a collection of 125 biographies of famous women, the *Lu Hsi Chüan*, with original illustrations attributed to the noted painter Ku Khai-Chih of the +4th century; it was first printed c. +1063, and reprinted by the Chhin Yu Thang of the Yu family in the latter part of the +13th century (Fig. 1170).

Before the use of photography, all kinds of objects were the subjects of woodcuts. The best-known works of this type include three archaeological catalogues of the Sung period: the *Kao Ku Thu*, which describes bronzes in the imperial and private collections, printed c. +1092; the *Hsü Kao Ku Thu*, which was a supplement to it; and the *Hsüan-Ho Po Ku Thu*, dealing with some 600 bronzes compiled during the Hsüan-ho period (+1119-25). These are important and have frequently been cited as a reliable secondary source for the study of Chinese ancient bronzes.

Another notable example was an album on plant life, the *Mei Hua Hsi Sheng Phu* (Fig. 1171) containing 100 excellent drawings of the plum in different stages of blossoming; it was printed in 1238 and reprinted in 1261. An album on farm life, the *Kung Chih Thu*, includes twenty-one scenes of tilling and rice cultivation, and twenty-four on sericulture, spinning, and weaving; it was perhaps printed first in 1145 and then again in 1237, based on a stone carving of 1210.

In scientific and technical works, illustrations have proved to be even more essential for understanding and interpretation. One outstanding illustrated work on architectural design, *T'ung Tso Fa Shih*, was first published in +1103 as a guide to public construction (Fig. 1172), while a book on astronomy describing the armillary sphere, *Hsin I Hsiang Fa Yao*, contains sixty drawings of the instrument; it was printed in Chhü-chou, Chekiang, in +1127. Two medical works also are well illustrated, one on acupuncture, the *T'ung Jen Chen Chu Ching*, first printed in +1026, the year in which two brass anatomical figures were made by imperial order, and the book was probably the first to contain illustrations of the human anatomy. The other is the celebrated work on materia medica, the *Ching Shih Cheng Lei*...
Pen Tshao, which includes pictures and descriptions of various kinds of medicines from the mineral, vegetable, and animal kingdoms; first printed in +1108, there were numerous reprints throughout the centuries. Illustrated books were also published on divination, calendars, and other subjects of popular interest, including paper money.

In spite of the alien rule of the Jurchens and Mongols, most printing activities continued, and while the Sung capital, Khaifeng, declined as a printing centre, and Mei-shan in Szechwan was destroyed during the Mongol invasion, Phing-yang (in modern Shansi) developed into one of the major centres of printing from the +12th century onwards. A few surviving examples illustrate the style and format of the woodcuts of this time, the earliest known work from this period being the Thien Ling Ssu edition of the Tripitaka, printed in 1148–73, in which a frontispiece precedes each chüan. Another example is the revised version of the materia medica, Ch'ang Hsiu Cheng-Ho Ching Shih Cheng Lei Pei Tung Pen Tshao, which was cut and printed by Chang Tshun-Hui of Phing-yang in 1249 (Fig. 1121). Another interesting item from this period is a large woodcut on a single sheet, a picture of four beauties, discovered by a Russian expedition in Karakhoto in 1909. It depicts four women famous in Chinese history, and is entitled Sui Chhao Tao Tiao Chhing Chhing Kuo Chhing Fang Tung (Beautiful Ladies of Successive Dynasties who over­turned Empires). It was carved and printed in the Chi family shop in Phing-yang, probably in the +12th century, and its layout, and its cutting and printing techniques represent the height of perfection and harmony. The picture is believed to be one of a pair used most likely for decoration in a private house.

During the Yüan period, woodcuts increased in number in such popular works as textbooks, fiction, and drama. They followed the established format of the earlier period, with about one third of a page devoted to illustrations and two thirds underneath to the text. This arrangement, indicating the function of illustration as a visual aid and an adornment to the text, continued until the 16th century. Illustrated books of this time, known as chhian hsiaol or fully illustrated editions, were carved by a group of cutters and published mostly by bookshops in Chhien­yang. The Hsin Khan Chhian Hsiang Chhing Chai Hsiao Chieh, the newly cut and fully-illustrated edition of the Book of Filial Piety with commentaries, was published in Chhien-yang in +1308, together with the Ta Hsieh and Chung Chieh, forming a series of textbooks for beginners. Many historical romances were published in the same manner, such as the Chhian Hsiang San Kuo Chhing Phing Hua [Fig. 1172].

Fig. 1172. Interior decorative designs as illustrated in an archtectural work of the Sung dynasty, Ting Tshao Fa Shih, printed in the early +11th century. From a facsimile reprint ed., 1925.
3.2. Paper and Printing

Illustration of the Romance of the Three Kingdoms with pictures above and text below as the typical format of early illustrated editions. The page above depicts the famous story of Liu Pei, Kuan Yu, and Chang Pei, the three heroes of the 3rd century in the popular novel San Kuo Chih Yen, wearing the oath of brotherhood at Peach Garden. From the Chhian Hung San Kuo Chih P'ing Hua, facsimile reprint, 1976.

Fig. 1173: First illustrated edition of Hsi Hsiang Chi, or Romance of the Western Chamber, published in 1498 (Fig. 1174), no fewer than ten others followed up to the end of the Ming. The earliest edition includes 150 illustrated themes some of which contain as many as eight pictures in sequence for a single theme. If connected, these would make a scroll some two or three feet long. The printer's colophon of this edition says: "This large-character edition offers a combination of narrative and pictures, so that one may amuse his mind when he is staying in a hotel, travelling in a boat, wandering around, or sitting idle." Again, in a collection of some 300 classical dramatic texts, over seventy per cent are illustrated.

A reprint of the collection, Chhian Hung Ping Hua Wu Chung, was published in Shanghai in 1955.

See separate discussion on pp. 282 ff. below.

3.2. Paper and Printing

During the Ming dynasty, especially in the latter part of the 16th and early part of the 17th century, woodcuts formed the greater part of book illustrations and reached their highest degree of excellence in Chinese history. In both quantity and quality, they not only surpassed anything in the past but have never since been equalled. Thousands of such illustrations survive, covering a greater variety of subject matter and representing different schools of format and style, using greatly refined techniques and a highly sophisticated polychrome process. All this was accomplished with little official support but was primarily the achievement of private and commercial agencies located in such centres as Nanking, Hsin-an, Hangchow, and Chhien-yang in southeast and south China, as well as at Peking in the north. This resulted from the political and economic stability of the country during most of the period, and from the rise of a new audience who were seeking reading materials for pleasure rather than for purely scholarly purposes or religious enthusiasm as in previous times.

The books most frequently illustrated were fiction, drama, poetry and art albums, scientific works, and primers, as well as historical, geographical, and biographical writings. As might be expected, the greatest number of woodcuts were produced for popular literature, and almost every edition of novels, short stories, and dramas carried pictures to illustrate the story; these ranged from a few to as many as forty or fifty in one book, or even over a hundred in some cases. After the first illustrated edition of the famous drama, Hsi Hsiang Chi, or Romance of the Western Chamber, was published in 1498, no fewer than ten others followed up to the end of the Ming. The earliest edition includes 150 illustrated themes some of which contain as many as eight pictures in sequence for a single theme. If connected, these would make a scroll some two or three feet long. The printer's colophon of this edition says: "This large-character edition offers a combination of narrative and pictures, so that one may amuse his mind when he is staying in a hotel, travelling in a boat, wandering around, or sitting idle." Again, in a collection of some 300 classical dramatic texts, over seventy per cent are illustrated.

a For a complete study of Ming illustrations, see Shih Hsio-Yen. See the 15th-century Illustrated Chinese Primer: Hsin Pien Tai Hsiang Ssu Yen, with introduction and notes by L. Carrington Goodrich (Hong Kong, 1967; reprinted 1976). The primer, which includes 306 drawings to illustrate 388 characters, was originally published in 1436 or earlier.

b See the facsimile reprint by the Commercial Press, Peking, 1955.
together containing 9,800 woodcuts for Ming works. The Fu Chhun Thang bookshop of the Thang family in Nanking alone printed over 1000 illustrations in some 100 works of the chhüan chzz "stories," while such famous novels as the Hsi Yu Chi, San Kuo Chih Yen, and Chhin Ping Mei Tzhu Hua all include illustrations of the story; in addition, the Shui Hu Chuan is known to have had at least seven different editions printed with illustrations during the Ming period.

Also illustrated were such collections of poetry as the Pai Yün Thu Phu, printed in 1597, with illustrations of 100 poems; and the Thang Shih Hua Phu which is a combination of poetry and painting printed in 1600. The woodcut is especially suitable for reproduction of works of art and over a dozen such albums were published under the Ming, including the Kao Sung Hua Phu, a painting manual of plants and birds by Kao Sung, (1550–4), and the Ku Shih Hua Phu, a collection of paintings by famous artists of successive dynasties copied by a court painter, Ku Ping (fl. 1599–1603), that was printed in 1603 (Fig. 1175). Many biographical, historical, and geographical works were also well illustrated. For example, the Lieh Nü Chüan is known to have had some half-dozen illustrated editions published between 1587 and 1644; the Chuang Yuan Thu Khan, printed in 1607 and 1609, portrays twenty-nine candidates who passed at the top of the civil service examinations in 1496–1521, and the Hsi Hu Tu Lan Chü with scenes of the West Lake in Hangchow, came out in 1547. Scientific and technical works were especially well illustrated to help explain the text, and included the famous work on agriculture, and technology, Thiên Kung Khai Wû, printed in about 1637; the Nung Cheng Chhüan Shü, a comprehensive treatise on agriculture by Hsi Kuang-Chhi (1562–1633), that appeared in 1659; the Wu Ching Tsung Yao, a collection of military classics printed in Chien-an in 1506–21; the San Tshai Thu Hui, an illustrated encyclopaedia devoted to pictures, maps, charts, and tables (1609); and three editions of the book of materia medica, the Pen Tshao Kang Mu, printed in 1596, 1603, and 1640.

Among the few known artist-designers of the Ming woodcuts, Chhen Hung-shou (tz..臼 Lao-Lien, 1599–1652) is the most noted for his creativity in showing the individual personality in human figures. An accomplished life painter before he earned a living as an illustr

Fig. 1175. A landscape painting by the Yüan artist Mi Fu copied by the Ming court painter Ku Ping in his album and printed in 1603. From Ku Shih Hua Phu, facsimile reprint, 1931.
in 1638; the Hsi Hsiang Chi and the Yuan Yang Tsung, both of which came out in 1638; the Shui Hu Yeh Tzu (Fig. 1176), which portrays forty characters of the novel Water Margin for playing cards and was designed in 1640; and the Po Ku Yeh Tsu, first published in 1653, which includes forty-eight figure designs of historical personages, that were also used for playing cards. His designs for all these works consist of single figures against blank surfaces without any background, showing each personality as described in the literature, and the bold and sharp lines of the bodies and clothing are especially remarkable. The first two works were cut by members of the Huang clan of Hsin-an, and display clear and delicate lines.

Most of the cutters are unknown to us, but the names of a few appear on the woodblocks which they carved. As the profession was highly technical, transmitted perhaps only through tradition, they usually came from certain families or clans, spread sometimes over several generations, and sometimes moving from one place to another. Best known among them are the cutters of the families of Huang, Wang, and Liu of Hsin-an (Hui-chou or She-hsien in modern Anhui), where the best ink and paper were produced. Especially significant was the Huang family, of which more than one hundred members are known to have cut wood blocks, including thirty-one who produced the majority of all the known book illustrations during the Ming period. Their cradle of activities was the village Chhiu-chhuan in Hsin-an; later they migrated to Nanking, Soochow, Hangchow, Peking, and elsewhere as their profession demanded. Because of the special delicacy of their style, which was characterised by fine, soft lines, their works are generally spoken of as the Hui school. Especially noted were Huang Ling, one of the earliest cutters of the family, who produced the famous multi-colour manual of ink-sticks, Chcheng Shih Mo Yuan (Fig. 1166); Huang Te-Shih (1560–1605), who contributed to the cutting of three archaeological catalogues; Huang Te-hsin (1574–1658), who cut the collection of Yuan drama, and whose five sons were all cutters; Huang I-Khai (1580–1622) and his brother Huang Ying-Kuang, who migrated to Hangchow and together produced the largest number of illustrated books of popular literature, including the Chin Phing Mei Hu and several editions of the Hsi Hsiang Chi. A total of some fifty titles are known to have been credited to members of the Huang family during the last seven decades of the Ming dynasty.

Generally speaking, woodcuts under the Ming developed gradually to a standard of artistic excellence and maturity. At the beginning of the period, both the technique and the subject matter continued the Sung–Yuan tradition, with cruder lines and composition, used mostly for religious and scholarly literature. Towards the end of the 15th and through the 16th century, the demand for illustrations for

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* See Huang Yung-Chhüan (1).
* Chang Hsiu-Min (15), pp. 61–5.
popular literature, art albums, and pictures for amusement prompted some complexity and sophistication in design. The four decades from the beginning of the 17th century through to the end of the dynasty in 1644 produced the greatest number of woodcuts, introducing new techniques which led to the greater refinement of the art, with delicate lines, detailed design and composition, and exquisite execution. It was the golden age of woodcuts and book illustration in Chinese graphic history.

Under the Chhing dynasty, the woodcut in book illustration showed less creativity and prosperity than in the Ming. In one sense, the decline resulted from the suppression of certain categories of fiction and drama which had inspired the greatest part of the Ming illustrations. On the other hand, a new horizon of official patronage had developed, and also a new interest in popular woodcuts of New Year pictures. Peking became the centre of official printing, while private and commercial printers continued to produce in other cities in both the north and the south.

During the first part of the Chhing, over a dozen illustrated books were produced at the imperial printing office, Wu Ying Tien, designed and cut by court artists and expert craftsmen. Many of these works were produced to record imperial ceremonies, journeys, military campaigns, or imperial establishments; the records were accompanied by poems composed by the emperors. One of such earlier works was the Wan Shou Sheng Tien Thu, which depicts various scenes at the celebration of Emperor Khang-Hei's sixtieth birthday in 1713, when a procession extended some six miles in Peking. It was painted by the court artist Wang Yuan-chhi (1642–1715) on silk, and later reproduced by the most skilful Chu Kuei in 148 woodcuts which, if joined in a scroll, would be 166 feet long. A similar work recording the events of the celebration of Emperor Chhien-Lung's eightieth birthday in 1791 was printed in 1796, but it was not so well executed as the earlier one. Another pictorial record, known as the Nan Hsin Sheng tien (Fig. 1178), was made during the emperor's inspection tours to four provinces in 1751–55. It depicts the most beautiful landscapes along several thousand miles of the journeys.

Imperial gardens, establishments, and collections of ritual articles were other themes for illustrated works, which always included poems composed by the emperors. These included the Pi Shu Shan Chuang Shih Thu, depicting scenes of the imperial summer palace in Jehol, printed in 1712, and the Yuan Ming Yuan Su Shih Ching Shih Thu (Fig. 1179), consisting of forty pictures of the summer palace in a suburb of Peking (1745). Another illustrated work is the Huang Chhao Li Chi Thu Shih, which portrays sacrificial vessels, robes, musical instruments, astronomical apparatus, weapons, insignia, etc., used in the imperial rites of the reigning

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32. PAPER AND PRINTING

Fig. 1117. Ladies playing on the rope swing, one of the 100 illustrations of the novel Chin Phing Mei, or Golden Lotus, cut by members of the Huang family from Hsin-An, Anhui, who resided in Hangchow during their career years. From Chin Phing Mei Tzu Hua, Chhung-Chen ed., c. +1628–44, facs. reprint.

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1 See separate discussion on pp. 287 ff. below.
3 See an excellent reproduction of forty-eight colour woodcuts of various local sceneries from the 1765 edition and sixteen black-and-white pictures from the 1784 edition in Fuchs (10).
4 see an excellent reproduction of forty-eight colour woodcuts of various local sceneries from the 1765 edition and sixteen black-and-white pictures from the 1784 edition in Fuchs (10).
5 See separate discussion on pp. 287 ff. below.
32. PAPER AND PRINTING

Fig. 1179. Temporary palace of Emperor Ch'ien-Lung near the Golden Mountain at Chenchiang, Chiangsu during his inspection tour to the South, printed in colour in +1766. From *Nan Hsien Shih Tien*, reproduced in Fuch (10).

Fig. 1179. Part of the scenery of the imperial garden, Yüan Ming Yüan, printed in +1745. From *Yüan Ming Yüan Shih Shih Ching Shih Tzu*, reproduced in Cheng Chen-To (7).

dynasty; this was printed in 1759 and revised in 1766. Portraits of meritorious persons were preserved in such works as the *Phing Ting Thaitwan San Shih Erh Kung Chien Thu Hsing* (1751) which contains some thirty-two portraits of military heroes of the conquest of Taiwan in 1683. Non-Chinese persons are portrayed in the *Huang Ching Chih Kung Thu* (1751) and depicts some 600 figures and their costumes from the native tribes of southwest China to the peoples of distant European countries, based on reports and observations by Chinese envoys who had been sent abroad.

Among noted works on agriculture and other subjects, the most famous is probably the *Yu Chih Keng Chih Thu* (4) which was based on the Sung version but includes twenty-three pictures each of tilling and weaving, designed by the court painter Chiao Ping-chen (4) with one additional poem for each subject on the top margin of the picture by the Emperor Khang-Hsi (Fig. 1180) and others. It was printed in colour in 1696, carved later on stone, and reproduced in woodcuts by Chu Kuei in 1712. Other similar works include the *Mien Hua Thu* (4) on the culture and processing of cotton, printed in 1765; the *Shou Shih Thang Khaou* (1742), primarily based on an earlier work on agriculture by Hsi Kuang-chhi; the *Wu Ying Tien Chih Chen Pan Chheng Shih* (1776), a manual for the various stages of making movable types and printing (Fig. 1143); and the grand encyclopaedia, *Thu Shu Chi Chheng* (5) which includes thousands of illustrations in its various sections, even though it was printed with bronze movable type in 1728 (Fig. 1147).

At this time, Western art was influencing that of the Chinese court due to the presence of Roman Catholic priests who were serving in various capacities at the imperial palace. Thus when the *Phing Ting I-Li Hau Pu Chien Thu* (4) with paintings of sixteen scenes from battles and memorable events in the conquests of Ili and...
Fig. 1181. Scenic mountains and rivers of Thai-Phing, Anhui, painted by Hsiao Yün-Tshung and cut by Liu Yung in +1648. From Chung-Kuo Pan Kho Thu Lu, pl. 211.

dominance of many famous Ming family publishers had gradually disappeared, a few noted designers collaborating with skilful cutters were able to contribute to give an excellence to early Chhing woodcuts, especially those illustrating landscapes and human figures. Most noted among these artists was Hsiao Yün-Tshung (1596-1673), whose design of pictures was most outstanding. He painted forty-three scenes of the landscape of Thai-Phing (in modern Anhui), Thai-Phing Shan Shui Thu Hua 2 (Fig. 1181), at the request of an official of that place. These were engraved on wood by a number of skilful cutters in 1648 to accompany poems and essays, and consisted panoramic views of the scenic mountains and rivers, all with very elaborate and delicate carving. Another of his works is an illustration with figures of Chhü Yüan’s Elegy on Encountering Sorrows, Li Sao Thu 3, printed in 1645 (Fig. 1182). Inspired by the expressive style of Chhen Hung-Shou and cut by some of the same cutters as the previous work, it shows both vivid facial expressions and dynamic flowing lines of garments.

Other important illustrations with figures include the Ling-Ten-Ko Kung Chhen
Thu Hsiang, printed in 1668, which portrays twenty-four famous officials, scholars, poets, and artists of successive dynasties; and the Wu Shuang Thu, printed in 1690, an album of forty unique personalities of Chinese history. Both of these works and two of the palace editions, the Keng Chih Thu and Pi Shu Shan Chuang Shih Thu, were cut by Chu Kuei, who was probably the most distinguished craftsmen of the early Ching and who contributed so much to the excellence of the work of this period. Another important book is the Wan Hsiao Thang Hua Chüan, published in 1743, illustrating 120 persons noted in history from Han to Ming times. The most distinguished work of multi-colour woodcuts was the painting manual of the Mustard Seed Garden, which will be discussed in the following section.

During the second part of the Ching period, after 1800, nothing particularly significant appeared, except for some illustrated works of a practical nature, archaeological repertories, local scenery, fiction, and other miscellaneous materials. However, among scientific and technical works, there was an illustrated book on botany, Chih Wu Min Shih Thu Khaoch, printed in 1848 after the death of its author, Wu Chhi-Pui (1789-1847); this included drawings of some 1714 specimens of plants, flowers, and fruits, based on previous records as well as the author's own collections and observations during his journeys throughout the country. Another illustrated book worthy of note is the Ho Kung Chi Chih Thu Shuo, on water conservancy, printed in 1836; this recorded the tools and materials for dyke building and river management. Of archaeological works, there were such illustrated catalogues as the Chi-Ku-Chai Chung Ting I Chhi Kuan Shih, on ancient bronze inscriptions, printed in 1804; and the Ku Yu Thu Khaoo on ancient jade (1889).

A number of novels and short stories produced in the Ching period were also illustrated. Especially notable is the Dream of the Red Chamber, of which the earliest edition, of 1791, includes some twenty or more pictures of heroes and heroines of the story, though the best is probably the Hung Lou Meng Thu Tuan (Fig. 1182), with fifty portraits of characters painted by Kai-Chhi20 (1774-1829); it is elegantly designed and well executed. Another noted figure painter who should be mentioned is Jen Hsiung12 (tzu Wei-Chhang, c. 1815-57); he produced three biographical works on knights-errant, scholars, and hermits, printed in 1856-8, and designed a set of wine-garbage cards, printed in 1854. All his work is vivid and forceful, displaying the influence of the Ming artist Chhen Hung-Shou.

Towards the end of the Ching dynasty Western printing techniques and facilities were introduced and gradually replaced the time-honoured art of woodcut illustration. Quite a few pictorial works, especially those from the Tien Shih Chai,21 were printed by lithography and other photo-mechanical processes. However, the art of the woodcut has survived to modern times. Certainly, there is a
school influenced by Western techniques and styles of print-making, but a traditional school still continues and has been revitalised, especially by a demand for multi-colour woodblock printing for the reproduction of works of art, stationery, and New Year pictures.

(3) DEVELOPMENT OF MULTI-COLOUR PRINTING

Chinese multi-colour woodblock printing, known as thao pan (set of blocks) or tou pan (assembled blocks), was produced by a set of separate blocks (Fig. 1184), each of which was registered in position and printed in succession on the paper using a water-based ink in different colours. The number of blocks in a set varies from a few to several dozens or more, depending upon the variety of colours and tones printed (Fig. 1185). This polychrome process was used for printing text with punctuation and commentaries, for cartographic works, paper money, book illustration, ornamental letter-papers, New Year pictures, and works on painting, calligraphy, and the decorative arts.

Reproduction of works of art is usually done with the same kind of ink, colour, and paper as those used for the original. To some extent, the exactness of wood-
Fig. 1185. Ten steps for making a multicolour blockprint as exemplified by the picture of goldfish. Courtesy of Jung Pao Chai, Peking.

block prints cannot be equalled even by the modern photo-mechanical processes, because in photo-engraving, the fine reticulated lines do not express the exact texture and spirit of the original brushwork. Moreover, offset prints cannot reproduce the rich gradations and tones of Chinese ink painting, while the oil-based ink is unable to produce the same effect as the water colours of the original; in addition a background shadow produced by the photographic method is often observed.

The colour prints from woodblocks require considerable skill and expertise to master the various steps in designing, engraving, registering, and printing. Although no record is left to tell how the old colour prints were made, the process is believed to have been very similar to that used today. For reproduction of colour painting, the first step is to study and analyse the colours used in the original. Separate outline copies of each basic colour are then traced on thin transparent paper, which is then stuck upside down on the smooth surface of the woodblock using a rice paste. After drying, the back layer of the paper is rubbed off and the block is ready for cutting. As the lines and coloured areas must reproduce the original work exactly, the original is always kept beside the cutter and the printer (Fig. 1186).

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The paper used for Chinese colour prints is usually the whitish, smooth, absorbent Hsüan-ehóh which is used by all Chinese artists for painting and calligraphy. The inks are the same water colours, most of which are earth pigments mixed with peach-tree resin or hide glue and water. These are mixed as they were for the originals so they produce the exact colours after drying. The worktable is made of two wooden boards placed to leave a slit between them (Fig. 1187). On the left side the engraved block is firmly fixed with pitch or wax to the table, with brushes and inks to hand. On the right side, sheets of paper are firmly held together under a clamp. When the block is inked, the printer must see that no colour runs beyond its proper boundaries. A sheet of paper is then laid upon the inked block and softly brushed over. Different pressure is applied to different parts of the block, depending upon the expression and texture needed for each stroke. Sometimes certain colours have to be printed first and dried before others are applied, and sometimes later printing must be done while the earlier colours are still wet. Gradation is achieved by applying varying degrees of colour from light to dark repeatedly from the same block, either by causing the ink to run on the block with a special brush, or by wiping away the ink at the desired place. In this way, an exact copy is produced master the various steps in designing, engraving, registering, and printing. Although no record is left to tell how the old colour prints were made, the process is believed to have been very similar to that used today. For reproduction of colour painting, the first step is to study and analyse the colours used in the original. Separate outline copies of each basic colour are then traced on thin transparent paper, which is then stuck upside down on the smooth surface of the woodblock using a rice paste. After drying, the back layer of the paper is rubbed off and the block is ready for cutting. As the lines and coloured areas must reproduce the original work exactly, the original is always kept beside the cutter and the printer (Fig. 1186).

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which sometimes cannot be distinguished from the original. As a noted typographer has said: 'There is hardly another graphic art in the world that depends so entirely on the artistic sympathy and understanding of the printer as does the Chinese colour print.\(^\text{a}\)

This colour process apparently evolved from one in which prints with black outlines were coloured at first by hand and later by applying various colours to different parts of the same block. When separate blocks were used for different colours with gradations of tone, the technique became a highly sophisticated and refined art of printing. Several of the earliest examples of prints coloured by hand survive. A picture of Kuan-yin dated +947 and a few similar sheets with six colours were found in Tunhuang,\(^\text{b}\) and paper money issued in +1107 was printed with legends in black, a circle design in vermillion, and 'blue face' in indigo, as a precaution against counterfeiting.\(^\text{c}\)

One of the earliest examples of colour printing extant is perhaps a single sheet of woodcut recently discovered in Sian. It depicts the legend of Tungfang Shuo\(^\text{d}\) (b. -106), a humorous official at the Han court who is said to have stolen the peaches of immortality from the Queen Mother of the West. The picture is attributed to the Thang artist Wu Tao-Tzu\(^\text{e}\) (d. +792) and printed in black, grey, and green with a seal in red, possibly by a commercial printer at Phing-yang under the Jurchens in the early 12th century (Fig. 1188).\(^\text{f}\) This piece is believed to have been used for

\(^{a}\) Tschichold (3), p. 41.
\(^{b}\) Specimens of early coloured prints are kept in the British Museum and in Musée Guimet, Paris.
\(^{c}\) See description in Shu Chung Kuang Chi (SKCS), ch. 67, pp. 18a-19a.
\(^{d}\) This print was found, together with a rubbing of calligraphy, some fragments of Jurchen documents, and fifty-eight iron and copper coins of the Sung and Chin period of which the latest dated to +1158, inside the cavity of a pillar for the stone tablet at the Forest of Steles (Pei Ling), Sian in 1973 when the tablet was repaired; see a report in WWTK, 1979 (no. 5), pp. 3-4, plate 2.
\(^{e}\) 東方朔  
\(^{f}\) 女道子  
\(^{g}\) 翰林
house decoration or as one of the New Year pictures with a theme popular then.

Texts printed with colour commentaries date back to the early part of the 14th century, although the actual beginning must have been earlier. One of the surviving examples is an edition of the Diamond Sutra, printed at the Tzu-fu Temple of Chung-hsin Circuit in 1340, using black for text and red for prayers and a picture of the ling tzu plant (Fig. 118g).

The multi-colour technique was further developed toward the end of the 16th century or around the turn of the 17th, when the Min and Ling families and other printers of the Chiangsu-Chekia region printed hundreds of classical works, illustrated novels, dramatic texts, and medical writings in two to five colours. The most noted among them was Min Chhi-Chi, who and others printed no less than one hundred titles of such a kind of work during this time. One of the earliest extant atlases printed in colours is probably the Shih Chu Yü Ti Thu, of 1643, a collection of sixty maps showing geographical areas in contemporary and ancient times. Place names and boundaries of the Ming period are shown in black, while those of antiquity, and the annotations, appear in red. All these works, however, were printed with solid colours without gradations.

This polychrome technique was advanced to the highest degree of perfection in the first part of the 17th century, when many collections of painting, calligraphy, and ornamental letter-papers were produced with even more sophisticated processes. Unlike the previous illustrations with black outlines, the new technique was characterised by applying colours to the blocks without outlines but with a variety of graded tones. This development reached its peak with the Shih Chu Chai Shu Hua Pin, a manual of calligraphy and painting from the Ten Bamboo Studio (Fig. 1190), and the Shih Chu Chai Ching Pin, a collection of ornamental letter-paper designs from the same studio (Fig. 1191) both printed in five colours with graded tones by Hu Cheng-Yen in Nanking. The first of these two monumental works appeared in 1619–33, and the second in 1644 or 1645.

Hu Cheng-Yen (c. 1582–1672) was a native of Hsiu-ning (Hoi-chou) in modern Anhui, a centre for fine paper, ink, and printing for many centuries. He later lived in Nanking, to which many prominent cutters and printers moved from the not far distant Hsiu-ning. Hu was a scholar and physician by profession, but became a seal carver, painter, calligrapher, letter-paper designer, and printer of artistic talent, and his collections included a number of paintings and examples of calligraphy from his own hand as well as by some thirty other contemporary artists.

His painting manual consisted of about 180 pictorial prints and 140 poems in calligraphy, which were grouped under eight categories, including birds, fruits, orchids, bamboo, plum blossoms, rocks, paintings in circular fan shape, and miscellaneous paintings and calligraphy. Each subject category contained about forty examples of painting and calligraphy, each printed on one double-page leaf.

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* This and other erotic albums are described in van Gulik (11).
* A few copies of this atlas are known to have survived in the Peking Library, the Bibliothèque Nationale, and the Library of Congress.
* Huang Ta (6), pp. 39–40.
Fig. 1190. A multicolour blockprint of the Ten Bamboo Studio by Hu Ching-Yen printed in c. +1627. From Shih-Chu-Chai Shu Hua Phu, reproduced by Tschichold (3).

The categorisation and selection of the pictures showed for the first time in Chinese art a systematic approach to the study of painting and calligraphy.

Before the complete edition of the Shih Chu Chai Shu Hua Phu was issued in 1633, a few advance editions are known to have been printed. These included one printed in 1622, of seventeen pictures of bamboos; one of unknown date on the four noble plants (plum blossom, orchid, bamboo, and chrysanthemum), with eight pictures; and one on birds printed in 1627, with ten pictures. The Shu Hua Phu was apparently a collection of previous works plus new ones printed in or before 1633. The earlier editions of this work are extremely rare.

Hu’s collection on ornamental letter papers, the Shih Chu Chai Chien Phu, consists of designs of rocks, ritual vessels, landscapes, human figures, and plants and

* An excellent facsimile reproduction of the first edition of this manual has been made with colour offset by Tschichold (3).

Fig. 1191. Letter-paper design from the Ten Bamboo Studio, printed with colours and gradation. From Shih Chu Chai Chien Phu, facsimile ed. by Jung Pao Chai, 1934.
flowers. Some of these designs were made, with or without colour, from embossed blocks, another Chinese printing invention. The process, known as kung pan* (embossed blocks) or kung hua* (embossed designs), employed either simple pressure on paper to produce the effect of relief from an engraved block, or a true embossing through pressure on paper placed between negative and positive blocks. One expert believes it was a process of true embossing with a negative cut from short-grained wood; it is not true, however, that this technique was Hu's creation or that his collection of writing-paper designs was the first of its kind. At least two other collections of such stationery are known to have been published around or before this time. One is the Lo Hsüan Pien Ku Chien Pha* (Collection of Letter Papers with Antique and New Designs from the Wisteria Pavilion), compiled by Wu Fa-Hsiang* (hao Lo-hsüan, b. 1578), also from Nanking, and printed in 1665, nineteen years earlier than the one from the Ten Bamboo Studio. The other is the Yin Shih Chien Pha* (Collection of letter papers from the Yin family), which includes embossed designs and is believed to have been printed at about the same time.*

The manual from the Ten Bamboo Studio was instrumental in the publication of later works of colour prints. Especially noted is the Chiieh Tsu Yuan Hua Chua* (Painting Manual of the Mustard Seed Garden) (Fig. 1192), which was even more influential than its predecessor and has enjoyed prestige as a model for beginners in brush work for the last three centuries. The Mustard Seed Garden was built in Nanking by Li Yu* (1611-80?), a playwright and prolific writer on many subjects, who printed a number of his own books and others under this name. Although he wrote a preface to the first series of this manual in 1679, he apparently was a sponsor but not the author. It is generally agreed that the first three series of this work, parts 2 and 3 of which were published in 1701, were prepared by his son-in-law, Shen Yin-Yu,* and illustrated by Wang Kai* and his two brothers Wang Shih* and Wang Nieh;* the fourth series was added by others in 1818. This work is a step-by-step instruction book on how to do paintings of landscapes (series 1); of plum blossom, orchid, bamboo, and chrysanthemum (series 2); of birds, insects, and flowers (series 3); and of human figures (series 4). This work has been widely circulated in China and Japan, with numerous editions reprinted in both countries and translation into different languages.*

(4) POPULARITY OF NEW YEAR PICTURES

No other significant works of colour prints are known to have been produced since the publication of the painting manual from the Mustard Seed Garden, except perhaps for some minor collections of ornamental letter-paper designs and for the numerous New Year pictures known as nien hua.* The New Year festival was the
most important event of the year, and was celebrated throughout the country as an extended holiday when people conclude the old year and look forward with new hopes and expectations for the coming one. Chinese in all walks of life liked to decorate their houses with pictures in bright colours and gay in content, either hand-coloured over black outlines or, more often, printed by a multi-colour process. The origin of *nien hua* may be traced back to the use of illustrated seasonal calendars, door gods to protect the house, and certain family scenes in paintings, all of which appeared in the Thang or earlier. Motifs and content continued to develop through the centuries, and this folk art increased in popularity when the technique of multi-colour woodcuts was widely applied to printing in the latter part of the Ming dynasty.a

New Year pictures fall into a wide variety of categories. Most popular are those reflecting human desires for happiness, prosperity, and longevity, symbolised by such figures as the bat, fish, peach, lotus, pomegranate, and peony. Gods of folk religion, heroes and heroines, landscapes and scenery, family life and children, farming and weaving, and many other topics were represented. One of the earliest extant examples is a delicately printed picture of Shou Hsing b (God of Longevity) (Fig. 1193) made in Soochow in 1597. Soochow, a commercial and industrial city in the southeast of China that was most prosperous during the early Chhing period, was one of two major centres for the production and distribution of New Year pictures. Here, in a street named Thao Hua Wu, where a villa of this name had been built by an artist in 1505, a scenic area was formed during the following centuries, and this contained over fifty printing shops by the middle of the 19th century. Such pictures as the Wan Nien Chhiao, c or Everlasting Bridge (Fig. 1194), and the Chhang-men City Gate, both printed in 1740, reflected the prosperous scenes of Soochow during this time.

Another major centre was located in Yang-liu-chhing, d a town near Tientsin, where many workshops were established from the end of the 16th century on. It had become the largest production and distribution centre by the early part of the 17th century, when annual production reached twenty million copies. One single shop with several hundred cutters and printers produced over a million pictures a year, and over sixty workshops were still operating in the middle of the 19th century. Two editions were made, one in the spring and autumn of each year. The spring edition was produced at great leisure, with more variety in designs and colours and in more refined style. The autumn edition, prepared in haste to meet

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*a* For the history of the development see A-Ying (2); Kuo Wei-Chhi (1), pp. 182–187; Josef Hejzlar (1), pp. 48–51; Pommeranz (1).

*b* Reproduced in Aoyama Arata (1), plate 6.

*c* Most of the pictures from Soochow survive in Japan, and forty-seven selected samples are reproduced in Aoyama Arata (1), plates 15–67; see also A-Ying (2).

the immediate needs of customers, was more robust in style. With the increasing demand for such pictures, many sub-centres were developed throughout the country, especially Yang-chia-wu in Shantung, Paoting in Hopei, Chu-hsien-chang in Honan, Yangchow in Chiangsu, and Fu-shan in Kuangtung. They became satellites of the major centres in the north and south, following the general style and pattern of their respective parent schools.

Generally speaking, the northern school inherited the techniques of woodblock printing of Phing-yang and Peking and was generally influenced by the style and subject-matter of traditional Chinese painting, especially those of the court painters. These themes put more emphasis on folk gods, women and children, scenes from the stage, and historical romances (Fig. 1195). The style of cutting was sharp and hard, and the work was more decorative with rich colours. On the other hand, the Soochow school followed the techniques of colour prints developed in the neighbouring areas during the Ming dynasty. The designs were more delicate and elegant, with subler execution, rich decoration, and warm tones. The themes included such familiar scenes as children playing with toys or New Year decorations often seen in scroll painting. Some Western influence in both technique and content is noticeable in the pictures produced in the Chhing period. Both perspective and chiaroscuro are used, and such new scenes as a European opera house (Fig. 1196) or a locomotive were introduced as decorative art in Chinese homes. As a whole, both techniques and contents reflect the life styles and tastes of the people in the northern and southern parts of the country.

* See selected samples in Chang Ying-Hsiieh (7).
(1) Development of Western Knowledge of Chinese Paper

Paper was introduced to Europe in the middle of the +10th century, manufactured there from the +12th century, and used for printing from the middle of the +15th century. It was a rag paper, which was assumed at the time that it was invented by Arabs or by Europeans. The fact of its true origin in China and gradual spread to Europe was not well established until around the turn of the present century. This slow recognition was due partly to the indirect transmission of the invention from China to the West through an intermediary, and partly to confusion about the nature of the material. The relationship between true paper and papyrus has been questioned from time to time, and belief in the Western origin of paper was discarded only recently.

That the Chinese used paper was unknown to Europeans for three centuries after it had already been introduced to the West. Only from the beginning of the 13th century, when European travellers visited the Eastern parts of the world, did they observe the use of paper money in China, although their primary interest was in money and not in paper. The earliest report of paper money was made by William Ruysbroeck, a missionary who was sent by the king of France to the Mongol capital, Karakorum, in 1253–4. After his return to France, he mentioned in 1255 that the Chinese used a common money made of pieces of cotton paper for their business transactions; the use of paper as a medium of exchange was probably not known in Europe prior to this. Ruysbroeck’s report was soon adopted by Roger Bacon, who mentioned in his Opus majus (c. 1266) “a card of mulberry tree on which are stamped certain lines.” However, a more detailed and direct observation about paper money was made by Marco Polo during his travels to the East from 1275 to 1295. He described very briefly the use of mulberry tree bark for papermaking, and went into great detail on the processes of making paper money and the systems of circulating it, using it in transactions, and replacing it when worn out.

Other pre-Renaissance writers of the 14th and early 15th centuries who gave similar accounts of the use of paper money in China were the prince of Armenia Hayton (1307), the archbishop of Soltania (c. 1330), the Dominican Jhn de Cova (c. 1330), the Franciscan friar Oderic of Pordenone (c. 1331), the Florentine merchant Francisco Balducci Pegolotti (1310–40), and the Venetian emissary Josafat Barbaro (1346). All these early reports primarily expressed surprise that...

(a) Spread of Paper and Printing to the West

The earliest dates for the use of paper in Europe are given as 950 in Spain and 1102 in Sicily, and for its manufacture 1160 in Xativa, Spain, and 1376 in Fabriano, Italy; see Hunter (g), pp. 470–4, 480 pp. 238ff below.

1 See C. G. Gilroy (c), p. 464; Hoernle (c), pp. 66–4.
2 For the confusion between paper and papyrus and for the theories on the Western origin of paper, see Tsien (g), pp. 130–2.
4 For the translation of a long chapter on paper money, see Yule (1), I, pp. 423–6.
5 For discussions and quotations of these writers, see Carter (c), p. 115, n. 21; Lach (3), 1, pp. 40–6.
the cheapest stuff could be substituted for the most valuable material, but not much information about paper itself or its origin in China was revealed by these writers. Thus the Renaissance historian Polydore Vergilinus (d. 1555) mentioned paper made of linen cloth in his work on inventions, first published in Venice in 1499, but he did not say who invented it or where.

During the latter part of the 16th century, when paper was already popular in Europe, some of the travellers who wrote exclusively on China no longer mentioned paper money, but discussed the materials for making paper and the great variety of its uses. Gaspar de Cruz, a Portuguese Dominican who visited China briefly in 1556 and published a book on the country in 1569, said that Chinese paper was made from the bark of trees, canes, silken rags, and also rags of any quality. He mentioned, too, the uses of paper for different occasions—for sealing and authentication, when, for instance, a paper on which the authority’s signature was written was glued across both the doors or the gates of a city. Again, he described its use at festivals, when doors were framed by triumphal paper arches, and scaffolds were erected and decorated in paper representing figures, statues, and pictures, all very well made, painted, and lighted with candles and lanterns. The use of paper at funeral ceremonies also came in for comment, and he explained how paper pictures of men and women were hung on cords to help send the dead to Heaven, while paper with printed images and cut in various shapes was burnt as offerings to the gods.

Another missionary, Martin de Rada, a Spanish Augustinian friar who travelled to China twice, in 1575 and 1578, reported that Chinese paper was made from the inside pith of canes. ‘It is very thin, and you cannot easily write on both sides of the paper, as the ink runs through.’ He also reported the ceremonial uses of paper and the burning of paper money as offerings to the dead. Rada’s information was generally adopted by Juan González de Mendoza, a Spanish Augustinian monk, in his best-selling book on China published in 1585, and he added that ‘they have abundance of paper and it is very good cheap.’

Not until the 17th and 18th centuries was more detailed information about Chinese paper and its early invention in China reported. At the beginning of the 17th century Matteo Ricci, the leader of the Jesuit missionaries to China, wrote that the use of paper was much more common in China than elsewhere, and its history of Chinese papermaking and westernisation of ideas in China. Although the Chinese invention of paper had been reported by Jesuit writers, the fact was apparently still unknown to the European scholarly community in the 17th century. A book on inventions, Mundus mirabilis (Wonderful world), by Everhard Hoppels, published in Ulm in 1689, still said that the inventor of paper was unknown but was deserving of the highest honours.

The story of Tshai Lun may have been known to the Jesuit missionaries because it was popular in China and Tshai had become a legendary figure worshipped in many public places throughout the country, but not until 1753 was summary of his biography published. Then, it appeared in Jean du Halde’s multi-volume history of China, originally published in Paris. The story says:

A great mandarin of the palace, whose name was Tshai Lun, invented a better sort of paper under the reign of Ho Ti, which was called Tshai hou chi, paper of the Lord Tshai. This mandarin made use of the bark of different trees, and of old worn-out pieces of silk and hempen cloth, by constant boiling of which matter he brought it to a liquid consistence, and reduced it to a sort of thin paste, of which he made different sorts of paper; he also made some from knots of silk, which they called flaxen paper. Soon after the industry of the Chinese brought these discoveries to perfection, they found out the secret of polishing the paper, and giving it a lustre.

Reports from missionaries to China in the 18th century contain little information on paper, except for one observation that Chinese paper was made from the bark of chhu-kou [perhaps paper mulberry], which produced fine, white, fibrous, and silky fibres, and it was recommended for introduction to France. Up to the early second half of the 19th century, all information on Chinese paper was based primarily on the account of Matteo Ricci, whose work seems to have been accepted as the authority on the history of Chinese papermaking. It was not until the discoveries toward the end of the 19th and early in this century of paper specimens in Egypt, Tunhuang,
Chinese Turkestan, and their scientific examination, that the fact of the Chinese invention of paper early in the Christian era and its step-by-step migration westward to Europe was firmly established.

(2) TRAVEL OF PAPER WESTWARDS

Only after paper was perfected as a writing material and became used in daily life in China, did it spread in all directions throughout the world. Its introduction to other nations occurred in two stages: first by the arrival of paper and paper products, later by the adoption of papermaking methods by that nation. From the available evidence, it seems that at least one to two centuries were required to develop local manufacture after paper products were first introduced. In its westward migration, for example, paper was introduced to the Arab world no later than the 7th century, but its manufacture there was not begun until the 8th century; it reached Europe in the 10th century, but paper mills were not established there until the 12th.

It has often been said that the Chinese kept the secret of their knowledge of papermaking until a few papermakers were captured by Arabs in the 8th century, but this is certainly not true. That the westward movement of papermaking was slow was due primarily to China's geographical and cultural separation rather than to secretiveness, for papermaking was learned by China's immediate neighbours as soon as they began to have contact with Chinese culture. The introduction of paper to Korea and Japan in the northeast and to Indo-China in the southeast was early, even though its migration to the west over the old silk road was slow and gradual. As archaeological evidence shows, the closer a country lay to China proper, the earlier is paper to be found there.

The westward migration of paper started with Eastern Turkestan, where it crossed the Chinese border from Tunhuang, perhaps in the 3rd century. In the Loulan region, paper fragments of the 3rd century were found by Sven Hedin and Aurel Stein, and in the Turfan and Kao-chhing area, paper of the 4th and 5th centuries was discovered by Prussian and Japanese expeditions. Early in the 6th century, and by Chinese excavations in more recent years. In the Khotan area, paper manuscripts in Chinese, Tibetan, Sanskrit, and the ancient Khotan language, dated as 8th century, were found, also by Stein. While some of the paper documents may have been brought from China itself to this region, there is evidence that paper was manufactured locally. Among the documents found in

- Phan Chi-Hsing (10), pp. 137–8, 188.
- Stein (11), p. 496.
- Hirth said the Arabic word kaghid for paper can be traced to the Chinese term kag-hid, paper-mulberry paper. S. Madushanha (49), pp. 148 ff, says kagaz and kirtas are synonymous, meaning paper primarily and document secondarily, and that kirtas represents an earlier borrowing.
- Cf. Hunter (9), p. 60.
- Cf. Hunter (9), p. 60.

The theory of Chinese secrecy about papermaking must have been based on the fact that it was a secret early in Europe, where paper still owners sometimes required an oath of loyalty of factory workers to guard the secret of the craft against possible competitors, or applied for a patent for monopoly of raw materials as well as the manufacture of paper; see Hunter (9), pp. 233–4, and discussions on pp. 398 ff. Below.

- Cf. below, pp. 319 ff.
- For discoveries of early paper specimens, see Conrady (5), pp. 95, 99, 101; Schindler (4), p. 225; Stein (11), I, pp. 135, 471; and a summary in Tien (1), pp. 142–5.

Turfan in 1972, one dated to 620 bears the name of a papermaker, chih shih Wei Hsien Nu, along with names of administrative officers of Kao-chhing. Again, another piece has a message about sending prisoners to work in paper factories, which must therefore have been operated locally. After studies by Chinese scientists of a score of paper documents discovered in recent years, it is believed that some papers in this region were made locally no later than the beginning of the 5th century. As to the Tibetan manuscripts mentioned earlier, it was learned that the raw fibre is not native to Sinkiang and may have been imported from Tibet.

Paper probably moved farther westwards to the Arab world before the 7th century. Trade and other contacts between Arabs and Chinese furnished opportunities for the Arabs to know paper quite early, and such Arabic words as kagaz for paper and its equivalent qirtas, which is found in the Koran, are believed to be of Chinese origin. As early as 650 Chinese paper was imported to Samarkand, but it was a rare article used exclusively for important documents, and it is generally believed that its manufacture in the Arab world was not begun until the middle of the 8th century. It is also said that in the battle on the banks of the Talas River in 751, when the allied Turkic-Tibetan forces routed the Chinese army of Kao Hsien-Chih and captured the prisoners, among them were various craftsmen, including papermakers, who were taken to Samarkand to start paper manufacture. Abundant crops of hemp and flax and the water supply from irrigation canals provided the natural resources for the paper industry at Samarkand, and manufacture grew; not only was the local demand filled, but 'paper of Samarkand' became an important article of commerce.

From Samarkand the paper industry soon passed to Baghdad, where a second paper mill was established by Chinese workmen around 794. As well as a religious and cultural centre of Islam (Fig. 117), Baghdad was then one of the richest cities of the world, and from this time, paper replaced parchment as the major writing material, the Arabian supply of the European market continued until the 15th century. Another papermaking centre in Western Asia was established at Damascus, which supplied paper known in Europe as charta damascena, as well as products of its other handicrafts, for many centuries. Another Syrian town,
Bambyn, also was known for its paper, which was mistakenly thought to have been made of cotton or bombycina.¹

Paper migrated from Asia to Africa in the 9th century, and gradually replaced papyrus as the major writing medium. The content of the Rainer collection in Vienna, which includes some 18,500 documents in papyrus and paper, indicates that all documents before +800 were written on papyrus; after that, the later the date the more paper was used.² Towards the end of the 19th century, paper was evidently more popular than papyrus, and was also used for wrapping; rags became treasured as the raw material. Toward the middle of the 10th century, paper entirely displaced papyrus as writing material, as in China it had replaced bamboo and wood since the +3rd century. The northwest coast of Africa became familiar with paper probably in the 9th or 10th century, following the Arab conquest of Morocco, where the capital, Fez, became a centre of papermaking. But Fez lay in the strategic area that marked the struggle between the Arabs and the Spanish, and it was from this region that paper was introduced to Europe.³

Paper could have entered Europe by two different routes: one through Spain, the other by way of Italy. Documentary evidence shows that Spain was the first European country to have it for writing as well as to develop a flourishing paper industry. With the Arab conquest of the Iberian peninsula, paper appeared in Spain no later than the 10th century, and a manuscript of the 10th century found in Santo Domingo is said to be one of the earliest examples of paper there; it is made of heavy, long-fibred linen rags and sized with starch, and thus similar to Arabian papers. The Moors introduced its manufacture there, probably early in the 12th century, and one old manuscript dating from 1129 was written on paper as well as parchment; the paper is believed to have been either imported to or made in Spain.⁴ The first Spanish paper mills were established in the city of Xátiva, which was famous for its flax, and an Arab traveller wrote in 1150 that paper manufactured there was better than any from elsewhere in the civilised world; it was sent to both East and West.⁵ The early mills were operated by Arabs, but after the Christian conquest by local people, and the first paper factory run by Christians was built in 1157 in Vidalon near the French border. Many Spanish Jews were also skilled in this craft, and after the conquest of the kingdom of Valencia, Jewish papermakers continued to work there, though a tax was levied on their product.⁶

Paper entered Italy not from other European nations but from the Arab world, perhaps from Damascus by way of Constantinople and Sicily. Appearing as early as the 12th century, several old Italian manuscripts still exist which show the early use of paper in Italy, while it is known to have been prohibited for official use in 1221; indeed, a legal ruling in Sicily stated that documents written on paper would have no authority.⁷ All paper referred to must have been imported, since none was manufactured locally until more than a century later.

The earliest paper mill known to have been established in Italy is the one at Fabriano in 1268–76, which still continues in operation today. Originally it was the most important source of fine rag paper, and several innovations arose there. Its pulp was made of short fibres thoroughly ground with metal beaters, the paper was sized with an animal glue, and watermarks with crosses and circles were introduced in 1282.⁸ All these factors contributed to the excellence of the Fabriano paper, and were soon adopted by other European papermakers, especially at paper mills established in other cities in Italy, which included Bologna (1293), Cividale, Padua, and Genoa. As a result by the time the 14th century had dawned, Italian paper surpassed, in production and quality, that from Spain and Damascus.

In France, paper was probably introduced from neighbouring towns in Spain, for there was a close affinity between the two countries. Spanish paper was used in France at the beginning of the 13th century, but French papermaking started in the 14th, for a mill is known to have been established near Troyes in 1348, and others were set up at Essonnes, Saint-Pierre, Saint-Cloud, and Toiles between 1354 and 1388.⁹ However, a legend relates that Jean Montgolfier was captured by Turks during the second Crusade and put to work at a paper mill, from which he escaped and returned to Europe in 1157. His grandsons, it was said, established several

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¹ Cf. Carter (1), p. 139, n. 11.
⁴ Ibid., p. 136, citing a statement by El-Edrisi.
⁵ Ibid., pp. 29–31.
paper mills at Ambert in the Auvergne, and certainly this became an important centre for papermaking in the middle of the 14th century. Germany used paper early in the 13th century, mostly imported from Italy, and manufacture was not begun there until the end of the 14th century, when a mill was established by Ulman Stromer (Fig. 1198), who, apparently, had learned the trade from Italians, two of whom collaborated with him in setting up his mill in Nuremberg in 1390. Stromer used the letter S as the watermark of his products, and it was his mill which, in 1391, suffered the first labour strike in the paper industry. It was around this time that the demand for paper increased due to woodblock printing being introduced to Nuremberg, and rose more rapidly still after the introduction of typography in the middle of the next century (Fig. 1199).

In the Netherlands, paper is known to have been used in 1322; the oldest paper found in Dutch archives is dated to 1346 and has been preserved at the Hague. A paper mill is said to have existed in 1428, but the industry was not well established until 1586, when two noted papermakers were authorised to manufacture the

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*b* Blum (1), p. 33.
*d* Blum (1), p. 33.

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raw materials. Switzerland was content to import most of its paper from Italy and France until the middle of the 15th century, but then the proceedings of Church councils required a large amount of paper for record-keeping, and a paper mill was established in Basel in 1433; many others then followed in the same area, which became a papermaking centre.

In England, paper is known to have been used for written transactions at the beginning of the 14th century, much later than on the continent. It must have been imported, perhaps from Spain, for as late as 1476, the famous early printer William Caxton at first used only papers imported from the Low Countries. However, a paper mill was established before 1495 by John Tate in Hertfordshire, and another by Thomas Thirily at Fen Ditton in 1557, though the best known of the early mills was the one set up in 1538 at Dartford in Kent, by Sir John Spilman. Spilman was a jeweller to Queen Elizabeth, and he managed to obtain a patent in 1589 that gave him a monopoly throughout the kingdom for collecting all kinds of rags for making white writing paper. Towards the end of the 17th century, some one hundred paper mills were operating in England.

Paper did not reach certain other parts of Europe until the latter part of the 15th century. The first mill in Poland was established in Crakow in 1491, with others in Wilno (1522) and in Warsaw (1534). Paper may have reached Russia early, but the first mill there was not established until 1576, and workmen were recruited from Germany when an extensive mill was set up in 1712. By 1801, there were some twenty-three mills operating in the Russian Empire.

Paper reached the New World probably in company with the early explorers in the late 15th or early 16th century. 'Paper books doubled together in folds like Spanish cloth' were mentioned by Juan de Grijalva who arrived in San Juan de Ulúa in 1518. These were probably a kind of quasi-paper made by beating fig or mulberry tree bark that had been used by the Mayas and Aztecs for writing.

The manufacture of true paper was introduced to America by European papermakers in the latter part of the 16th century, when a twenty-year concession was granted by the Spanish court in 1575 to two papermakers to 'manufacture paper in New Spain'. In 1580 they set up a mill at Culhuacán near Mexico City, the first to be built on the American continent.

Paper used in colonial America north of Mexico was imported from Europe, mostly from the continent, before being locally manufactured in the late 17th century, when the first mill in northern North America was built in 1650 near Germantown, Philadelphia, by a German immigrant, William Rittenhouse, who had learned the craft in his native country. Only two years after his arrival in Philadelphia Rittenhouse, with a group of others in the German settlement, started paper manufacture. At the beginning of the 18th century two other mills were established in Pennsylvania: one in 1710 by William de Wees, a relative of Rittenhouse who probably learned the craft at his mill; another, the Ivy Mill, in 1729 by Thomas Willcox, an English immigrant, at Chester Creek near Philadelphia. Many workers from Willcox's mill later established their own mills for the manufacture of paper in neighbouring areas.

The paper produced at the Ivy Mill supplied the growing printing and publishing activities in Pennsylvania and New York. One of those much involved with it was Benjamin Franklin, who though primarily a printer was also interested in the development of the American paper industry and in improving papermaking methods. He presented an essay on this subject, criticising the European method of making large sheets of paper by pasting small sheets together and burnishing the joints with an agate or flint. He described the Chinese manner of making sheets as large as twenty feet by six feet, by two workmen, who dried these upon the flat, inclined sides of a heated kiln, making a remarkably smooth surface. After a detailed description of the Chinese method, Franklin concluded: 'Thus the great sheet is obtained, smooth and sized, and a number of the European operations saved.'

In Canada, paper was imported primarily from the United States and Europe, before its first paper mill was established in 1805 at St Andrews, Quebec, by Walter Ware from Massachusetts. A little later, another was built in 1819 by R. A. Holland at Bedford Basin, near Halifax, the increasing need for large quantities of paper for printing newspapers probably being the incentive for this local production of paper. This was true, too, in Australia, where the first paper mill was established near Melbourne in 1868. By this time, papermaking had completed its journey from China to every corner of the world.

(3) Introduction of Printing to the West

The travel of paper from China westwards to Europe by way of the Arab world can be traced step by step, but the spread of printing, on the other hand, is not so clear. Such information available indicates that it might have taken the same route to the West overland by way of the silk road or by sea, though at a much later date than paper. Printing appeared in Central and Western Asia as well as in Africa before it was known in Europe, while printed matter, including playing cards, printed textiles, woodcuts, and books printed from woodblocks, is known to have existed in Europe before Gutenberg. Although no direct relationship has yet been established between European typography and Chinese printing, a number of theories in favour of the Chinese origin of the European techniques have been advanced. Some of these are based on early references, others on the circumstantial evidence

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* See Hunter (9), pp. 474–6.
* 'Description of the process to be observed in making large sheets of paper in the Chinese manner, with one smooth surface,' in Transactions of the American Philosophical Society (Philadelphia, 1793), pp. 8–10.
* Hunter (9), pp. 506, 519.
* Hunter (9), p. 368.
that close contact between the East and West, especially during the Mongol conquest, provided a Chinese background for the European invention of typography.

In a way similar to the migration of paper to the West, printing probably first crossed the northwestern border of China to reach Eastern Turkestan. This region, known as Turfan, was occupied by Turkic people from the + 6th century and came under Chinese domination a hundred years later. In the middle of the + 8th century, however, the area was conquered by the Uighurs, a Turkic tribe, which established an empire that lasted almost five hundred years, until they submitted to the Mongols at the beginning of the 13th century. During the Uighur period, Turfan was a place where many religions and cultures mingled, as discoveries by Prussian, Japanese and Chinese expeditions during this century of documents in seventeen different languages, and other cultural relics testify. The documents found are mostly religious texts and commercial papers, including many examples of blockprinting in Uighur, Chinese, Sanskrit, Tangut, Tibetan, and Mongol, and correspond to the languages found in the Tunhuang documents.

The Uighur prints are all translations of Buddhist works in the Sogdian alphabet with occasional introductory matter by Uighur scholars. What is so interesting is that some of the books have titles and page numbers in Chinese characters (Fig. 1199), indicating that the blocks must have been carved or printed by Chinese craftsmen who used the characters for identification in handling and binding. The Chinese books also are Buddhist sutras printed in large characters and bound mostly in the folded format, with some in rolls as was the fashion in China. A Sanskrit sutra in Lantsa script, probably from the + 13th century, has been found too; it is in the pathi form with two long, narrow sheets pasted together. Also included are Tibetan charms contained in hollow clay Buddhist figures, Mongol prints in the 'Phags-pa script, woodcut pictures, and some materials in the Tangut language. The Tangut people established an empire from the + 8th through to the early + 13th century in northwestern China, bordering Turfan, and used both blocks and movable type extensively for printing.

Both movable-type prints in Uighur and block-printing from the Turfan area have also been discovered on other occasions. The Chinese expeditions in 1928–30 found three additional printed fragments of Buddhist texts in Chinese, two of which are written on the back of the paper in the Uighur language and bear a Chinese seal in red. Also a font of several hundred wooden type for the Uighur language (Fig. 1201), dating to about + 1300, was discovered in Tunhuang. This shows that

* The items found by Albert Grunwedel and Albert von LeCoq of the Prussian group in the Turfan basin in 1907–17 were kept in the Museum für Volkerkunde, Berlin, and are said to have been partly destroyed during World War II. For a more detailed description of documents from the Turfan region, see von LeCoq (1), p. 68; Carter (1), pp. 141–6; Huang Wen-Pi (2).

* For the Tangut printing, see Goodrich (29), pp. 64–5; also pp. 159ff. above.

* The Chinese findings are included in a report by Huang Wen-Pi (2).

* The Uighur type were found by Paul Pelliot in 1907; cf. Carter (1), pp. 140–7, 218. A recent report says the set can no longer be located.

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Fig. 1200. Printing in non-Chinese languages, c. + 1300, found in Turfan, bears features in Chinese. (a) Buddhist text in Sanskrit but titles and pagination in Chinese characters on the right. (b) Tibetan text in Chinese page number on the left margin. (c) A sutra in 'Phags-pa' script with pagination in Chinese characters at the centre folding line. Museum für Volkerkunde, Berlin.
conversion from block printing to movable type is natural for an alphabetic language such as Uighur, and not only European languages.

The introduction of printing farther to the west was probably accomplished by the Uighurs during the Mongol period. After the Mongol conquest of Turfan, a great number of Uighurs were recruited into the Mongol army; Uighur scholars served as Mongol brains, and Uighur culture became the initial basis of Mongol power. If there was any connection in the spread of printing between Asia and the West, the Uighurs who used both block printing and movable type had good opportunities to play an important role in this introduction.

The Mongol conquests incorporated Persia into an empire of which the capital was in China. Thus the Chinese cultural impact on Persia was manifest during the middle of the 13th and the early part of the 14th century. It was here that printing in China was first reported in literary works and was first used in western Asia. As is generally known, paper money was printed in Tabriz in 1294, exactly following the Chinese system, and even the Chinese word chuan for money was adopted, and subsequently incorporated, into the Persian vocabulary. Although this monetary system did not last long in Persia, the wood carvers who had been employed for the enterprise may have been engaged in printing other material not known to us.

The earliest description of the methods of Chinese printing in any literature was given by a Persian scholar-official, Rashid-eddin, prime minister under the Mongol ruler Ghazan Khan, who took ten years, from 1301 to 1311, to complete a history of the world, that included a description of the reproduction and distribution of Chinese books. Rashid said that when any book was desired, a copy was made by a skilful calligrapher on tablets and carefully corrected by proof-readers whose names were inscribed on the back of the tablets. The letters were then cut out by expert engravers, and all pages of the books consecutively numbered. When completed, the tablets were placed in sealed bags to be kept by reliable persons, and if anyone wanted a copy of the book, he paid the charges fixed by the government. The tablets were then taken out of the bags and imposed on leaves of paper to obtain the printed sheets as desired. In this way, alterations could not be made and documents could be faithfully transmitted. A few years later the same description of Chinese printing was incorporated into a work by an Arab author. Thus the Chinese method of printing, including the various steps of transcribing, proof reading, cutting blocks, printing, and distribution, were for the first time carefully recorded.

Despite the fact that the Islamic religion did not favour printing, some fifty pieces of printed matter, believed to have been made between +900 and +1350, were found in Egypt toward the end of the 19th century. These are all fragments of Islamic prayers, charms, and texts from the Koran in old Egyptian script (Fig. 1202). Except for one in red, they are printed on paper in black ink, though not by pressure but by rubbing with a brush in a way similar to the Chinese method. Judging from the materials used, the religious nature of the documents, and the printing techniques used, experts believe that these printed specimens are connected with printing in China and Central Asia rather than an independent development. The time of the transmission to Egypt is uncertain, but scholars incline to a comparatively late date, after the time printing in China had begun to travel across Turkestan to the Arab world during the Mongol conquest. It could have been introduced through Persia or by travellers or traders on other routes, since Chinese intercourse with North Africa was very close in the early part of the +14th century.

After the submission of the Uighurs in 1206, the Jurchens and Koreans in 1231, and the Persians in 1243, the Mongol army moved farther north to overrun Russia in 1240 and to invade Poland again in 1259 and Hungary in 1283. They thus reached the border of Germany where block printing appeared not long after the climax of the Mongol conquests. Along with the military expansion, commercial, diplomatic, and cultural relations developed between Europe and Mongol China during the 13th and early 14th centuries; overland highways connecting China,
Persia, and Russia were built to help the flow of increased traffic in the way of couriers, caravans, craftsmen, and envoys. In 1245 an embassy was sent to the Mongol court by the Pope, who received in reply a letter with a seal carved by a Russian in Chinese characters and impressed in red (Fig. 1203). Soon after, in 1248 and 1253, two other embassies were sent by the King of France and, as we have seen, one of the envoys, William Ruysbroeck, was the first European to report on the use of paper money in China. The same practice, described by Marco Polo in the record of his travels, was somewhat later, but after Polo left China in 1294, John of Monte Corvino, a Roman Catholic missionary, was sent there by the Pope, and stayed for over thirty years until his death in 1328. He and other missionaries worked in Peking, Fukien, and Yangchow, building churches, learning the language, translating the Bible, and preparing religious pictures as aids to preaching Christianity. Since the printing of Buddhist pictures was very common in China before and during this time, the use of this simple and convenient method for reproducing the translated Bible and religious pictures would have been natural. As these materials were required in large numbers of copies for circulation both among Chinese Christians and also among non-converts, it would be surprising if they were not printed. If they were, then the sudden appearance of religious prints and block books in Europe in the early 14th century can be reasonably explained.

Before the use of typography in Europe in the middle of the 15th century, various kinds of printed matter were already there, as early perhaps as a century or more before Gutenberg. There were playing cards, printed textiles, prints of religious images, and block books, all of which involved the use of wood blocks for duplication. Among these, playing cards were one of the earliest examples of block printing to appear in Europe, doubtless because of their early and widespread use in the East. For card games were played in China before the 9th century, at the time when books were evolving from paper rolls to paged form, and they spread over much of the Asian continent before the Crusades. Probably they were brought to Europe by the Mongol armies, traders, and travellers, some time in the early 14th century (Fig. 1204), references to their earliest appearance being 1377 in Germany and Spain, 1379 in Italy and Belgium, and 1381 in France. Because card games were played in all sectors of society, their popularity demanded the reproduction of playing cards in great quantity, though the craze for gambling
printing on paper. Since the method is identical, the transfer from one material to the other is simple, since textile printers and the early block printers in Europe were closely connected. Professional wood carvers could of course, be employed for printing on any material. The technique of carving blocks for printing on textiles was in fact exactly the same as that for paper. The same kind of wood was chosen, the transfer of design from paper to block, the manner of cutting in relief, and of placing cloth on the block and pressing it with a burnisher or pad stuffed with horsehair were all the same. If a piece of paper is substituted for a piece of fabric, the result is printed paper.

The earliest specimens of printed textiles extant in Europe are those from France and Germany dating back to the +6th or +7th century, even earlier than those from Tunhuang and Turfan. However, a recent discovery of silk fabrics at Ma-Wang-Tui, Changhai, indicating printing on textiles of a set of continuous patterns, goes back as early as the -2nd century. Whether European textile printing was influenced by the Chinese is not clear, but some patterns of Chinese origin, borrowed by Persian weavers, are said to have been transmitted to Western Europe, and certainly many Chinese decorative motifs had been successfully copied by European makers of figured fabrics before 1500.

Religious pictures and block books provide the closest examples of printing before Gutenberg. Similar in nature, and differing only in format, when single sheets of image prints were collected together, they naturally evolved into book form. The image prints were first produced in southern Germany and Venice and gradually spread over most of central Europe between 1400 and 1450. Their subject-matter is exclusively religious, including pictures of certain sacred personalities or representations of biblical stories with legends in Latin engraved at the foot of the sheet or in cartouches proceeding from the mouths of the principal figures.

Most of the several hundred image prints still in existence are undated, but they are believed to have been produced during the latter part of the 14th and early part of the 15th centuries. Although a few have some artistic merit, most of the pictures are crude in style and workmanship. They were printed in outline and filled in with colour by hand or by stencil, but all the same they may possibly have some connection with Chinese printing, since the use of block prints for Buddhist pictures had long been practised in China. Many such single-sheet prints with Buddhist figures and legends were discovered in Tunhuang, and printing of tens of thousands of such pictures on silk and paper are recorded in literary sources. Then,
in the 14th century when European missionaries were sent to China, they made use, it is said, of religious pictures for distribution to the ignorant. It is possible, therefore, that these old practices for religious propagation in China were borrowed for similar purposes in another land.

At first, each picture was printed on a single sheet, or sometimes pictures were paired on one sheet, but later, some were pasted back to back or printed on both sides of the paper and gathered into books. The block prints that have been preserved include some containing pictures with text (Fig. 1205) and some having pictures alone; only very few have text alone. They were prepared not by priests or

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in monasteries, but by independent printers who sometimes also produced playing cards, image prints, and even textiles. The demand for block printed books was probably very great, as the few such books still in existence are known to have been published in numerous editions, and their production continued after typography came into fashion. This was probably because block books were familiar to users throughout Europe, they cost less to produce, and block carvers were there to continue their traditional way of business until their generation passed away.

The close resemblance between the early block books of Europe and those of China is probably the most convincing evidence that European printers followed Chinese models. Not only were the methods of cutting, printing, and binding similar, but also the materials and the manner in which they were used. It is stated that the wood used in European xylography was cut parallel with the grain in flat blocks. Moreover, the material to be printed was transferred from paper to the woodblock on which it was fastened with rice paste, two pages were engraved on one block, water-based ink was used, the impressions were taken by means of friction on one side of thin paper, and the double pages were put together two by two with the blank sides folded inside. All these procedures were not only exactly the same as the Chinese methods, but were contrary to prevailing European practice. The European method was usually to cut wood across the grain, to employ oil-based inks, to print on both sides of the paper, and to use pressure rather than rubbing.

Robert Curzon, Baron de la Zouche (1810-73), has said that the European and Chinese block books are so precisely alike, in almost every respect, that 'we must suppose that the process of printing them must have been copied from ancient Chinese specimens, brought from that country by some early travellers, whose names have not been handed down to our times'. Since all the technical processes are of Chinese rather than European tradition, it seems that the European block printers must not only have seen Chinese samples, but perhaps had been taught by missionaries or others who had learned these un-European methods from Chinese printers during their residence in China.

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(4) Chinese Background of European Printing

While Chinese paper was mentioned by European travellers as early as the 13th century, the art of printing in China was not clearly recorded in European literature until some three centuries later. Only after the accomplishments of Gutenberg and other printers became known in the middle of the 16th century, did European writers begin to record the invention and look into the origins of
printing. The fact that printing was used in China several centuries before it was in Europe was acknowledged by historians and other writers, who also offered the opinion that European printing was influenced by the Chinese, and although none of their theories have been substantiated further, neither have they been disproved. On the other hand, these earlier opinions have provided some incentive for later scholars to try to trace possible Chinese connections with European printing, and while no concrete proof has yet been presented, circumstantial evidence is strong. Today, even one who believes that printing in Europe in the 15th century was 'an altogether independent outgrowth of its own times and conditions', has acknowledged that 'Europeans in their varied contacts with the Orient learned something of printing and perhaps even saw documents and books printed on paper.' Almost all defenders of an independent origin of European printing emphasise technical differences between Chinese block printing and typography, but not the cultural considerations offered by many earlier and later writers.

The question of who was the inventor of printing was raised as early as the beginning of the 16th century by Garcia de Recende (c. 1470–1556), a Portuguese poet who, incidentally, refers in a poem to the question of whether printing was first discovered in Germany or China. But it was not until the middle of the century that Europeans began to write books on printing and to notice that printing had been used much earlier in China. The first to make a clear mention of Chinese printing was the Italian historian, Paulus Juovius (1498–1552), who noted that printing was invented in China and introduced to Europe through Russia. In his Historia sui temporis, published in Venice in 1546, he wrote:

There are there (Canton) printers who print according to our own method, books containing histories and rites on a very long folio which is folded inwards into square pages. Pope Leo has very graciously let me see a volume of this kind, given him as a present with an elephant by the king of Portugal. So that from this we can easily believe that examples of this kind, before the Portuguese had reached India, came to us through the Scythians and Muscovites as, an incomparable aid to letters.

Juovius had originally studied medicine but he was close to the political and religious powers in Italy, was sent as ambassador to Moscow not long after Russia was freed from Mongol domination, and wrote a history and several other books about Russia. He may also have had some knowledge of China, as we are told that

several Chinese books and maps together with their translations were sent to him by the Portuguese historian João de Barros (1498–1570). With his professional and academic credentials, 'his statements concerning Russia therefore carry considerable weight', as Carter has remarked, and even though he gave no references for his claims about Chinese printing, as a historian he must have had some evidence to support his statements, of course that evidence might have seemed too obvious to need mention in a general history, for contacts between East and West had been so frequent during the period of the Mongol conquests, not long before his lifetime.

A little later, Gaspar da Cruz and Martin de Rada, the two early visitors to China whose comments on paper were mentioned earlier, also made some remarks on Chinese printing. Cruz said that 'it is over nine hundred years since the Chinese have used printing, and that they not only make printed books but also different figures'. In saying this, he was the first European visitor to China who indicated a period for the earliest use of printing not only for books but also for pictures or illustrations. Theories that printing originated in the Sui or early Tang in the +6th or +7th century were generally spoken of in the latter part of the Ming dynasty, the time when Cruz was in China, while numerous books printed with illustrations or separate sheets of pictures would also have been available to him.

Rada mentioned Chinese printing in his reports and also brought back to Spain a number of Chinese books. He talked with a Chinese official who 'was greatly surprised to learn that we likewise had a script and that we used the art of printing for our books, as they do, because they used it many centuries before we did'. He also acquired many 'printed books of all the sciences, both astrology and astronomy, as [well as] physiognomy, chiromancy, arithmetic, and their laws, medicine, fencing, and of every kind of their games, and of their gods'. Among the books brought from China were eight local gazetteers, in which, he noted, such precious metals as gold and silver were recorded.

From this time on, similar statements were made by many other writers, including Juan Gonzalez de Mendoza, whose most comprehensive and authoritative work on China published in 1585 devoted two full chapters to Chinese books and printing. In one of these, 'The substance and manner of these books that Friar Herrada and his companions brought from China', de Mendoza describes in categories all kinds of books he acquired there. The list includes

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history, geography and gazetteers, chronology, navigation, ceremonies and rites, laws and punishments, herbal medicine, geology, astronomy, biographies of famous persons, games, music, mathematics, architecture, astrology, chiromancy, physiognomy, calligraphy, divination, and military works. All these books must have been read with the help of native Chinese in the Philippines, where the missionaries stayed. As Mendoza wrote, "they (friars) had bought a good number, out of which are taken the most things that we have put in the small historie." Interestingly, a few Chinese books of the 16th century survive in libraries of Spain and Portugal.

In another chapter, 'Of the antiquitie and manner of printing bookes, vsed in this kingdom, long before the vse in our Europe', he discusses the admirable invention of printing begun in Europe in 1456 by John Gutenberg of Germany, whence the same invention was brought into Italy. He added:

But the Chinos doo affirme, that the first beginning was in their countrie, and the invention was a man whom they reuerence for a saint: whereby it is evident that manie

years after that they had the vse thereof, it was brought into Almaine by the way of Ruscia and Moscouia, from whence, as it is certaine, they may come by lande, and that some merchants that came from Arabia Felix, might bring some books, from whence this John Gutenbergo, whom the histories dooth make authour, had his first foundation.

It is interesting to note that, besides his claim that Gutenberg was influenced by Chinese printing which came by way of Russia, he also mentioned another route, through trade from Arabia by sea. He concluded:

The which being of a truth, as they haue authoritie for the same, it dooth plainlie appear that this invention came from them vnto vs: as for the better credite hereof, at this day there are found amongst them many booke printed 500 years before the invention began in Almaine: of the which I haue one, and I haue seen others, as well in Spaine and in Italie as in the Indies.

Mendoza's generalisations concerning things Chinese had great influence on some later writers, and throughout the 16th century, such authors as the eminent French historian Louis le Roy (1510–77), Francesco Sansovino (1521–86), a renowned poet and translator; and Michel de Montaigne (1533–92), a brilliant essayist, all repeated the same story that printing originated in China several hundred years before it reached Europe, and inspired Gutenberg's invention.

Besides these opinions, which seem to have all derived from Jovius's account, there is a different view which points to direct and personal contacts with Chinese printing. This alternative theory relates to an Italian engraver, Pamfilo Castald (1508–1599), who in 1686 was commemorated by a statue in Lombardy honouring him for having introduced typography to Europe. He is said to have been born at Feltre, a town northwest of Venice, and to have used wooden movable type after having seen Chinese books brought from China by Marco Polo. In 1426 he printed at Venice several broadsides which are said to be preserved among the archives at Feltre. The tradition goes on to say that Gutenberg, whose wife was of the Venetian Contarini family, had seen printing blocks brought from China to Venice, and by development of this inspiration arrived at the invention of printing. This story was given by the Robert Curzon, in two accounts to the Philobiblon Society of London in 1854–8, citing a newspaper article by a Dr. Jacopo Facen of Feltre in 1843. The same story is included in several editions of Marco Polo, and Henry Yule, the eminent translator of Polo's works, was disinclined to the view that this tradition was correct, though he believed that many a traveler and overland trader may have brought home Chinese wood blocks.

While many authors suggest the Chinese origin of printing and its influence on European typography, there are some who hold a different opinion, not disputing the cultural theories, but basing their contention primarily upon technical differences between Chinese and European methods. An early expression of this view was made by Guido Panciroli (1523–99), an Italian scholar and author, who believed that Gutenberg's movable type differed in technique from Chinese printing. He said that 'typography is old in China, but as found out in Mentz, it is a modern thing.' He did not specify what the differences were between the two, but implied an improvement of modern technology over the old method. As explained by André Blum, a respected author on the origins of paper and printing, 'The essential element in the invention of printing in the West is not that it was derived from wood block printing... but that it consisted rather in the creation of movable characters made from a fusible metal.'

He said that three things are needed for typography: a matrix or mould in which the letter is engraved in intaglio, an alloy of the modern thing. As G. F. Hudson says: "Since Korean typography underwent so remarkable a development just before the appearance of the process in Europe, and there were possible lines of news transmission between the Far East and Germany, the burden of proof really lies on those who assert the complete independence of the European invention."

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* This account is given in Curzon (1), pp. 6 ff; cited in Yule (1), I, pp. 138–40.
* Curzon (2), p. 25.
* II Condabone, no. 105, of 27 December 1843; cited in Yule (1), I, p. 139.
* Yule (1), I, pp. 139–40.
* See discussion on pp. 397 ff. below.
* De Fang Ch'ang-ling of Columbia University has suggested in an unpublished paper, 'On Printing in Korea', the possibility that European typography might have come with the knowledge of Korean movable type through the contacts between European residents and Korean students at the Mongol capital of Peking in the 14th century, just as in the case of the meeting between Adam Schall and the Korean crown prince in the 17th century.
Another question of controversy is whether typography was an independent invention or merely a combination of existing technology. As Theodore De Vinne remarked, some scholars believe that 'typography was not an original invention, that it was nothing more than a new application of old theories and methods of impression'. According to this view, engraving can be traced back to the Egyptian seals, printing with ink to Roman hand stamps, and the combination of movable letters to the suggestions by Cicero and St Jerome. Gutenberg, therefore, was not the first to print on paper, for printed matter, in the form of playing cards, prints of pictures and printed books, was a merchantable commodity before he was born.

If typography was not an original invention, then the question arose whether existing techniques were derived from the East or the West. A British collector and antiquarian, John Bagford (1659–1716), wrote in 'An Essay on the Invention of Printing':

The general notion of most Authors is, that we had the hint [of printing] from the Chinese; but I am not in the least inclined to be of that opinion, for at that time of day we had no knowledge of them. I think we might more probably take it from the Ancient Romans, their Medals, Seals, and the Marks or Names at the bottom of their sacrificial Pots.

Although this author and some others attributed the existing techniques, including the use of seals, ink, and other materials and facilities, to the root of Western culture and not to the Chinese, it is the reverse that is true, as discussed in detail in the Introduction of this study. All the basic elements prerequisite to printing were available both in the West and in China, but the combination of them led to the early appearance of printing in Chinese culture and not in the West.

After discussing various factors leading to the invention of printing in Europe, Douglas McMurtrie, a modern authority on the history of printing, argues that the Europeans may have learned the idea of printing, though not the processes, from the Orient, but 'an idea is not an invention'. This statement is certainly debatable. Since an invention always involves both novelty and practice, processes carried out without a novel idea cannot qualify as an invention. The materials and facilities for European typography, including the ink, metal, and the press, may be somewhat different from those used in the Orient, but they constitute only an improvement of an already existing idea and procedures to suit different circumstances. If the basic principle of printing is to obtain multiple copies of a positive impression with ink on paper from a mirror image, this very idea suggests an invention.

Based on this principle, block printing is the ancestor of all printing processes, no matter whether wood or metal; block or movable; or plane, intaglio, or in relief. If the technical differences of typography from block printing justify its consideration

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b This article was originally published in the Philosophical Transactions of the Royal Society, vol. 25, 1766–7, and reprinted by the Committee on Invention of Printing, Chicago Club of Printing House Craftsmen, Chicago, Illinois, 1940; Douglas McMurtrie says in the Introductory Note that critics considered him not a scholar and 'quite incompetent' to write on this topic.

c See above, pp. 3 ff; also C. R. Miller (1).


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as a separate invention, then all other new methods of printing, such as lithography, offset, photogravure, and now film setting, would have to be regarded as equally independent inventions.

In summing up, the origins of printing in Europe seem to have involved three key questions. First, was typography an altogether independent invention, or was it influenced by the principle and practice of block printing? Since block prints and books existed in Europe before and contemporary with the beginning of typography, most opinions agree that European printers were exposed to at least the principle, if not the practice, of block printing. Secondly, if this was the case, was block printing in Europe introduced from China? For this question, almost all the views which have been expressed cast little doubt about the close relationship between the two, and their near similarity has warranted the belief that European knowledge of engraving on wood must have been taken from China. Thirdly, did the first maker of European typography have direct or indirect access to Chinese printing or metal type from the Far East? While traditions which suggest a particular name or names are doubtful, it is the general belief that samples of printed books, wood blocks, or metal types might have been brought to Europe from the Far East by unknown travellers via land or sea trading routes. All this circumstantial evidence suggests strongly the presence of a Chinese connection in the origins of European printing.

(i) MIGRATION OF PAPER AND PRINTING

EASTWARDS AND SOUTHWARDS

Among the many neighbours of ancient China, some formed close ties with Chinese civilization while others did not. To the north and west, the Mongols, Turks, Manchus, and Tibetans, although their histories were interwoven with that of China through wars and conquests, did not assimilate Chinese culture until they took up residence on Chinese territory. To the east and southwest, on the other hand, the Koreans, Japanese, and Vietnamese were clearly identified with the Chinese cultural outlook from very early times. They borrowed the Chinese writing system, followed Confucian thought, modelled their political and social institutions after those of China, and adopted Chinese forms of art and material life. While Japan maintained an independent political relationship with China, both Korea and Vietnam were under Chinese rule or acknowledge the suzerainty of China for prolonged periods. In one way or another, these three nations, and perhaps also Liu-Chhiu, became parts of the domain of Chinese culture, which is the basic element of East Asian civilization.

(i) INCEPTION OF PAPER AND PRINTING IN KOREA

Korea not only was the earliest nation to borrow many things Chinese for her own, but also formed a cultural bridge between China and Japan before they made...
direct contact in the +7th century. How early paper and papermaking methods were introduced to Korea is uncertain, but geographical proximity suggests that these dates must have been very early. Since the northern part of Korea, including Lolang, was under Chinese control from -108 and throughout the entire Han period, the importing of paper and paper books to Korea must have been no later than the +3rd century, when paper began to be popular and spread beyond the Chinese border in both the northwest and southeast. From the latter half of the +4th century, Chinese Buddhist missions were sent to Korea, and in the +6th century Korean monks and students were in the Thang capital, Chhang-an, while more Chinese monks, scholars, artisans, and painters went to Korea. Since the crafts of making brushes, ink, and paper were learned by all foreign students in China, and papermaking is said to have been introduced to Japan in +610 by the Korean monk Damjing (in Japanese: Doncho, +579-631), the manufacture of paper in Korea must have been no later than this date, and perhaps began as early as the +6th century.

Korean papermakers used raw materials, tools, and techniques similar to those used by the Chinese. The materials included hemp, rattan, mulberry, bamboo, rice straw, seaweed, and especially paper mulberry (lae in Korean), which has been one of the major materials for papermaking in East Asia. The preparation of the pulp by pounding fibres of paper mulberry bark, boiling, sun-bleaching, and adding mucilaginous liquid was the same as is described in Chinese records. Moreover, the mould was made either of bamboo or a Korean grass (Miscanthus sp.), with Chinese methods of construction for the frame, cover, and the two deckle sticks. After examining several hundred Korean papers from the +16th century onward, Dard Hunter said that the 'laid lines' run the narrow way and the 'chain lines', often narrowly spaced and irregular, run the length of the mould. Every sheet of Korean paper carries this marked characteristic.

Some specimens of the earliest Korean paper survive. A piece of glossy white paper made of hemp fibres is reported to have been discovered recently in a site of the Koguryo era (+37-668) in North Korea, and from the Thang dynasty, it was described as thick, strong, whitish, and glossy, and was used for mounting scrolls and rubbings. A coarser and more durable kind called 'laid lines', run the narrow way and the 'chain lines', often narrowly spaced and irregular, run the length of the mould. Every sheet of Korean paper carries this marked characteristic.

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survival of a complete set of wood blocks which is perhaps the largest and oldest of its kind in the world; and, finally, being the first to use metal type, so antedating Europe by some two hundred years. The earliest extant printing was discovered in Korea in 1966 in a stone stupa at Pulguk-sa in Kyongju, the capital of the Silla Kingdom (+668-935), and provides material evidence that printing existed around +700. The specimen is composed of separate pieces of thick paper mulberry paper joined together in a continuous scroll about 20 feet long and 2 inches wide, and mounted on a wooden roller lacquered at each end. The printing was done from a series of twelve woodblocks, each about 20 or 21 inches long and 2 inches wide, with eight characters in each vertical line. The text is a Buddhist sutra in Chinese, Wu Kou Ching Kuang Ta Tho Lo Ni Ching (Fig. 1110), translated from the Sanskrit Rasvinimalavesiiddadhavdhārāni by the monk Mi-Tho-Hsién of Tokhara between +680 and +704, while he was living in the Thang capital Chihang-an. This period corresponds closely with the reign of Empress Wu, who ruled China from +684 to +704, and during whose period on the throne about a dozen new forms of characters were created in Chinese. At least four of these, including ch’eng for proof, chu for beginning, shen for to confer, and it for earth, occur in this printed text, the last appearing four times. What is more, the calligraphic style and its variations are very similar to those of the Thang manuscripts from Tunhuang, and it is generally believed that, after completion of the translation in +704, this specimen must have been printed in Thang China and brought to Korea for ceremonial use no later than +751, when the stupa was built.

Korean printing was promoted, as in Vietnam and Japan, first by the spread of Buddhism and, later, by the adoption of the civil service examination system modelled after the Chinese pattern. As early as in the +10th century, several printed sets of the Tripitaka were obtained from Sung China and the Liao or Kitan Kingdom, and with these examples as a basis, the first Tripitaka Korana, in some

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*Fig. 1206. Text of the Eighty Thousand Tripitaka, printed in Korea in the +11th century. From Tripitaka Korana, reprint by Dong-Kook University, Seoul, 1957.*

5924 chapters, was printed between 1011 and 1082, in fulfilment of a vow for expulsion of the Kitan invaders. In addition, a supplement, consisting of about 4000 chapters of writings by Korean, Kitan, and Sung authors, was compiled and printed by the princely monk Gitan before he died in 1101. This edition was later destroyed when the Mongols invaded the country in 1292, and a new edition in 6791 chapters was printed from 1237 to 1245. This is the famous ‘Eighty Thousand Tripitaka’ (Fig. 1206), so called because it consisted of 81,258 blocks of magnolia

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a See Goodrich (31, 32). Ledyard (3); Yi Hongjik (3); also discussion on pp. 149 ff. above.

b Cf. S. Chōki Thang Chon (reprint, 1966), ch. 304, p. 1.4; such new forms of characters are found in the +2nd rolls of Tunhuang manuscripts of the late Thang period, see Giles (3), p. xvi; sample characters are given in Nghien Toan and Louis Ricard (1), pp. 114-15.

c See examples given by Yi Hongjik (3), p. 56; (3), pp. 183 ff.

d See Goodrich (32), pp. 376 ff. Some Korean scholars try to prove that this text was printed in Korea, on the ground that the aid or paper mulberry was used and the new forms of characters and certain calligraphic variations also appear in a few manuscripts now kept in Japan; see Yi Hongjik (3), (2). Those arguments seem unconvincing, inasmuch as such paper mulberry had been used in China since the +2nd century, and there is no evidence that those peculiar forms of characters were also used in Korea. Furthermore, there is no other record indicating that printing was done in Korea until some 300 years later; see also discussion on pp. 149 ff. above.

e Cf. Sang Shil (ESSS/TW), ch. 407, p. 54, which says a copy of the Tripitaka was requested by Korea in +697 and granted by China two years later; and that no fewer than six or seven copies were obtained from the Kitan Kingdom; see Carter (5), pp. 89, 105; Chang Hsiu-Min (2), p. 105.

f The theory that the first Korana Tripitaka was cut in the middle of the +4th century is invalid, since an ambiguous statement based on a dream in the source is generally considered a forgery; see Ch’ang (3), pp. 104-5.

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3. PAPER AND PRINTING

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1 佛額寺 2 無常光大施羅尼師 3 聖陀仙 4 鬱(郁) 5 體(體)
Eighty thousand blocks for printing the Tripitaka Koreana in the +13th century are preserved intact in the Haein Temple in South Korea.

The printing of secular works came somewhat later, and on a smaller scale. First, in +1042, three Chinese historical works appeared under imperial auspices, and in +1045 two Confucian classics were printed by the Imperial Library, but the rising tide of scholarship caused the Koreans to turn to Sung China for their supply of books, where some blocks were also engraved and brought to Korea. However, a reluctance developed among some Sung scholar-officials to exporting Chinese books to Korea for reasons of national security, but this only encouraged further development of printing by the Koreans so that they could become self-sufficient in supplying the books they needed, especially the Confucian classics, Neo-Confucian writings, and medical works.

In the +12th century, Koryô began extensive printing after the establishment in 1101 of a printing office in the National Academy, which took over the wood blocks from the imperial library, with the result that a member of the Chinese mission to Korea, Hsi Ching (+1091-1153), could report a government collection at Koryô which numbered several tens of thousands.

Under the Mongol domination from around 1270, further political and cultural ties were established between Korea and China, and also with Central Asia. In 1290 the Yüan court sent a group of craftsmen to repair the Haein-sa wood blocks, and one copy of the Korean Tripitaka was presented to the Yüan court in 1308, and another to Mongolia in +1314. Furthermore, to honour the Yüan emperor, in 1312 a Korean king who had married a Mongol princess ordered fifty copies of the Tripitaka to be printed for distribution to various temples. Again, a large collection of over 10,000 Chinese books was brought to Korea in 1314, this in addition to some 4000 volumes donated by the Yüan court. All these activities were related to Buddhism in one way or another, for extensive printing of secular works was not begun until the overthrow of the Koryô dynasty at the end of the 14th century. Then the establishment of the Yi dynasty (+1392-1910) brought political stability, social reforms, and cultural vitality to Korea; it promoted Confucianism over Buddhism, adopted the civil service examination system, established the national university, and created an alphabetic script, known as Han-gul, as its national form of writing. It was under this new regime also that the demand for more books promoted the wide application of metal type for printing.

Although the first extant book printed from metal type was made at the beginning of the 15th century, a contemporary record indicates that a copy of the ancient and modern ritual code, Kogum Sangjong, was printed about +1234 on Kanghwa Island, off the west coast of Korea from 'cast characters' (in Korean: cha ch'a).

* Gitan brought printing blocks from China, in addition to some 4000 class of printed books and manuscripts.
* See Poon Ming-sun (4), pp. 55-63; a Chihian-chou printer, Hus Chien, in Hangchow, engraved some 9000 printing blocks for the Koreans, for 3000 taels of silver; he was exiled as the result of a petition by Su Shih, see Su Tung-P'ei Chi (SSHC), ch. 5, pp. 38-40.
* Cr. Paik Nak-Choon (I), p. 72.
* Hsiian-Ho Feng Shih Kao-Li Thu Ching (TSHCC), pp. 32, 99.
* Cr. Carter (I), p. 223.
* Mentioned in the collected writings of Yi Kyo-Bo (+1168-1241) as cited in Kim Won-Yong (1), pp. 5-6. A recent claim that a movable type edition of the Kome Chido Ta'pan dates from c. +160 has been proved in error through a mistaken attribution of its author, Huang Chien (see Goodrich, 38), p. 476.
and statutes of the Ming dynasty and a biography of the founding fathers of the Yi dynasty, were printed in 1395 and 1397 respectively. Then, in 1403, a new Bureau of Type Casting (Chuja-so) was added to the Office of Publications (Sŏjŏkkwŏn). From this time until the middle of the 19th century, no fewer than thirty fonts are known to have been produced, ranging from 60,000 to as many as 300,000 characters each, making a total of two or three million. Except for one made of zinc in 1436 and two of iron in the 17th century, the metal fonts were bronze; there were also six or seven fonts of wooden type.

All the early fonts were given names from the sexagesimal cycle, for example kemi-jŏ for type cast in 1403 (Fig. 1208); later ones were named after calligraphers, the titles of books to be printed, or places where the fonts were stored. The most elegant calligraphy among all these fonts was that of one made in 1434 and modelled after the style of the famous Chinese calligrapher Madame Wei of the +2nd century (Fig. 1209). All the type was of Chinese characters except for a few of the Korean alphabetic scripts (Fig. 1210). Most of the early fonts have now been lost through fire or war, or melted down for recasting, the great loss occurring during the Japanese invasion of 1592-8, when many technicians and their fonts were taken back to Japan which was starting its own movable-type printing. The use of wood and iron instead of bronze in Korea was necessitated by the resulting shortage of copper and the interruption of trade after the war.

The Office of Publications played a major role in printing and book manufacture, especially with movable type. We know, too, from the number of craftsmen employed, that there was a division of labour in this office during the 15th century. The employees included over 100 foundrymen, typecasters, type cutters, wood carvers, typesetters, printers, papermakers, proofreaders, and inspectors, and a very strict system of punishments and rewards was maintained for quality control. Careful work was rewarded with bonuses or official titles; negligence was punished by thirty blows per error. For this reason, Korean
Fig. 1209. A page of the Yumii tonji, or Collected Works of Liu Tsung-Yuan (+773–819), printed with bronze movable type of +1434 in the calligraphic style of Madame Wei. From British Library.

Fig. 1210. A Korean work printed with bronze movable type in Han-gul script, +1777.
editions have been known for careful collation and physical qualities compared with those printed in Ming China.

It appears that the use of movable-type printing in Korea was influenced by three major factors, all more or less related to Chinese practice. One was the idea of movable type. This was unquestionably inspired in Korea by the method described in Chinese records, for in the preface to a movable-type edition of Po Shih Wen Chi, printed in Korea in +1485, the Korean scholar Kim Jongik2 said explicitly that 'the movable type method was begun by Shen Kua and brought to perfection by Yang Wei-Chung'. Although he was mistaken in identifying Shen Kua as the inventor, his acknowledgement of its Chinese origin is clear. How it arrived in Korea is not certain, but it may have been brought back by the princely monk Gitan, who travelled to China and resided in Hangchow in the latter part of the +11th century, at the time and in the very place of Pi Sheng's invention. He could, therefore, have been informed by his contemporaries in China, or through reading Shen Kua's description, which certainly influenced the application of movable type by Korean printers. If so, the use of movable type in Korea must have begun earlier than the generally accepted date of 1234.

Second, the technology of type-casting was apparently adapted from that of the Chinese. As described by the Korean scholar Sung Hyon4 (+1439-1504), the character was first cut in beech wood which was then pressed into soft clay to make a mould. Molten bronze was poured into the mould to form the type, which was then polished to its final shape. In 1102, the Chinese method of casting coins, known as 'drum-casting' (ku chu5), was introduced to Korea, and later it was said that the 'clean and even' inscriptions cast by the Chinese method were the indispensable prerequisite for making a clear type.

Third, the demand by the educated elite for more books during the 12th century could only be solved by the use of movable-type printing. With the establishment of the Bureau of Type Casting, printing developed with such vigour that 'no book on the Three Major Factors, all more or less related to Chinese practice. One was the idea of movable type. This was unquestionably inspired in Korea by the method described in Chinese records, for in the preface to a movable-type edition of Po Shih Wen Chi, printed in Korea in +1485, the Korean scholar Kim Jongik2 said explicitly that 'the movable type method was begun by Shen Kua and brought to perfection by Yang Wei-Chung'. Although he was mistaken in identifying Shen Kua as the inventor, his acknowledgement of its Chinese origin is clear. How it arrived in Korea is not certain, but it may have been brought back by the princely monk Gitan, who travelled to China and resided in Hangchow in the latter part of the +11th century, at the time and in the very place of Pi Sheng's invention. He could, therefore, have been informed by his contemporaries in China, or through reading Shen Kua's description, which certainly influenced the application of movable type by Korean printers. If so, the use of movable type in Korea must have begun earlier than the generally accepted date of 1234.

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what is more, the court used hundreds of thousands of sheets of paper at a time copying Buddhist sutras, thus creating another major demand.\footnote{ Cf. Jugaku Bunsho (1), p. 40.}

The administrative code of +701 provided for a government office to make paper, and after the capital had been moved to Kyoto, the Kamayain,\footnote{ Cf. Jugaku Bunsho (1), pp. 39-40, 51-2, 207, 319-20.} a paper mill, was set up between +806 and 810 to supply the needs of the court.\footnote{ Cf. Jugaku Bunsho (1), pp. 105-10.} Today the Shosoin still preserves many examples of old paper (Fig. 1212), and early government documents there often contain references to paper; indeed, from +727 to 780 some 233 different varieties of paper were referred to.\footnote{ 紙屋院 藤 槟榔木 羟皮} At this time the government used many different papermaking materials. Most early Japanese papers were made of hemp, two types of paper mulberry: \textit{koko} (Broussonetia papyrifera, Vent.) and \textit{kajinoki} (Broussonetia kazinoki, Sieb.), and \textit{gampi} (Wikstroemia
The early papers in Japan were produced by the same method as that used in China, called *tamezuki* (accumulation papermaking), which is still in use for some papers. Another method, *nagashizuki* (discharge papermaking), that was developed in the +8th or +9th century, has been used to produce most Japanese paper in later times; its distinctiveness lies both in the technique of the vatman and in the addition of a vegetable mucilage to the fibres in the vat. The mucilage performs a number of functions, such as causing the fibres to be evenly distributed in the solution, with the result that the paper is stronger, firmer, and glossier. With the *tamezuki* method the vatman dips the mould into the vat, lifts out the pulp solution, and then allows the water to drain, but with the *nagashizuki* method the vatman shakes the mould with the pulp both forward and back and from right to left, which serves to align the fibres regularly, and rather than allowing the excess water to drain naturally, he shakes the mould so as to remove the water. One of the early books on papermaking, *Kamayain* in *Kyoto* published in 1798, gives the step-by-step procedures with illustrations (Fig. 1213).④

During the Heian period the most famous papers were those manufactured in the Kamayain in Kyoto, but towards the end of the period these papers were sometimes made of recycled materials, and they declined in quality. Danshi, ⑤ a high-quality paper made of paper mulberry (koko), originally manufactured in Tohoku and later at other places also, replaced the Kamayain paper at court. During the Heian period paper production spread throughout the country as indicated by the fact that at the beginning of the +9th century levies of paper were exacted from forty-two provinces.⑥ From the Kamakura period (+1192–1333) a variety of papers came into prominence, some limited to particular places and others produced more widely, and paper became a popular as well as an aristocratic commodity. During the 15th century paper guilds and paper markets arose, and later the paper trade increased with economic growth and the elimination of tariffs. The scale of this trade may be gauged from the fact that in the 15th century the association of paper merchants in Osaka consisted of about 70 wholesalers, 155 or 156 brokers, and about 300 retailers; indeed, paper was one of the most important trade commodities in both Osaka and Tokyo.⑦ Unfortunately, despite its high quality, aesthetic appeal, and popularity, Japanese handmade paper has gone into a long-term decline as a result of competition with cheaper machine-made paper, first introduced in the 1870s.⑧

In Japan, besides its use as a material for writing, paper has been put to many such uses as for umbrellas and waterproof coverings, handkerchiefs and toilet paper, for windows and walls, and for clothing.⑨ The last came in two types: *kamiko* ⑩ and *tsuru*.⑪

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*Fig. 1213. Steps in making paper mulberry paper in Japan in the +12th century. (a) Cutting paper mulberry trees. (b) Stripping the bark. (c) Washing the bark after peeling. (d) Boiling the fibres into pulp. (e) Dipping the mould into the vat. (f) Drying the sheets on wooden board. From Kamisuki Shokki, +1798.*

③ *Tr. Tengu Washi Taisai* vol. 1, pp. 51–5.
④ Cfr. G. E. Hamilton (1).
32. PAPER AND PRINTING

(Figs. 1087, 1214) made directly of specially treated sheets of paper, and shifu, made from thread spun out of paper strips. The former, which originated among Buddhist monks for ritualistic reasons, was most likely an idea imported from China, and its use was recorded first in the +11th century. The weaving of shifu is recorded only from 1712. Chinese books were introduced to Japan at an early date, as discussed above. Following the Taika reform of +645, the institution of the Taiho code in +701, and the spread of Buddhism at the same time, Chinese influence at the court was paramount, and as a result, fifteen official missions travelled to the Thang from +630 to 834, and many monks and students went to China for study, often staying there for many years. With such close cultural and religious contacts between the two countries, it is not surprising that it was during this period that printing appeared in Japan. The earliest extant Japanese printing is certainly the famous

one million dharami (Fig. 1215), which consists of four different versions of Sanskrit charms transiterated into Chinese characters, and was probably printed between +764 and +770. Each charm, printed on yellowish hemp paper varying in size from 12 to 22 inches long and a little over 2 inches wide, was inserted into a small wooden pagoda. The pagodas were equally divided among ten leading Buddhist temples of the time, seven of which were in Nara. Each of the four versions consists of a text of from 71 to a little more than 200 characters, with fifteen to forty lines to each text. Making copies of dharami was a popular means of gaining religious merit; in this case the crisis of a revolt was the occasion for the good work, carried out by the Empress Shotoku. Contemporary records do not refer to printing, but it has been determined from examination that the dharami were in fact printed, either from wooden blocks or possibly from stone, porcelain, or copper plates. The characters are uneven and crudely formed when compared with earlier printing found in Korea or the Diamond Sutra of 868 from Tunhuang. Despite the early date of this
example, there seems to be no question that the technique for printing came from China.\footnote{See Kimiya Yasuhiko (2), pp. 17-29.}

The first known printing of complete books in Japan did not occur until some two centuries after this incident. One stimulus at that time was the importation to Japan of the Chinese imperial Khai-Pao edition of the *Tripitaka*, which was presented by the Sung Emperor Thai-Tsung to the Japanese monk Chonen\footnote{Cf. ibid., pp. 302-4, 307.} in +983.\footnote{Cf. Kawase Kazuma (1), pp. 6-7; (2), pp. 10-23; Kimiya Yasuhiko (1), pp. 307-8, and (2), pp. 34-7, both give the same convenient table of *surikyo* editions described in contemporary records.} Another was the Buddhist custom of making a large number of copies of a *sutra* as a pious work, often to commemorate a deceased person. As these copies were not meant to be read, there was no need for care in their preparation, and many copies were turned out efficiently by printing. Contemporary records state that one thousand copies of the *Lotus Sutra* were printed in 1009 and again in 1014; these are the earliest examples of such works, which are known as *surikyo* (folded or printed *sutra*).\footnote{See Kawase Kazuma (1), No. 5, which illustrates this work; Chibbet (1), p. 50, refers to a similar book with a handwritten date of +1009, but Nagasawa Kikuya (1), p. 21, points out that since this date is on the reverse side of the paper from the printing, it is not acceptable as a date for the printing of the book.}

The *sutra* read by monks and others were originally reproduced by hand-copying in the monasteries, and this work continued to be important even after the development of printing. Following the examples of the Sung *Tripitaka* and the *surikyo*, however, printing began to be used to reproduce *sutra* for reading, and the earliest extant example is a Chinese text, *Chheng Wei Shih Lun*\footnote{Cf. Kawase Kazuma (1), (2), pp. 24-7; (3), p. 47; (1), p. 6; Chibbet (1), pp. 39-57.} (The Doctrine of Mere Consciousness), printed in 1088 by the Kofukuji in Nara (Fig. 1216).\footnote{Cf. Kawase Kazuma (2), pp. 24-7; (3), p. 47; (1), p. 6; Chibbet (1), pp. 39-57.} From the 11th century through to the end of the Kamakura period (+1192-1333), the printing of *sutra* was concentrated in the great Buddhist temples of Nara and Kyoto. Though these were almost all reissues of Chinese books in Japan, the calligraphic style followed that of the handwritten copies of *sutra* rather than the square and formalised printing style developed in China during the Sung.\footnote{Cf. Kawase Kazuma (1), No. 4.}

During the Kamakura period Zen Buddhism and Neo-Confucianism were introduced from China to Japan where they became very influential. One result was that Zen Buddhism and Neo-Confucianism were introduced from China to Japan where they became very influential. One result was that from the +13th to the 16th centuries, the major efforts in Japanese printing were concentrated in parallel groups of Zen temples in Kyoto and Kamakura, known as the Gozanji.\footnote{See Kawase Kazuma (1), pp. 6-7; (2), pp. 10-23; Kimiya Yasuhiko (1), pp. 307-8, and (2), pp. 34-7, both give the same convenient table of *surikyo* editions described in contemporary records.} The books published by these temples are known as *Gozamban*\footnote{Cf. Kawase Kazuma (1), pp. 6-7; (2), pp. 10-23; Kimiya Yasuhiko (1), pp. 307-8, and (2), pp. 34-7, both give the same convenient table of *surikyo* editions described in contemporary records.} and represented several new developments in Japanese printing. First, the calligraphic style of these works made a break with the past; in place of the earlier styles of handwriting, these copied closely the forms of Sung editions, including their square characters.\footnote{Cf. Kawase Kazuma (2), pp. 24-7; (3), p. 47; (1), p. 6; Chibbet (1), pp. 39-57.} Secondly, secular works were published for the first time in Japan, and significantly these were all reprints of Chinese books. First among them was the poetry of Han-Shan\footnote{Kawase Kazuma (3), pp. 70-83; (4), pp. 190-211; Kimiya Yasuhiko (1), pp. 354-5.} printed in 1325, while a milestone in the study of Confucian classics was reached with the publication of the *Analects of Confucius* (Fig. 1217) in 1364.\footnote{Ibid. (3), pp. 72-3, cites Nagasawa’s demonstration of the mistakes in Shimada Kan’s earlier attribution of another edition of the *Analects*, an attribution followed in Chang Hsiu-Min (5), p. 135.} Altogether the Gozan temples are known to have published seventy-nine secular Chinese works in addition to almost two hundred editions of religious writings. Over half of the secular works were the collected literary writings of Chinese authors, and the *Gozamban* also included the earliest medical works printed in Japan.\footnote{Cf. Kawase Kazuma (3), pp. 70-83; (4), pp. 190-211; Kimiya Yasuhiko (1), pp. 354-5.} Thirdly, it was the Japanese script (kana) was used for the...
first time in printed books; the first example came out in 1321, followed from 1387 to 1589 by its use in a number of calendars.

In the second half of the 14th century, during the unsettled conditions at the end of the Yuan, many Chinese block carvers migrated to Japan and worked on the Gozamban. One group of eight carvers arrived in 1367 and may have included Chhen Meng-Tshai and Chhen Po-Shou, both of whom came from Nan-thai, a suburb of Fuchow. The first book printed by them came out in 1367, and we know that more than thirty Chinese printers were active in Japan for approximately the next thirty years. The names appearing most often in colophons and book margins were Chhen Meng-Jung from Chiang-nan and Yii Liang-Fu from Phu-thien; indeed, the name Yii Liang-Fu appears in seventeen books, indicating that he was by far the most productive of the carvers. This work by Chinese carvers was significant because it accompanied a rise in the quality and quantity of printing in Japan. It was also associated with the adoption of the Chinese format in printing, and served to introduce many Chinese works to Japan.

Until the end of the 16th century Japanese printing was entirely dominated by the presses in the Buddhist temples, and the spread of printing outside Buddhist circles only began during the brief flourishing of movable-type printing. From 1592 to 1595 the Japanese warlord Toyotomi Hideyoshi unsuccessfully attempted to conquer Korea, and among the booty he brought back was equipment for movable-type printing; it was used until about 1650, being popular among the court, individuals, and the temples. The most noteworthy examples produced by it were the Sagabon, fine editions of famous classical works of Japanese literature for example, the Ise Monogatari (Fig. 1218). This was the first time such works had been printed in Japan, and use was made of an important technical innovation linked type, which represented more than one kana symbol. The movable type brought back from Korea was bronze, but bronze type was used only rarely in Japan, wooden type being the more usual. Printing of many secular works in Chinese continued and though an impressive number of editions were published in

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Fig. 1217. The Gozamban edition of Confucian Analects, printed for the first time in Japan in 1364. The above is a reprint of the original edition with single commentary on the left and double commentary on the right.

Fig. 1218. Ise Monogatari, a Japanese literary classic written in kana accompanied with fine illustration and printed on tinted paper in 1606. Far Eastern Library, University of Chicago.
During the same period that movable type was introduced from Korea, the Jesuits brought a printing press from Europe to Japan. The press reached Japan in 1590, accompanied by two Japanese brothers who had been trained in type-casting and printing in Portugal, but because Christianity was already proscribed at this time, the press was moved about among various locations in western Japan, and in 1614 it was sent to Macao. Thirty complete editions in Japanese, romanised Japanese, and European languages published by this Japanese Mission Press are extant; they include religious tracts, dictionaries and aids to language study, as well as works of literature. Yet because of the increasingly strict interdiction on Christianity, the influence of these missionary efforts on Japanese printing was limited.

Beginning in the 17th century wood block prints developed into one of the great arts of Japan. In its early stages this development was related to the importation of Ming books with wood-block illustrations, as is especially evident in the work of Moronobu Hishikawa (c. 1610–94), sometimes considered the founder of ukiyoe, or 'Pictures of the Floating Life'. He first made black and white prints, with colours often applied by hand, a practice continued by his successors. Moronobu not only studied Chinese prints but also reproduced Chinese art books, and an album of erotic colour prints, Feng Liu Chieh Chiang Ts'ai, published in China in 1606, was copied and published in Japan in the late 17th century by him or his followers and under the same title. Reproduction of other Chinese colour prints followed later. Among many masters of the late 18th century, the work of such artists as Suzuki Harunobu (+ 1725–70) and Ando Hiroshige (+ 1797–1858) (see Fig. 1219) was especially noted. Although ukiyoe soon surpassed the artistic level reached in China by wood block prints and became famous for realistic portrayal of contemporary subjects and Japanese life, some elements of Chinese stylistic influence are clear in its formative stages. Even the technique of perspective was perhaps not derived from Dutch paintings, as has been frequently been asserted, but learned indirectly through acquaintance with Chinese block prints influenced by Western works.

During the Edo period (+ 1603–1867), as the Japanese economy prospered, more and more books were printed to fulfill the demands of the increasingly sophisticated townspeople. Particularly popular were numerous illustrated stories and novels, for though book illustrations had been used to some degree in earlier periods, it was at this time that they began to reflect the contemporary culture (Fig. 1220). Publishing became increasingly the domain of commercial establishments in the large cities; Tokyo displaced Kyoto as the major publishing centre, even though the latter continued to be important, and Osaka also became active in printing at this time.

Despite these new trends, Chinese classical books and Buddhist works continued to be important elements in publishing during the early part of this period. The government supported Neo-Confucianism and issued many Chinese books for use in schools, while with support of the Shogunate, several temples engaged in large-scale printings of the Buddhist Tripitaka, and at least two ambitious projects were completed in the 17th century. One is a complete set of the Daizokyo in 5325 chuan, printed with wooden movable type by the Tendai Monk Tenkai of the Kan'ei Temple from 1637 to 1648. It was probably the first Tripitaka ever printed with movable type. Some thirty years later, another set of the Tripitaka was printed with some 60,000 cherry wood blocks from 1669 to 1681 by the monk Tetsugen, a disciple of the Chinese Zen priest Yin-Yuan (in Japanese Ingen) who founded the
Mamukuji in Mount Obuku, Kyoto, where the entire set of blocks survives intact today.\(^a\)

Close to both China and Japan are the Liu-Chhiu (Ryukyu) Islands, the people of which had their own line of kings, even though they became a tributary of China, from the + 14th century on.\(^b\) In 1392 the king sent a son to China to study, and at about the same time the first Ming emperor sent thirty-six Fukienese families of boatmen and artisans to Liu-Chhiu to service the tribute missions. These Chinese settled in a special village called Thang-ying, or Chinese Camp, which also became the site of a Confucian and other Chinese temples.\(^c\) Descendants of these Chinese families played important roles in Liu-Chhiu government, in education, and culture, and beginning in 1481, they, rather than native Liu-Chhiu people, provided the students regularly sent to China.\(^d\) From the 13th century the Liu-Chhiu people had begun to use Japanese kana to write their language, but after contact with China they also used Chinese characters.\(^e\) One of the fruits of their close relationship with China was that probably by the 14th or 15th century the Liu-Chhiu began to use paper. Before this time, diplomatic documents sent to the Yuan court were written on wooden tablets.

During the 18th century Chinese envoys wrote about Liu-Chhiu paper; and one described various kinds of paper made there from paper mulberry bark. The two best-known Liu Chhiu papers were called lu shou chih\(^f\) (paper of longevity) and wei phing chih\(^g\) (screen mounting paper), the latter a decorated paper used for windows and walls.\(^h\) From 1723 to 1798 these and one other kind, tzu hua chih\(^i\) (purple cloud paper), were presented as tribute to China on several occasions.\(^i\) It seems then that paper production must have begun in Liu-Chhiu by the 17th century and possibly earlier.

The date when printing began in Liu-Chhiu is unknown, but was probably around 1500. An 18th-century Chinese official teacher of Liu-Chhiu students, Phan Hsiang,\(^j\) recorded valuable notes on printing in Liu-Chhiu (Fig. 1221), and according to these it was during the Cheng-Te period (1368–21) that the king arranged for the printing of the Four Books, the Five Classics, as well as works on philology, Neo-Confucianism, and literature; the printing blocks were stored in the palace.\(^k\) As aids in reading, some of these books had printed punctuation marks and

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\(^a\) According to a brochure given to Joseph Needham when he visited the collection, known as the Obasuu edition, housed in a new building in the Mampuku Temple in 1971.

\(^b\) The most important collection of documents on Chinese-Liu-Chhiu relations is the Li Tai FU An,\(^l\) which contains 263 chapters of official papers from 507 years of the tributary period from 1372 to 1879. A copied manuscript is now kept in the Taiwan University Library; see selected edition by Wu Fu-Yuan (1973).


\(^d\) See ibid., pp. 117–23.

\(^e\) Thao Tsung-I (11. 十 1360), cited in Li Tai Pao An, ibid., pp. 100–2.

\(^f\) See Lin-Chhiu Ju Hsueh Chien Wen Lu, p. 76.

\(^g\) See Lu-Chhiu Kao Chih Lo (TSCHC), ch. 14, pp. 26–36; Chuang Shen (1), pp. 100–2.

\(^h\) Cf. Chien Ta-Yu (1), pp. 34–8; Chuang Shen (1), pp. 100–9.

\(^i\) See Lin-Chhiu Ju Hsueh Chien Wen Lu, pp. 77–83; Chang Hsin-Min (5), pp. 11–6.

\(^j\) 南國寺, 太學山, 師愛, 紫泥家, 師明

\(^k\) 紫泥家, 紫泥家, 紫泥家, 紫泥家
commissioned the blocks for the *Liu Yü Yen* 1, the Six Maxims in Colloquial Chinese, for use as a language text in Liu-Chhii. 6

The calendar used in Liu-Chhii was issued annually by the Chinese government, but because of delay in transportation, temporary calendars were printed in Liu-Chhii. 5 Yet, despite the development of Liu-Chhii handicrafts, Chinese envoys in 1808 still found it necessary to take with them to Liu-Chhii block carvers, as well as barbers and tailors. 6 This suggests that Liu-Chhii printing must have remained quite limited, and that as late as the early 19th century was still dependent on Chinese craftsmen.

### (3) Development of Papermaking and Printing in Vietnam

Like Korea and Japan, Vietnam has been within the cultural sphere of East Asian civilisation, although it is located on the southeastern tip of the Asian continent. The northern part of modern Vietnam, Tongking, known in Chinese history as Chiao-Chou, 2 Chiao-Chih, 3 or Nan-Yüeh, 4 was ruled directly by China as a tributary state from the late second to the early 10th century. Its territory later extended to include Champa or Chan-Chheng 5 in the southern part of the peninsula. For over two thousand years, Vietnam followed Chinese patterns of life and thought, practised Chinese bureaucratic and family systems, adopted Confucian learning as well as Buddhism from China, and used Chinese writing for serious literature. The Vietnamese created their own system of writing, called *nôm* 6 in the +14th century, by combining parts of Chinese characters, and adopted a ‘national writing’ by transcribing their language into Latin letters, from 1600 (Fig. 1222). But the primary system of writing, used in government, scholarship, and religion, consisted of Chinese characters, and this continued up to the early 20th century.

Because of its geographical proximity and its political ties with China, Vietnam must have been introduced to paper and printing very early, and several references in early Chinese literature imply that paper may have been made in Vietnam in the +3rd century. Some 30,000 rolls of a kind of ‘honey fragrance paper’ (*mi hsiang chih*) are reported to have been brought to China in +284 from ‘Ta Chhin’ 7, and scholars believe this must have been made of garco bark in Vietnam and shipped to China. 8

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* See *Liu-Chhii Ju Hauck Chien Wen Lu*, pp. 78–81, 28, 81–3, 85.
* See ibid. p. 78.
* See *Liu-Chhii Ju Hauck Chien Wen Lu*, pp. 79–81.
* See *Liu-Chhii Ju Hauck Chien Wen Lu*, pp. 81–2, 85.
* See *ibid*., pp. 141–2, 204–5; appendix, pp. 9–11; *Liu-Chhii Kuo Chih Lien*, ch. 6, p. 84; says the Liu-Chhii king had had the Sacred Edict printed and appointed Chheng Shun-Tse to expound it.
* See *ibid*, p. 165; *Liu-Chhii Kuo Chih Lien*, ch. 4, gives a notice included in the Liu-Chhii calendar that the Chinese calendar was to be taken as the authoritative version when it had arrived.
* See *ibid*, ch. 5; cited in *Cheng Hsin-Min* (3), p. 165.

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Fig. 1221. Teaching Chinese classics to Liu-Chhii students by Phan Hsiang at the National Academy in Peking, +1760–4. From *Liu-Chhii Ju Hauck Chien Wen Lu*, c. +1784.

*kana* to show pronunciation beside the characters, 8 but unlike Japanese editions, Liu-Chhii publications used Chinese reign periods in dating, and were undoubtedly based directly on Chinese editions. 9 Some even contained the original Chinese publication information. For instance, an illustrated edition of the *Four Books* had a picture of the original publisher, Yü Ming-Thai, 1 and a picture of Confucius bore the surname of the original carver, Liu. 2

Phan recorded the names of three works about the royal family by native Liu-Chhii authors, and fourteen or fifteen works by Chinese residents, for the most part literary collections. 3 Five of the latter were by Chheng Shun-Tse, 4 including one book printed in 1708. It seems that the blocks for the latter may have been carved in Fukien where, in that very same year Chheng, as a Liu-Chhii envoy, had
China by Alexandrian merchants. During the period from +265 to 290 a tribute of more than 10,000 rolls of an 'intricate filament paper' (tie li chih) made of fern or seaweed was recorded as sent by Nan-Yieh to China, while another source from the +3rd century says that paper was made by the people of Chiang–Nan by pounding the bark of the paper mulberry tree, which was called kiu in Ching, Yang, Chiao, and Kuang; Chiao here corresponds to modern Vietnam. From these early sources we may assume that paper could have been produced in the northern part of Vietnam by the +3rd century.

This assumption seems to contradict a later reference that says paper was not made in Vietnam even as late as the first part of the 13th century. The Chu Fan Chih, a record of foreign nations and products written by Chao Ju-Kua in 1225, says: 'In Chiao-Chih they do not know how to manufacture paper and writing brushes, so those from our provinces are in demand.' Since this book was based on oral information from Chinese and foreign oversea traders, the above statement may have referred to the central and southern part of Vietnam along the sea coast, while the earlier source perhaps applied to the northern part bordering China. This theory seems to be supported by the fact that, at about this time, the method of papermaking also crossed Chinese borders to both the northeast and the northwest overland, not by the sea route. Even in modern times the Chinese method of papermaking is said to have been closely followed by the papermakers in north Vietnam. According to Dard Hunter, who visited the Tongking area in 1904, all the techniques used by papermakers in the Tongking area early in this century were more closely related to those of China than to those of any other country of Asia.

Chinese sources of later date record that paper and paper products continued to be exported to China from Vietnam, for their tributary relations were maintained after Vietnam's independence in the +10th century. It is said that paper fans were presented to the Chinese emperor by a Vietnamese envoy in 1370, and that an annual tribute of 10,000 paper fans was sent to China from the six provinces of

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**Fig. 1222.** Evolution of writing system in Vietnam, showing stages in which the Chinese,纸, and Latin forms were adopted or replaced. From DeFrancis (1).
northern Vietnam for more than a decade after 1470. One record says that under the Chching dynasty some 200 sheets of yellow paper with a golden dragon design, along with inkstones, ink sticks, and brushes, were sent to China in 1790 in return for gifts of books, silk, and jade vessels from the Chinese emperor.  

Papermaking in Vietnam was unquestionably a direct transmission from China; its materials, tools, and methods are found to be almost the same. Besides the bark of the daphne tree (yeah kuei, Daphne involucrata, Wall.), which is a native product, the raw materials included bamboo, rice straw, and seaweed, and as far as techniques were concerned, not only the woven mould, but also the maceration of paper stock, the construction of vats, and the actual procedures were similar to those used in China. Even the same mucilaginous material used by Chinese women as pomade for the hair was also used as a sizing substance by the Vietnamese papermakers.  

While paper was introduced to Vietnam very early, the Vietnamese must also have been exposed to Chinese books at about the same time. Yet the earliest record of access is of the 11th century, when they acquired various kinds of Chinese books—excepting, of course, those whose export was prohibited—and paid for them with their native products and spices. Within eight years after its independence, Vietnam received a gift of three copies of the printed Tripitaka and one set of the Taoist canon as a gift from the Sung court. Printing probably began in Vietnam by the 15th century, for the earliest known reference to it concerns population registers printed during the period from 1251 to 1258. In the Tran dynasty (1225–1400) a copy of the Tripitaka was received from the Yuan court in 1295, to replace one destroyed during the Mongol invasion, and its printing is said to have been arranged, though, apparently, it was not carried out. Four years later, however, a Buddhist liturgy and manuals of writing for official documents are known to have been printed.  

Under the Le dynasty (1418–1789), when Chinese institutions were followed closely, the Confucian Classics were printed in Vietnam for the first time. An edition of the Four Books (Ssu Shu Ta Chhuan) was published in 1457 and blocks for the Five Classics (Wu Ching) were carved in the same year. Printing flourished especially during the second half of the 15th century, when printing blocks became so numerous that a special house was built at the Confucian temple to store them. In later periods many more government editions of the Confucian Classics, histories, poetry collections, and dictionaries were printed, primarily for the civil service examinations.  

The Vietnamese government attempted on certain occasions to control both printing and distribution of books. In 1734 scholars were prohibited from buying Chinese editions of Confucian classics and were restricted to the use of Vietnamese editions, and at various times there were regulations concerning the distribution of government publications. In 1796 official editions of the Five Classics and the Four Books printed at Hanoi were ordered to be distributed throughout the country. On the basis of a calendrical work obtained in China in 1806, the Vietnamese calendar was formally inaugurated and the government began issuing an annual calendar, following exactly the format and content of the Chinese. The official editions included those printed by the National Academy, the Institute of Worthy Scholars, the Palace, and the Institute of History, which were similar to the central publishing agencies in China. Book publishing was concentrated in the capitals, Hanoi and later Hui, and in Nam-dinh.  

Private printings in Vietnam included books similar to the official publications; Confucian classics, histories, and readers primarily for candidates for the civil service examination. In addition, literary collections, genealogies, fiction, and medical works were published, while such Chinese novels as the Romance of the Three Kingdoms were especially popular. Besides Chinese literature, there were many original books by Vietnamese authors, including some women. The private publishers and printers came mostly from a single county, Gian-loi in Hai-duong province, and the block carvers in particular tended to come from two villages there.  

All the earlier Vietnamese editions are of three types: those entirely in Chinese, those in Vietnamese characters or nom (Fig. 129), and those having Chinese text with nom annotation as an aid to pronunciation. Some idea of these publications may be derived from the catalogue of books in the library of the former Ecole Francaise d’Extreme-Orient, which contains 2258 works in Chinese by Vietnamese, 561 works in nom, and 351 Vietnamese editions of Chinese books. Most of the Vietnamese editions of Chinese works are Buddhist and Taoist writings, with smaller numbers of Confucian classics, literary works, histories, medical books, and miscellaneous writings. Although no complete edition of the Tripitaka was ever been printed in Vietnam, many Buddhist works were published and more than 400 printed sutras dating from 1652 to 1924 are still preserved in Hanoi, among them more than twenty written by Vietnamese.  

Although the majority of books were printed from wooden blocks, some were printed with movable type, an early example dating from 1712. Two large sets are known to have been printed with wooden movable type, which were acquired in China. A collection of administrative codes was printed in ninety-eight volumes with this type in 1855, and a collection of imperial poetry and prose was printed in
sixty-eight volumes in 1877. Bronze movable type may also have been used. Vietnam has also had a flourishing wood block colour print industry, especially for New Year pictures with subjects and methods of production similar to those in China (Fig. 1224).b

(4) INTRODUCTION OF PAPER AND PRINTING TO SOUTH AND SOUTHEAST ASIA

The region of the Asian continent and archipelago beyond Vietnam contains a heterogeneous mixture of racial and cultural elements at all stages of their development, and has been culturally dominated or at least strongly influenced by India through the waves of Hinduism, Buddhism, and Mohammedanism before the coming of European Christians. Moreover, communication between India and

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* See a report on modern Vietnamese New Year pictures in Shang I (7), pp. 59-61.
southeast Asia resulted in the mass migration of Indian population and ideas eastward into Burma, Malaysia, Siam (Thailand), Indonesia, and Indochina (modern Vietnam, Cambodia, and Laos) where the Indian and Chinese cultures met and mingled. Generally speaking, the people in the area beyond Vietnam were outside the sphere of East Asian civilisation, although some Chinese influence through trade and migration was felt in some of these countries during various periods.

Despite the cultural divergences, however, one common factor for all lands and peoples in this area seems to have been the lack of a written tradition such as characterised the Chinese culture. Since the sacred texts of India were transmitted primarily through oral tradition and memorisation, written texts were not normally used by the learned men. For the various nations of southeast Asia, few native written records from early times are known, and most of their histories depend upon oral tradition or the records in Chinese and occasionally in Arabic and Persian sources. For this reason, the need of paper and printing for transmission of ideas was negligible in this region, and though paper might have been introduced to this area at an early date, printing was not known until after the coming of Europeans in the 16th century.

In India, before the advent of paper, materials used for writing included tree bark, leaves, wooden boards, leather, cloth, bones, clay, stone, and metal, especially copper—indeed a copper plate of the +9th century bearing Sanskrit inscriptions on both sides was found in 1780 in Eastern India (Fig. 1225). But in Bengal and southern India the commonest were palm leaves while birch bark was used in Kashmir and the northern parts of the country. The palm leaf (Fig. 1226) was cut in a standard shape and written on with an iron stylus, the incisions being filled with a dye; holes were pierced through the leaves, and cords were inserted to hold the pile of leaves together. Although paper production began in India by the 14th century or earlier, palm leaves continued in use even as late as the 19th century, while they were also used in Ceylon (Sri Lanka), Burma, and Siam. In Indonesia both palm leaves and birch bark were used; in the Philippines bamboo, leaves, and bark were all employed, and according to Chinese sources, in Champa (Chan-Chheng) and Cambodia (Chen-La) parchment made of deer and sheep skins was blackened by smoking and written on with bamboo stylus and white powder. Also, in many parts of southeast Asia where true paper was not produced, a kind of quasi-paper called tapa was manufactured. In Indonesia, the Philippines, Malaysia, and many Pacific islands, it was made by pounding the inner bark of the paper mulberry, first into small pieces, which were later combined into large sheets.

Fig. 1225. First copper-plate with Sanskrit inscription found at Mungir concerning land grant by King Devapala, 9-9th century. The top, surmounted by an ornament, is perhaps a seal. British Museum.
similar to paper. It was used primarily for clothing and occasionally for writing by people in some of these areas.

Paper appears to have been known and used in India in the second part of the 7th century, as is attested in the writings of a Chinese Buddhist pilgrim, I-Ching, who travelled to India from +671 to 675. In the messages he sent home he said: 'The priests and laymen in India make Caityas, or images with earth, or impress the Buddha’s image on silk or paper, and worship it with offerings wherever they go.' He also referred to the use of discarded paper for toilet paper and to reinforcing umbrellas or hats with paper, and included the Sanskrit word चारी for paper in his one-thousand-character lexicon. Apparently paper was not yet manufactured in this area, for when he was in Sumatra, he requested that paper be sent from China for copying sutras. Because previous records, including the detailed account by that earlier pilgrim to India, the Chinese Buddhist pilgrim, I-Ching, who travelled to India from +671 to 675, make no mention of paper, it is believed that it must have entered India between +645 and 671.

It seems that paper and papermaking were introduced to India over more than one route and at different times. One way it came was probably from China through Tibet and Nepal to the Bengal region, because we know that papermaking was introduced to Tibet in about +50, when the Tibetan king asked the Thang court to send him silkworms for breeding, and craftsmen for making wine, mills, paper, and ink. Since Nepal was then under Tibetan suzerainty and Nepal-Indian relations were very close, it is likely that paper also entered India at this time.

Another route to India was perhaps through Kashmir, for the Muslims, who established power in west India in the +8th century and in north India in the +12th, very likely first imported paper into the country and then fostered its manufacture. Early paper manuscripts from India date from the 11th to the 14th century, while skilled artisans, including papermakers and bookbinders, were brought by a future sultan for Samarkand to Kashmir at the beginning of the 15th century. During the same period, Ma Huan, a Chinese in the mission of Cheng Ho who visited Bengal in 1406, mentioned the manufacture there of paper from bark, which was glossy like deer skin. Clearly, paper was being manufactured in both Kashmir and Bengal no later than about +1400 and possibly as early as the 11th century.

Printing in south and southeast Asia, with the exception of Vietnam, was mostly introduced by Europeans from the 16th century onwards and was used primarily by missionaries, colonial governments, and European residents. The first printing by European techniques in Asia began in the middle of the 16th century, by a press said to have been bound for Ethiopia, but brought to and used in Goa by Jesuit missionaries for printing religious tracts and other literature.

The Portuguese published works in many other Indian cities besides Goa in the 16th and 17th centuries. The first work in a local language was a translation into Malayalam of Xavier’s catechism, probably printed in Cochin in 1577, and printing in Tamil began in Panikeral in +1587. However, because the native languages were replaced by Portuguese in Goa in the late 17th century, printing ceased there until 1821. Danish missionaries began printing at Tranquebar on the
east coast of India about 1713, but the British did not begin regular printing until 1778 in Bengal and Hooghly, though an earlier attempt had been made at Bombay in 1674 or 1675 and something may have been printed at that time. 

Printing was introduced to the Philippines in the 16th century, but in the 10th century, before the Spanish conquest, trade relations had already been established between China and the islands. Envoys and tribute from Luzon and Mindoro were sent to the Ming court in the 14th and 15th centuries. However, it was in the 16th century that numerous books were brought by Dominican friars to Manila, where a large Chinese community helped not only in their translation but also in introducing wood-block and movable-type printing. Indeed, Chinese printers monopolised the printing industry in the Philippines for over fifteen years before native craftsmen participated in the trade. The earliest extant printing there includes two editions of the *Doctrina Christiana* by the Dominican friar Juan Cobo, one in Spanish and Tagalog, the other in Chinese, entitled *Wu Chi Tiu Chou Ching Chiao Chen Chaun Shih Lu* (Veritable Record of the Authentic Tradition of the True Faith in the Infinite God) (Fig. 1227). Both were printed in 1593 from wood blocks, and both the technique and the Chinese style of the illustrations indicate that these blocks must have been carved by Chinese. Typography was first used in 1604, when two books were printed with locally-made metal types by a Chinese printer named Juan de Vera, whose achievement in cutting punches and striking matrices has been called a 'semi-invention' of typography. His brother, Pedro de Vera, and another Chinese named Keng Yong, also printed several books during the following few years. Between 1593 and 1640, there were eight Chinese printers whose names are known, and among fifteen titles printed in Manila between 1593 and 1604, at least five are in Chinese.

The 17th century witnessed the rise of the Dutch at the expense of the Portuguese as the major European power in Asia. The Dutch gradually extended their power over Indonesia, establishing Batavia in 1619, and they took Malacca and Ceylon from the Portuguese in 1641 and 1658. The first Dutch printing in Asia was at Batavia, probably in 1659, but there is more definite evidence of printing under government auspices from 1668. The former may have been an almanac or chronicle, the latter was certainly a peace treaty between the Dutch and the prince of Macassar. Malay vocabularies appeared in the early 18th century, and about 1750 a Malay Bible in Arabic letters was published by a short-lived seminary press. Over the years a variety of presses were set up, government, private, and religious, and the first newspaper appeared in 1744, but was suppressed within two years.

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Fig. 1227. Earliest extant printing in the Philippines, a Chinese edition of Juan Cobo's *Doctrina Christiana*, + 1593. The woodcut represents the Dominican friar showing a book to a Chinese scholar. From Van der Loon (1).

In general, the authorities of the various European colonies in Asia kept close control over the press, in order to prevent criticism of the government and to guard against rousing antagonism among the local peoples, due to missionary printing activities. In Ceylon, Dutch missionaries began printing in 1737, beginning with a Sinhalese Prayer Book, and between 1737 and 1767 thirty-four titles are known to have been published.
printed there. Most were religious works and almost all in Sinhalese or Tamil.8 Although the British began trade and settlement on a limited scale in Asia in the early 17th century, they did not become the dominant colonial power of the area until the late 18th century. But after they established control of the Straits Settlements in Malaya, they began printing at Penang in 1806, at Malacca in 1815, and at Singapore in 1822. The earliest printing in Penang was commercial and also served government needs, while in the other two cities printing was started by the Baptist missionaries of the London Missionary Society, who had first started their printing activities in the Danish colony of Serampore near Calcutta in 1801.8 American Baptist counterparts of the British missionaries initiated printing in Burma and Siam, printing in Burmese beginning at Rangoon in 1816, in Siamese at Bangkok in 1836, with some earlier works for the Baptist having been printed at Singapore.4 In these, as in earlier cases, the main products of missionary presses were religious tracts and Bibles in local languages, but they also published such other works as dictionaries, grammars, and introductions to European knowledge. These missionary presses represented an important step in the early diffusion of printing in this area.

(j) CONTRIBUTION OF PAPER AND PRINTING TO WORLD CIVILISATION

The advent of paper and printing reflected a stage of maturity in the progress of civilisation; every step in their development has been a milestone in the history of humanity. Paper may have been discovered by accident, but when it evolved it became the most convenient and cheapest material for writing, and showed its supremacy over every other material wheresoever it had been used. Eventually it replaced writing materials that were more cumbersome or expensive, and penetrated into the fabric of society as an indispensable article of daily life. It was certainly one of the most important prerequisites for printing, which originally served as a mechanical extension of handwriting. But as soon as the printed word multiplied, it had an impact on all aspects of the political, social, economic, and cultural life of mankind. This was especially evident in the transformation of European society from the medieval to the modern age, for the introduction of typography to Europe in the middle of the 15th century has generally been recognised as the turning point in this great transition.

(1) THE ROLE OF PAPER IN CHINESE AND WESTERN CULTURES

Little was written about paper in the West until after its extensive application to printing in the late 15th and 16th centuries. Before that time, however, paper is

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8 Rhodes (1), pp. 67-79; McMurrich (4); Pridley (1), pp. 109-90.
9 Cf. Byrd (1), pp. 2-17; Rhodes (1), p. 27.
11 About 200-1000 printing presses were operating in France in the 16th century and paper mills had to supply some 1500-3000 reels a year; see Fedorov & Martin (1), p. 40, n. 50.
during the Later Han. It was not developed into a special form of art until the +3rd or +4th century, after paper had been greatly improved and was extensively used for writing. The basic calligraphic styles—the cursive or running, and standard or regular—which are still prevalent today, were all evolved during this period. The superiority of paper for such art is obvious, for neither bamboo nor wood nor stone has such a smooth and receptive surface. Without paper, the various calligraphic styles could not have developed so perfectly throughout the ages.

Early paintings were made on walls but in the Tang dynasty artists began to paint on paper. By the Sung, calligraphy and painting developed side by side into one art, exemplified by the typical brush works of such influential artists as Su Shi (1036–1101) and Mi Fu (1051–1122). The so-called School of Literati in painting, which used brush strokes freely in movement and rapidly in execution, flourished from this time, and it was primarily the use of the whitish, smooth, soft, and absorbent surface of the paper that resulted in such subtle and free expressiveness (Fig. 1229). Although silk has some of these qualities, expense and its other limitations prevented it becoming as popular a medium for art, while some of the tonal effects available on paper such as washing, splashing, or gradations of ink, could not be easily achieved on a silk surface. Most Western artists habitually paint on canvas with oil paint, but the Chinese, as well as all the peoples of East Asia, have found paper the ideal medium for their artistic expression.

Paper is not only preferred for fine arts, but has also been used in applied and decorative arts in the East as well as in the West. The most popular such item is probably wallpaper, which found its way from China to Europe as early as the 16th century and to America in the early part of the 18th. The introduction of this most welcome product of China, which eventually replaced wall hangings of expensive silk, leather, and tapestry in European homes, has enriched the living conditions of ordinary people as well as those of wealthy and royal households. Other popular uses of paper in decorating Chinese houses include folding screens, hanging scrolls, household posters, and New Year pictures, which have made Chinese living quarters much more attractive and enjoyable.

The wonders of paper have been attested by a multitude of literary references which commend its origin, nature, and appearance, as well as utility. The earliest such praise of paper, by the scholar Fu Hsien (+239–93), is expressed in rhymed-
prose entitled Chih fu (On Paper), the text of which is transcribed in Fig. 1230 and may be translated as follows:

For order the world requires
Both crudity and elegance,
With politeness to balance deficiency and abundance;
So the tool and the substance alter
To meet in the changing times.

As the Book of Changes used incised symbols
To substitute for the knotted cords,
So paper was invented to replace bamboo slips.
For convenience even plain and thrifty,
To adapt to changes as time advances.

Lovely and precious is this material,
Luxury but at a small price;
Matter immaculate and pure in its nature
Embodied in beauty with elegance incarnate,
Truly it pleases men of letters.

It makes new substance out of rags,
Open it stretches,
Closed it rolls up,
Contracting, expanding,
Secreting, expounding.

To kinship and friendship scattered afar,
When you are lonely and no one is by,
You take brush to write on paper
And the fish and the wild goose carry
Your affection
Ten thousand miles...
And your thoughts on a corner.

After a lapse of more than a millennium, the first poem on papermaking in a European language appeared in a book about trades by Hans Sachs (+1494–1576), whose verses mainly describe the technical procedures involved in converting rags to the finished product. It was published in 1568, accompanying a block engraving by Jost Amman, and this picture is the earliest illustration depicting a papermaker at work with his essential tools (Fig. 1199). A little later, in 1588, an account of papermaking in verse form appeared in English. This work, by Thomas Churchyard (c. +1520–1604), expresses in its 353 lines an interest in the

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*a* This rhymed-prose has been rendered into English by T. H. Tsien and Ming-Sun Poon and paraphrased in verse form by Howard W. Winger; part of the verse in a different translation is cited in Tsien (2), p. 138.

*b* Legends relate to the sending of silk letters by means of fish body and wild goose claw during the Chhin and Han periods.

*c* See Chih fu (CHSK), ch. 51, p. 54.

nature of paper similar to that of the Chinese verses reproduced above, but relates different details regarding technical matters. A few salient lines on the usefulness of paper are worth quoting:

I prayse the man that first did Paper make,
   The only thing that sets all virtues forth:
   It shooes new bookees, and keeps old workes awake,
   Much more of price than all the world is worth:
   Though parchment duer a greater time and space,
   Yet can it not put paper out of place:
   For paper, still, for man to man doth go,
   When parchment comes in few men's hands you knowe.\(^a\)

(2) IMPACT OF PRINTING ON WESTERN CIVILISATION

Printing facilitated the economical mass production and distribution of books and had profound effects upon European thought and society in the late 15th and early 16th centuries. It stimulated the spirit of the Renaissance and the Reformation, which in its turn promoted further development of papermaking and printing until there was a flourishing publishing industry. It also helped to establish national languages and indigenous literature, and even to encourage nationalism itself; it popularised education, spread literacy, and increased the chances of social mobility. In short, almost everything in the progress of modern civilisation can be linked in one way or another to the introduction and development of printing in the Western world.\(^b\)

Mass production of texts increased their chance of survival or preservation and reduced the probability of their loss through neglect or the destruction of single collections. But it did more than this. Wider distribution of texts and the enlargement of the reading public, meant that the clergy's monopoly of learning was challenged by laymen, including lawyers, merchants, tradesmen, and artisans, who became important consumers of books. At the same time, the pride of place hitherto taken by religious works was gradually superseded by texts of humanist authors.\(^c\) With this increased readership and a broader spectrum of subjects, scholars became more aware of inconsistencies and contradictions in hallowed texts, weakening their faith in the validity of old views, and setting the stage for the advancement of new learning.\(^d\)

\(^a\) The poem, entitled 'A Description and Playne Discourse of Paper... 1538,' is cited in Hunter (4), p. 15; (9), p. 120.

\(^b\) For the impact of printing on Western society and thought, see studies by Eisenstein (1) and (2), Felve & Martin (1), Hinch (1), and McLuhan (1), and the catalogue of an exhibition, entitled Printing and the Mind of Man, held at the British Museum in 1965.

\(^c\) Between 1450 and 1600, about twenty million books were printed in Europe, representing some 10,000–15,000 different texts, or 25,000–35,000 editions. Of these incunabula, about seventy per cent are in Latin and the rest in Italian, German, French, and Flemish; forty-five per cent are religious works, thirty per cent are literature, and ten per cent each concern law and scientific subjects; see Scol (1), Lenhart (1), and Felve & Martin (1), pp. 238–9, n. 344.

\(^d\) Cf. Eisenstein (1), pp. 72 ff.
The standardisation of texts resulting from printing stood in contrast to the inevitable corruption that was bound to be present in all hand-copied texts. The printing press does not guarantee freedom from textual errors, but the requirement for multiple proof-reading before sending to the press and the distribution of errata to correct mistakes after printing, paved the way for the improvement of future editions. The editorial functions of the early printers also brought about a degree of systematisation of book format not to be found in the age of scribes, and this gradually created a habit of systematic thinking by readers, as well as promoting the organisation of knowledge in many diverse fields.

The introduction of printing was very closely related to the religious reformation in Europe, and Martin Luther referred to it as 'God's highest and extremest act of grace, whereby the business of the Gospel is driven forward'. Conditions for the reformation actually came into existence before he launched his protest in 1517, when a number of Bibles were already being printed in the vernacular. This encouraged a belief that Gospel truths could be learned and understood by common men, and made possible national variations in worship in contrast to the international but standard forms of the Roman Church. The original motivation of the Protestant movement was to seek correction of abuses, particularly the Church’s sale of indulgences, the scale of which had been enlarged by printing, since it had been used to produce large numbers of indulgences in what became a profit-making enterprise. However, the press enabled Protestant views to be circulated widely in the form of pamphlets, tracts, and manifestoes. Indeed, the Protestant movement was to seek correction of abuses, particularly the Church’s sale of indulgences, the scale of which had been enlarged by printing, since it had been used to produce large numbers of indulgences in what became a profit-making enterprise. However, the press enabled Protestant views to be circulated widely in the form of pamphlets, tracts, and manifestoes. Indeed, without the intervention of printing, Protestantism might have remained a local issue and not become a major movement which forever helped to end the priestly monopoly of learning, contributed to the overthrow of ignorance and superstition, and assisted Western Europe to escape from the Dark Ages.

Vernacular literature existed, of course, before the advent of printing, but printing had a profound influence on its development. The spoken languages of Western Europe developed into written languages before the 16th century, and gradually evolved into their modern forms by the 17th, by which time some written languages of the Middle Ages had disappeared, and Latin, once a lingua franca, was becoming used less frequently, and was later to become a dying language. The emerging national monarchies and chancellories favoured this trend towards unified national languages, while authors tried to determine the best style through which to convey what they wanted to say; for their part publishers naturally encouraged the growing use of the vernacular which brought an expanding market. As books became easier to publish in national languages, printing stabilised the vocabulary, grammar, structure, spelling, and punctuation of each, and, furthermore, promoted its use. Once fiction was printed and widely circulated, the common language became firmly established; this, in its turn, facilitated the eventual growth of specific national literatures and cultures, which in turn led to the realisation of a distinct national consciousness and to nationalism.

The popularisation of education and the spread of literacy were also closely related to the expansion of printing. As books became cheaper and easier to obtain, more people were able to gain access to the printed texts which eventually affected their outlook on the world and their position in it. And, naturally enough, easier access to printed material promoted the rise of literacy, which stimulated a still greater demand for more books. Moreover, early printed manuals and advertisements probably made it clear to many with an artisanal background that profits and prestige could be acquired by printing such materials themselves, and this, of course, may have encouraged the spread of literacy among the artisan class. It is evident, too, that some of the manuals were primers for teaching oneself to read and write, thus extending the market for books still further. There is also some biographical evidence which suggests that printing may have opened up opportunities to men of humble origin to advance their social position.

(3) Effects of Printing on Chinese Book Production

In China as in the West, printing made possible more and cheaper books and other material with a wider range of subjects for a larger reading public; naturally enough, this all had a certain amount of influence on the modes of Chinese scholarship and society. When large-scale printing began to emerge in the 10th century, the output was enormous; for instance nearly half a million copies of Buddhist books and pictures are known to have been printed in the eastern part of China in one small area alone over a period of less than half a century. Again, during the Sung dynasty, some six different editions of the Buddhist Tripitaka, which required tens of thousands of blocks for each edition, were printed and distributed throughout the country and abroad. At about the same time, the T’ien canon was also printed.

* Cited in Black (1), p. 432.
* Cf. id. pp. 80 ff.
* A Bible in High German was first printed in 1466; this ran to nineteen editions before Luther’s time; see Febvre & Martin (1), p. 109.
* For the development of national languages and printing, see Steinberg (1), pp. 120 ff.; Febvre & Martin (1), pp. 319 ff.; Eisenstein (2), pp. 117–18.

* For stabilisation of language and rise of nationalism, see Chaytor (1), pp. 22 ff.
* Among the priests who spearheaded the Strasbourg reformation, one was the son of a shoemaker and another the son of a blacksmith. Although of humble background, they were steeped in the new learning through their access to the printed press; see Eisenstein (2), p. 372.
* These included three versions of the invocation now at 84,000 copies each, and printings of about a dozen other texts, and charms and pictures, including 140,000 copies of one Buddhist image, amounting to a total of 400,000 copies printed in the Wu-Yeh Kingdom from 937 to 977; see discussion on pp. 157 ff. above.
* These editions, in from 5000 to 7000 leaves each containing about 10 to 15 leaves (double pages) per sheet, would require 60,000 to 80,000 blocks for each edition, or about one-third as many if carved on both sides. See printing of Buddhist collections on pp. 159 ff. above.
As everywhere else in the world, religion had proved to be a motivating force for the use of printing. But once the techniques became more sophisticated, the dominance of religious literature was gradually overtaken by secular subjects and the percentage of religious publications declined in China as it was later to do in Europe. Thus as early as the 11th century Feng Tao borrowed the art of printing from the Buddhists to reproduce standardised Confucian texts, instead of carving them on stone, and since then, the printing of Confucian classics, histories, and other works intensified. Thus when a large printing project was started by the Sung government in 988, only some 4000 wood blocks were kept in the National Academy, but by 1005, when the emperor inquired about the project, Hsing Pin (+930–1010), then Director of the National Academy, reported that the wood blocks at the Academy numbered 100,000, representing all kinds of classics, histories, and their commentaries. This is indeed most impressive; it means that printing by this central government agency alone increased as many as twenty-five times within a period of less than twenty years.

Printing blocks could be used again and again, and sometimes lasted for several hundred years until they either deteriorated or were destroyed. There is very little information about how many copies were printed from the same block, because they were re-used so often, though it appears that the number varied a great deal, from a few in the case of a scholarly work of limited circulation to tens of thousands of a popular text in great demand. However, one modern writer claims that thirty copies were usually printed for the first impression, and each new block could be used to print up to 15,000 copies, or 25,000 after retouching.

In one bronze movable type edition of a Sung encyclopaedia, Thai Phing Yü Lan,\(^2\) in 1000 chüan, reprinted in 1574, a run of 100 copies is mentioned in the colophon. If this figure for a particular reference work applies to other large sets, no fewer than 100 copies for each new title or each new block may be reckoned to have been produced at that time. This may also be true of other times, since the mode of printing did not change very much until the middle of the 19th century.

While no clear record of copies printed for a block edition is available, we know more precisely the cost of production and how much was saved by the application of printing. There are detailed listings of various costs for certain printed editions, including material, labour, and the charges for renting blocks (Fig. 1231). For example, the complete works of a Sung scholar, Wang Yü-Chheng\(^3\) (+954–1001),

\(^*\) Cf. Yü Hai (CCSC ed., 1889), ch. 43, p. 18a.

\(^\star\) See Lu Chhien (i), p. 632.

\(^\star\) Cf. description in Chhin Kuan of the Sung dynasty printed c. 1173. The account on the back of the book says it used 448 blocks and 500 sheets of paper and was sold for 300 cash. Original copy preserved at the Naiaku Bunko, Tokyo.

\(^1\) Hsiao Chhu Chi,\(^1\) thirty chüan in eight tshe, printed at Huang-chou in 1147, contains 169,848 characters on 432 blocks. The cost of production included 260 pieces of cash for 448 sheets of printing paper, eleven sheets of blue cover paper, and eight large sheets of paper; 500 cash for ink and for renting blocks and brushes; and 430 cash for binding; with a total cost of 1136 cash for labour, rent, and other expenses.
except for paper. The set was sold for 5000 pieces of cash per copy. These figures give an average unit cost of about one piece of cash for the rent of each block with tools, and another piece of cash for the labour of printing and binding one leaf. The retail price in this case was about 600 pieces of cash per *tshe*, while that of other works during a similar period ranged from 400 to 400 pieces of cash.

Another case is that of a Yuan gazetteer of Nankung, Ch'in-Ling Hsin Chih, fifteen *ch'ian* in thirteen *tshe*, the printing of which cost a total of 7,179,899 taels of silver in the Chung-Thung currency. There is no mention of how many copies were printed, but the cost seems rather high. In Ming times, printing costs were much lower. Carving was only twenty pieces of cash per copy, while copying during the previous years was said to have cost ten to twenty pieces of cash, while copying during the previous years was said to have cost ten to twenty pieces of cash, while copying during the previous years was said to have cost ten to twenty pieces of cash. If so, the average cost was about 100 pieces of cash per *ch'ian*, indicating that the cost ratio between a printed edition and a copied manuscript was one to ten.

Printing was of course much cheaper than the time-consuming process of hand copying. For instance, the text ("pai wen") of a collection of Confucian classics contains nearly a million words, and if a copyist could write as many as 10,000 characters a day, it would still take 100 working days to complete one copy. Certainly, carving on blocks was slower, but in the end it produced more copies far more cheaply. How much the price was reduced by printing may be illustrated by comparing the cost of a hand-copied manuscript with that of a printed edition at a comparable time.

In the early 12th century during the latter part of the Thang dynasty, the charge by a professional copyist was about 1000 pieces of cash per *ch'ian* of about 5000 to 10,000 characters. This is confirmed by the copying cost of some of the Buddhist *sutra* found in Tunhuang, the charges on which are sometimes given in the colophon and are of the same order. The price for a manuscript copy of the rhymed dictionary hand-copied by the famous woman calligrapher Wu Tai-Luan (fl. 827–35) also came to this average figure. At about the same time, the Japanese monk Ennin (+793–864) bought in China in 830 a copy of Buddhist *sutra* in four *ch'ian*, costing 540 pieces of cash. Because of its cheapness in comparison with the copied manuscripts, it is believed that this book must be a printed edition. If so, the average cost was about 100 pieces of cash per *ch'ian*, indicating that the cost ratio between a printed edition and a copied manuscript was one to ten.

This cost ratio continued with little change in later times. In 1042, for example, the printing of calendars by the Sung government is recorded as costing 30,000 pieces of cash, while copying during the previous years was said to have cost ten times this amount. A Ming author, Hu Ying-Ling (1453–1502), said that if no printed edition were available on the market, the hand-copied manuscript of a book would cost ten times as much as the printed work; moreover, once a printed edition appeared, the transcribed copy could no longer be sold and would be discarded. All these cases indicate that printing had reduced the cost of a book by as much as ninety per cent before the end of the 16th century although, of course, the price fluctuated from time to time.

The development of printing naturally encouraged greater emphasis on textual criticism so that more reliable texts could be produced than ever before. Because of the permanence and wider dissemination of the text, scholars were more aware of the need for its reliability and correctness through careful collation and proof-reading before it was finally engraved on to blocks. Collation of texts was a preoccupation of many scholars (Fig. 12), who served in the official agencies or worked independently, and at least four proof-readings were usually required before printing; the latter were followed by transcription, correction, engraving, and the first impression. Because of this careful preparation, a well-collated and printed edition was valued above a copied manuscript, which was likely to contain unintentional errors. Textual accuracy was, therefore, an additional important reason beside its lower cost, for readers to choose a printed edition.

A typical example of such serious effort in preparation is the printing of the Nine Classics and Three Commentaries in 1230 or 1300. Some twenty-three different editions were used for collation, and a special manual, the *Chiu Ching Sun Chuan Ten Ke Li*, was prepared to provide guidelines; it gave specifications on such
Printing did not result in much change in the physical appearance of the book, except perhaps for some special features of the printed page. The evolution from the roll form to the flat binding, in the late 9th or early 10th century, was primarily because of the inconvenience of opening the paper rolls for reading; it was not necessarily a result of printing. The special features that were added to the printed page, and which do not appear on manuscripts except for those copied from a printed edition, include such signs in the body of the block as the centre line, the "fish tail", and the "elephant trunk" at the centre of the block to mark the fold. The cutter's name and the number of characters on the block are also sometimes indicated.

An important feature of a printed book is the addition of the printer's colophon (phai chi'1) or trade mark in the book, which can normally be found on the back of the title page, or at the end of the table of contents. It is a boxed square either in an oblong form or in designs of a gourd, a tripod, or a round stamp providing such information as the date, place, printer's name and occasionally a note on the process of printing and an advertisement of the printer (Fig. 1235). However, the most visible change in the appearance of a printed book was the calligraphic transformation sometime in the middle of the 16th century of the text from a regular written to a printed style. This printed text, called the Sung style (Sung thi tz'u), is characterised by a formalised and stereotyped construction, with more straight lines than curves. It is easier for block cutters to carve and has been followed by printers ever since, though with slight variations from time to time. The metal type used in modern printing is developed from this style.

The expansion of printing activities naturally resulted in the establishment of printing centres throughout the country. Wherever skilled block cutters and sponsors were available, more printing facilities were located. Under the Sung, as we have seen, printing centres included Hangchow (in Chekiang) and Khai-feng (in Honan), capitals of the Sung; Chien-an and Chien-yang (in Fukien), where trade editions had been known for centuries; and Mei-shan (in Szechuan), a cultural centre until the Ming. Of some 1,500 Sung editions of which the location of printing can be identified, more than 90 per cent are known to have been printed in provinces where such centres were located. Indeed, it has become clear that factors such as political status, economic strength, cultural tradition, and the availability of materials, were responsible for the prosperity of the printing industry.
It should not be a surprise to realise that commercial printers were concerned more with the market demand than with textual accuracy or quality of printing. Such popular materials as handbooks of everyday knowledge, manuals of letter writing, popular novels and drama, as well as basic textbooks and reference works, especially attracted their attention, and they published more books of this kind for the common people than did the official agencies or private families, who hesitated to print such commonplace material. Nevertheless the commercial printers should have the credit for popular education and the spread of literacy, because they made books available at a low price to a large readership that could not otherwise afford to buy or easily gain access to them.

(4) The Influence of Printing on Chinese Scholarship and Society

In many respects, Chinese culture has had an extensive literary or bookish tradition, characterised among world civilisations by its productivity, continuity, and universality. It is unique in the volume of its output, the length of the period covered, and its uninterrupted and widespread intellectual transmission. From very ancient times, an enormous amount of literature and documents was produced and transmitted, and the production of historical records and annals has continued almost without interruption to the present day. As to magnitude, a single work often ran to millions of words. Written words were revered and from antiquity books were assiduously read and studied not only by the Chinese but also by other peoples of East Asia throughout a prolonged period of history, and this bookish tradition contributed to the production of more written and printed pages in Chinese than were produced in the West until about the end of the 17th century. It also contributed to the early invention in China of paper and printing, which became important vehicles for sustaining the Chinese cultural heritage throughout the centuries.

The power of printing in mass production, distribution, and preservation stimulated the revival of classical learning and changed the mode of scholarship and authorship under the Sung dynasty. While the Thang promoted Buddhism and Taoism, and produced poetry that is prized as the gem of the period, the Sung became one of the great ages in Chinese history for its scholarly achievements in critical studies of classical works, art, archaeology, material culture, and science. The restoration of Confucian learning was reflected in such scholarly activities as new interpretations and the large-scale printing of Confucian classics, studies in classical philology, textual criticism, as well as compilation of voluminous general and local histories, bibliographies, and catalogues. The revived interest in Confucianism was an obvious victory of Chinese traditional thought and political philosophy. The work of Chu Hsi (1130–1200) and other Sung scholars who founded Neo-Confucianism, became the guiding principle of Chinese society until the end of the 19th century, when it was challenged by Western thought and institutions.

* See commercialisation of Sung printing in Poon (2), pp. 157 ff.
* More than 5,000 separate titles, or over half a million volumes (shu), produced before the late Ming period, are known to have been registered in Chinese bibliographies and other sources before printing was widely used in Europe in the late 15th century; see estimate by Yang Chia-Lo (2), p. 37, Both Swingle (1), p. 191, and Laucombe (1), p. 770, suggest that by 1700 or even 1800, more pages, written and printed, existed in Chinese than in all other languages put together.
As we have seen, when printing first appeared in China, it was motivated by the need for great quantities of Buddhist texts. Not until two or three hundred years after its invention did the Confucian classics and other scholarly literature appear in print, and there were those two great projects for printing the Confucian learning begun in the 10th century signal the revival of Confucian learning. Both the Nine Classics sponsored by the prime minister Feng Tao (588–954) of the Later Thang, and the printing started privately in the 9th century by Wu Chao-I (d. 967) of the Later Shu state, were significant in several ways. The initiative of Feng Tao made the National Academy the official agency for printing classics, histories, textbooks, and other volumes to be distributed at the national level. It also made the government the one of the most influential agencies in printing. The Wu Chao-I project became a typical case of Confucian scholars preaching the moral values of private enterprise in printing. From this time on, almost all printing was engaged in by the government, by private families, and by commercial agencies dominated by the Confucian scholars.

The revival of Confucian learning gave impetus to the flourishing schools and academies which supplied candidates for the civil service examinations which were themselves based on Confucian writings and ideas. As a result three or more institutions of higher education were set up in the Sung capitals, Kaifeng and Hangchow: the National University (Th’ai Hsueh), which had an average enrolment of about 2600 students who had passed the entrance examinations; the National Academy (Kuo Tzu Chien), which enrolled about 200 children of officials; and the School of Four Gates (Ssu Men Hsieh), which had an average of 500 students from ordinary families. On the local level there were, during the Sung period over 1000 official and private schools and academies distributed through almost all the prefectures and counties of the country. The National Academy played the key role in the central government’s printing, and many of the local schools and academies also engaged in printing textbooks, dictionaries, histories, philosophical writings, and medical works. In fact, under the Sung, no fewer than 250 titles are known to have been printed by the Kuo Tzu Chien, and over 300 such works were printed by local academies.

Printing no doubt also had some positive relationship with the Chinese civil service examination which recruited educated personnel for service in the government. The beginning of this system can be traced back to the Han or earlier, but it was not fully utilised until Thang and Sung times. It was, indeed, under the Sung that the system was further perfected, the number of participants greatly increased, and it was at this time that the number in the government of those holding the highest degree, the doctoral graduates (chin-shih), was more than double that of the previous dynasty. The growth of the general scholarly population during the Sung was even more impressive. The number of chin-shih quadrupled from early Sung to late Sung, reaching a total of over 40,000 for the entire period. Yet to become a candidate for the doctoral examination was no easy task; one had to have passed the qualifying examination on the prefectural level and to have received the degree of ‘presented man’ (chi-jien). Even so, the number of chi-jien is estimated at 200,000 for the 12th century, and 400,000 for the 13th. Including students at the various institutions of higher learning and local schools and academies, the total intellectual population of the Sung must, therefore, have been very large.

Examinations at all levels emphasised literary, historical, and scholarly knowledge, based on Confucian doctrines. The books used in preparation for these examinations included Confucian classics, histories, reference works such as dictionaries and encyclopaedias, as well as examination aids such as model essays, and pocket editions which could be taken into the examination halls. The demand for such materials for reading and study seems to have been one of the major reasons for the large-scale printing of textbooks and other required material during the Sung dynasty. The initiation of the two large printing projects for the Confucian classics, mentioned earlier, was certainly stimulated by the convenience and economy of printing.

The definite relationship between printing and the civil service examination is further attested by the fact that the more successful doctoral candidates there were in a specific region, the larger was the proportion of imprints produced in that area. For example, the top five provinces in the eastern, southeastern, western, and central regions, which produced eighty-four per cent of the holders of the doctoral degree during the Sung, printed ninety per cent of the books during the same period. On the other hand, one poor province in the southwest, which produced...
the fewest graduates, also printed the least titles. This correlation between books and examinations clearly indicates the way printing contributed to the popularisation of education and advancement of scholarship. The reverse is, however, also true; the examination system promoted the expansion and prosperity of the printing trade.

The civil service examinations provided a fair system for recruiting into government service the qualified people from various social strata and from different geographical regions. An intelligent person of humble origin could climb the ladder of competitive examinations and eventually become one of the top administrators in the Chinese bureaucracy, and the general fairness of the system is confirmed by the fact that a clear majority of the successful candidates under the Sung came from families without any background of official connections. The distribution of books to relatively poor and humble people to a certain extent facilitated their upward movement from the lower strata of society by way of the examination system, and was helped, in spite of the increasing disparity between rich and poor, by the fact that printed books cost much less than manuscripts.

While printing in the West has primarily a business for profit, it had strong moral implications in Chinese society. It was considered a positive merit for an individual to preserve and disseminate knowledge, and rulers were politically rewarded for such action by receiving public support. Reverence for ancient literature was one of the basic elements of Confucian teaching, and the story of the burning of the books by the First Emperor of the Chhin dynasty in -212 has been emphasised by Confucian scholars as the most flagrant crime in history. From Han times onwards, almost all rulers who adopted Confucianism as state doctrine, chose to recover and preserve ancient books when they succeeded to the throne, a procedure that was also considered a virtue which brought honour to the family and to the individual.

Yeh Te-Hui, author of the celebrated work on books and printing, opened his book by citing a number of cases in Chinese history to illustrate how printing of books was crucial to gaining prosperity, to preserving fortunes during times of disorder, and to commanding respect from others. Furthermore, attention to the reliability and correctness of a text by block-cutters and printers was particularly emphasised; failure to observe this would be punished, by spiritual if not by human powers. Evidently, printing in China was not primarily for profit; moral

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3 The province of Kuei-chou (modern Kueichow) had 103 graduates and printed only two titles.

4 The names of successful candidates in the two examination lists of 1118 and 1256 show about forty per cent of them were descendants of former officials in the government, but some sixty per cent came from families with no history of civil service employment in the paternal line for three previous generations; see Kracke (1), p. 69.

5 For printing and social mobility of the Ming and Chhing periods, see Ho Ping-Ti (2), pp. 212 ff.

6 The stories include one on Wu Chao-!s private printing of the Confucian classics, which resulted in political status and wealth for his family and descendants after the conquest of the Shu state by the Sung dynasty in 965, while other powerful families were executed or otherwise punished; see Yeh Te-Hui (2), pp. 1 ff.

7 Hung Shao (c. 1129–1190) said that four block-cutters were struck by lightning for having changed the text of a book on medical prescriptions; see his I Chien Chih (TSHCC), p. 89.

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Fig. 134. Moral reward to a sponsor of printing. Picture depicts a private printing enterprise owned by Chang I-Ti of the Sung dynasty, a man with little learning, who was awarded by Heaven with two great scholarly sons, Chheng Hao and Chheng I, because he printed good books from the Confucian, Buddhist, and Taoist canons. From T’ieh Chih Wei-Tsu Chi.
obligations became an important factor in Chinese society to promote and develop it (Fig. 1234).

(5) SOME CONCLUDING REMARKS

Generally speaking, paper and printing served similar purposes in the East and the West, but had different impact upon their respective societies. Paper, however, seems to have played a more important role in China than in the West. Unlike printing, which was scarcely mentioned in Chinese literature, paper was written about and praised for its qualities and usefulness from very early times. Emperors bestowed it upon scholars and officials as the highest honour and reward, and along with brush, ink, and inkstone, it was one of the scholar’s four treasures. Thus paper was no ordinary commodity, but was always associated in Chinese society with prestige and scholarship.

The very early use of paper for writing and for books in China was an epoch-making step in the history of civilisation. Without paper, certainly, no printing could have taken place and, as we have seen, in China paper also had other profoundly important effects; it helped sustain the Chinese cultural tradition, it was instrumental in refining Chinese art, it helped smooth the path of government and transactions in the business world, and played a not insignificant part in improving various household and other daily activities. With the adoption of paper, people everywhere have found their lives much easier, more convenient, better served.

Printing played a similar role in book production in China and in Europe, but the scale and pattern of its influence on the two societies was different. Certainly it made similar contributions in both to the reduction of costs, increase of productivity, and accessibility to a large public, as well as providing the standardisation of texts and a greater chance of their survival. But otherwise printing developed in different directions using different procedures. In the West, the printing press underwent a gradual mechanisation and sophisticated, eventually growing into a powerful publishing industry with mass production and distribution; in China, on the other hand, printing was continuously carried on as a handicraft, without significant changes in technology until modern times.

As to the impact of printing on intellectual life and society, there were again some similarities between East and West. In both printing promoted culture, widened the scope of subjects that interested scholars, helped shift the bias from religious to classical learning, it popularised education, spread literacy, and enriched art and literature; though it did so to a different degree in each. But in the West printing also stimulated intellectual unrest and promoted the development of national languages and their use in literature; in China, on the contrary, it facilitated the continuity and universality of the written language and thus became an important vehicle for sustaining the cultural tradition. This is seen especially in the printing of the Confucian classics and similar material for the civil service examinations, and therefore acted as an important element in the relative stability of Chinese culture and society.

There was another difference. While Chinese culture always had an extensive literary tradition, at the close of the Middle Ages Western civilisation possessed only a very limited legacy of books. Yet as Europe emerged from the Dark Ages, the intellectual awakening resulted in a great demand for books. As soon as printing was available, it was utilised for book production to the maximum extent. In this respect, it was unlike printing in China, which has always produced an optimum number of copies for immediate use without excessive accumulation of copies in stock. Furthermore, Chinese printing was generally sponsored by government and private agencies without pecuniary motivation, whereas the European press was usually operated as a trade for profit. The different motives for printing seem also to have been responsible for different effects of the invention on society.

In general, printing in Europe from the 16th century onwards was vigorously expanded, supporting many drastic and radical changes in thought and society. On the other hand, the progress of printing in China and other nations in East Asia was comparatively stable and constant with modest changes occurring within a stable tradition. These diversities reflect the distinctive characters of Eastern and Western cultures, especially their attitudes towards material life. Chinese society has long been dominated by the Confucian doctrine, which concerns itself primarily with proper human relationships and social order by way of moral teachings and ethics rather than with purserance of material advance and extreme changes in society. The high degree of social and cultural stability over long periods in Chinese history, especially from the 13th to the 19th century, contrasts greatly with the constant turmoil of life and intellectual unrest during the same period in the West. Such different environments in China and the West were certainly bound to affect the role of printing, and in this sense printing was not only shaped by the political and social conditions of the time; it also exerted an equal effect on those conditions.
The following abbreviations for journals, symposia, and other collective publications, and a few names of publishers are used in the footnotes and bibliography of this volume. For editions of books consulted, a date is given after the title and an abbreviation is indicated in parentheses following the title in the footnotes and at the end of the entry in the bibliography.

### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AA</td>
<td>Artibus Asiae</td>
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<tr>
<td>AAN</td>
<td>American Anthropologist</td>
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<tr>
<td>ACP</td>
<td>Annals of Chemistry and of Physics</td>
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<tr>
<td>ACO</td>
<td>Asian Colleges Quarterly (Thaitai)</td>
</tr>
<tr>
<td>ACTAS</td>
<td>Acta Asiatica (Bull. of Eastern Culture, Tokyo)</td>
</tr>
<tr>
<td>ADV</td>
<td>Advances in Chemistry</td>
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<tr>
<td>AJSL</td>
<td>American Journal of Semitic Languages and Literatures</td>
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<tr>
<td>AM</td>
<td>Acta Major</td>
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<tr>
<td>AMP</td>
<td>American Printer</td>
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<tr>
<td>APR</td>
<td>Asian Pacific Record (Singapore)</td>
</tr>
<tr>
<td>ARSI</td>
<td>Annual Reports of the Smithsonian Institution</td>
</tr>
<tr>
<td>ARTT</td>
<td>Art Typographic</td>
</tr>
<tr>
<td>AS/A</td>
<td>Chung-Tung Teu Chi Yuan Yen Shan (Washington, D.C.)</td>
</tr>
<tr>
<td>AS/BIE</td>
<td>Bulletin of the Institute of Ethnology, Academia Sinica (Taipei)</td>
</tr>
<tr>
<td>AS/HHP</td>
<td>Bulletin of the Institute of History andPhilology, Academia Sinica (Shanghai, Taipei)</td>
</tr>
<tr>
<td>AS/MI/E</td>
<td>Monograph of the Institute of Ethnology, Academia Sinica (Taipei)</td>
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<tr>
<td>ASQR</td>
<td>Asiatic Quarterly Review; Asian Review</td>
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<tr>
<td>ASS</td>
<td>Asian Speech; Business Japan</td>
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<tr>
<td>BALA</td>
<td>Bulletin of the American Library Association</td>
</tr>
<tr>
<td>BBLR</td>
<td>Bulletin of the Bibliographical Society of China</td>
</tr>
<tr>
<td>BCEAL</td>
<td>Bulletin (Newsletter) of the Committee on East Asian Libraries, Assoc. for Asiatic Studies (Chung-Kuo Wen Hua Lu Hsien Chueh, Chengan)</td>
</tr>
<tr>
<td>BGSH</td>
<td>Bulletin of the Chinese Society of Art (Chung-Hua Hsien Ta Shih, (Peking))</td>
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<tr>
<td>BIBS</td>
<td>Bulletin of the Bibliographical Society of China</td>
</tr>
<tr>
<td>BIBH</td>
<td>Bulletin of the International Association of Paper Historians</td>
</tr>
<tr>
<td>BLJL</td>
<td>Bulletin, Joint Round Table Library (Manchester)</td>
</tr>
<tr>
<td>BLAC</td>
<td>Bulletin of the Library Association of China (Chung-Hao Thu Shen Yuan Hsia Hui Hui)</td>
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<tr>
<td>BLAS</td>
<td>Bulletin of the London School of Oriental and African Studies</td>
</tr>
<tr>
<td>BMFA</td>
<td>Bulletin of the Museum of Fine Arts</td>
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<tr>
<td>BMFEA</td>
<td>Bulletin of the Museum of Far Eastern Antiquities (Stockholm)</td>
</tr>
</tbody>
</table>

**A** Chinese and Japanese books before 1800

**B** Chinese and Japanese books and journal articles since 1800

**C** Books and Journal articles in Western Languages
Kung Chih Tue (cont.)
engraved on stone, +1210, and probably
painted on wood blocks in +1237.
Lou Shou 羅煕; redrawn by Chiao Ping-chen
購畫录 under imperial auspices and
printed in +1712.
Kuo Ch'ing Fan 謝敏賡編.
Mirror of Scientific and Technological Origins.
Chang, +1725.
Chen Yüan-Lung 陳元龍.
1735 ed.
Kuo Ts'ai Luan 覃正謨.
Essential Discussions of Appreciating Antique
Objects.
Ming, +1388.
Tahao Chao 曹昭.
TSCHC.
Kuei Shih 工部尚書.
Collected Missing Passages from Classical
Languages.
Japan, +807.
Inae Himonai 阿部広政.
Kiku 吉木館.
Record of Ancient Masters [of Japan].
Japan, +1712.
Tr. L. D. Philippp (1).
Kao Chin Chi 古今集.
Commentary on Things Old and New.
Chin, mid +4th century.
Tshui Pao 端鷹.
HWTS.
Kuo Chin Shih Wu-Chen 古今集物集.
Origins of Things Ancient and Modern.
Ming, +1439.
Chao Hung-Tsai 周宏薇.
Kuo Chih Thu Shih Oo Ch'ing 古今畫圖集.
See Thu Shih Oo Ch'ing.
Kuo Chih Thu Shih Oo Ch'ing 古今畫圖集.
See Lioh Nioh Ch'ing.
Ko Shih Hau Pu 考史匯纂.
Collection of Paintings [by Famous Artists
of Successive Dynasties] Compiled by Mr Ku.
Ming, +1605.
Ko Ta Tho 古史略.
Illustrated Description of Ancient Jade Objects.
Yuan, +1341.
Che T'eu-Jen 朱德潤.
1752 ed.
Kuan Po 古賢子.
The Writings of Master Kuan.
Chou and Ch'han.
Au-Yen, Kuan Chung 畢著.
Kuang-Ch'uan Shih Pu 廣川書譜.
The Kuang-ch'uan Bibliographical Notes.
Sun, +1125.
Tung Yu 唐遇.
TSCHC.
Kuang-Ming Chih 慶明集.
Further Collections of Essays on Buddhism.
Ch. Ming Chih Chi.
Thang, c. +1600.
Tao-Hsian 潛宣.
SPFX.
Kuang-Hsiang Chih Ch'ang 廣西芷章.
General Topographical History of Kuangsi.
Chang, +1800.
Ed. Hsieh Ch'ih-Khiun 謝僑.
1812 ed.
Kuei Pe 華佗.
Enlargement of the Ch'ang T'ai Dictionary of
Songs of Characters.
Sun, +1017.
Chen Peng-Nien 陳彭年.
SPFX.
Kuei Hsin-Tsu 華新詞.
Miscellaneous Information from Kuei-Hsin
Street (in Hangzhou).
Sun, late +1350, perhaps not finished
before +1358.
Chao Mi 趙密.
KHTC.
Kuei-Ch'un Tsu 曹春錦.
On Returning Home.
Sun, +1677.
Ouyang Hsiung 裴湘.
KSTC.
Kuang-Ming Pu Fei Chien Ch'iu T'ai 公門不費
縵珍錄.
Public Records of Merit without Expenditures.
Chihung.
Author unknown.
Kuei T'ao 慶道.
See T'ang Kuei Shih Pa.
Kuei T'ao Pei T'ao 開葵奇彩.
Kuei-Pao Kao-Regen-Period Pharmacopoeia.
Sun, c. +1799.
Kuei T'ao Ch'ing 魏桃.
Illustrations of Ancient Objects.
Sun, +1099.
Li Ta-Lin 劉大林.
1752 ed.
Kuang Pu Fei Ch'iu 萬古餘香.
Further Works by the Rechian.
Ming, c. +1600.
The Luang 陸雲.
TSCHC.
Kuang Yi Wan Chueh Chau 圖版與圖志.
Map of All Countries in the World.
Ming, +c. +1654.
Li Ma-Yau (Maite Russo) 劉時要.
Lan Ting Kuo 樂時國.
Investigation of the Meeting at Orchid Pavilion
At the Pavilion.
Chih, +1657.
Chou Hsuan 周煥.
SPFX.
Lan Ting K'ueh (cont.)
[and a preface to it written by Wang Hui-
Chih].
Sung, +c. +1224.
Sang Shih-Chang 楊世昌.
CPTC.
Luo Hsieh As Pi Chi 孫學筆記.
Notes from the Hall of Old Students.
Sung, c. +1190.
Lu Yu 罗隱.
HCTC.
Liu Tao Tsu Chi Ch'ung 老杜遺言.
See Tao Tsing.
Li Sai Yu 宋誘序.
Pictures on the Stairs on Exoticating Surveys.
Chihung, +c. +1645.
Hsiun Yen-Taehong 疏遠通.
Li Tai Chou Pi 譚氏編.
Catalogues of Famous Painting.
Sung, +c. +847.
Chang Yen-Yian 張彦遠.
TSCHC.
Li Ta Chou Chieh 譚秀全集.
Collected Works of Li Yu.
Chihung, +c. +1714.
Li Yu 李域.
Reprint, Taipéi, 1790.
Liang Chih Man Chih 梁池漫志.
Bridge Pool Essays.
Sun, +1192.
Fei Kun 费勗.
CPTC.
Liu An Ch'iao 聖安荘.
Lives of Celebrated Women.
Date uncertain, possibly probably Han.
Ahsa., Lu Hsiang 劉潢.
KSTC.
Ling Fei-Chü Kuei Chuan Hsiueh 梁儀闡 AUDIO.
Portraits of Meritorious Persons in the Hall of
Ling Yen.
Sung, c. +1668.
Lin Yen 劉勤.
Liu Ch'ang T'ao 六國圖.
Illustrations of Objects Mentioned in the Six
Classes.
Sung, +c. +1155.
Yang Ch'ao 楊超.
1750 ed.
Liu Ch'ang T'ao 六國圖.
1750 ed.
Liu Ch'ang Chih Chiu Wen Lu 露珠入夢見聞.".
Records of Liu-Chihui as Learned from its
Students in China.
Chihung, +c. +1754.
Phan Hsiang 被相.
Reprint, Taipéi, 1793.
Liu Ch'ang Kuei Chih Lien 檀國顯志略.
Account of the Liu-Chihui Islands.
Chihung, +c. +1757.
Chou Huan 周煥.
Liu Chih 圖録.
TSCHC.
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Chihing, + 1648.
Chiang-Yen Hsiao-Hsian 潘鳳萍: paintings by paintings by Wei Shou; Yin-Thuang 詹云徴

Thai Phong Shing Hsi Feng 太平統志
Prescriptions Collected by Imperial Benevolence during the Thai-Phong Reign-Period. Sung, commissioned +992; completed +999. Ed. Wang Hsueh-Yin 王濬英, Chiang Yen 潘鳳萍 et al.

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Thai-Phong Reign-Period Imperial Encyclopedia. Sung, +989.
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SPTK.

Thang Hao Tzu 唐浩圖.
History of the Administrative Statutes of the Thang Dynasty. Sung, +968.
Wang Pao 王溥. Peking, 1933.

Thang Kuo Shih Pu 唐國史補
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Li Chao 李肇.

CTTS.

Thang Lie Tze 唐列志
Institutes of the Thang Dynasty. Thang, +738 or +779.
Ed. Li Lin-Pu 李林浦.
Japaneed, 1836.

Thang Shih Hui Pu 唐詩集補
Manual of Painting with Themes from the Thang Poetry.
Ming, c. +758.
Ed. Hsiao Fung-Chih 欧風池.

Thang Shih Lie Ching 唐史列傳
Collected Imperial Edicts of the Thang Dynasty. Sung, +707.
Ed. Sung Min-Chiu 宋敏求.

Thang Yie 唐野
The Thang Dynasty Rhyme Sounds.
Thang, +797.

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See Sheng Chiao Shih Lu.

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The Exploitation of the Works of Nature. Ming, +1657.
Sung Ying-Hsing 宋應星.
Tr. Sun 1 & Tzu & Sun Hsieh-Chuan (1).

KHC.

Thien Lin Wu Chi 杜林文集
Collected Writings of Ku Yen-Wu. Chihing, +1773.
Ku Yen-Wu 胡廷武.

SPTK.

Thuy Chhi Chheng 圖會成.
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Thuy Hung-Van 鄭洪遠
Ed. Chien Meng-Lei 鄭夢龍 et al.
Index by Giles (2).

Thuy Le 燕截.
Historical Collections. Sung, +1798.
Cheng Chiao 樑超.

Thuy Le Chhieh Chhia 海 olarak.
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Wang Wei-Li 王惟一 & Wang Wei-Te 王惟二.

Tung Meng Hsiu 談義秀
An Admonition to Those Who are Immature and Ignorant. Sung, first pr. +1215.
Li Pea-Chung 吕本中.

Tung Su Pon 透物燈.
Theoruses of Popular Terms, Ideas and Customs.
Chihing, +1751.

Tie Hao 順超.
Reserves of Western Material on Political and Social History. Thang, c. +842.
Tu Yu 桃宇.

Tsa Fei Yuan Kwei 事例源流
Ed. Wang Chih-Jo 王知若 & Yang Yl 順贍.
1620 ed.

Tie Chhong 前崇.
Master Tchih-Chiu's Elaboration of the Olden Chhia (Spring and Autumn Annals), dealing with the period -782 to -480.
Chiao, (c. -400 to 399.
Attrib. Tchih-Chiu Meng 左邦明.
SPTK.

Tie Shun Chhia 沈純八詠.
Ming, +1943.
Kao Lien 高進.

1863 ed.

Tieh Cheng-Ming Huo La 東京會要錄.
Dreams of the Glories of the Eastern Capital (Kaiyaleung).
Sung, +1147, first pr. +1187.
Meng Yian-Lao 梅 aç 廠.

TSHCC.

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ST.

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TSHCC.

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Clarifications of Strange Things (Taisin).
Sung, c. +1550.
Chao Hsü-Ku 曹希楷.

TSHCC.

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Comprehensive Mirror of History (for Aid in Government) (+405 to +555).
Sung, begun +1065, completed +1084.
Sooma Kung 司馬光.
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Miscellany from the Purple Peach Studio.
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