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ORIENTAL WOODWORKING

by

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CHAPTER I

INTRODUCTION

Chinese furniture, particularly from the Ming dynasty period, has had a great impact om contemporary Western furniture. Both design and technical skills from China have influenced Western furniture-making since its introduction to the West in the seventeenth century. At that time China became accessible to the West for trade through the efforts of Portugal, and then England. Since that time, the evidence of Chinese influence on Western furniture can be seen in the techniques and design of pieces such as the Parson's table and the chaise lounge, which is thought to have been inspired by the famous Ming "drunkard's chair." [1]

From Queen Anne period chairs with Chinese backs, to contemporary Scandinavian design we find the Chinese influence of woodworking. Both Chinese joinery and design helped educate European woodworkers.

Chinese furniture has been the main influence on my own work. The constructed nature of Chinese furniture, with its combination of largely concealed joinery and visibly constructed detail, is the basis for my goal of simple elegance. From Chinese furniture I have learned to work with subtle curves and pieces which create an impression of lightness. The relationship among the elements of a piece of furniture strikes a middle ground between a flowing quality and a constructed quality. I have tried to achieve this balance in my own work. The pieces of furniture designed for

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[1] Gertrude Z. Thomas, Richer Than Spices (New York: Alfred Knopf, 1961), p. 5.

this thesis attempt to use some of the design and technical characteristics of Chinese furniture from an interpretive rather than historical point of view.

The purpose of this paper is to examine the development of Chinese furniture and its influence on my own furniture. A brief history of China will provide the reader with the historical context of the culture. The history of Chinese furniture will be dealt with in greater detail, with an emphasis on the progression of a particular piece of furniture: the chair. Techniques will then be discussed, focusing on the development and refinement of specific techniques such as frame and panel construction and mortise and tenon.

The last part of this paper will detail the furniture designed by the author of this paper. The individual pieces designed for the thesis show will be analyzed and discussed in terms of technique and design, and the relationship to Chinese furniture of the Ming dynasty.

It is my hope that this paper will provide an introduction to Chinese furniture-making and a point of departure for the interested reader.

CHAPTER II

A HISTORY OF CHINA

To understand the tradition and continuity of Chinese furniture, it is important to briefly mention how the Chinese civilization developed. During the most important period, 221 B.C. to 1911 A.D., China was ruled by a series of dynasties which kept the country more or less united. This enabled China to develop a strong central bureaucracy with one script, one literature, one language, one system of ethics, and one tradition in the arts. This homogeneity existed primarily in the ruling class, and was not affected by the cultural diversity of the Chinese peasantry. [1] In addition, China developed without Western influence until the seventeenth century, when the Portuguese opened China to trade. This insulation from outside influence was also a factor in the continuity of Chinese culture.

Chinese society became increasingly fluid; slavery disappeared, and status became based on wealth and official position which the poor could sometimes obtain. The central government developed a good network of roads, a postal system, armies, a state waterway system, large public works, and a large, well-educated civil service which was open to all classes through open competition. The peasants as a whole were the ones who determined how long a dynasty would rule. When they became too dissatisfied there would be a massive peasant uprising which would overturn the existing ruler and create a new dynasty. A typical pattern shows a dynasty swept into

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[1] Andrew Boyd, Chinese Architecture 1500 B.C. to 1911 A.D. (London: The University of Chicago Press, 1964), p. 3.

power by such an uprising, initiating reforms that allow peasant production to increase and the economy to improve. Meanwhile, the landowners gradually extend their control and exploitation of the peasants. Eventually, the peasants who become increasingly impoverished and desperate, rebel, and the cycle begins again.

This system of dynasties which lasted for twenty-one centuries, allowed China to develop economically and technically. In fact, for much of this time period, China was more advanced than Europe, and contributed to many of the inventions of the period. The dynasty system also allowed the Arts to evolve slowly over hundreds of years, to a high level of refinement.

The dynasties were as follows:

The Han Dynasty, 206 B.C. to 220 A.D.
The Chin Dynasty, 265 to 420 A.D.
The Sui Dynasty, 581 to 618 A.D.
The T'ang Dynasty, 618 to 907 A.D.
The Sung Dynasty, 960 to 1279 A.D.
The Yuan Dynasty, 1279 to 1368 A.D.
The Ming Dynasty, 1368 to 1674 A.D.
The Ch'ing Dynasty, 1644 to 1911 A.D. [2]

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[2]Ibid.

CHAPTER III

HISTORY OF CHINESE FURNITURE

A major problem in any study of furniture history is the vulnerability of wood to the elements. The effects of fire, flood, war and weather all result in the survival of a relatively small number of wooden furniture artifacts. In addition, this number obviously decreases as one continues back in time.

We know that the history of Chinese furniture can be traced back at least as far as the Shang dyansty, which lasted from 1700-1100 B.C. This is the earliest period from which a large number of non-wooden artifacts survive. According to Gustav Ecke, author of Chinese Domestic Furniture, "the two principal modes of joinery, as they survive today, were in the Shang period fully developed." [1] Proof of the existence of furniture in the Shang period comes from bronze castings which depict furniture. Pictographic writing from this period also includes furniture. Surviving paintings illustrate the history of Chinese furniture and the "continuity of form and structure that characterizes the entire history of Chinese furniture." [2]

The earliest fragments of furniture itself date back to the Han

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[1] Gustav Ecke, Chinese Domestic Furniture (Rutland, Vermont and Tokyo, Japan: Charles E. Tuttle Co., 1962), p. 3.

[2] William Drummond, Chinese Furniture (New York: Intercultural Press, 1969), p. 2.

dynasty which lasted from the third century B.C. to the third century A.D. The earliest intact furniture, however, dates back to the T'ang dynasty, around the eighth century A.D. These pieces are preserved in the Shosoin, the Treasure House at Nara in Japan. Throughout the history of Chinese furniture, it seems to be the consensus that the forms and styles did not change a great deal. The furniture, regardless of dynasty, is characterized by "restraint and severity of style."[3]

Two other problems hamper the study of Chinese furniture. One of these problems is the great loss and destruction of property in China during frequent times of war and political upheaval. The other problem is the low priority position accorded to the Chinese cabinetmaker, relative to other craftsmen, by his contemporaries. It seems that while those working in bronze, jade, and ceramics were considered artists, the cabinetmaker was thought to be "merely" an artisan. Thus, no surviving furniture is signed, and no cabinetmaker is mentioned as an artist in historical documents.[4]

Mention has been made of the continuity of form and style which characterizes Chinese furniture. The slowness with which innovations appeared and then were generally accepted also adds to the difficulty in dating pieces of furniture.

Chinese society was governed at every level by strong tradition. Cabinetmakers developed a repertoire of techniques and elements which became firmly established, and likewise governed by tradition. Changes came very slowly.

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[3]Ibid., p. 25.

[4]George Kates, Chinese Household Furniture (New York: Dover Publications, 1948), p. 9.

Some historians believe that the earliest piece of Chinese furniture was a low platform, possibly covered by matting. These platforms in various sizes were to be knelt upon, sat upon in a cross-legged position, or reclined on. These platforms, rectangular in shape, evolved into the plain bench and the couch. A later, but still early (first century A.D.) development from the original low platform was a canopied bed.[5]

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[5]Ibid., p. 25

CHAPTER IV

HISTORY OF THE CHAIR IN CHINA

The development of the chair is considered to be an important step in furniture history. Once people raise themselves up from the ground, they must then raise those things which they use. It has been mentioned that the Chinese had traditionally lived low to the ground on mats and low platforms. The Japanese, who copied this way of living from the Chinese, still live in terms of furniture and household arrangements similar to the Chinese of the T'ang period.[1] George Kates, author of Chinese Household Furniture, points out that this transition by the Chinese from ground level brought with it a whole new set of standards and values for furniture and interior decor.

Since it is beyond the scope of this paper to trace the evolution of every form of Chinese furniture, I have chosen to trace the development of the chair through the Ming dynasty because of the importance of the chair as a piece of furniture. There is some disagreement concerning when the chair was developed or introduced into China. Some historians say that the chair was brought to China from India, along with Buddhism, in the first century A.D. Other historians feel that the chair came from India in the second century A.D. Robert Ellsworth, author of Chinese Furniture, summarizes the three major theories:

1. The chair arrived in China from India around the second century A.D.

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[1] Ibid., p. 25.

2. The chair was introduced by nomadic tribes earlier than the second century A.D. These tribes used the chairs by the fourth century B.C.

3. The Chinese themselves developed the chair by modifying an early type of bed.[2]

In Ellsworth's opinion, it is the second and third theories which are most likely true.

It is definitely known that by the fourth century B.C., the Chinese had raised themselves off the floor by means of a piece of furniture which was used for sitting and reclining. Although none of these pieces remain from this period there are both literary and graphic references to the chair. A miniature bronze sculpture dated from the Han dynasty shows a figure seated in a chair which has the beginnings of legs, as opposed to a solid base. The front is actually a solid piece of wood with two cut out openings and a remaining section of wood in the center. The back has two genuine legs at each corner and the arms and back are of one solid piece of wood. Stone rubbings taken from the Han period show two other chairs, both with straight backs. The front and back legs are joined by three stretchers on each side, while a single stretcher connects the front legs. The design of these chairs is far more refined than the bronze miniature--particularly the legs, of which there are now distinctly four, joined at the base by stretchers.[3] In general summary, it could be said the base of the chair developed from a box-like structure to a box with openings cut out, to a base with legs connected at the bottom in a frame-like

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[2]Robert Ellsworth, Chinese Furniture (New York: Random House Inc., 1970), p. 14.

[3]Louise Hawley Stone, The Chair in China (Toronto: The Royal Ontario Museum, 1952), pp. 5-8.

manner, to free-standing legs.

Still later in the Han dynasty a stone carving on a tomb shows more changes. The back has a curved splat and a curved railing which continues forward to become the arms. The legs are crossed with stretchers at the bottoms from front to back. There is some controversy surrounding the source of this chair since there are Western features present such as the curved back.[5]

Several other chair styles also developed in the Han dynasty. One style was a folding chair with both a head and foot rest, and another had ornate carving showing Indian influence.[6] Many important developments resulted in the Han dynasty including the introduction of leather and rattan seats.

It is important to keep in mind that chairs remained for use only by the wealthy until much later. Through the next two dynasties, there is very little mention of the chair in literature. One reference to the chair in the Sui dynasty notes that there were horizontal bars at the bottom and that the chair folded.[7] There is more material in the T'ang dynasty, including representations of the chair in art work. It is during this dynasty that the chair is referred to as a Barbarian Bed.[8] The Barbarian Bed is actually a folding or portable style chair thought to be imported from India. In the Indian version the seat was woven around the seat frame and stretched tightly. There were four legs which were attached to the frame corners. The Chinese rope bed had crossed legs attached to the

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[5]Ibid.

[6]Stone, The Chair in China, pp. 11-14.

[7]Ibid., p. 17.

[8]C.P. Fitzgerald, Barbarian Beds (Cranbury, New Jersey: A.S. Barnes and Co. Inc., 1966), p.

two horizontal structures of the seat. The seat was then woven around these structures.[9] This chair had no side braces so the chair had to be used carefully with the sitter perched on the front horizontal piece and woven surface. The seat easily folded up if all the weight was in the center of the seat.

Later in this period, backs were added to the folding chair (fig. 1) which made it more comfortable and less likely to fold up when in use. Another variation of this chair involved a smaller seat made of hard mat instead of softer rope.

Furniture was more widely distributed by the end of the T'ang dynasty. Its use, particularly of chairs, was still limited to "imperial, official, or ecclesiastical use."[10]

This dynasty is important because China had attained the position of cultural leader in the East. Chinese influence was even present in parts of the Western world. Ironically, much of the information we have about China during the T'ang dynasty comes second hand from Japan.

The earliest surviving chair is dated from the Sung dynasty. The chair is simple and completely wooden. The back splat is simple, with posts on either side. There are several carved pieces including the tops of the posts and pieces under the seat next to the front legs, which leads many historians to conclude that the work was done by highly skilled artisans rather than simple carpenters.

By the time of the Sung dynasty, China had become more involved with the outside world. It is thought that this outside influence may have been partly responsible for the more widespread use of the chair

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[9]Ellsworth, Chinese Furniture, p. 14.

[10]Ibid., p. 16.

at this time. It was also at this time that the chair became an article of artistic worth.

While the Sung dynasty witnessed the still rare but increasing use of elevated furniture in China, it was the Yuan dynasty in the twelfth century that brought the use of furniture into the average Chinese household. Proof of this was the excavations of several tombs of well to do, but not imperial families. Murals in these tombs show tables and chairs (fig. 2) in general use. The chairs and tables have rounded legs and stretchers. In addition, the number of stretchers on the tables and chairs has dropped from three to two on each side.[11]

The Ming Dynasty Chair

The Ming dynasty which lasted from around 1368 A.D. to 1674 A.D. is considered to be the height of Chinese furniture. The simplicity and elegance which had been the major features of Chinese furniture since the second century A.D. remained through the Ming dynasty. It was in this period that earlier chair designs were refined, and certain chairs were designated for certain uses. For example, some chairs were built with the bark left on the wood. These chairs were used in the gardens and other informal settings.[12]

Several distinct chairs emerged in this period. One, the high, yoke-back armchair (fig. 3) is considered a classic of the period.[13] The posts at the back curve in slightly while the back splat curves out creating tension and in the most successful examples, balance. All curved elements were made from one piece though never steam bent. According to Ellsworth, steam molding came from the Western world.

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[11] Stone, The Chair in China, p. 18.

[12] Ibid., p. 49.

[13] Ellsworth, Chinese Furniture, p. 82.

Variations on this chair include an apron that continues all the way down the front legs, the height of the back, and spandrels added under the arm for strength. Other high yoke-back armchairs of this period have still more spandrels and beaded edges on the apron and inside of the front legs. The effect is that of a heavier and (in my opinion) less elegant chair.

The continuous high back armchair (fig. 4) is thought to be a somewhat later chair, although problems of dating exist with this as with all Chinese furniture. Some other examples of this chair are less ornate than the yoke-back chair. In other examples of this chair, both the spandrels and apron are gone, resulting in a chair which appears lighter and better proportioned. This type of chair also utilizes an exaggerated splay of the legs which add to the continuity and harmony of the whole piece. One particularly refined example of this type of chair is compared by Ellsworth to a Queen Anne side chair, even though the Ming chair is about one hundred fifty years older than the Queen Anne chair (fig. 5). Photographs of the two chairs side by side show a great similarity. "The back of this Queen Anne chair is both shaped and joined in exactly the same manner as a sixteenth century Chinese continous yoke-back chair." (Ellsworth, p. 83) Some variations on this chair include more shaping in the chair rails, shaped arm braces, and beaded aprons. One more unusual variation was curvilinear seat braces which permit the seat to be lightened without loss of support. Some variations which Ellsworth considers to mark a decline in the so-called "purity" of the Ming style, have yoke backs that curve upward rather than back. Also, heavily spandreled chairs with ornate carving are thought to be evidence of decline.

Another style of Ming chair is the low-backed armchair thought to have occurred later, in the late seventeenth century and early eighteenth century.[14] These chairs have a continuous back and some interesting variations which include carving and lattice designs.

One of the oldest styles of Chinese chairs is the continuous horseshoe armchair (fig. 6). Some of these chairs have carving on the back splat and apron. One variation utilizes the shape of bamboo as the carved motif. These chairs vary a great deal in size and heaviness. One example, extremely light and severe (fig. 7), is dated late in this period while some of the most ornate chairs were made much earlier. This kind of simultaneous existence of all types adds to both the continuity of Chinese design and the difficulty in categorizing.[15]

The last major style of this period is the side chair. Compared to other chair styles of the Ming period, the side chair has few surviving examples. This is probably due to the fragility of a chair without arms. There are, as with the other chair types, variations which include spandrels, yoked or non-yoked back, aprons and carving.

An interesting observation to be made in comparing the different chairs is that variations in individual techniques and designs are subtle. It is in the seemingly infinite combining of variations that the range of Chinese furniture was developed.

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[14] Ibid., p. 86.

[15] Ibid.

CHAPTER V

CONSTRUCTION TECHNIQUES IN CHINESE FURNITURE

Although Chinese furniture construction uses very complex joinery, when the furniture is together the effect is simple and clean. The joinery is largely based on a variety of mitered mortise and tenon joints which are often used in frame and panel construction. These joints seem to be refined specifically to integrate with the design of the furniture. The complexity of the joinery is hidden inside the furniture. However, the furniture still looks constructed, with a good balance between the separate elements in a piece of furniture, and the harmony they form as a whole. A key element of this is the Chinese rule, that if two pieces come together in the same plane, they are always mitered. This permits your eye to flow more easily around the corner. Only when two pieces are not flush are they allowed to butt up to one another. This emphasizes the construction of the furniture. These two rules create a beautiful harmony between the separateness and unity of the pieces.[1]

The complexity of the joints is necessary to some degree to allow the wood to expand across the grain. Panels are allowed to float in grooves in the frame pieces. On larger panels transverse braces are sliding dovetailed to the inside of the panels to hold them flat, yet still permit them to expand and contract with the seasons.[2]

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[1] Ibid., p. 58.

[2] Ibid.

Another key element in Chinese joinery is the absence of glue in the joints. Simultaneously, the pieces had to interlock solidly enough for use and yet be easily taken apart for transportation. These elements were upheld by strong traditions in China, and changed very little from the fourth century B.C. until the Western influence after the eighteenth century.

The mortise and tenon joint, with its many variations is the basis of most Chinese joinery. The most common use of this joint is in the mitered mortise and tenoned joint used in the frame and panel construction of table tops and chair seats. The miter is used because the frame pieces are coming together in the same plane. In this frame and panel construction, the tenon will be on the longer side and the mortise will be on the shorter side. Often this mortise goes through, and by having it on the narrow end of a piece, keeps the longer side of a table clean. In a chair, this keeps the front clean from the visible joint detail. This frame and panel construction usually has cross braces running across the shorter dimension of the panel, or across the grain of the panel. These cross braces are tenoned in to the frame, and are connected to the panel by a sliding dovetail. This allows the panel to expand and contract with the seasons, and yet holds it flat. The panel also is tongue and grooved into the frame with room for movement. At the same time this helps the braces to hold the panel flat and in position. This type of frame and panel formed the core of most Chinese furniture. It was used to form table tops, chair seats, cabinet sides, tops, backs, and doors.[3] This type of frame and panel is further complicated when a leg comes up to support it. If the leg is stepped back from the corner it is allowed to simply double tenon into the bottom of the table or

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[3]Ibid., p. 60.

chair seat (fig. 8). If instead, the leg is flush with the corner, it must be mitered on two faces, and at the same time double tenoned into the bottom of the mitered mortise and tenon of the top. (fig. 9,10). In this double tenon, one tenon is shorter than the other. The shorter tenon of the leg fits into the shorter mortised top frame, and also pins the mitered mortise and tenon of the top frame, thus locking the top together.

Chinese furniture frequently has an apron or skirt that runs between the legs directly under the table top, chair seat, or enclosed part of the cabinet. This apron may be fastened to the mitered frame it fits under and to the legs, either by dovetail pegs, pins, or floating splines which would be glued into just the apron.[4] In addition, if the leg was stepped back from the corner, it was often notched out to fit over the apron so that once the leg was in place it locked the apron in place. On the other hand, if the leg was flush with the corner, the apron usually miter mortise and tenoned into the leg. In either case, the leg would lock the apron in place. Once the leg was removed however, the apron would easily come off.

Another variation of the mortise and tenon is the slide lock mortise and tenon. This is a joint that quickly knocks down for dismantling. In this joint, the mortise is twice as long as the tenon. The tenon at the end is a full size rectangle, but tapers down to its base. At the base, the tenon also tapers across the length. Half of the mortise is the full size of the end of the tenon; the other half has a double taper corresponding to the tenon. The tenon is inserted into the full size end of the mortise then slid sideways until the double taper to the

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[4]Ibid., pp. 64-65.

tenon locks into the corresponding double taper of the mortise. This type of joint is used in a variety of Chinese furniture, including couches and cabinets.[5]

The Chinese used a variety of cabinets for storing clothing, rolled-up paintings, and calligraphy. These cabinets were always constructed using miter frame and panel construction with double doors on the front and often a center post in the middle of the two doors (fig. 11).[6] This center post enabled the door to be locked securely to the post when closed. When the doors were opened however, the center post could easily be removed to allow easier access to the interior. This post is held in place at the top by a simple mortise and tenon. At the bottom there is a floating spline which is fastened into the lower rail. The bottom of the post has a mortise which is open on one side. This allows the post to slide to one side then drop down out of the mortise at the top. When the doors are closed however, the post cannot move, and the door can be solidly locked in place.

All doors on Chinese cabinets were removable.[7] One type, the wooden hinged cabinets were particularly unique. On the wooden hinged cabinets the outside frame piece of the door had a wooden pin that stuck out of the top and bottom edge of the cabinet. The top and bottom frame pieces in the cabinet have corresponding holes in them, with the top hole being twice as deep as the bottom. The door can be removed by opening it to a right angle to the cabinet, then lifting the door until the bottom pin is free. The bottom is then moved out, and the door dropped down

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[5]Ibid., pp. 69-71.

[6]Ibid., p. 62.

[7]Ibid., p. 62.

until the top pin is free. This can only be done with the door at right angles to the cabinet, because the top front frame of the cabinet makes it impossible to lift the door (fig. 11). More common metal hinges were also used. These also had to be opened at right angles to lift off.

The Chinese never used steam bending to generate curved pieces. Instead, they shaped solid stock into the various curves they needed. Most curved pieces were shaped from one piece of wood. Only in the horseshoe armchair was the curve so severe that it had to be constructed. Here the Chinese used a splice joint which is called a double tongue and grooved, half lapped joint with a locking peg. The peg in the joint locks it together, but when it is removed the joint easily slips apart.[8]

Chairs use another unique joint at the point where the leg passes through the mitered frame of the seat of the chair. The leg is a continuous piece from the floor to the top of the back. However, the leg below the seat is larger in diameter than it is above the seat. This provides a shelf for the seat to rest on.

The Chinese developed a complex system of joinery that integrates beautifully with the demands placed on it. The construction allowed the wood to expand and contract, as well as being strong and durable. In addition, the construction did not require glue, and was easily dismantled for transportation. At the same time, by always mitering pieces coming together in the same plane, and simple mortise and tenoning of those that did not, they developed an aesthetic in furniture that later generations have found difficult to match.[9]

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[8]Ibid., p. 71.

[9]Ibid., p. 58.

CHAPTER VI

A PERSONAL INTERPRETATION OF CHINESE FURNITURE

A Side Table in Rosewood
(fig. 12,13)

The side table was a take-off on the Altar tables of the Ming dynasty. Early in my research I decided to make this piece a direct interpretation of the Chinese table. The Altar tables (fig. 8) of this period have long, narrow tops of various sizes, which were usually thirty-two inches in height. The tops are the traditional mitered frame and panel with the through tenons exposed on the end of the table. The legs are stepped in from the ends of the table, and the top over-hangs the legs and understructure, which emphasizes the supportive nature of the legs and understructure. The legs from the front and end view splay out slightly which give the table a solid looking stance, together with an uplifting feeling to the top. The cross section of the legs varies from rectangular to oval in the different tables. The legs are usually straight, but occasionally there is an example where the leg has a soft curve in it. These Altar tables usually have an apron under the top which gives the top a heavier look. In addition, there are braces between the legs at each end. Sometimes these end braces are filled in with heavily carved panels. This makes the whole table appear very solid. Out of the range of these tables, I was most interested in the lighter, more simply designed Altar tables.

In beginning to develop the design of the table, I decided to keep the basic proportions of the Altar table, and to keep the design relatively simple, yet elegant. The table's function was not one of an Altar table. It was conceived as a side table for use in a dining room, living room, or hallway. After investigating other commercial tables of this type, I discovered that many of them had two tops which folded open to become a dining table or desk. This versatility in function seemed to make the table much more useful in a residence where space is limited. Thus, I decided to design a folding top. Because the table was to function also as a dining table or desk, I used a standard height of twenty-nine inches instead of the thirty-two inches of the Altar table. I also decided to reduce the size of the top to 60 x 18 inches, giving the effect of a slightly reduced Altar Table. The legs were designed to splay out from under the top with a soft curve which would give the table a solid stance. To emphasize this, the legs also become slightly thicker as they approach the floor. The stretchers connecting the legs on the end curve up slightly, and through mortise and tenon into the leg. The longer, bottom stretchers on the front curve up and taper slightly in the middle, and through mortise and tenon into the leg. The bottom edge of the upper stretcher curves up a bit less than the bottom stretcher, so that the negative space between them tapers a little in the center as well. This top stretcher continues through a notch in the top of the leg to support the overhanging top. In the Ming dynasty version, the leg would come up to the under side of the top. Since I decided to leave a space between the top stretcher and the top, I stopped the leg short of the top edge of the top stretcher. This visually permits the support for the top to go from the legs to the stretcher, to the cross braces, to the top. The space between the top, and the top stretcher,

helps the table appear lighter from a lower angle. It also makes more obvious the three cross pieces directly under the top which are part of the system by which the top slides and folds open to become twice as wide. I felt it was important to show the sliding mechanism, and designed it to become an integral part of the entire design. The top itself is two mitered frame and panels which are hinged on the back edge, enabling the top to be folded open and centered over the base, after it is slid forward.

The technique of construction closely follows the traditions of the Chinese, with a few exceptions. I decided to use veneered plywood for the panels of the top to eliminate the problem of expansion and contraction, as well as to increase the strength of the top when opened. The mortise and tenons in the top frame were all floating tenons instead of tenons which were integral parts of the frame. This was done primarily to simplify the construction. The visual results are similar. Also, I exposed the through tenons on the front of the table; something the Chinese would not have done.

Generally, the rosewood side table is the closest to its Chinese counterpart of all of the pieces in this thesis. Its major design difference is the increase in exposed joinery, and in the emphasis on exposing the structure of the individual pieces which make up the entire table.

In the rosewood side table I began to choose wood for the various parts so that the grain would follow the curve of the stretchers and legs. This was successful in the stretchers which were flat, but less successful in the legs which curve in two planes. Bandsawing the shape began to change the grain patterns from what they had been on the surfaces.

My decision to use Brazilian rosewood was largely based on its similarity to the rosewoods in use during the Ming dynasty.

A Glass Topped Coffee Table

(fig. 14)

The walnut coffee table, with its glass top, was primarily an interpretation of the Ming dynasty Chinese K'ang tables (fig. 10). It also included elements of other Chinese tables. After completing the rosewood table, I chose to make the coffee table a more interpretive, less historically identical piece.

K'ang tables are low tables measuring approximately one foot in height. They resemble a contemporary coffee table. Originally however, the K'ang table was used on the K'ang, an elevated platform used for eating, sleeping, and relaxing. The K'angs were usually the only heated part of a household, and so tended to be the focal point, particularly in Northern China. The K'ang table had a mitered frame and panel top, and often had a wide apron under the top. The legs, though most often cabriole legs, ranged from straight to exaggerated cabriole curves.

Ornamentation also varied widely from one table to the next. On some K'ang tables the entire surface of the legs and apron would be carved, while others would be plain.

In designing the coffee table I decided to tend more toward the more plain version for basic features. The coffee table would be square with all four sides the same. The top would be glass, with particular attention paid to the way in which the wood meets the glass and supports it. For legs, I decided to use a simplified cabriole leg which would be square and at right angles to the stretcher. This would make the joinery easier. Below the stretchers the legs curve out, then back in tapering to the floor. For the stretchers, I decided to use a variation on a stretcher that appears on other Chinese tables, as a

second lower stretcher. This stretcher is straight except that it steps down just before it meets the leg. This step down creates an open space between the edge of the glass and the stretcher. This open space sets the glass and wooden structure apart so that the weight of the glass appears to rest on the stretcher. The stretcher in turn is supported by the leg. To further accentuate this effect, I decided to shape the stretcher from the top view in a similar way as the front view. This would increase the size of the gap between the glass and wood in the corners.

At this point I liked the design, and felt it had a Chinese feeling without being too close to a specific Chinese table. The center part of the table looked too open however giving the table a flimsy look. Tc give it a more solid look I used a tinted glass. It still needed more structure so I started by trying a variety of lattice designs under the glass. These developed into fairly complex structures which started to dominate the rest of the design. Finally, I chose a simpler cross which has raised blips in four places. This design, although not specifically Chinese seemed well balanced with the rest of the design. The four blips raised up and supported the glass which in combination with the frame around the glass, protected the glass and allowed me to use 3/8 inch glass which saved the cost of a thicker glass piece. The glass was also supported by ebony tabs inside the stretchers.

The technique of construction of the table follows the rule of Chinese jointery and remains quite simple. Legs are mortise and tenoned to the stretchers and do not miter since they do not meet in the same plane. The cross pieces under the glass through double tenon in to

the stretchers and are wedged with ebony to relate to the tabs that support the glass. The cross under the glass was half lapped together. This would not have been done by the Chinese. Instead, they would have mitered these pieces, possibly with a floating tenon. I used the half lap because it was the strongest and simplest joint for the purpose.

While the walnut coffee table has a definite Chinese look to it, the glass top gives it a contemporary look as well. In this table, I continued attempts to get the grain to follow the shapes in the piece. With the legs in particular, I tried to match the grain as I glued up stock to get the required thickness. As I cut the curves in the legs, I noted that the grain patterns changed radically, often going in opposite directions on the glue seam. After studying the legs, I realized that the key was not in the face grain, but in the end grain. In the glued up legs where the end grain followed a similar arc, the grain on the curved legs matched across the glue seams. The opposite occurred when the edges were perpendicular to each other. In addition, it seemed that if the end grain angled at 45 degrees from the inside corner to the outside corner, and the same template is used on both faces of the leg, then the resulting leg will tend to have grain that follows the curve of the leg.

Padouk Chair

(fig. 15)

In looking at Chinese chairs, there were several aspects of them which I found particularly interesting. I decided then, to concentrate on interpreting these particular aspects and to let the other parts of the chair drift further away from the traditional Chinese chairs. I wanted also to incorporate the animated look of an earlier chair which

I designed and built.

One aspect I found particularly interesting was on the yoke-back chairs (fig. 13). In this chair the legs and back splat curve in opposite directions. This seemed to create an interesting tension. The top of the back also has a beautiful shape that cups around the sitter's head or neck when leaning back against the chair. The Chinese chair, from the seat down, is like a rectangular table. Above the seat, however, there is a lot of shaping and curves. The most dramatic curve is in the horse-shoe armchair (fig. 6). The Chinese did not steam bend or laminate these curves, but cut them from solid stock. In extreme curves like this where it is not practical to get the whole piece from one board, they constructed the curve with a series of splice joints.

In designing the chair, the back and joints were the elements I wanted most like the Chinese chair. The lower part of the chair was to be considerably different from the Chinese. Also, in starting the design, I was very interested in comfort, since I found a number of Ming dynasty chairs to be quite uncomfortable. (This experience was at the Philadelphia Museum of Art.) Presumably, my discomfort was caused by the difference in body size. In designing the back, I decided on a single slat which was common in China. I then developed a curve that would provide maximum comfort for upright sitting. Next, I developed side posts to support the top of the back slat. After developing a number of variations on this, I decided to have this post curve back behind the back slat, then curve forward to become a low arm rest. This created an interesting tension between the two opposing curves. To balance the tension, I carried the back slat down below the seat to a rail between the back legs. This kept the back posts and slats in better balance. For the legs, I used softly

curved, animated legs which give an impression of walking forward. In the seat I also tried to repeat the slat of the back using two thin shaped slats with a small space down the middle. I also increased the comfort in the seat by giving it more curve and angling it back. The Chinese seats were flat, hard, and parallel to the ground, which made them uncomfortable.

The design of the chair was at this point fairly successful. I felt it had some of the elements of the Chinese, but was not really an interpretation of a specific chair. The design could stand on its own without necessarily being recognized as Chinese. At the same time, it seemed to have some of the formal elegance of the Chinese chairs.

In the construction of the chair, I followed the general rules on construction in Chinese furniture. Most of the pieces in the chair come together in the same plane and are mitered together. Most of these are mitered mortise and tenon joints except at the top of the back which is mitered with a floating tenon. Both of these techniques are present in Chinese furniture. For the sharply curved piece that formed the arm rest and back, I used the double tongue and grooved half lapped joint with a locking peg. This joint was not as strong as if it had been laminated or steam bent, but it was definitely a Chinese construction technique. After doing some testing with this joint, I decided that because it seemed weak, I would thicken the area where these joints were, to give the chair sufficient strength. Also to avoid short grain, I needed to use three of these splice joints on each side. By experimenting with the angles on these joints, I was able to get the post to angle in at the top, thus giving the back a nice taper. The seat of the chair was then slot screwed

to the frame, which The Chinese would never have done. It was, however, a practical solution and the screws were well hidden under the seat.

In the chair, I continued to experiment with the results of the grain as curves are cut. In this case, the most interesting part was the grain in the seat and back. In construction of the back and seat, I decided against shaping them out of thick stock. Instead, I decided to bandsaw the profile out of the face of the board. This would give me a thin strip with the correct profile. By cutting a whole series of pieces like this across the face of a board, I could then slip match these and glue them up. Also, as I edge glued them, they were offset to give a curve across the back and seat. By picking a wide, flat sawn board with a symmetrical end grain pattern, I was able to get a symmetrical face to the slip matched seat and back. Also, the grain can be controlled by the way the curve is laid out on the board. It became a challenge to get the grain to follow the outline shape of the back and seat, and to camouflage the glue seams in the process. After some experimenting, I was able to get quite close on the final seat and back. In the rest of the chair, I was more dependent on finding the right piece of wood, since most of the curves were in one plane. Thus, the results were not as good.

For this chair I used padouk, because it closely resembles a reddish rosewood used in many of the Ming dynasty pieces at the Philadelphia Museum of Art. The cost of this wood is also considerably less that the Brazilian rosewood.

Generally, I felt that the chair succeeded in using certain aspects of the Chinese design and technique, while resulting in a more animated, contemporary chair. The only problem I felt with the chair was that the area with the splice joints seemed a little too thick. Also, the top of the back leg ended up a bit thin.

Roll-top Desk in Padouk

(fig. 16, 17)

As I set up the problem of designing a desk, I developed a number of aspects which I wanted to include. The first of these was that the desk would have the overall shape of a western secretary desk. There is no counterpart for this type of desk in the Ming dynasty period, thus limiting the Chinese influence to subtle aspects of the design and construction.

I diverged from the western secretary by eliminating the drawers under the writing surface. I also was very interested in some of the shaping possibilities of a tambour, and wanted to include a tambour in the desk. For construction I decided to use the Chinese frame and panel technique, with more curving shapes than the Chinese would have used. I decided on a roll-top desk without the traditional (western) doors above it. This simplified the overall shape, leaving the ends to bulge out, and the front, top, and back to curve inward. Up to this point I expected to use solid panels, but then noticed a photograph of a small Chinese Scroll Cupboard (fig. 18) in which the panels were not solid. Instead, they were constructed with slats, with thin spaces between them which bulged out slightly. I then applied this idea to the design by making the end and back slats in this way, but leaving the top solid for practical reasons. I also eliminated the frame member connecting the two ends, and just thickened these slats to provide enough strength. Next, it was necessary to open the tambour in some way. I decided to try to eliminate the canvas backing from the entire tambour, and just use two strips of canvas at the ends. This allowed me to taper the pieces so there would be a space between the tambours in the center.

As I was developing the aesthetic aspect of the design, I also was very concerned with the function of the desk. I started by measuring many existing desks. As my desk began to finalize, I did a mock-up of the writing surface and interior storage cabinets. The curve in the front permits the desk to wrap around the user. The curve of the interior cabinet provides more writing surface in the center of the desk where it is needed. The interior cabinet was then divided to provide spaces for envelopes and sheets of paper. There were also a few drawers for pens, etc. This interior cabinet was then left as a separate unit so it could be lifted out for dusting. The curves in the end panels and legs also gave the desk an animated look similar to the chair.

In constructing the desk, I tried to follow the Chinese technique as much as possible. Most of the joints are either mortise and tenon or floating tenon joints. In the leg, the curves were constructed with the same Chinese splice joint that I used in the chair. The tambour, which was not used in China, was done in the European tradition, with canvas and hot animal glue. In the desk I also mitered frame pieces that were flush, and simply butted those that were stepped back in. The result was more stepped back pieces which was not the case with the chair. This gave the desk a slightly more constructed look. The overall shape of the desk and chair are, however, still similar enough to form a pair.

I was generally satisfied with the desk. It was the most complex piece I had done up to that point. Generally, I felt the desk to be a little on the light side. In a second version of the same piece, I thickened many of the pieces which strengthened the desk without changing the look. The tambour was also a little tight, probably caused by the carcass being a little out of square. In total I was very satisfied

with the desk since, as with the other thesis pieces, it was elegant, formal and comfortable.

CHAPTER VII

MUSEUM COLLECTIONS

The Philadelphia Museum of Art. Benjamin Franklin Parkway, Philadelphia, Pennsylvania.

The Philadelphia Museum of Art has by far the best collection of Ming dynasty furniture I have seen. There is a sizable permanent display which includes chairs, tables, beds, and cabinets. For example, there is a large testered bed with lattice work, and a very interesting table with a game board inside. The entire area is not always open, so it is advisable to call ahead to determine a good day to visit the museum. On one of my visits, I set up an appointment to visit the Oriental curator who was in charge of the Ming dynasty furniture. She was very interested in my point of view as a furniture maker, and allowed me to handle and extensively examine the pieces in the collection.

The Royal Ontario Museum. 100 Queen Park, Toronto, Ontario M55 2C6

The Royal Ontario Museum has a good collection of Chinese furniture with several outstanding pieces. There is a good permanent display which includes two excellent examples of folding chairs. I did not have an appointment, so I only saw the collection as a regular visitor.

The Metropolitan Museum of Art. New York, New York.

The Metropolitan Museum of Art has a number of good pieces, however they do not have a permanent display. I was able to see photographs of the pieces in their library. Perhaps an appointment with the curator

might permit one to see them.

The William Rockhill Nelson Gallery of Art. Kansas City, Missouri.

I was unable to visit this museum, but have heard from a number of sources that it has one of the finest collections of Chinese furniture in the country.

The Henry Francis DuPont Winterthur Museum. Winterthur, Delaware.

This museum is primarily American decorative art, but it had a few Chinese export pieces which were of later dates. The collection of American furniture, however, is superb.

CHAPTER VIII

CONCLUSION

In the process of working on this thesis, I read extensively about Ming dynasty furniture. Perhaps more important, I was able to see and examine many actual pieces in several museums. The design and construction of these pieces is, I believe, some of the finest yet to be done.

In my own work, I was able to develop from the rosewood table, which was an interpretation of a specific type of Ming dynasty table, to the coffee table and chair, which are more distantly related to the Chinese, through to the desk which was not similar to any specific Chinese furniture, but still reflected my earlier research and studies.

The process of interpreting a set of ideas, in this case, Chinese furniture, into a separate but related new idea, is a critical part of the creative process.

LIST OF REFERENCES

Adachi, Barbara. The Living Treasures of Japan. London: Westerham Press, c Omnific, 1973.

Boyd, Andrew. Chinese Architecture 1500 B.C. to 1911 A.D. London: The University of Chicago Press, c Alec Tiranti, Ltd., 1962.

Cescimsky, Herbert. Chinese Furniture. London: Benn Bros., 1922.

Drummond, William. Chinese Furniture. New York: Intercultural Press, 1969.

Dye, Daniel Sheet. A Grammar of Chinese Latice. Cambridge: Harvard University press, 1937, 1949.

Ecke, Gustav. Chinese Domestic Furniture. Peking: Henri Vetch, 1944; Rutland, Vermont: Charles E. Tuttle Co., 1963.

Ellsworth, Robert Hatfield. Chinese Furniture. New York: Random House, Inc. 1970.

Fitzgerald, C.P. Barbarian Beds. Crambury, New Jersey: A.S. Barnes and Co. 1966.

Froncek, Thomas. The Horizon Book of the Arts of China. New York: American Heritage Publishing Co., 1969.

Kates, George N. Chinese Household Furniture. New York: Dover Publications, Inc., 1948.

Lee, Jean Gordon. Chinese Furniture. Philadelphia Museum of Art Bulletin, Vol. 58. No. 276, 1963.

Richie, Donald. Design and Craftsmanship of Japan. New York: Hardy N. Abrams.

Sickman, Laurence. Chinese Domestic Furniture. Kansas City, Missouri: Nelson Gallery of Art Atkins Museum Publications, 1966.

Stone, Louise Hawley. The Chair in China. Toronto: Royal Ontario Museum, 1952.

Thomas, Gertrude Z. Richer Than Spices. New York: Alfred A. Knopf, 1961.

Yanagi, Soetsu. The Unknown Craftsmen. Tokyo: Kodansha International Ltd., 1972.

Fig. 1 Folding Chair from the Han Dynasty

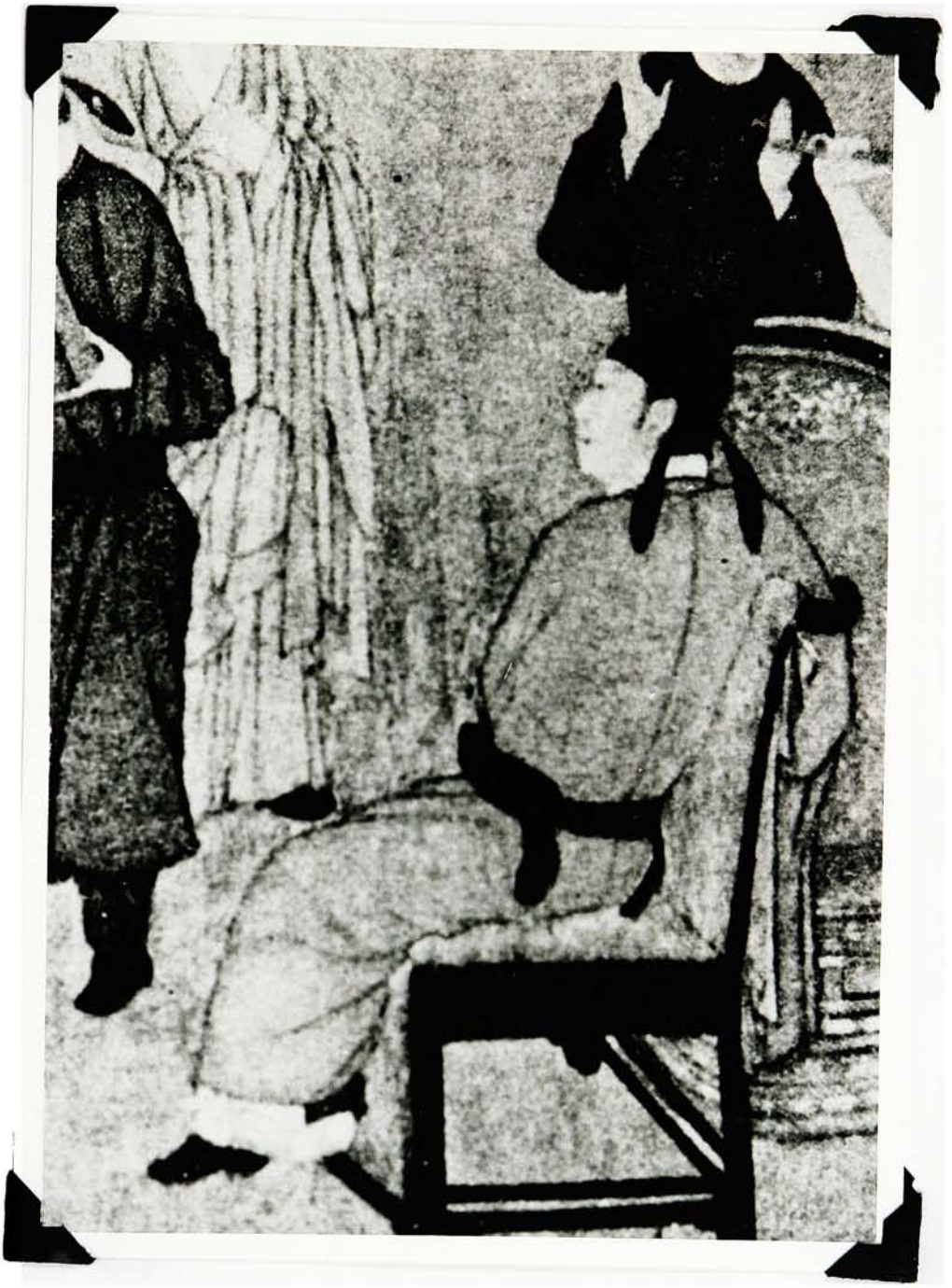

Fig. 2 Mural from the Yuan Dynasty

Fig. 3 High Yoke-back Armchair

Fig. 4 Continuous High Back Armchair

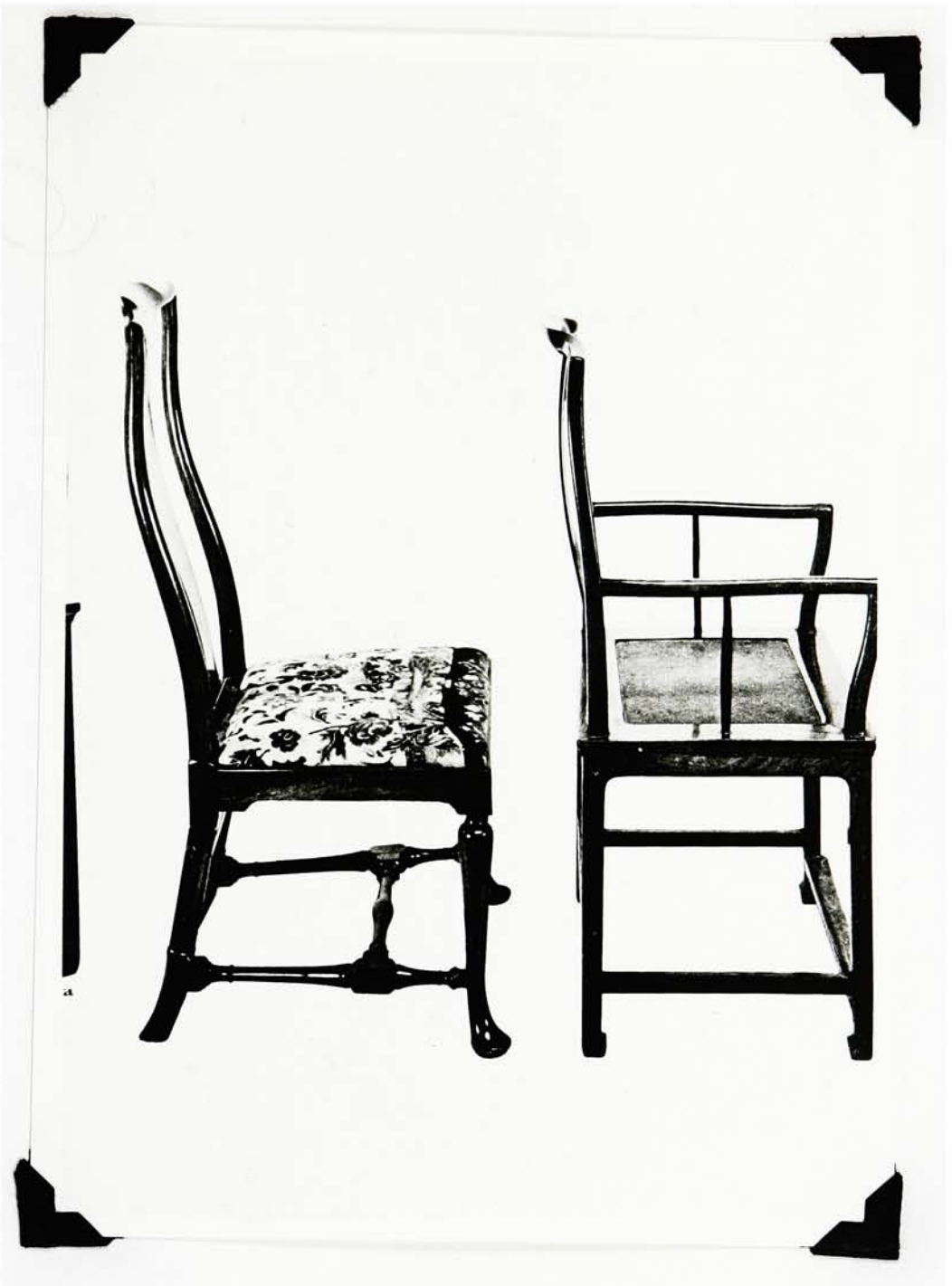

Fig. 5 Comparison of a Ming Dynasty Chair and a Queen Anne Chair

Fig. 6 Early Ming Dynasty Continuous Horseshoe Armchairs

Fig. 7 Late Ming Dynasty Horseshoe Armchair

Fig. 8 Ming Dynasty Altar Table

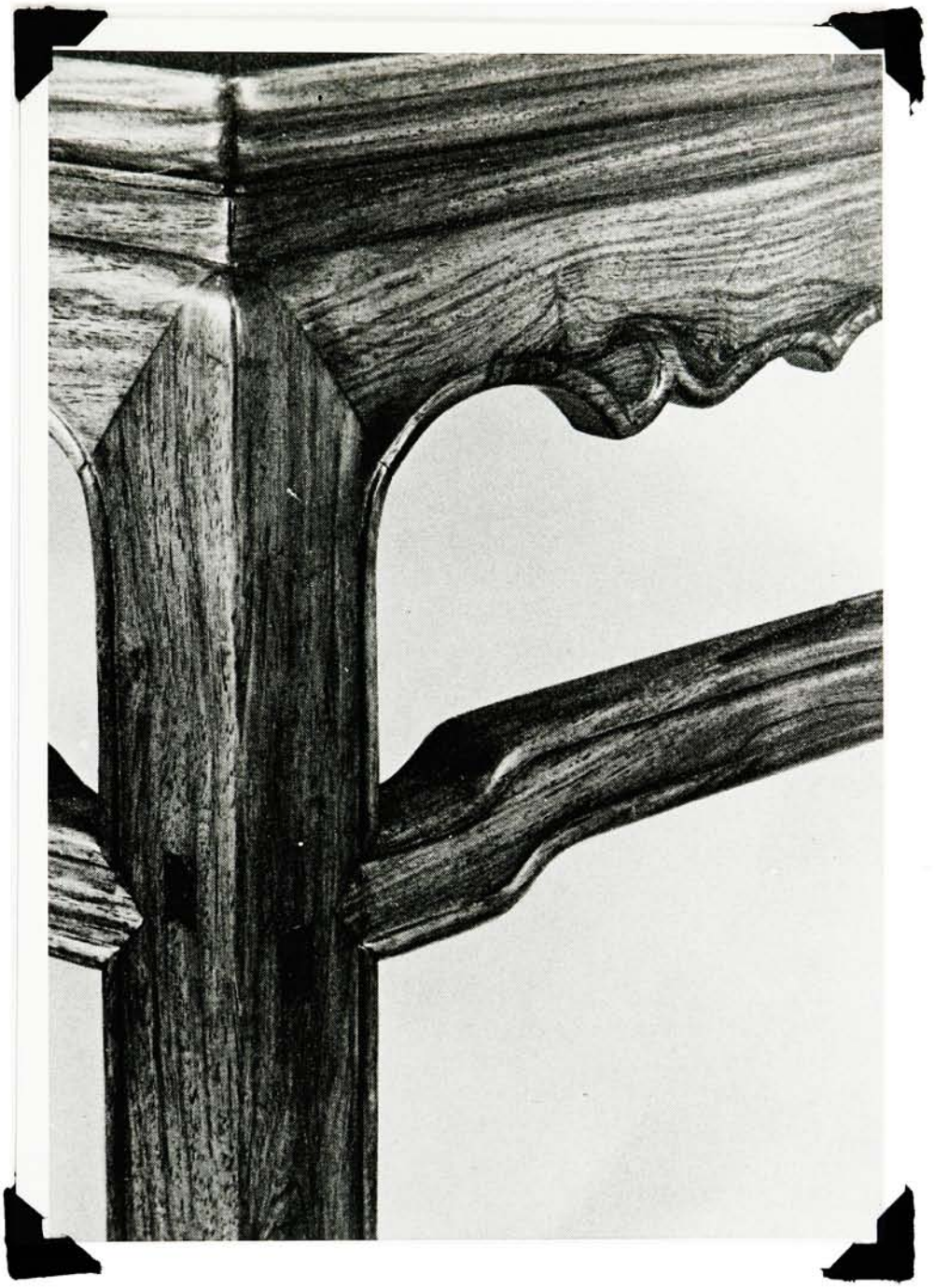

Fig. 9 Detail of Ming Dynasty Game Table

Fig. 10 Mind Dynasty K'ang Table

Fig. 11 Ming Dynasty Cabinet

Fig. 12 Rosewood Side Table

Fig. 13 Rosewood Side Table

Fig. 14 Walnut and Glass Coffee Table

Fig. 15 Padouk Chair

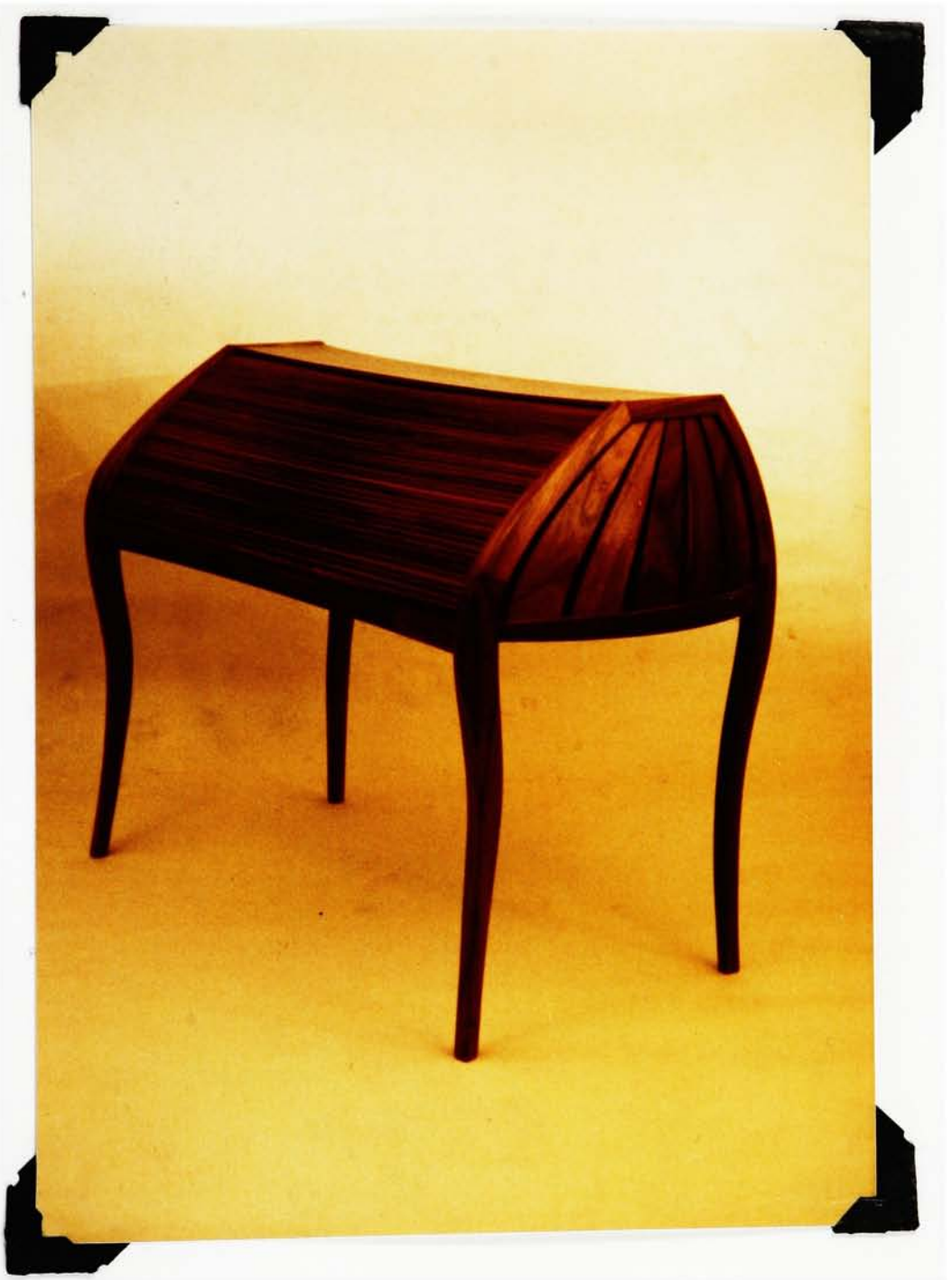

Fig. 16 Padouk Desk

Fig. 17 Padouk Desk

Fig. 18 Ming Dynasty Scroll Cabinet