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Author(s): Lisa Kronthal

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Street NW, Suite 320, Washington, DC 20005. (202) 452-9545

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CONSERVATION OF CHINESE SHADOW PUPPETS FROM THE ANTHROPOLOGY COLLECTION OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Lisa Kronthal

Abstract

Chinese shadow puppets of the East City type are traditionally cut from donkey skin that is treated to be translucent, painted with dyes and coated with tung oil. The history of the American Museum's collection of Chinese shadow puppets, and details concerning the materials and techniques used in their manufacture, are described in this paper. The tung oil coating in most collections has remained soft and tacky, resulting in extensive damages due to adhesion of elements to themselves and storage materials, and particulate dirt and fibers embedded in the coating. Preliminary research into the physical characteristics of this problematic coating is discussed. Other common damages in these collections include tears and warping of the skin and detached elements. A survey of the collection is described as well as research into appropriate materials and techniques for new storage and treatment. Silicone coated Mylar™ as a long term storage material was explored focusing on its methods of manufacture and transfer potential. For tear repairs of the translucent skin a range of intestinal lining materials including goldbeater's skin, reconstituted collagen, and natural skin condoms in combination with adhesives including BEVA™ 371, Acryloid F-10 and polyvinyl acetate resins were investigated.

Introduction

Shadow puppetry in Asia is a theatrical art form which has survived centuries to tell historical tales and myths which remain relevant to contemporary Asian societies. A comprehensive collection of 19th century Beijing, East City type shadow puppets were acquired for the American Museum of Natural History by the renowned Sinologist and ethnographer Berthold Laufer. The puppets were cut from thin, translucent skin which was painted with dyes and coated with oil. Accompanying the collection were typical items that would be carried with the figures by the itinerant performer, including musical instruments, stage props, carrying cases or trunks and screens. All artifacts were thoroughly documented and individual puppets and plays identified and described in detail by Laufer.

There are many similar collections of these East City type shadow puppets both in this country and around the world. The puppets within these collections have comparable condition issues due to the traditionally applied coating which remains sticky over time and to the inherent fragility of the finely carved skin that is prone to tears and losses. The American Museum archives contain extensive correspondence between the keepers of these collections, most of which concerns the problematic coating. There was clearly an attempt to solve these condition issues using a variety of materials and techniques. These previous treatments are no longer acceptable as they often left

individual puppets as well as whole collections irreversibly damaged.

The rehousing and treatment of ethnographic collections requires approaches and techniques which are often very different from those involved with other collections. Although the coating is problematic, its historic importance makes its removal unacceptable. Therefore, in order to preserve it suitable rehousing environments and repair techniques and materials must be developed. Additionally, collections such as these which exist to perform a function require treatment procedures which will maintain this purpose. Returning the puppets to a usable condition and preserving this state assumed priority with this collection.

Background

In 1901, Franz Boas, then a curator in the Department of Anthropology at the American Museum, commissioned the German ethnologist Berthold Laufer to travel to China for field investigation and the collection of artifacts documenting the traditional daily life of the Chinese people. These investigations continued the work of the Jesup North Pacific Expedition, launched in 1897 to research the cultures living along the rim of the North Pacific Ocean, from British Columbia to China and Japan (Stalberg, 1983).

Laufer was particularly thorough in gathering objects connected with popular performing arts, such as the puppet theater, shadow theater, and local music. He purchased the complete repertoire of a 19th century puppet master of the late Qing dynasty including musical instruments, stage curtains, dramatic texts, wax cylinder recordings of dialogue and music, and more than 1000 shadow figures. This extraordinarily complete and well documented collection has been the focus of this project.

Laufer saw increasing value in studying Chinese shadow theater since he felt it could be the origin of shadow theater around the world. He explains to Boas that many studies had come out in Germany regarding the shadow theater of Turkey, Syria, India, and Java, yet were lacking information concerning Chinese Shadow theater. He also considered the material necessary to understand the migration of Indian tales since the plots of many of the dramas and myths are Buddhist ones. It was for all of these reasons and more that Laufer studied these collections and art forms with passion and dedication.

Unfortunately he was unable to secure funds to completely catalogue the material he collected and left for Chicago's Field Museum where another large collection of East City figures exists. In spite of the fact that the notes he left were written in three different languages as well as an obsolete version of German shorthand, dedicated researchers and specialists have continued to study his writing and have learned a great deal about the collection. They have identified figures and settings, described the plays in detail, and have published their findings extensively. A summary of this research follows allowing the reader to more fully appreciate this art form which

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is unfamiliar to many Westerners.

History of Chinese Shadow Theater

There are several hypotheses concerning the origin of shadow theater. A common attribution relies on a Han dynasty tale involving the Emperor Wu Ti (reigned from 140 - 86 BC). Devastated by the death of his wife the Emperor had his magician summon her spirit so that he could be comforted by her ghost. A curtain was erected with a light behind it so that the Emperor, sitting on the opposite side could see the shadow of his dead love.

There is recorded proof of shadow puppetry's existence in China during the Sung dynasty (960 - 1278) and some scholars will push this date back to the Tang dynasty (618-907). During the Tang dynasty, papercuts were pasted on lanterns, screens and windows with the light illuminating them from behind. This created images similar to those made by shadow figures, leading many to see them as a source of inspiration. Additionally, the style and technique used in cutting the puppets is very similar to those used in the papercuts. In fact, the earliest Chinese shadow puppets known from the Sung dynasty were made of paper.

From the 11th century on, tales of battles and myths were told by itinerant entertainers. By the 14th century, shadow puppet troupes were being sent to entertain armies in distant parts of China. Later officials brought their own troupes with them to their provincial posts. During the 16th century Ming dynasty (1368 - 1644) the art had assumed an important and respected role in theater and several distinct schools of shadow puppetry emerged. The Luan-chou school in Beijing (Peking) gained fame and royal sponsorship during the late Ming. Under the Qing dynasty (1644 - 1911) two branches within this school developed known as East City (Peking) and West City types.

The Eastern school, which is the focus of the American Museum's collection, is considered the most refined of the Chinese shadow puppet schools (Figure 1). It employs very skilled, detailed carving techniques and the thinnest and most translucent skins. The puppets are carved into shapes of human figures, animals or scenery and are designed to be manipulated in front of a lamp projecting shadow images onto a translucent screen. The audience gathers on the opposite side of the screen to view the shadow performance (Figure 2). Unlike their more common Indonesian counterparts, the East City shadow puppets are cut from skin that is thin enough to allow for colored light transmittance, and the images can be seen in color. Since the puppets are held very close to the screen the colors and details in carving are all sharply in focus.

The theater incorporates elaborate props, furniture and scenery creating spectacular and complex compositions on the screen. It can depict dragons, monsters and flying immortals as well as fires, battles and bloody deaths. Since the puppets are hidden behind a screen, more complex myths and legends can be performed in shadow theater than in the other performing arts such as opera

or wooden puppetry. This allows fantastic transformations such as flight, decapitation, and other supernatural phenomena that often take place in Chinese legends to be illustrated.

Influence by Chinese Opera

Chinese opera and shadow theater are closely related and strongly impact one another. They share similar stories which cover both historic and mythological themes. Both performances are spoken and sung with the background music an integral aspect of the performance. Drums, flutes, gongs, horns and string instruments will often accompany the plays.

The puppet masters adopted painted faces, masks and costume design from the opera and also incorporated its stylized movements into the shadow theater. The articulated limbs of the East city type figures allow the puppeteers to achieve these complex movements. The masks, face painting and costumes allowed the viewer, familiar with the meanings of each color and form, to decipher the personalities of the characters in a drama.

As in Chinese opera, the characters in shadow theater are divided into four major groups. These groups include the Chou (comic actors), the Ching (male, military characters), the Sheng (scholars or officials) and the Tan (women characters who can be military, educated or servants). Immortals and supernaturals can take any of these roles (Broman, 1981). Painted faces and headdresses symbolize the personality traits or rank of the different characters. For example, a fierce and powerful general may wear a red and black mask, the red designating strength, and the black loyalty.

The style and methods used for cutting and carving the skin also help to distinguish personalities or identities (Figures 3, 4). The faces of noble gentlemen and women are usually completely cut away leaving graceful outlines of eyes, nose, lips and forehead while those of the comic actors, warriors, mythological or hell figures will most often be left solid or painted. Different styles of facial hair provide clues for male characters. A finely combed beard is appropriate for a highly respected gentleman while a more fierce character would wear a fuller beard. Costumes are also used to indicate social standing. Generally, the more detailed the carving, the more important the character. Lower class characters are depicted wearing very plain unembroidered and therefore uncarved garments (Figure 5). The costumes of officials and generals are elaborately carved and painted to represent the lavish embroidery that covered their clothing (Figure 6). These distinctions would have allowed the audience to remain completely aware of the hierarchy of the actors on stage.

Like opera, the shadow theater performances combine the spiritual nature of the stories with activities of daily life forming an important link between these worlds. Aspects of the Chinese Buddhist spiritual universe, including the layering within heaven's kingdoms and hell's law courts, are commonly depicted in the shadow theater. The Laufer collection includes many depictions of

punishments in hell, such as criminals being sawed in half or victims writhing in kettles of boiling water (Figure 7). The agonized and tortured expressions of the characters are profoundly depicted in these simply carved figures (Figure 8).

Technology and Manufacture

The construction of a shadow puppet begins with soaking a hide, traditionally donkey, in water and then stretching it on a frame. The wet skin is rubbed and scraped, first with a stone then with bamboo until it is thinned to translucency. Often, the hide of a young animal or a hide which has been split or skived is used for parts of the figures which require greater translucency. When thicker skins were needed sheep or cow was used.

The outline of the figure is traced or drawn freehand onto the skin, usually by incising, and is cut out using chisels or knives. Most of the puppets depict human figures and are composed of eleven parts. For less important figures, the legs, torso, and even head may be cut from one solid piece of hide. These characters are not required to express individual personalities and therefore do not need to make the range of movements obtained with the more complex articulated puppets.

As mentioned, different parts of the puppet body are made from different sections of the hide. Traditionally, the skin from the belly of the donkey is employed for faces and upper body parts while thicker sections are more appropriate for the feet, legs and torso. The thinner skins of the faces allow greater light transmittance creating a sense of illumination while the weight and rigidity of the thicker skins in the lower body keep the puppet balanced and stable. Often tiny lead plates are attached to the bottom of the pant legs to obtain greater balance. All skin parts are cut parallel to the grain of the hide to reduce warping.

The puppet maker cuts the base of the puppet legs and arms, where they meet the torso, into shapes like spoked wheels. These radial cuts prevent a large, dark spot from appearing on the screen when the parts are overlapped and light is transmitted. Silk or cotton string holds the parts together and occasionally metal wire is used to reinforce separate parts. The heads are not attached permanently. Instead, they fit into a collar of parchment allowing the character to change costumes in the middle of a performance. Often many heads are needed to show the changing status and emotions of a single character in the course of a play. This construction also allows decapitation, a frequent mode of execution, to be convincingly portrayed. Iron alloy wires with bamboo handles were attached to the figures for manipulation by the puppeteer.

Traditionally, the skin was painted on both sides with vegetable dyes. Later, synthetic dyes and paints were used. An application of oil, usually tung oil, was applied in order to saturate the colors resulting in a more vivid projection as well as greater transparency. The coating was periodically reapplied by the puppeteer as part of the regular maintenance procedures for his

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collection.

Condition - Inherent Instabilities

Structural instabilities throughout the collection are mostly related to the manufacture of the puppets, specifically their thinness and intricately cut designs. Common damages resulting from this inherent vice include tears of the skin, warping, and detached elements. It was common for the puppet master to manufacture his own figures and to regularly restore damaged figures. Therefore, before treatment a clear distinction must be made between ethnographic and modern interventions. Ethnographic repairs in the Laufer collection include sewing, pinning and patching with skin. These repairs have historic importance and should be preserved if possible. Modern attempts at restoration include applying transparent, pressure sensitive tape to tears and using paper clips to connect detached elements. Repairs which were carried out after the puppets have left their original context should be removed and redone using more appropriate materials or techniques.

The tung oil coating has been the main culprit when considering condition and preservation issues within many shadow puppet collections. In the American Museum collection, old storage conditions in hot, humid environments aggravated these problems. Puppets were piled into shallow trays and were found stuck to adjacent puppets, to storage materials like brown Kraft paper or to plastic bag enclosures (Figure 9). Correspondence with other institutions indicates that this sticking problem was of widespread concern. One letter written to American Museum restorers in 1974 reads:

We own a large collection of shadow puppets made of traditional "parchment", dyed with bright colors, and then coated with a shellac-like substance. The problem lies with the latter material which in time, has become tacky and sticky and adheres to whatever guard sheet we lay between the images. We've not been able to find a solvent which can remove the sticky material without removing the color (AMNH archives, 1974).

The response to this inquiry suggested either complete removal of the coating using MEK or 'if one wanted to preserve the coating then application of Butcher's wax would act to prevent sticking'. The collection was treated by soaking the artifacts in baths of MEK removing the coating entirely along with much of the originally applied colors.

Correspondence with a European institution describes a different approach. In their case, it was realized that removal of the coating would cause irreparable changes. So instead, paraffin was applied directly to the surfaces in an attempt to reduce the sticking. Unsatisfied with the results they then rubbed all surfaces with Vaseline (petroleum jelly). In their letter they state with pride, "now the certainty exists that the valuable collection is no longer in danger".

These previous approaches to the problematic coating either attempted to cover it with another material or to remove it all together. Both of these options are unacceptable. Instead, a less intrusive treatment involving upgrading storage conditions and developing treatment procedures compatible with these inherently fragile and sticky artifacts needed to be developed.

Tung oil

An investigation into tung oil and its drying properties offered some help in understanding the troublesome surface treatment. Most sources that have been referred to concerning Beijing shadow puppets describe tung oil as the primary coating material. Several oil samples were removed from puppets in the collection representing the range of oil types found on the puppets distinguished by their surface characteristics. All samples were positively identified as tung oil using FTIR and GCMS.

Tung oil, also known as Chinese wood oil, is obtained from the seeds of the fruit of *Aleurites fordii*, a tree which has grown in China for centuries. The native method for separating the oil involves roasting the seeds over a flame and grinding them with stones or wooden presses. A cold-pressed version of the oil called 'white tung oil' is light in color and is mainly exported. The hot pressed oil has a very dark color and is called 'black tung oil'.

Tung oil contains a large proportion (75 - 85%) of eleostearic acid, a stereo-isomeride of linoleic acid, the acid found in linseed oil. These acids contain two unsaturated double bonds, a property which gives an oil its drying property. However, under normal temperature and humidity conditions it takes tung oil approximately thirty days for a full gain in weight or for drying to be complete, distinguishing it as a slow drying oil. In fact, tung oil is not recommended as an artists material since it requires extensive processing to dry to a satisfactory level.

Under humid conditions the oil will dry more rapidly with a resulting film which is wrinkled, cracked or reticulated. This drying rate increase in moist air is not 'drying' in the usual sense through oxidation and polymerization as the full weight gain is still not complete, but is a colloidal change in which moisture acts as the coagulant (Gettens and Stout, 1942). The reticulated surface texture of the coatings on the puppets is common and could have resulted from application and 'drying' in a humid environment.

Preliminary examination by FTIR and SEM/EDS on the puppet coating has not found any additional ingredients which may have facilitated a drying process, i.e. metallic driers. At this point it remains unclear whether these additives would have been detected using the analytical equipment that was available. An interesting differential drying phenomenon was observed throughout the collection. The oil appears to dry to a harder, less tacky state in blue and green dyed areas and generally remains soft and tacky in red, orange and unpainted areas. Apparently,

the blue and green dyes may contain elements or mordants different from those used within the other painted areas and could be acting as driers when in contact with the oil. Further research focused on the composition of Chinese dyes and oils used in the 19th century and appropriate techniques to separate and identify these materials needs to be carried out to understand this phenomenon more completely. However, the preliminary investigation seems to indicate that the inadvertent inclusion of driers in some areas helped the oil to form a more stable coating, which could have been achieved overall if the original oil was modified before application.

Rehousing - Silicone Mylar™ Investigation

Since the oil is ethnographically important and cannot be altered or removed, choosing appropriate and compatible storage materials for rehousing is a priority. Several attempts at creating safe housing for the collection were undertaken in the past. In spite of good intentions, these campaigns have complicated storage and condition issues. A variety of materials were used as interleaves including silicone release paper, acid free tissue, brown Kraft paper, Mylar™ and plastic. The puppets stuck to all of these surfaces. Requirements for the new storage environment included controlled temperature and humidity conditions as well as storage upon a surface which is non-stick, non-reactive and non-textured. We considered vertical storage, Teflon™ surfaces and silicone Mylar™ surfaces. Vertical storage was found to be impractical due to space considerations and Teflon™ was too costly. This left silicone Mylar™ as the only safe and practical choice. The slick, smooth surface would inhibit future sticking. The only shortcoming of this material is that there may be some transfer of glossiness (burnishing) with time to the side of the puppet in contact with the slick surface due to the softness of the coating.

It was inadvertently found that the silicone coating on the Mylar™ that was on hand in the lab was not permanently adhered to its substrate and was readily removed by a range of solvents. For long term storage, such qualities were unacceptable. The eventual loss of the non-stick properties of this material when in contact with the soft oil seemed too risky.

While researching the variety of technologies involved in the manufacture of the product several interesting facts were found. Many companies purchase the raw Mylar™, using either Dupont Mylar™ A or D, and apply the silicone coatings. Due to issues of propriety, the coating companies were hesitant to describe in detail their application and/or polymerization techniques. A representative from Custom Coating and Lamination, a Massachusetts based company described several polymerization techniques that could be used. The major ones involve UV or heat curing technologies. Conflicting opinions from the suppliers concerning the effect these processes have on the final physical qualities of the coating was common. Several representatives claimed that if the film is polymerized it should not be possible to remove it, while others claimed there are varying levels of transfer of the coating to whatever material is laid upon it, the UV cured coatings transferring the least and the heat cured coatings having a higher possibility of transfer. Additionally, the heat cured techniques allow for a wide range of release levels while

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the UV cure is less flexible in that respect. Requirements for the storage surface for the shadow puppets included a film with a low transfer potential and medium or high release levels. A coating company named Douglas Hanson uses a UV activation polymerization technique which results in a product which meets these requirements. Both Conservators Products and Talas distribute this product.

Rehousing the collection involved preparation of each shelf by lining first with acid free corrugated board and then with the Douglas Hanson silicone Mylar™. Puppets were laid onto the silicone Mylar™ surfaces and pinned in position through pre-existing holes in the carvings with map pins that had been coated with an isolating layer of B-72. The B-72 should protect the steel pins from organometallic corrosion which could develop through contact with the acidic tung oil coating.

Treatment

During the rehousing, a survey of the entire collection was conducted in order to prioritize each puppet by its relative need for treatment. The survey results were entered into a database created specifically for the collection. It was found that over three hundred of the approximately 1500 puppets were considered priority one and most in need of treatment. These puppets often required a combination of the following; removal of old storage materials stuck in the coating, mending of tears within the skin and/or reattaching separated elements.

Solubility tests on the coating revealed that it was soluble, in varying degrees, in a wide range of solvents. Acetone and ethanol solubilized the coating readily, toluene, petroleum benzine and xylene moderately and Stoddards minimally. In most cases, the storage papers were saturated by the coating so that their removal would involve some loss of coating. The goal in removal of the storage materials from the puppet surfaces was to retain as much of the original coating as possible along with its original, reticulated texture. By wetting the papers with Stoddards, a scalpel could be inserted at the interface of the coating and the paper and, in most cases, the paper could be removed with minimal loss of oil. The Stoddards appeared to function mostly as a lubricant enabling separation of the layers while retaining the original surface texture of the coating.

The goals in mending were to find a combination of materials that were compatible with the skin and oiled substrate and would maintain the transparency of the skin when viewed through transmitted light or as a shadow. A variety of materials were considered for repair of tears including gampi papers, oiled papers, goldbeaters skin, natural skin condoms, and sausage casings (reconstituted collagen). The papers were eliminated as an option for many reasons including differential aging of the paper in contact with the acidic skin and oil, dimensional incompatibility and visual inconsistencies.

The collagenous materials were given primary consideration due to their visual and chemical compatibility with the skin substrate. A discussion on the Conservation Distribution List concerning reconstituted collagen as a mending material outlined relevant issues concerning the use of sausage casings in conservation. In summary, the preparation of the collagen in manufacturing a casing involves reducing bits of animal skin in hydrochloric acid, spin extruding the gelled product, bathing in aluminum sulphate, buffering, and adding plasticizers, consolidants and tanning agents. These steps, especially the acid preparation, reduce the length of the collagen fibers resulting in a product that has a very short shelf life and becomes quickly embrittled upon removal from the package (Conservation Distribution List, 4/16/97). Requirements for a stable, flexible mend led to the elimination of this product as an option.

The natural skin condoms were more promising. The intestinal material used in their manufacture comes from the caecum of the large intestine of sheep or lamb. The processes involved in its preparation include trimming and defatting of the skin, soaking in salt solutions, addition of surfactants, light tanning and coating with a lubricant which can be removed with acetone or ethanol. There is no acid preparation involved as maintenance of strength and endurance are crucial requirements for such products. Unfortunately, for use on the puppets, the final product is too thick and does not lead to visually acceptable results but may be useful for other types of mending which require more thickness or strength.

It was concluded that goldbeater's skin resulted in successful mends that were strong, unobtrusive and transparent. Talas supplies sheep appendix gold beater's skin but other suppliers will carry skin made from the caecum of intestinal material. Before use, it must be degreased using acetone and its surfaces lightly abraded with pumice to reduce unevenness. The final product is much thinner and more transparent than any of the other considered products. It can be toned with dyes in order to achieve desired colors while maintaining translucency. Orasol™ dyes in ethanol were used for this purpose.

Several adhesives in both film and solvent form were tested in conjunction with the goldbeater's skin lining. Requirements of the adhesive include compatibility with the skin, the coating and the lining material, as well as long term stability, transparency, and flexibility. Included in these categories were BEVA 371™, polyvinyl acetate resins and Acryloid F-10. After a number of trials it was found that the F-10 and PVA resins both had difficulty attaching to either the oily skin or the goldbeaters lining material. Additionally, they seemed to lack the strength required by some of the mends. BEVA 371 in solvent form or as a reactivated film adheres best to the coated skin and the lining material while also maintaining the strength and integrity required of the mend. Future monitoring and research into the aging properties of BEVA when used in this acidic environment will be undertaken.

Before applying mending materials, the oil in the mend locations was reduced. Since the oil penetrates into the porous skin it is impossible to remove it completely. If necessary, the area to be mended can be relaxed into position using controlled humidification techniques and dried under

pressure. Often, both sides of a tear will need the reinforcement offered by the mending materials. A tinted varnish can be applied to the surface of the mend if necessary. The final mended tear is strong, clear and flexible (Figures 10, 11).

Conclusion

The rehousing, survey and treatment of the Chinese shadow puppet collection demanded resolution of conservation issues which, while focusing on ethnographic artifacts, can be applied to a wider variety of collections. Preservation of the original function and composition of the puppets was considered paramount and treatments were developed to accommodate the challenging materials which compose them. These treatments were customized for a large scale collection which is often the focus of research and exhibition.

In pursuing an acceptable approach to the needs of this collection, the author was granted the opportunity to research the history and technology of shadow puppetry in China. Simply understanding the importance of color and form within the figures was a determining factor in their subsequent treatment. Investigations into past treatments created focused awareness on the detrimental results these efforts can have. This accumulated knowledge concerning a wide range of issues allowed for the development of a sensitive and appropriate approach to storage and treatment.

Epilogue

In the 20th century, especially between 1920 and 1970, shadow puppetry went through dramatic transformations. Plastic sheets replaced the fine leather puppets and synthetic colors supplanted the natural dyes. Combined with cruder cutting techniques, the effect was cheap and represented a sad departure from the tradition of the elegant, older shadow puppets. Communist ideology became a dominant theme in shadow troupes so that content within the dramas changes as well.

After the Cultural Revolution (1966-76) ended village troupes again began performing old dramas, using puppets that were one hundred to two hundred years old (Berliner, 1994). Even with this rebirth, the popularity of this theater has suffered in the shadow of modern film and performance. An interview with an old shadow puppeteer in Beijing in the 1930's concerning the state of the theater reveals his beliefs concerning the future of shadow theater in China:

We produce no plays in terms of present day life. Those who love the shadows, it seems, love also the glorious past. Young people and women are now going to theaters and motion pictures. Only four companies are now operating in Peking, all in the hands of white headed old fellows like myself. I have no son to succeed me and I have no pupils to continue the old traditions, to make my shadows dance when I am gone (Wimsatt, 1936).

Acknowledgments

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Materials list

Silicone Mylar™:	Douglas Hanson, P.O. Box 528, Hammond, Wisconsin, 54015, (800)525-2400 Conservators' Products, Co., P.O. Box 411, Chatham, New Jersey, 07928, (973)927-4855
Goldbeater's skin	Talas, 568 Broadway, #107, New York, New York (212)219-0770
Orasol dyes	Conservation Support Systems, P.O. Box 91746, Santa Barbara, California, 93190, (800)482-6299

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Author's Address

Associate Conservator, Anthropology Department, American Museum of Natural History, Central Park West at 79th Street, New York, New York, 10024.



Figure 1. Shadow figure, Beijing, East City type.

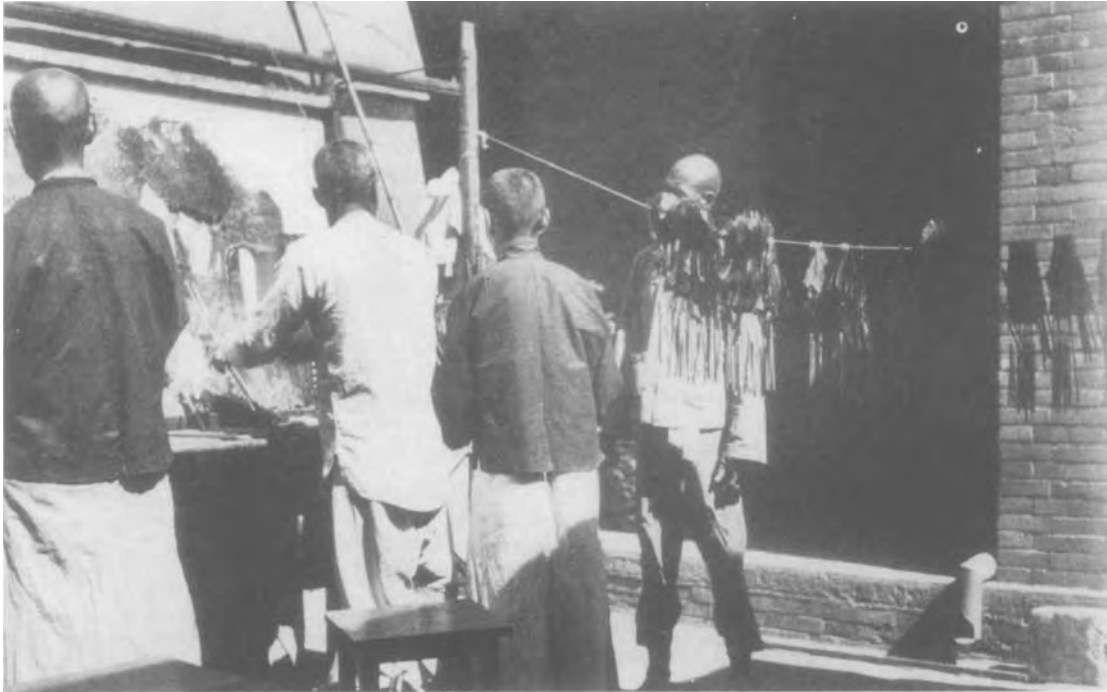


Figure 2. Shadow puppet performers.

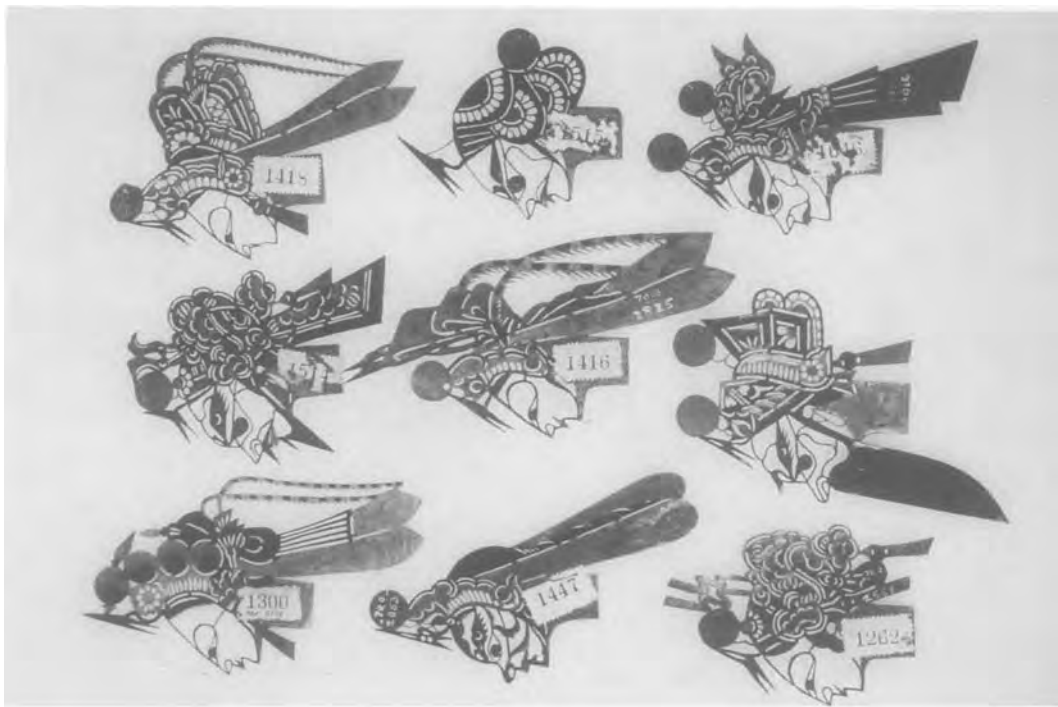


Figure 4. Heads, Beijing, East City type.

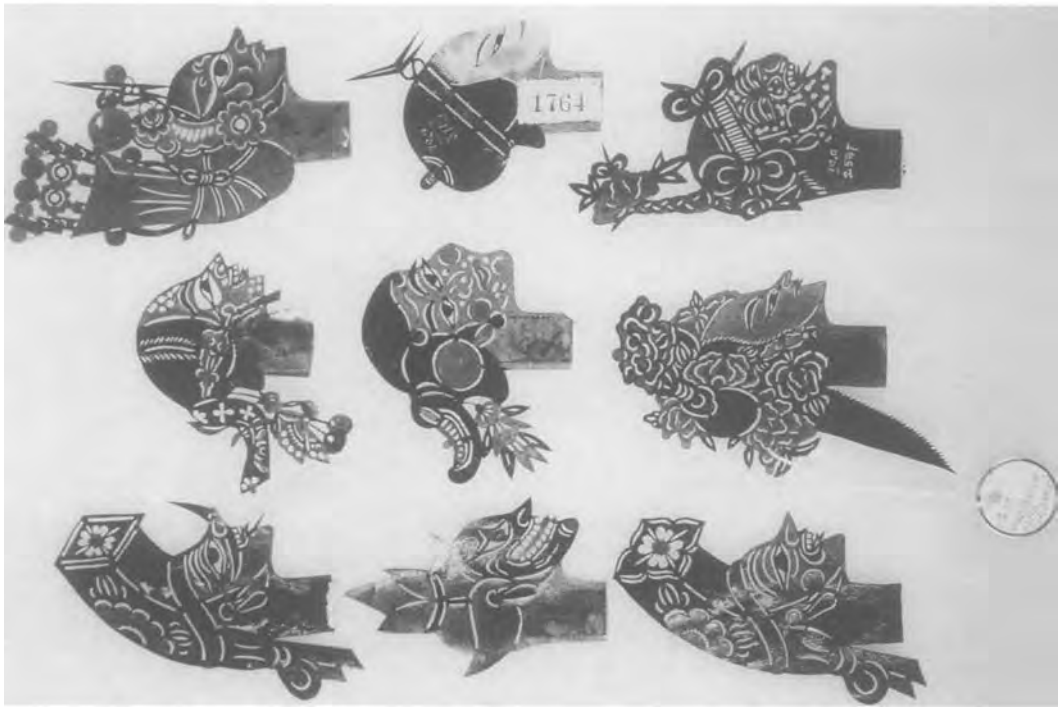


Figure 3. Heads, Beijing, East City type.



Figure 5. Shadow figure, Beijing, East City type.

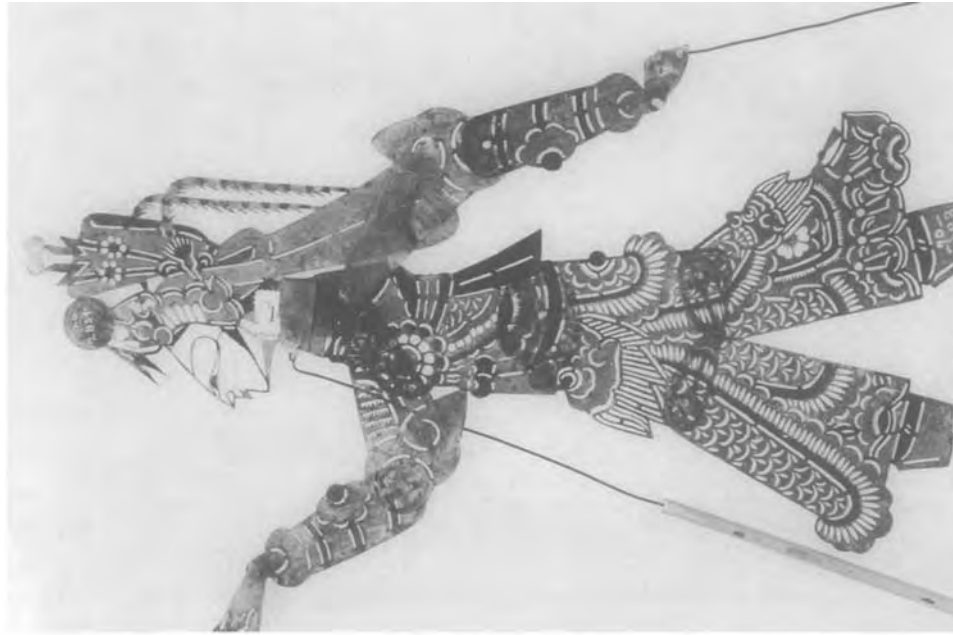


Figure 6. Shadow figure, Beijing, East City type.



Figure 8. Shadow figures, hell characters;
Beijing, East City type.

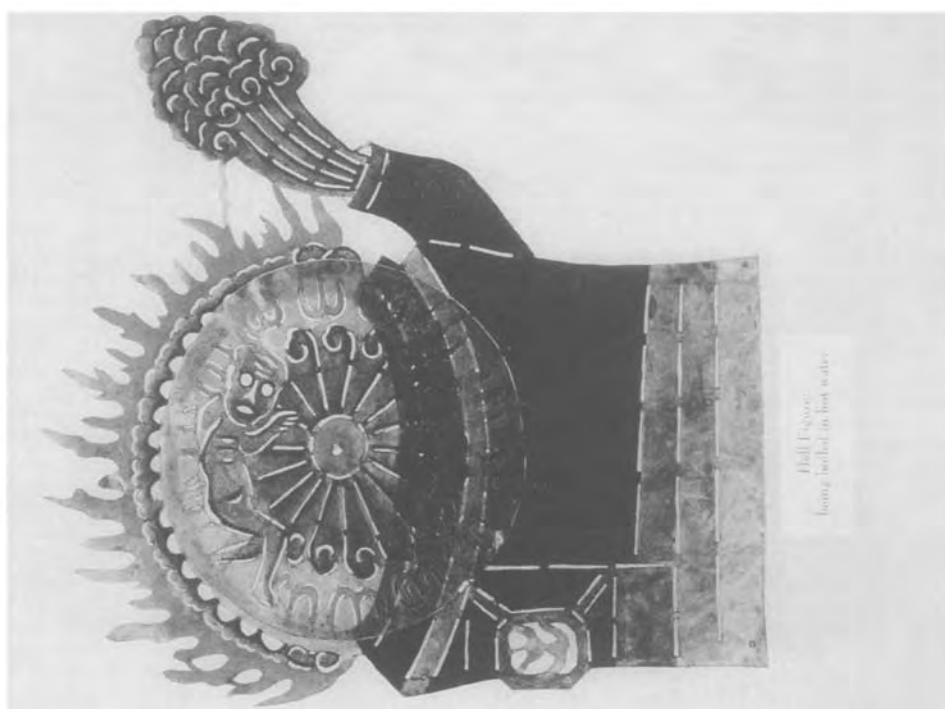


Figure 7. Shadow figure, hell character in kettle of
boiling water; Beijing, East City type.



Figure 9. Old storage of Chinese shadow puppets at AMNH.