SWORD MAKING

# THE TO-KEN SOCIETY OF GREAT BRITAIN

for the Study and Preservation of Japanese Swords and Fittings

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PROGRAMME 90

JANUARY - FEBRUARY 1976

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FORTHCOMING EVENTS

March Meeting: 1.3.76 - A general discussion on blades led by Victor Harris.

April Meeting: 5.4.76 - A tsuba evening, bring what you have along and we'll talk about them.

April 24th & 25th: - To-Ken stand at the Royal Lancaster Hotel, Arms Fair. Come and support the Society and maybe you'll be able to buy that Juyo sword in Shin-Gunto mounts that is still 'sleeping'.

May 23rd: - To-Ken stand at the Bedford Arms Fair, County Hotel, Bedford. Starts at 10.00 a.m. and your support will be appreciated.

May Meeting: - We hope to have Mr. Ronald Knutsen talking about his experiences in Japan, and giving us a Batto (close sword) demonstration, but this still has to be confirmed.

June Meeting: - Mr. Kazoo Iida will be visiting London with 30 Japanese experts and will be attending, lets make their visit worthwhile and show them some good pieces.

Both of the above Arms Fairs are one of the few opportunities of the Society to show its face to the world. I hope that as many members as possible support both Fairs, if only to show their faces at the stand, and buy drinks for the 'minders'.

The January meeting took the form of a discussion on the various forms of Koshirae. I got the ball rolling, and I am pleased to say that everyone became involved and had something to say. Rather than repeat what happened then, what follows is a hitherto unpublished paper by Clement Milward, kindly supplied by Malcolm Kesson :-

# STYLES OF THE MOUNTINGS OF JAPANESE SWORDS

## Part 1 - The Long Sword

Although there is considerable European literature on Japanese sword furniture, no one has so far described the different types of complete mounting, or as the Japanese call it Koshirae, the term applied to the entire assembly of the handle, stabbard and fittings; in fact the whole sword with the exception of the blade.

Basically there are two types of swords, long and short. The long swords are either Katana or tachi, according to the side of the Nakago (tang) on which the signature appears. When in Shira-Saya (the storing scabbard) the blade would be correctly named, but a long blade could be mounted as a tachi for court wear, or as a katana for war or everyday usage. The sword would then be described according to its mounting, and it is by no means uncommon to find a tachi blade mounted as a katana or vice versa.

Katana and tachi blades have a minimum length of $26\frac{1}{2}$ inches, while the average is about 28 inches. In 1603 a law was passed prohibiting the wearing of swords over $31\frac{1}{4}$ inches, but with time this edict fell into disuse, and long blades were again worn.

The archaic forms of mountings such as have been found in Dolmen burial grounds, and of which a very few examples still exist in temple treasures, are outside the scope of this article, with perhaps one exception - the Ken. This is the only Japanese, straight, double edged blade, and reproductions of it are frequent in Japanese art, as it is Bishamon's sword. It will be familiar to sword collectors in Horimono as the Amakuriken, with the dragon twining round it. Actual examples, may occasionally be met with, but they are of course, modern copies, sometimes of excellent quality in both blades and mounts.

In early times the fighting sword was called Tachi, but at the end of the Kamakura period (1346) this term came to designate the sword worn at court. Tachi are worn slung from the waist with the cutting edge downwards whilst the Katana, or fighting sword, is thrust through the Obi (sash) with the cutting edge uppermost.

There are two types of Tachi Koshirae or court swords and the main differences are readily recognisable. The first has the guard in the same place as the blade and is called Efu-no-tachi. This is the traditional Tachi worn by nobles and court guards (Efu) at the Imperial Court in the Kamakura period (1100 - 1346). The second type has the ordinary discoid guard and is known as Itomaki-no-tachi, or cord bound sword, from the binding at the top of the scabbard. This was the ordinary fighting sword of the Kamakura period, and sometimes the hilts were unbound and just plain Same, or else bound in the normal manner. This type of Koshirae presents very little variation, except for the colour of the Sageo (cord) and the number of rings on the scabbard, these features being governed by strict court etiquette.

Another type of Tachi Koshirae that shows more variables is the Tori-Kubi-Tachi. In this type the pommel is in the form of a bird's head and, although copied later, were originally worn by court falconers of the Kamakura period. The Tsuba is usually en-suite with the rest of the mounts but one sometimes finds an early iron Tsuba. The hilt may be lacquered and have metal plates on the sides and the scabbard itself may be of two different types and colours of lacquer. Usually these variants are wholly or partly copies of early Tachi-Koshirae.

At the beginning of the Oei period (1394) these Tachi mountings ceased to be worn for everyday wear and became reserved for the ceremonial dress at court, under the name of Kazari-Tachi or decorative swords. The fighting Koshirae became the Katana which was worn, as previously mentioned, through the Obi with the edge uppermost.

Before dealing with the Katana, it is perhaps worthwhile considering the age of the actual Koshirae of the mounted swords one finds. To the Japanese, the important things are the blades, the metal mounts (Kodugu) and the Tsuba. The actual scabbard and hilt are of minor significance, although they had to be immaculate in wear, any damage resulting in them being scrapped. Thus, though the blade and its fittings may be of great antiquity, the Koshirae "in toto", is seldom older than the nineteenth century. Another factor is that the blades were kept in Shira-Saya and the Koshirae held together by a wooden blade (Tsunagi). A treasured blade might have several sets of Koshirae so that it could be mounted as occasion demanded, for everyday use, as a Tachi for court wear, and possibly as an ornate set for special occasions.

The essential parts of the Katana Koshirae may be said to be a blade exceeding 26½ inches in length, a wooden scabbard covered with lacquer, and having a Kurikata through which the Sageo (cord) passes; a Tsuba; and a grip with a cord, thread, or leather binding. The Katana, as covered by this definition, is capable of an infinite variety of decoration, in both the scabbard lacquer and metal mounts. It is likely, however, that the very ornate mountings are mostly nineteenth century in origin and would not have been worn by the Samurai, but by the Daimyo, the rich merchants and the professional classes.

The standard Katana has few slight differences in actual form and details. The scabbard mouth, Kurikata and Kojiri (scabbard tip) are usually of horn but are sometimes metal decorated en suite with the rest of the mounts. Occasionally one finds a small hook about halfway down the scabbard and pointing towards the hilt. This is called Saguri, and is to hold the scabbard in the Obi when drawing the sword. Another feature sometimes found is a small scabbard built into the sheath to carry the Kogai, in the same manner as that found in the Wakizashi. These are less common, and in the examples the writer has seen, the majority have been mountings of the second half of the nineteenth century. So until some explanation has been given by a Japanese authority, one cannot give a reason for its presence in a Katana.

A markedly different type of Katana Koshirae is that known as the Han-Dachi, or half Tachi. This is to all intents and purposes a Tachi Koshirae as far as the scabbard mounts are concerned, except that the hanging rings have been replaced with a Kurikata, showing that it is worn Katana fashion, through the Obi.

Our last Katana mounting is that known as Chisa-Katana. This mounting worn by the merchant and professional classes such as doctors, tea ceremony experts and possibly lay court officials, but never by Samurai. The blade may be Katana in length, but is usually Shoto (short sword) under 2 feet in length, having a Kurikata, it is worn Katana fashion and often has Kogai on the side and, more rarely, the companion Kodzoka, though the writer has seldom met with an example having both. The Tsuba may be full size, but usually its diameter is smaller. The hilt is often completely bound in cord or leather, or even lacquered en suite, with the scabbard and sometimes there is a band of metal with a circular inset design known as a Doganc. These are "probable" features of Chisa-Katana Koshirae, but one that is almost inevitable is that both the tip of the hilt, and the tip of the scabbard, are pointed, sometimes as long as three inches. These pointed tips are a constant factor of the Chisa-Katana mounting.

We have considered the Katana as a single sword, but it is most often met with as the long sword of a pair. This pair were known as a Daisho, Dai - long, Sho - short. The wearing of the Daisho was the privilege of three classes :- the Kuge (nobles), the Daimyo and the Samurai or warrior class. Indeed in 1614 these three classes were compelled to wear the two swords, no more, no less. Usually the Daisho were identically mounted throughout, that is to say scabbards, metal fittings and Tsuba. There is, however, one divergence in these identically mounted pairs and that is in the shape of the scabbard tips, that of the Katana being square and of the Wakizashi being rounded. This is usual but not inevitable. The Wakizashi carries one or two built-in sheathes for the Kogai and Kodzuka, but it may not have either. One recent Japanese writer, states that the Kogai was carried in the Katana and the Kodzuka in the Wakizashi. However, the writer has never met such an example nor seen one illustrated in any books or catalogues of Japanese sword collation, so this statement may well be a mistranslation. One particular Koshirae is worthy of remark; this is when the Kashira is of plain black lacquer, horn or Shakudo, whilst the Fuchi, Kodzuka and Kogai are decorated in either a very restrained manner or with the owner's Mon alone. Sometimes the Tsuba of such a Koshirae are en suite and on others are plain black Shakudo like the Kashira. This style of mounting was worn on the occasion of the annual visit to the Shogun.

The last long sword Koshirae is the military mounting, as used in the recent war. Most frequently met with are the warrant officer's, in which both the scabbard and hilt are of metal; the former painted to imitate leather while the latter is a stamping imitating a cord bound hilt. These blades are machine made, and as such are of no interest. The other type is the officer's mounting, used either with an old family blade or a modern blade, as the case may be. The scabbard is often the one belonging to its pre-war mounting, but enclosed in a leather covering for war service. The

hilt is bound with a coarse modern brown cord, and the Fuchi, Kashira and Tsuba may be either a regulation brass set, decorated in low relief with cherry blossoms, or occasionally an old set, usually iron. In most cases the Kurikata has been removed and a ring attached on the back edge of the scabbard, at about the same level, so the sword is in essence, a Tachi Koshirae.

Thus the three mountings, Tachi, Katana and Chisa-Katana cover the Koshirae of the long sword - Daito.

## Part 2 - The Short Sword

In the preceeding part the writer has described the Koshirae or complete mountings of the long sword - Daito. The remaining Koshirae are those used to mount the blades called Shoto (short swords) of between one and two feet, and the Tanto of 12 inches or under. This classification is an exact one, but both modern and ancient writers on the sword use the names indiscriminately. Perhaps the most usual of the Shoto Koshirae has already been dealt with, namely the Wakizashi, as the companion sword of the Daisho. Companion sword is a very satisfactory name for this weapon, for etiquette forbade that the long sword should be brought into the house or room, and it would be placed on a rack, but the Wakizashi was always worn, at least by the Samurai.

After the Kamakura period (1396) the Wakizashi was not always mounted in similar Koshirae to the long sword and in such circumstances perhaps the most favoured mounting was that of the Aikuchi, which was also used in pre-Kamakura days. This may be of almost any materials, with or without Kogai and Kodzuka, and mounting blades of either Shoto or Tanto length. One feature alone identifies the mounting as Aikuchi, and that is the absence of a Tsuba. One Koshirae fairly frequently met with, has no metal fittings and was worn with civil dress; the lacquer is usually plain but sometimes decorated, it is called Dashizane Koshirae.

In pre Kamakura times nearly all short swords were designated Tanto, and indeed Tanto and Aikuchi were largely inter-changeable in the Kamakura period itself. The only other type of Koshirae without a Tsuba is the Kwaiken. This always mounts a true Tanto blade of 12 inches or less, and almost invariably the scabbard and hilt are of the same material, usually lacquer. The Kwaiken is a woman's dagger and in most cases the Kurikata is a hinged ring and not a fixed projection.

It is not unusual to meet with short knives mounted in a similar way, the blades often being as short as 5 inches. These are not Kwaiken, but are the mounting of a small general purpose knife. In many cases the scabbard and hilt are finely lacquered or are of carved wood, in the latter case, occasionally by well-known Netsuke carvers such as Minko and Masa-Nao.

These small knives are carved with a single edge, but there is a term Ka-Kushi used to describe a pocket Ken (double edged blade). As no description is given as to its mountings, it is not unlikely that it is similar to the above.

The remaining short bladed Koshirae are all fitted with Tsuba, and are Tanto, Hamidashi and Metazashi respectively. In the Tanto, we at last meet a weapon, the Koshirae of which could not be confused with anything else. The Tanto Koshirae mounts a Tanto blade of 12 inches or under, and has a reasonably sized Tsuba in proportion. It may or may not carry a Kodzuka and Kogai and the Buka (hilt) is usually Same (ray skin) covered or bound with cord or thread.

The Hamidashi is almost identical with the Tanto, but in this case, the distinguishing characteristic is the possession of a Tsuba which only projects as a slight rim beyond the sides of the scabbard and hilt. The great majority of Hamidashi are of Tanto length, but one occasionally meets with blades in excess of the standard 12 inches.

With the Metazashi we again return to the treacherous ground of conflicting fact and surmise. The term Metazashi is given in the dictionary as a short sword or dagger worn on the right side, it could, therefore, be either of Shoto or Tanto length. As to its Koshirae we are on even less firm ground and various Japanese authorities offer conflicting descriptions, however, the consensus of opinion points to the presence of a small Tsuba, with an opening through which the top of the Kodzuka projects. This opening is not a complete circle, but with a gap on the outer edge, in the form of a 'C'. This identification is offered with diffidence and must only be considered as applying to the 19th century mountings. From pre-Kamakura times, until the beginning of the last century the sword books refer to the Metazashi as worn on the right side, but give vague descriptions as to its mounting. Prior to the 1614 edict, the Samurai carried three swords, two on the left, and one on the right side. These three Koshirae, so far described cover the standard mountings, but as any collector knows only too well, one is always meeting with eccentric types. One such appears so frequently, that it may almost be considered as a Koshirae, this is the style known as Ebi-saya-maki.

The scabbard is a series of gadroons imitating the shell of the Ebi or crayfish. In the extreme forms the Kashira and Kojiri resemble the head and tail of a crayfish. This Sayamaki style as it is called, is rarely met with on a Katana or Chisa-katana, but on Shoto and Tanto mountings it is comparatively common. The term Ebi-saya-maki should only by rights be used when the ribbing is very pronounced, and the Kashira and Kojiri are curled round suggestive of the head and tail of the crayfish, but it is often applied to a Koshirae that is only slightly ribbed.

Similarly there are certain other forms. Perhaps the two commonest forms are:

(a) a very flat scabbard often broader than usual and

(b) a scabbard with the tip ending in an irregular arrow point.

Though these are named styles they must not be considered as separate Koshirae.

A group of short daggers which vary in their Koshirae as Tanto, Aikuchi and Hamidashi cannot be ignored. These were those worn with civil costumes during the last half of the nineteenth century. Sometimes they are mounted entirely in silver, but more often the scabbards are of the finest quality lacquer and the mounts in silver by the last great Kodugu makers such as Giokusai and others of the Ishiguro school. These are, in a sense un-Japanese, for the true Japanese taste in sword mounting is quiet and restrained. Be that as it may, they represent the finest metal craftmanship, and as the blades they mount are often early, they must at least be considered worthy of mention in this brief study of styles of mounting.

This article has dealt with the standard Koshirae, the blades and fittings are outside its scope. There are, however, a large number of different shapes and lengths of blades which have special names, particularly in the case of short blades. The 'form' names do not concern us so much as the 'length' names, which are often used to describe swords. The Wakizashi blade is often described as :-

| | |
|---|---|
| O, | $17\frac{1}{4}$ - $23\frac{3}{4}$ inches, |
| Chu | $15\frac{1}{2}$ - 21 inches, |
| Ko | $11\frac{9}{10}$ - 15 inches |

It will be seen that they overlap. A further term is Kusungubu for a blade of $9\frac{1}{2}$ inches, usually it is mounted as an Aikuchi. These are not Koshirae, but the writer has given them as they are widely used and the unwary might believe them to be some particular form of mounting.

Clement Milward.

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As promised a couple of programmes ago, Gene Mathers gave a lecture on metallurgy in Japanese swords, and the following is a transcript of his talk. Thanks for the info Gene!

## THE METALLURGY OF THE JAPANESE SWORD

### Introduction

I entitled my talk "the metallurgy of the Japanese sword" but, whilst preparing my notes I came to realise that it would be doing the sword a great injustice to regard it solely as an object for scientific study. To the Japanese the sword is a treasure rich in both religious, artistic and social significance. It is not only a superb weapon it was also an object of great pride to the man who made it, the mark of honour and rank to the man who wore it and the very embodiment of the creed of Bushido - the way of the warrior.

There is an unbroken tradition of sword manufacture and use which has changed but little over a period of more than 1000 years. Whilst this, in itself, is sufficient to make the Japanese sword unique there are other more important aspects which merely serve to add to the uniqueness of a weapon which the late Edgar Bain, himself an enthusiastic collector, has described as being made by "a fantastically long and laborious process fraught with innumerable opportunities for serious shortcomings" and which must surely be one of the most outstanding examples of empirical metallurgy.

The Japanese race are not the aboriginal inhabitants of Japan but come originally from China and Korea, the first wave of immigrants crossing into the archipelago sometime around 600BC. These early immigrants brought with them a knowledge of bronze casting but it was a second wave of immigrants crossing into Japan around the 2nd century AD who brought with them the skills of ironworking. The use of iron came relatively late to China, the earliest date is claimed to be around 800BC. Curiously, iron casting was developed almost as soon as the new metal became to be used - possibly because Chinese iron is high in phosphorus and also because a high phosphide coal was freely available in Shansi province. Naturally, cast iron is too brittle for use as an implement of war but it was found that wrought iron could be used to make a serviceable weapon, giving around 180 Vickers in the work hardened condition.

The benefits of pile welding high carbon and low carbon irons together to give an averaged carbon content was realised fairly early in the West, as was quenching and case hardening - all of these three techniques being in use around 500BC. It is not known whether these techniques were imported into China or were developed independently but what is known is that pile welding of hard and soft iron - rather more poetically put by the Chinese as "the harmony of yin and yang" - was taking place in China by the first century AD. There seems to my mind little doubt that the technique was taken to Japan by the early iron users, although the Japanese product must have been inferior, since sword blades were imported into Japan from China.

The swords of this early period were straight, single edged and pointed but around 700AD the style changed to give a sword which has remained essentially the same to the present day, being curved and single edged, primarily a cutting weapon.

The sword blade has several easily recognisable metallurgical features which serve to define the maker or school. How these effects are produced will, I hope, become clear as my talk proceeds.

The surface of a blade exhibits a grained effect, called hada, somewhat similar to the appearance of a polished piece of wood. Over 50 styles of hada are recognised, these being derived from five basic forms illustrated here. These are mokume - wood grain, masame - straight grain, itame - a mixture of mokume and masame, ayasugi - wave like and nashiji - sliced pear fruit. These are a function of the forging technique and are produced by sectioning layers of different inclusion content or composition which have been forged together to give a laminated structure.

The misty region forming the cutting edge is known as the yakiba and is composed of martensite, with a hardness of between 600 and 900 Vickers, depending upon carbon content and heat treatment. The yakiba is as-quenched as distinct from western made swords, which were in general quenched and tempered. As the body of the Japanese sword is ferritic/pearlitic this quenching gives a unique combination of an extremely hard cutting edge able to be ground to razor sharpness and to hold this edge during use, backed by a strong tough body able to withstand the impact loadings imposed during combat. Many different shapes of yakiba, called hamon, are recognised - Hawley listing over 90 in his book, and these range from a straight edge bounding the hardened region and parallel with the cutting edge, to a representation of a chrysanthemum floating on a river. When one considers that such an effect is produced by phase transformations, so that the martensitic areas are revealed on polishing against a ground mass of ferrite/pearlite, the skill of the smith becomes self evident.

At the sword tip the hardened edge is turned back to give a characteristic shape, called boshi - one of the most interesting of these is the Kaen or flame boshi where low carbon, low hardenability steel is combined with high carbon steel. On hardening the high carbon steel transforms to martensite and gives a flame like appearance to the tip.

At the butt end of the sword the hardened edge is, in koto or old swords, carried on into the tang but on shinto, new swords, the undesirability of a hard, brittle region in a highly stressed area where the hilt and blade meet is recognised and the yakiba is frequently either tapered off to finish before the tsuba is reached or is straightened and narrowed at this important junction.

The hamon or shape of the hardened region is defined by a misty line called nioi which is a narrow area of fine martensite crystals, at times unresolveable by the naked eye, against a background of pearlite. Nie are larger crystals of martensite which can be separated from the hamon and are frequently used to give certain appearances to the hardened edge. For instance as can be seen here, the hamon can be shaped to represent mountains or waves and nie used to give an appearance like clouds floating past a mountain top or spray breaking from a wave crest.

Other effects which can be seen I will deal with fairly rapidly - most of these effects will only be seen in high quality blades and some will be confined to koto blades, since shinto smiths seem unable to reproduce them. Double yakiba is an effect produced on blades by the formation of a second martensitic region lying parallel to the cutting edge, utsuri or reflection is a diffuse hardened region, similar in orientation to a double yakiba but due, I consider, to a change in composition, rather than to a heat treatment process. Rio-no-me are large martensite crystals in the body of the blade. Possibly two of the most interesting effects are mazuma or kin-suji, bright specks or lines formed in the yakiba and on or near the nioi line and which may arbitrarily cross it. These are formed by deliberate alloying additions of copper or gold. All of these effects, however, are produced merely by changes to the basic fabrication procedure, which remains essentially the same for all Japanese swords.

Iron Production

I shall now go on to describing this fabrication process which as far as empirical metallurgy is concerned, can have no rival.

The smith, certainly in the early, koto, days was not only a swordmaker, but was also an ironsmelter and steel founder. The ore which was used was the iron bearing sand, found in great quantities in Japan, particularly along the mountain rivers where it settled after being washed out of the hills. The ore was basically magnetite and was smelted by a direct reduction of the oxide by charcoal. I have no doubt that the skills of iron smelting were imported from China and modified to suit the conditions in Japan. Certainly it is true that much of the equipment in use in Japan was widespread in the far east. This tattara or bellows used for copper smelting is almost identical with a double acting reciprocating bellows which I have seen and which is reputedly from Tibet.

The furnace seems to be of a fairly standard type of shaft bloomery furnace and to have changed little in basic design and construction over something like 1000 years - the tattara process I am about to describe was, in fact, in use up until the beginning of the 2nd war. Any improvements which were made appeared to be centred around the bellows, enabling high temperatures to be obtained with less manpower, and to furnace size, enabling larger amounts of ore to be processed.

Masahide, in conjunction with an armourer, Sakakibara Kozan, described the design and operation of a furnace at Shishikuri, in the sixteenth century. The iron smelter selected a small hill and excavated in the side a hole 18 feet square and 8 or 9 feet deep. This was covered and dried by burning timber in it for 60 or 70 days and this operation also, no doubt, was used to produce the charcoal required for the smelting operation. Once this is done two ditches, 12ft. long and 3 ft. wide are dug on either side of where the furnace will stand. The floor is then covered with ash and charcoal and beaten flat. The furnace, measuring approximately 3ft by 5ft is made in three sections, jogama (top) chugama (middle) and shitagama (bottom) from refractory clay. The shitagama, lower portion of the furnace, contains all of the holes for the bellows and the tap holes. Masahide states that two tattara or bellows were used, each worked by a team of 6 men. From each tattara between 7 and 10 bamboo tubes, covered in clay, led into the bottom of the furnace. Four tap holes were made in the furnace, a pair of holes, one on either side at the base of the shitagama called moto and two similarly disposed but at a higher level called waki. A wall is built on either side of the furnace to keep the heat of the furnace from the men working the bellows. Once the assembly work had been completed the furnace was dried by burning wood in it. The furnace was then filled with charcoal and the bellows were worked. Once the furnace was well alight the ore was added and a direct reduction process occurred, resulting in a pasty mass of iron being formed, as more ore and charcoal was added the carbon content of this spongy mass increased, certainly on the outer layers, to the point where melting occurred. Experience on the part of the iron smelter told

him at which point he could knock out the clay plug from the lower hole and tap this molten cast iron into the fune, the trenches on either side of the furnace. This lowered the level of the charge in the furnace so more charcoal and ore were added and the process repeated until the moto holes were choked. When this occurred the plugs were knocked from the waki holes and cast iron tapping continued until these also became choked. More charcoal was added, according to Masahide a further three times and the furnace then allowed to cool. The whole process was said to take a total of three days and nights although other furnaces in other times differed from this figure in later years 24 hrs was sufficient, probably because improved furnace and bellows design increased furnace temperatures. Whilst still warm the jogama and chugama were removed, to be reused at a later date. The shitagama was broken open and the blooms of spongy iron removed. I think the addition of charcoal must have been carried out to allow some diffusion of carbon into the bloom to give a rather more homogeneous product, since the bloom could be quenched in water and broken into pieces with a hammer, suggesting that the bloom had a certain amount of through hardenability. This supposition is given some credence by the fact that a technique was in existence where carbon was not added after tapping of the cast iron had been completed and these blooms had to be cut open with a chisel, suggesting that the core of the bloom was low in carbon, not hardenable and could not therefore be broken open in a brittle manner.

The smelting process must have been extremely tiring, particularly for the teams of bellows workers, although it is reported that a furnace at Hinogori was worked continuously for a period of fifteen hundred days, only ceasing when all the trees in the district had been cut down. Subsequent writers record finding pieces of iron "as big as the back of an ox" at the site and this seems to suggest that in the early days of sword making cast iron was used, being refined to give steel of course, and the bloom was discarded.

During the fifteenth and sixteenth century steel production was rationalized and made more efficient by introducing mass production methods. The smith hence no longer made his own steel but purchased his raw material from a steel maker or a steel stockist and swords to a great extent lost their local character, since they could be made from ores not locally obtained or smelted. This change also meant that the smith needed to develop a series of tests by which he could judge the quality of the material he had obtained. This sorting was carried out by hardness "testing", if that is the correct term and by observing the fracture faces of samples given a known heat treatment. Masahide observed that if one takes hard and soft steels - that is high and low carbon steels - heat them to the same temperature and quench them, the hard steel will have a coarser grain if fractured and will be very much more brittle than the low carbon steel. The effect of working the steel to cause grain refinement was also realised, again by fracture testing, as was the deleterious effects of overheating. The fibrous nature of the material they were working was also turned to use, Sakakibara Kozan - an armour manufacturer as distinct from a sword smith has pointed out that the grains - that is, the fibres - of plates should be at right angles to each other before they are welded together, to produce a single plate of superior properties, suitable for armour.

Splitting of the steel by loading along the grain flow - that is, in the transverse direction, and chipping by loading across the fibres - the short transverse in plate rolling terminology - were both known and swords and armours were made such that these flaws could be avoided.

The deleterious effects of inclusions in the steel was recognised and great efforts were made to prevent the incorporation of dirt and oxides during the working operations. It was also thought necessary to prevent the incorporation of evil spirits and the smith himself led an ascetic, monk like life. Before beginning work on a sword the smithy was decorated with shimenawa - straw ropes, a sign of purity and cleanliness, the smithy was cleaned and the smith purified himself by prayer and ritual washings. The smithy was a shrine, a holy place wherein the smith and the spirits of his ancestors laboured together to reach perfection.

The bloom, either quenched and broken or chiseled into pieces, was examined and sorted according to hardness. It was then necessary to refine the iron to remove the furnace slag and this was achieved by an extensive piling and welding operation which gave a product the cleanliness of which was not achieved in the west until Huntsman developed his fusion process in the 18th century. This refining process could also be used to adjust the carbon content of the material to give a steel of around .05 to .1% carbon for the body and 0.6 - 0.9% for the cutting edge. Although in the shinto period sen-tetsu-cast iron was, in general, not used for sword making Masahide details techniques for decarburising it to give a steel - firstly by heating the cast iron in the oxidising region of a charcoal hearth furnace, secondly by melting in a crucible and stirring in iron oxide and thirdly by placing at the bottom of the hearth a sealed clay container full of water, this presumably giving a strongly oxidising atmosphere. The latter two techniques were used, in fact, to give low carbon steel. In all three cases the steel was extensively forged to refine the structure and remove slag. Masahide also commented that namban tetsu (southern barbarian iron), Roshiya and Horanda-tetsu (Russian and Dutch iron) and wootz imported from India could also be used although he gives no ideas as to how any refinement was achieved, merely commenting that brittle steel when beaten 30 to 50 times becomes good and strong and that he had used these materials to make swords indistinguishable from ones made from native ores. It would appear that many of the koto smiths used cast iron, refined by some technique such as I have already described and folded and forged less than 7 times - the details of this are, unfortunately unrecorded.

But to return to the process of steel production described by Masahide, a basic technique which was altered in detail only depending upon the quality of the steel and what was required of the end product. The selected pieces of steel from the bloom were heaped up on a spatula of steel and a flux composed of powdered clay, powdered whetstone, thought to be a form of limestone, and powdered charcoal, all mixed to a milky consistency, were brushed over them. This heap of fluxed steel was then heated in a charcoal fire to the required temperature - probably around 1000°C - and then hammer-forged into a billet measuring some 4" x 5" x $\frac{5}{8}$" thick. This was

notched, folded, fluxed, reheated and welded together once more, the notching could be arranged such that the grains would either cross or lie parallel on alternate layers. The folding and forging process was repeated anything up to 7 to 10 times for the uagane, or tool steel for the cutting edge and up to 20 times for the shin-gane, the soft steel for the body of the sword. Above this number of foldings it would appear that the strength of the metal began to fall, probably because of an increase in the amount of entrained oxides and a loss of carbon. These last two points must have been important, since as much as 5% of the billet weight could be lost at a single folding. Defects and blisters were cut out and great care was taken to ensure that scale and oxides were not forged in - the anvil and hammers - these latter sometimes being made of stone - for instance, were polished to a mirror like finish. The smith could, of course, ring various changes during the forging operation to give him the exact quality of steel which he desired or to produce certain visual effects in the blade. Thus the final few folding operations could be changed to cutting and piling layers of different carbon or inclusion content, which will give a grained effect on the polished surface of the blade.

There is a popular misconception that layers produced by simply folding and forging will be visible to the naked eye. I doubt that this can be so, I reckon that any more than 6 or 7 foldings will result in an almost complete loss of grain and the billet will be virtually homogeneous - this can be fairly easily demonstrated by folding and "forging" together two layers of different coloured plasticine. It is also possible to calculate the thickness of these layers and to show that the eye could not distinguish them, for example 10 foldings will give $2^{10}$ layers, approximately 1000, 20 foldings will give $2^{20}$ or approximately 2 million layers. On a sword 12 mm thick a layer would hence be 0.01 mm or $10^{-5}$ mm thick. The human eye can only distinguish alternate layers around 0.1 mm in thickness so that, even on only 10 foldings, the layers are an order of magnitude smaller than this and should hence be indistinguishable, even if the effects of diffusion are ignored. The presence of grain on the surface of a sword must hence be a concious decision on the part of the smith and could be produced by pile welding together steels of varying carbon content or inclusion content, folding and forging two or three times perhaps, then gouging and hammering the finished blade before grinding. This would give an effect, similar to a piece of polished wood, where the surface intersected different layers - this, again, can be demonstrated with layers of different coloured plasticines. Inclusions are, inevitably, present in all swords but metallurgical examination of a blade by Gwassan Sadayoshi (circa 1850) has revealed that the strong grain in this sword is produced by discrete refractory particles which appear to have been added at the interface during the last few foldings. The deleterious effect of these particles has been recognised as great care has been taken to exclude them from the cutting edge. Inclusions are generally present, however, due to unintentional slag entrapment. It is perhaps worth noting that inclusions give a grain with a slightly different appearance to that produced in a sword whose grain is formed by variations in carbon content, since this gives an unbroken, continuous pattern to the surface whereas slag or oxides tend to give a rather more broken and discontinuous pattern.

Strong grain was regarded as being desirable, in that it indicated that the sword had been extensively forged by a man who exhibited no mean skill, as the sword had also to be defect free. I think that this strong grain in a defect free blade indicated the worth of the smith, rather than the blade. All of this took place once the sword had been constructed to give a combination of high and low carbon steel. This table shows the chemical analysis of various swords, where it can be seen that the body of the sword is made of low carbon steel whereas the cutting edges are of almost entectoid composition. Also noticeable are the small amounts of other elements in particular the sulphur and phosphorus. The only exception is the shin gunto blade, made in 1940, which is fairly obviously made from a single sheet of high carbon steel. This difference in composition was obtained in several different ways, the simplest method, kobuse, being to wrap the soft core steel with the tool steel, flux heat and forge weld into a composite block, which would then be drawn out to the shape of the sword. Another simple method, called wariha, was to notch the edge of the core steel and to weld into this notch the hard, tool steel to form the cutting edge. The wakizashi blade by Nobutomo I think is made in the kobuse style - one can see the low carbon steel showing through on the back of the blade and at the tang end, where the high carbon steel overlays the low carbon steel to give an effect somewhat similar to the Kaen boshi I mentioned earlier.

Other, more complicated forms of construction could also be employed, often using low, medium and high carbon steels. Here, in ori awase san mai and ori awase ni mai high and low carbon steels have been combined to give a high carbon cutting edge and low or medium carbon shinogi-ji and jigane. It is also recorded that some swords are constructed with the cutting edge made from medium carbon steel, backed by a high carbon steel to improve through hardenability but without producing too hard a cutting edge which may chip in combat. In general, the more complicated the construction of a sword, the more skilled the smith and hence the more expensive the sword.

Once the composite block had been forge welded together it was roughly forged to shape, the forging of the taper down towards the cutting edge imparting a curve, which could need correction to give the desired shape. The sword was then scraped to shape with a tool called a sen and partially polished with coarse whetstones. It was then thoroughly inspected for any flaws or defects. The smaller defects, particularly on the back of the blade were either blended in or cut out and repaired by welding in an insert - one of these can be seen in this sword by Norimune. Large defects, delanimations or cracks meant that the sword was scrap - so stringent was this examination and so critical were some of the smiths of their final product that sometimes as few as 20 to 30 blades were made in a smiths working lifetime.

Provided, however, that the sword maker was pleased with his work the sword progressed to a process which sets the Japanese blade apart from all other edge weapons - that of selective quenching to produce the hardened edge. Unlike the European or near Eastern sword which was quenched and then tempered to make the weapon hard but tough, the Japanese sword was selectively quenched so that only the cutting edge transformed to martensite, leaving the body of the blade as pearlite plus ferrite or cementite - obviously a far superior combination of extreme hardness coupled with ductility.

This unique combination was achieved by covering the blade with sabidoro, a mixture of clay, whetstone and charcoal to a depth of around $\frac{1}{4}$". Along the cutting edge the clay was removed with a spatula so that only a light wash of sabidoro remained on the surface. The clay could be removed in such a way that a pattern could be formed along the cutting edge as I illustrated earlier - these range from sugu-ha - a straight line to kikusui - a chrysanthemum floating on a river.

Once the clay had dried the sword was heated to the appropriate temperature and quenched in water. The austenitising temperature and the temperature of the water were both extremely important and were secrets of the trade which the smith jealously guarded even from his pupils until they were fully proficient. There is an interesting tale told about Masamune who was about to quench a blade, watched by his favourite and best pupil, Samonji. Samonji surreptitiously put his hand into the water bath to test the temperature. Masamune, infuriated by his pupils presumption, struck off the offending hand with the sword he was working on. Samonji died in disgrace some time later. He was replaced by Sadamune who became Masamunes star pupil and son-in-law.

The heating and quenching took place in a darkened room, so that the correct temperature could be accurately judged. The austenitising temperature was seemingly anywhere between azuki iro or dark red, circa 700°C and summer moonlight, probably around 1200°C. The temperature to which the sword was heated depended to a great extent on the pattern of yakiba or hardened edge. The brightness of the nioi was found to vary with the quality of the metal and the method of application of the clay. The undesirable structures produced by overheating the steel were also recognised - nie; the bright specks to be found in the yakiba, lose their lustre and become more and more dull as the austenitisation temperature rises presumably due to a loss of carbon by diffusion. Small grain size is also recognised as being desirable by specifying fine nie, excessive or coarse nie was regarded as being undesirable and this can be shown to be a function of a large grain size.

Nioi is solely a function of the quenching technique and quite arbitrarily will cross composition boundaries. Nie, on the other hand, is a function of composition and hence need not follow the shape of the yakiba or hardened region but can be seen in some blades crossing the boundary to give an appearance like clouds on a mountain or spray from waves. Such an appearance must obviously be intentional on the part of the smith and could be produced either by forging in a strip of higher carbon steel which would transform to martensite even at the slower cooling rate produced by the clay covering, or perhaps by sprinkling the surfaces of the edge and side plate steel with a flux containing a high proportion of carbon prior to quenching. The carbon diffusing into the sword could have the effect of promoting grain growth along the interface and retarding the decomposition of the austenite. The larger grains transform to martensite more readily than small ones and thus form a bright speck or streak composed of discrete crystals of martensite. Fairly obviously, great care is needed to ensure that during forging this high carbon region is not lost but is oriented in the right direction and in precisely the right position. The use of a clay covering containing granules of carbon could perhaps be used to achieve a similar result.

The water temperature was, as I have said, a jealously guarded secret but well water at the temperature of February or August is supposed to be the correct temperature. Other authorities, however, claim that water at the temperature of June or July is best. It is generally accepted that if hot water is used to prevent quench cracking then the quality of the sword suffers. Similarly, tempering the blade after quenching in an attempt to reduce the hardness is also frowned upon, probably because the tempering would be uneven and distortion, which would have to be corrected, would occur. These defects would make the sword weak and such blades are classed as yaki naoshi mono - not to be trusted in a fight.

Something which is rarely thought about is the effect of the clay covering not only preventing the body of the sword being quenched but also preventing the body of the sword from being heated to austenitising temperature in the first place - this may, in fact, be of rather more importance in defining the characteristics of the hamon than the quenching operation itself. By heating the sword in the fire for a long period of time a greater width of blade will be heated which, on quenching, will give a yakiba with strong and wide nie. This is a region which I think that I will give some further thought to - it may be an area for some fruitful research.

The final operation was one of polishing the blade to bring out the fine detail of the metallurgical structure. This sharpening operation was carried out by hand on large stones placed in a bucket of water. The blade was worked back and forth over the stones, of which there were four successively finer grades until the surfaces were flat and flawless and the edge had reached its correct degree of sharpness. Once the polisher was satisfied the polishing operation itself was started. This was achieved by polishing the blade with successively finer grades of uchi-gumori or limestone, slivers of which were attached to cloth or paper. Cinnabar (red mercuric oxide) was sometimes used to bring out a difficult structure. According to a modern expert Inami Hakusui, polishing of the blade such as can be seen today was not practised until around 1580 but the fine metallurgical effects on some of the earlier blades such as the spectacularly grained Gwassan school swords would suggest that most of the koto swords must have been given a fairly fine polish, otherwise these aspects would not be visible. No etching is used to reveal the structure, it seems to me that there must be some form of relief polishing, the hardened areas standing out proud from the softer, surrounding matrix. The surface finish is matt, except on the mune and shinogi-ji which is burnished with a hardened steel needle. This polishing of the Japanese sword is hence a direct antecedent of the art of metallography with the construction forging and heat treatment of the blade revealed, as in a modern microspecimen, by a fine polish. As a final flourish, the smith signed his name and possibly the date (in the tang). The sword was then mounted in its fittings and presented to its proud new owner. Occasionally the sword was tested to prove its service performance - there were two types of tests - tsujigiri and tameshigiri. Tsujigiri was rather unpopular with the peasant population since the local young bloods would merely cut someone down in the street. Tameshigiri was the legal form of testing and was generally carried out on the bodies of executed criminals. Certain types of cut are more difficult than others - rio kuruma - a horizontal cut through both thigh bones - being the most difficult. Other tests consisted of cutting through a sheet of iron set vertically in a stand or

through a pile of coins and I have read that one smith in the 1930's used to demonstrate his blades by cutting through a machine gun barrel. The results of tests are generally inscribed on the tang and the record is claimed to be through seven bodies with one blow, although this is taken with a pinch of salt by most experts. The testing was carried out before a panel of sword experts by an expert swordsman, who would direct the placing of the body and nominate the cut he was going to make. After testing the blade would be examined and then cleaned and examined again for any chips or flaws. The body was also examined to ensure that the cut was clean. The use of corpses was discontinued some time in the nineteenth century and straw, wrapped around a bamboo pole, was substituted as representative of the resistance offered to a blade by a human body. This type of test is still in use today and was shown in Bronowski's recent series on TV - "The Ascent of Man".

If anyone in the audience is sufficiently inspired by my talk to wish to see some excellent blades and fittings then I would suggest that a visit is made to see the collection in the George Vth gallery in the British Museum or the really wonderful collection of swords and fittings on display at the Bethnal Green Museum. Finally, I would like to thank Mr. Basil Robinson of the Victoria and Albert Museum for allowing me to photograph some of the blades in the Bethnal Green Museum and also Mr. Richard Marriott-Smith of the Sussex Armoury for the most generous loan of the three wonderful blades you have seen tonight.

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Our February meeting started off with an Auction that attracted about thirty members and about the same number of lots for sale, which included several swords, Tsuba, some pieces of armour and a Netsuke. Most of the swords were in Shin gunto koshirae and the highest price realised was £75 for a Gendaito. Bidding was slow, which was surprising as the prices were very reasonable, but the able auctioneer, Mr. Chris Allen coaxed it along in his own inimitable style. This was followed by a talk given by Mike Mortimer, his notes are reproduced below.

## STRAIGHT SWORD AND CURVED SWORDS

This short talk is intended to make a few statements, to pose a few questions, to demonstrate one or two points, and to prove nothing. It is merely a condensation of thoughts which have passed through my mind during many years as a swordsman. It is going to be a little bit technical but without jargon since it is no value to any of us for me to try to prove how clever I am and how difficult and obscure the subject is. For instance, when I speak of fencing and fencers I mean things European. When I speak of Kendo and Kendoka then you will know that things Japanese are meant.

Since it is somewhat germane to the subject I am going to explain how I come to be a member of the To-Ken Society. I think it is always interesting to learn how people gravitate to the Society, since their reasons for doing so differ.

Ever since I was at school I have been a fencer, for which Errol Flynn is almost certainly to blame. You must remember that Flynn's derring-do films were all the rage when I was about 14. I know of other people, including my present coach, who have been called to the sport through watching films and have never looked back. I am going to admit that I have also been influenced by Japanese films since watching and making films are among my other activities.

Unfortunately, fencing in films has rather more in common with another activity practised in the "salle" (French for a room), namely ballet. Next time you have the opportunity watch sword fights carefully and notice how the antagonists are not going for one another but rather away from one another. This has to be, of course, actors come expensive. For connoisseurs of fights watch the sabre duel between Ronald Colman and Douglas Fairbanks Jnr. in the 1934 "Prisoner of Zenda". That really is a fight and their fencing is really credible.

Gentlemen, I digress, and probably not for the last time. After many years of toil, much sweat, and sometimes even a little blood I reached the standard of a County sabreur which means that quite definitely I have got a foot on the ladder. If I continue to practise for the next thirty years as hard as the last thirty I am convinced that I shall make the Olympic team. A sabreur, by the way is one who fences with the sabre - this thing (show sabre).

Now, in the course of all this activity I had acquired a modest number of swords in various ways. A few years ago realising that there was a great tradition of swordsmanship in Japan I thought it was time to add a Japanese sword to my collection. I knew that such items did not come cheap so I ought to find out something to avoid the possibility a lot of money for not very much.

I knew there was a shop selling Japanese swords just off Charing Cross Road so I wandered in there one day and explained my purpose. From the reception I got I nearly gave up on the spot - the proprietor was in one of his taciturn moods. However, he did venture the titles of a couple of books which I bought and read. This led to museums and odd small displays in publisher's showrooms but which were not very helpful in themselves. I had reached an impasse in my studies.

The breakthrough came whilst watching episode 4 of "The Ascent of Man", the T.V. programme. I'm sure you all recall that this devoted considerable footage to the forging of the Japanese sword. Better still it gave the name of the Society among the credits. I wrote to the producer of the programme who passed on Sidney Divers address to whom I wrote a suitably humble letter. He replied, I sent off a cheque to Malcolm Hutchinson and here I am.

Now, since joining the Society I have been struck by the fact that almost the last thing we regard the Japanese sword as is a weapon. Primarily, it seems to be a work of art (which it is, do not misunderstand me) to be admired, but it doesn't do anything. Is it really made by Tom, or Dick, or Harry? Look at this utsuri! But gentlemen! Surely, in the ultimate the purpose of this shard of steel is nothing less than to do your enemy and prevent him from doing you! The same basic objective since primitive man began to use weapons. Since joining the Society I have only seen one man make an

aggressive gesture, albeit a mock one, with a sword in his hand. Being captain of the British Kendo team he was plainly feeling something. I can sense our Chairman stirring at this juncture and make due reference and deference to the requirements of sword etiquette. There is no doubt that we acknowledge how dangerous our charges can be when handled carelessly, let alone used for their true purpose.

To me a sword is a weapon first and foremost and my appraisal begins when the sword sits in my right hand. How does it feel? What is its balance like? Could I face a foe with confidence with this in my hand? Some swords sit like a dream, others feel like a butcher's cleaver, heavy and ponderous. Had you realised how much the characteristic curve of a Bizen sword contributes to its balance bearing in mind that there is no artificial counterbalance in the form of a pommel?

I am no Kendoka and furthermore I have seen very little of the art and I am almost certainly treading on uncertain ground. However, I make no bones about saying that I hope to get some reaction from my audience during the course of the evening. I never regard the pursuit of knowledge as a one-way business.

In spite of the teachings of Musashi who favoured the use of katana and wakizashi simultaneously it is my belief that a less skilled practitioner has quite enough to contend with using the long sword only. Like golf, the left hand plays an important part in Kendo, but it is the right hand which judges how the sword sits and how it suits the swordsman.

Let us now look briefly at the history of the sword. Of necessity this must be very sketchy and omit much more than it mentions. Our knowledge of primitive swords comes from two main sources. What is dug up as archeology and what we see as pictures. The majority of both come from tombs.

As you know the science of smelting and working metals evolved at different times in different parts of the world which are classed for convenience as the Bronze Age and the Iron Age. Copper, which is the main constituent of bronze is a soft metal with a low melting point. When alloyed with a proportion of zinc and a trace of other soft metals, generally tin, it becomes much harder and is capable of bearing an edge and a point. Bronze swords were generally cast in stone moulds, leaf shaped or with parallel edges, and with a diamond or flattened hexagon section. They were short and could be used for cutting or point work. Bear in mind the Greek warriors of Myceanae with their plumed helmets, their large round shields and their short swords.

From them the Romans adopted the short sword and the large shield although the main infantry weapon of Rome was the spear, a thrusting one-handed pole arm longer than a sword, while the legionaire covered himself with his shield.

Here I would like to digress again and dispose of the subject of shields. On receipt of the last bulletin a few days ago I almost had to depart from my draft. I had firmly convinced myself that the

Japanese were the only martial race who had never taken up the use of the shield at any period. However, on page six, second paragraph, there is a reference to shields being pierced by arrows. I open myself to correction but I have seen no evidence in writing or in portrait that Samurai actually carried shields as part of their protective equipment. The reference to shields, I feel sure, concerns the kind of portable pallisade behind which a bowman sheltered whilst notching an arrow, emerging to aim and shoot. European cross-bowmen used a similar device during the vulnerable period whilst winding their machines.

As stated before, all martial races used the shield. The Romans have already been mentioned who developed its use to the point of the "tortoise" whereby a body of men would use their shields to cover and protect themselves from light missiles whilst manouvering. The Norsemen used their round shields, which also served to armour the gunwales of their long ships whilst they were at sea. Crusaders, used their heart-shaped shields and so on through the ages. Finally, bear in mind that the round Scottish target was carried by some Highland stalwarts as recently as 1746 at Culloden. I may refer to the shield again in passing when speaking of the development of swordsmanship.

Bronze was superceded by iron which is unfortunate for the historian. Iron rusts and in the fullness of time decomposes chemically. It is therefore difficult to preserve, particularly the soft irons which the early low melting temperatures produced. In the more readily available books on Japanese swords there are several illustrations of the shards recovered from Dolmen or barrow burials. All these weapons are straight, some have two edges, similar in some respects to European swords at the same period, with a simple cross guard, and some have single edges.

Round about 800 the Japanese made an important advance. They discovered how to forge steel by literally hammering carbon into iron. They f rged a vastly superior metal to iron being far harder and durable. It is malleable and ductile and can be made more corrosion resistant than iron. Most important it can be tempered.

Since that time the basic method of sword forging in Japan has scarcely changed apart from one major detail. Instead of forging straight single edged swords they began to utilise the natural curvature of the blade which the method of forging and also the final tempering will produce. It is a feature of mechanics that a curved blade will cut more efficiently than a straight one when describing a curved path. The Japanese had evolved the most efficient cutting weapon possible and the fact that it has remained unchanged for 12 centuries must be irrefutable evidence of this premise. But is it the most efficient sword?

In Europe for some centuries there was no parallel development. Swords remained straight, double edged, heavy and ponderous and with no particularly distinguished metallurgy. In the Middle East some discoveries had been made regarding the folding of metal and here again this development led to curved blades with single edges. On these

scimitars the curvature tended to be so pronounced as to make the use of the point almost impossible, reducing the weapon to cutting exclusively. As with the Japanese sword many tales are told of the sharpness of blades culminating in the alleged meeting of King Richard the Lionheart, and Saladin. Debate on the efficacy of swords let to demonstration. The King supported at each end a steel shafted mace and with a swing and a clang severed it in two. Saladin countered this by tossing a gauze handkerchief into the air and allowed it merely to alight on the motionless edge of his sabre. The silk continued its earthward journey - in two pieces.

Obstinately, European swords continued to remain and for the purpose of this talk we can almost discount curved swords in this continent. It is not more than 250 years ago that curved cutting swords were seen in Europe and then they were used almost exclusively as cavalry weapons.

As metallurgy and the art of forging improved European swords tended to become longer and more flexible. The use of the edge gave way to the use of the point although both edges were sharpened and could be used for cutting. Of course, any blade over 3 feet long, when used single-handed, no matter how well counter-balanced it may be, is not any easy thing to swing and make a decisive cut.

Here I want to bring in (I nearly used the word inject) a few medical facts. The proportion of puncture wounds, i.e. stabs or thrusts delivered to the human torso which prove fatal is far higher than those for cuts. The human frame is so constructed that it can recover from quite hideous slashing injuries whereas before the advent of modern surgery most deep punctures proved fatal. The majority of cuts are aimed at the head, the most vulnerable part of the human corpus which we acknowledge still in modern warfare by retaining the last vestige of armour, the tin hat. Thus the head is protected which means that the shoulders become vulnerable.

As swords became lighter the use of shields became an encumbrance and were gradually discarded. However, the need for defence as distinct to offence was still felt and we see a parallel situation to Musashi's simultaneous use of two weapons whereby a dagger was used in the opposite hand to the sword arm. Parries tended to be taken with the dagger while the sword was poised for the counter attack. Although the dagger, which tended to be long, at least as long as a tanto, 12 - 14 inches, was useful if the fight came to close quarters it was eventually discarded since swordsmen discovered that the dexterous use of one main weapon served for offence and defence. It was a case of judgement, timing and rythym and is known as cadence.

Likewise, Samurai, as far as I have been able to ascertain never really took to the use of two weapons at once. In both schools of swordsmanship similar features applied. If you were attacked you could prevent yourself being hit in a number of ways, by blocking or deflecting your opponents attack with your own blade, by physical evasion, or by a combination of both. Having frustrated the attack you should then be well-placed for a counter attack, or riposte, and it is the skillful fencer

who deals with his opponents attack in such a way so as to gain the best advantage for his riposte.

By mentioning the word, riposte, I have to confess that I have galloped you along to the Renaissance, to Verona, Montague and Capulet, Romeo and Juliet. It was from the Renaissance that the European style of fencing developed and the tradition is still with us today. For several centuries the principal masters-at-arms were Italian; then the leadership passed to the French. Today international fencing is conducted in French, most of the nomenclature is French, and thus, any fencer who holds an F.I.E. licence, (Federation International d'Escrime) can fence in Manchester, Madrid, or Moscow and be able to conduct himself correctly on the piste although he may not be able to speak a word of the host country's language. Similarly, in Kendo, all business is conducted in Japanese which is only right and proper.

Before we move on let us take a last look at the history of the sword and here I must let personal prejudice come to the fore. My part of Bucks was very strong for the Parliament in the English Civil war. I am a frequent visitor to Hampden House, which was the original home of John Hampden, one of the leading Parliamentarians who had the misfortune to be mortally wounded early in the war at the battle of Chalgrove in 1643. In my opinion Cromwell's New Model Army was the finest English force ever to take the field and the tragedy was that they did so against fellow Englishmen.

In the English Civil War the sword reached its apogee. It had two edges and a robust point and its grip and balance were such that it could be used forehand, backhand, and point equally effectively. But alas for the sword.

The cumbersome, erratic matchlock arquebus gave way to the more efficient wheel-lock gun. The cavalry were armed with a pair of such pistols, which were, in fact, more like carbines. They rode to within a few yards of their enemy discharged two volleys into them and galloped away to reload. The battlefield had ceased to belong to the paladin - fire power was now King. In Japan, Nobunaga had found the value of massed musketry some half-century earlier and there too they must have found that the whizzing bullet was no respecter of persons. Champion or churl was equally vulnerable. (Commercial for "Seven Samurai").

To return to the technicalities of both schools of swordsmanship then. In fencing I have mentioned and shown one weapon, the sabre. This, as you can see has been downgraded to a mere sporting weapon. It is light, extremely mobile, and modern sabre has become a very athletic sport indeed. It will scarcely injure a grasshopper but it does have a whippy blade and not for nothing has my club nicknamed me Mortimer wheeler, because when attacked with a dropped shoulder stance I generally stop-cut to shoulder. If misjudged, the blade whips over the shoulder and puts a welt on the attacker's back. After an energetic sabre match there is much comparison of welts in the showers.

Very occasionally one reads a report that a duel has been fought and this (show epee) is the weapon you would use if involved in such an event - with a sharp end of course. This is a epee, which is the general French word for a sword. You can see its direct descent from the rapier although it has lost everything but the large cocquille, or handguard. It is a pointing weapon exclusively.

It is at epee that the conditions of the duel are most faithfully reproduced. The target consists of the opponents whole being from the top of the head to the tip of the toe. The only real rule to apply is the "double hit" rule whereby hits landing simultaneously both count. In fencing scores count against the fencer who is hit, to a maximum number of points and there is also a time factor. This is artificial since a duel would almost certainly end when blood had been drawn. The Pentathlon event provides for one hit only.

The real aim of epee is to attack your opponent's sword arm this being the nearest part of him. It is not easy needing control, timing, and accuracy of the point. If you attack the arm and miss obviously, you follow through to the body.

I well remember a Martini Epee final some years ago with a fiery Italian in the last eight. On the word "allez" (French for "begin") with a mighty lunge virtually transfixed his opponent's foot - great tactics - thoroughly demoralised his opponent.

My final sally in this dissertation is one that you may find strange coming from a fencer who has won some trifling prowess mainly with an edged weapon, the sabre, although the point does play an important part. I believe that weapon for weapon the point is superior to the edge. The Japanese do not, apparently, subscribe to this. The rules of Kendo admit to one thrust only, the tsuki to the throat. The other scoring strokes are all cuts delivered with the edge to various parts of the target. In any case a curved blade is not an easy thing to make a point with. The grip of a katana is not right for thrusting accurately and the forming of some points (kissaki) indicates to me that the smith did not seriously intend them to be pointing weapons.

The Japanese "en garde" position is with the katana held approximately thus. The blade in the centre of the body, the hands at waist level, the point in line with your opponent's throat. In order to deliver a telling cut you surely have to expose the wrists and forearms and in so doing open the way to what is known as the stop action. Technically, this is a counter attack into your opponent's preparation and is recognised in Kendo, I feel, by the fact that whilst the hands are held at waist level only one cut, kote, to the right wrist scores. When the hands are raised, to deliver a cut, an attack to either wrist is legitimate. To make a cut you must expose the arm which is what your opponent is waiting for. On your preparation he may attempt to stop-cut. You must always be prepared to parry the stop-cut, then riposte.

Conversely, when you are attacked the cadence should go; stop-cut, parry, riposte, as quick as that. It must be stressed that if you allowed your opponent to develop a full-blooded cut with sabre or katana it would

be extremely difficult to parry. This is where your footwork practice would come into its own. In order to preserve the edge parries in Kendo are taken on the side or the mune, but I believe that Japanese tactics do not involve much contact of blades, rather the technique known as "absence of blade". This makes much use of feints until a contestant makes an error allowing an attack to be made.

Using an edged weapon it can be seen that the target is not constantly threatened, whereas a pointing weapon is almost invariably menacing its target. Observe too that the point is much closer to the adversary and has much less distance to travel to make a hit. When it moves the blade is in the same plane actuated by the straightening of both the arm and the left leg.

At this tantalising juncture I am going to end my little talk with an epigram, coined appropriately by a French master-at-arms. "La pointe d'une epee est un realite qui fait bien disparu les fantomes." The point of a sword is a reality which disposes of ghosts most effectively.

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EDITOR'S NOTE

With respect Mike, I think there are a couple of points that you may have missed or not put enough emphasis on.

Firstly, we all join the Society for different reasons. Mostly we are fascinated by the Japanese sword and appreciate the strength and beauty of the worlds finest blades, others are interested in the technical and metallurgical aspects of swords. Still others, like yourself are interested in the combative use of swords, but I think most of us have a combination of some of these different interests.

As far as kendo, as an efficient fighting art is concerned, I stand to be corrected, but I do not think that kendo was ever designed to be <u>soley</u> an efficient means of cutting ones adversary, Kenjutsu (the combat form of kendo), however, was exactly that. The 'Do' forms of Bujitsu, i.e. judo, kendo, kyodo as opposed to the 'jitsu' forms jujitsu, kenjitsu and kyujitsu were intended much more as a means to zen enlightenment, a means of moving meditation through rigourous and useful exercise. Therefore, the mental approach to kendo is very different from that of European fencing, which as far as I am aware, does not emphasise mental harmony etc. Notwithstanding that, I think my money would be on Toshiro Mifune in the Mifune vs Eroll Flynn duel.

The discussion that followed Mike's talk was useful and informative, thanks very much Mike for an interesting evening.

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