

Jigane is the Key

In May 2020 The Token Society of Great Britain held its first “virtual meeting” during the Corvid 19 lockdown. As a first meeting and because we were unfamiliar with the technology we limited access to 30 people. The meeting was oversubscribed and as a result we decided to record the presentation for distribution to the membership. In addition the author was asked to produce an article covering the subject discussed. Both during and after the meeting a number of participants were kind enough to supply additional information which I believe helped explain some of the topics discussed so the overall content has been modified from the original to include this additional information.

Jigane a definition: - Steel or rather visible surface steel of a sword. Not to be confused with Ji-hada this describes the grain, the forging structure of the sword. Jigane can show hues and its appearance, at least as far as koto blades are concerned, make it possible to draw conclusions as to where the sword was made. (Source Markus Sesko Encyclopaedia of Japanese swords)

Introduction:

In 2013 I was lucky enough to make contact with Michael Hagenbusch. For those who did not know Michael he was one of the founding members of the NBTHK European branch and an extremely knowledgeable collector. He had one of the finest if not the finest collections of Japanese swords certainly within Europe and possibly of anywhere outside of Japan. I was very fortunate to visit him on a number of occasions and we sat for many hours in his tea room looking at the most incredible swords. Michael would almost always start his description of a sword with the term which forms the title of this presentation.

He would argue that apart from shape every other feature of a blade was dependant on the jigane-the surface steel. The quality of the blade was ultimately determined by the material used and the way the smith modified and manipulated it. However if the starting material was poor the end result could not be good.

A material problem:



In its basic form iron is relatively soft and will bend easily. It will not maintain a sharp edge. Adding small amounts of carbon to iron makes it harder enabling it to hold a sharp edge but it also makes it more brittle. The smith is therefore faced with a problem. If the blade is too soft it will not hold its shape and blunt easily. If it is too hard it is likely to break in combat.

The Swordsmith has to resolve these conflicting issues. The blade must be:

- Rigid enough to hold its shape
- Soft enough to absorb shock in combat
- Hard enough to hold an edge.

These problems are resolved through the choice of raw material and manufacturing techniques which are unique to Japanese swords.

The basic raw materials used in the manufacture of a sword are Satetsu (sand iron) which was washed down from the volcanic mountain ranges and traditionally it was collected by hanging tatami mats in the rivers, and pine charcoal. The use of pine charcoal was of particular importance as its structure enabled it to hold more oxygen and therefore burn at higher temperatures than could be achieved using hardwood.



Satetsu (sand iron)



Pine charcoal

The sand iron was smelted in a large clay vessel called a tatara. Over 72 hours approximately 10 tons of Satetsu was heated with 12 tons of charcoal. The resulting bloom produced about 2.5 tons of kera which included about 1 ton of tamahagane. Tamahagane is the raw material used in the manufacture of swords.



Tatara smelting Satetsu



Tamahagane

Many reference books refer to Tamahagane which literally translates as “Jewel steel” as being extremely pure and high quality. In fact it isn’t, it has a great deal of impurities in the form of sand, clay lining from the vessel and slag in it. However it is relatively free of trace elements such as sulphur or phosphorous which both have a detrimental effect on worked steel. The impurities described are largely removed by the smith as he works the material. The resulting steel is both relatively pure and capable of developing the characteristic associated with a Japanese blade.

HESHITETSU - TAMAHAGANE WAFER



Photo: © John Miles

In the first stage of the process the swordsmiths flattens the pieces of tamahagane in to workable sized wafers. These are sorted into pieces of different hardness.



Photo: © John Miles

Stacking the wafers



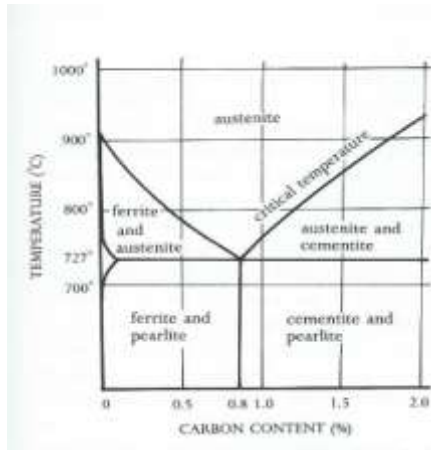
Photo: © John Miles

folding the block

Once sorted the wafers are stacked on a forged plate. The smith will mix pieces of varying properties and carbon content. A quotation in a recent publication about modern swordsmiths quotes one smith as saying this is the most critical and important stage of manufacturing. If the smith gets this wrong the end result will not be acceptable. This assembled block is wrapped in damp paper and covered in a clay slurry and then heated and hammered to weld the different pieces together. Once stably combined the block is cut part way through and then folded. The act of cutting folding and hammering helps remove impurities such as slag and purifies the material. This process is repeated anything between 10 and 16 times. Each time an amount of material is lost so the more often it is carried out the greater the total expense in terms of lost material. It is the combination of stacking and folding that create the hada or grain pattern in the surface of the blade.

The other features within the jigane and hamon such as ji-nie, chickei in the jihada, inazuma, kinsuji and sunagashi in the hamon are all influenced by the composition of the block but created as result of the heat treatment and hardening of the sword.

When steel of approximately 0.7% carbon content (which tamahagane is) is heated beyond its critical temperature of between 725C and 850C the physical structure of the iron changes in to a crystalline form that enables it to take on more carbon and become harder creating a material which in the west is called austenite. If the steel is allowed to cool slowly austenite decomposes and reverts to its original softer form of pearlite and ferrite. However if the steel is cooled rapidly that decomposition is arrested and a harder material, known as martensite is frozen within the piece.



Transition phases of iron

The table above shows the transition phase of pearlite to Austenite. It can be seen that there is a relatively small window of opportunity when the transition is at its optimum.



Coating the blade with clay

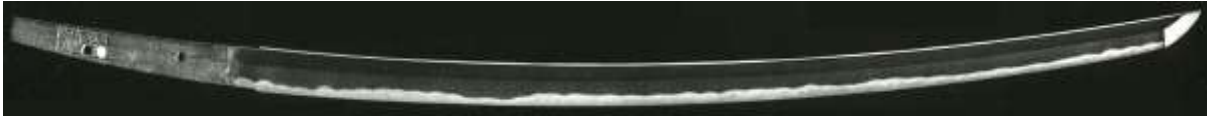
Most students will be familiar with the image of a smith coating a billet with clay to heat treat it. The blade is initially covered with a thin layer clay compound which has a high carbon content and then a second thicker layer is applied to the body of the sword excluding the edge. I understand the reason for covering the edge with this thinner layer is firstly it supplies more carbon to the edge when heating the blade and secondly prevents the thin steel from oxidising.



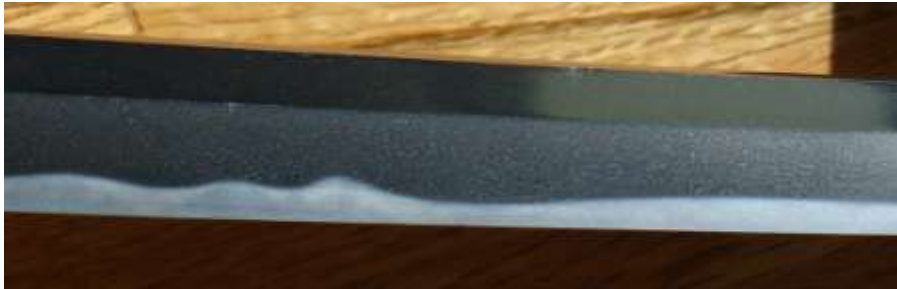
Yakiire

Once the blade reaches the critical temperature, something that is judged based on the colour of the sword, rather poetically it is described as being the colour of the moon in autumn; it is removed from the furnace and plunged in to a tank of warm water.

The edge cools rapidly freezing in the martensite, the back more slowly allowing the steel to revert back to softer pearlite. This creates an incredible degree of stress on the blade and smiths today expect a failure rate of 10% with the blade either twisting or cracking.



This treatment called Yakiire has a number of significant effects on the blade. Firstly the quenching causes the blade to curve. The back cools more slowly and so shrinks more than the edge pulling the blade into its characteristic curve.



Secondly the border between the thin and thick clay area creates a the Hamon (edge name)



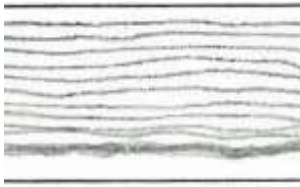
The process also develops the activity within the jigane and the hamon.



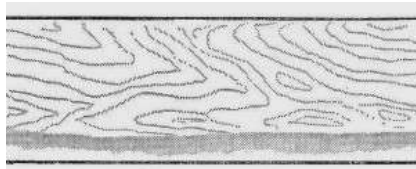
The image above shows a number of the activities within the jihada. These are all created from the same material, martensite. The only difference is in particle size and the way some of these particles

combine to create other features. In Japanese sword terminology this harder material is generally known as nie or nioi. Nie translates as boil or boiling. It likens the particles of hard steel to the bubbles created in boiling water. Nioi which is the same material but in much finer form may be better described as vapour or mist.

Examples of Ji-hada and activity.



Masame hada



Itame hada



Mokume hada

For those of us of a certain age the illustrations shown above were our initiation in to the different forms of hada in a Japanese blade. In the book *Token Kantei Dokuhon*, later translated and published in English as *The Connoisseurs book of Japanese swords*, the author, Kokan Nagayama, identifies these with particular traditions:

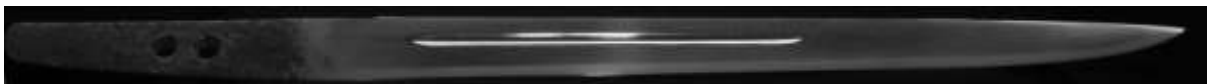
Masame- Yamato

Itame- Soshu

Mokume- Everything else.

Unfortunately life is not quite that simple. The statement that only Soshu work could be considered as itame has been largely superseded and itame is used with much broader application in other traditions. Likewise while masame appears frequently in Yamato work it is rarely exclusive.

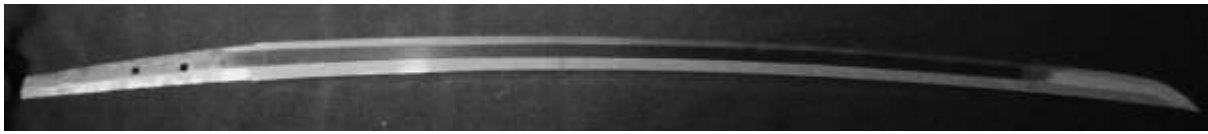
The following examples illustrate a number of different forms of ji-hada and activity within the jigane. It is by no means comprehensive and is based on forms that I believe to be particularly good quality and aesthetically appealing and in addition the majority are images of blades I have had the opportunity to study in hand. The choice is purely subjective and very biased for which I hope the reader will forgive me. I think they illustrate the points being discussed.



Yamato Hosho Masame hada

The example above shows a tanto attributed to the Yamato Hosho School. Of the five Yamato mainline schools Hosho was the only one which produced blades of almost exclusively masame.

Several smiths in Shinto times recreated this but pure masame is most commonly seen in Hosho work. It is extremely beautiful creating sinuous parallel lines running the length of the blade and greatly enriched with ji-nie. The hamon has a ko-nie deki which is very bright.



Yamato Taima combined masame and itame hada

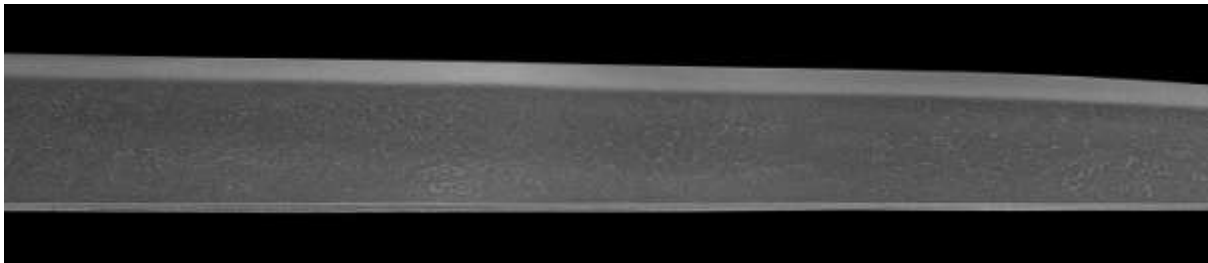
The sword above is very different but also made by one of the five mainline Yamato schools Taima. This school is famous for the beauty of their jigane. The hada combines a sinuous masame with ko-itame and mokume. The surface is rich in activity such as ji-nie and chickei. It is said that if in kantei your first bid is for the Soshu smith Yukimitsu and that answer is wrong, bid Taima in the second round. I think this illustrates very clearly just how good Taima steel is. I personally believe it is amongst the most beautiful of all Yamato work.



Yamashiro Awataguchi Nashiji hada

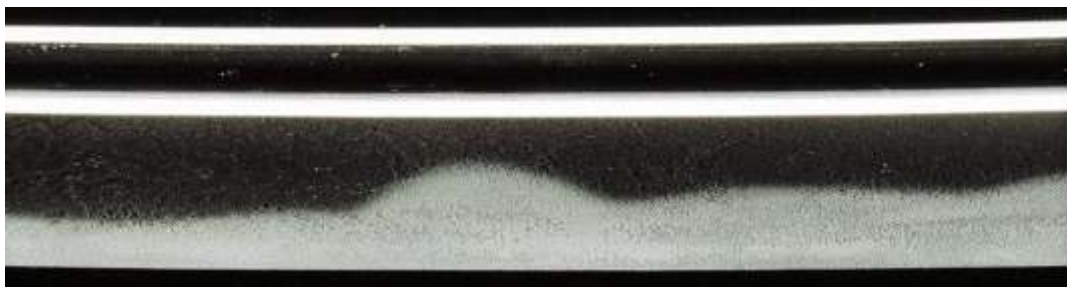
To anyone who knows me it will come as no surprise that the Yamashiro Awataguchi school would figure very highly on any list of fine workmanship I compiled. However I have a confession to make. I waited nearly 25 years to see my first Awataguchi blade in hand and when I did I thought it was possibly the most boring sword I had ever seen. I could see nothing in it. It took some time for my eyes to focus in to the steel but when they did what I saw was truly breath taking. The smiths of the

Awataguchi School produced a unique hada. It is a very fine ko-itame, so tight it almost appears muji (grainless) but as you turn it in the light it becomes clear that it is covered in masses of incredibly bright ko-nie and bright chickei. The hamon which is ko-nie deki is alive with activity in the form of inazuma and kinsuji. Known as Nashiji (pear skin) hada it is both unique and beautiful. The Awataguchi smiths worked almost exclusively for the nobility. This meant they used the very best materials and took their time to make swords. Each time a block is heated and folded material is lost so folding it to form such a uniform and tight hada structure would be very costly in raw material. Awataguchi work is very conservative and refined, in line with the tastes of their client base. It requires a great deal of effort to appreciate it. But once you start to see the detail and understand it there is really nothing to compare to it. It is incredibly beautiful.



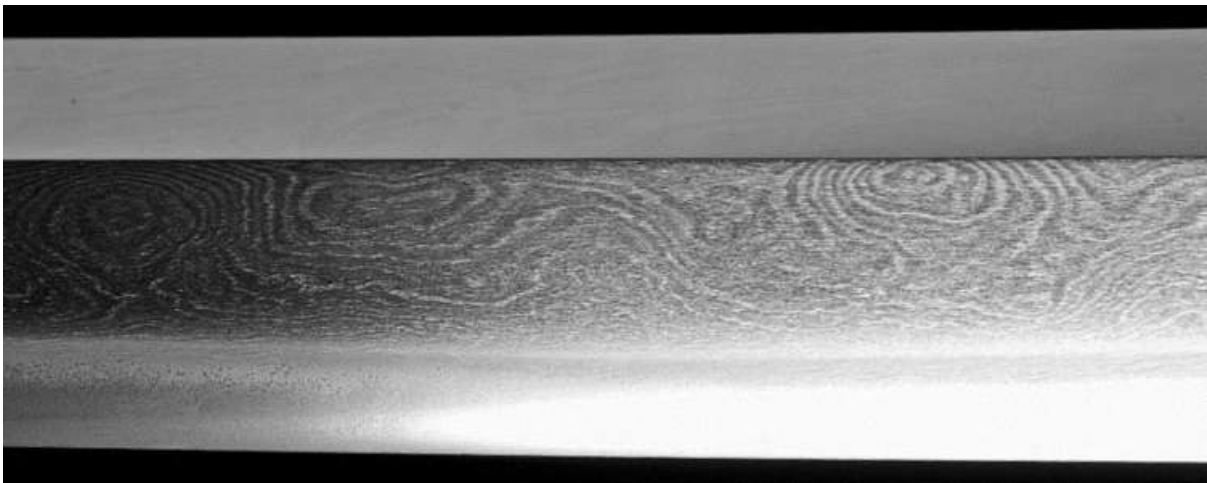
Soshu Shintogo Kunimitsu

When the Bakufu established its headquarters in Kamakura the incumbent Shogun summoned three smiths Kunitsuna of the Awataguchi School, Sukezane and Kunimune of Bizen to go to Kamakura and make swords for him. These smiths are credited with the foundation of the Sagami or as it is more commonly known Soshu tradition. The first true exponent of this tradition is regarded as Shintogo Kunimitsu. In the past there was a debate as to whether Shintogo was the same man as Awataguchi Kunimitsu. I think it is now generally accepted that they were two different people. However what is not in doubt is the influence of Awataguchi workmanship on Shintogo's production. He created an incredibly fine ko-itame hada but like his predecessor Awataguchi Kunitsuna he introduced more nagare, or running hada. He also appears to have worked at higher temperatures producing more abundant and brighter nie. Regarded as one of the three greatest makers of tanto his blades are exquisite.



Soshu Masamune hada

Perhaps the best known and most highly regarded member of the Soshu tradition was Masamune. His work has always been held in very high regard. It was especially valued by Nobunaga and Hideyoshi. There are many who regard his jigane as the most beautiful there is. The image above shows a combination of beautifully forged ko-itame, nagare and mokume interspersed with a huge amount of very bright ji-nie and chickei. It appears almost alive with activity. It is thought that Masamune achieved these results by working with softer steel and raising it to higher temperatures. If this is the case it is a great testament to his forging that the blade did not break during quenching. Also in the image clusters of bright nie appear to burst out of the hamon into the ji. It has been suggested that because Masamune heated the blade to such high temperatures that sometimes clay fell off the billet and these explosions of nie were the accidental result of this. Whether this is true or not the result creates something of exceptional beauty. Looking at a Masamune blade has been likened to looking at a landscape covered in thawing snow. I believe you could spend many years studying one of his blades and still find new features to admire.

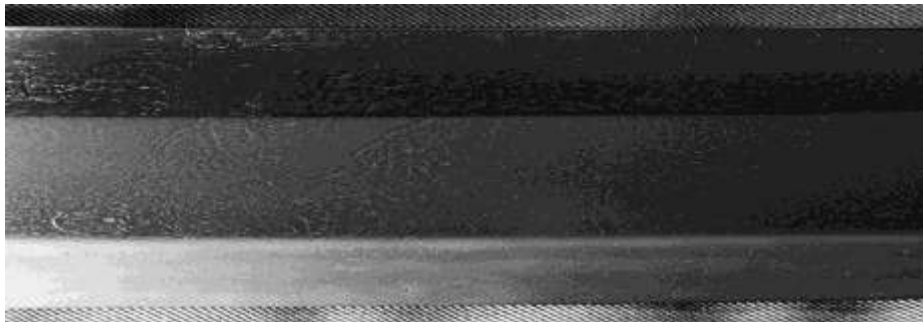


Soshu Norishige Matsukawa hada

When we move in to the next generation of Soshu smiths things start to change. It is true that Masamune's immediate followers such as Go-Yoshihiro, Sadamune and Kaneuji produced workmanship very similar to that of the master. Another of Masamune's 10 brilliant students, Norishige appears to have attempted to achieve a similar effect rather differently. Norishige was a Northern Province smith and his swords combine steels of greater variation than other Soshu masters. Most notably you see the dark or blacker steel noted as a Northern Province characteristic.

The result is a unique hada known as Matsukawa, or pine bark hada. It is very clear and active. It has a great deal of activity within the structure. It is altogether coarser in appearance. There are many who greatly appreciate this form and Norishige made some exceptional blades. However from a purely personal perspective I feel they lack the natural and more subtle beauty seen in the work of his master.

Again and as a purely personal view point I feel that after Norishige the overall quality of the Soshu tradition fell away. Later smiths seemed to try too hard to recreate the effects achieved by their predecessors and the results look altogether more contrived.



Chu Aoe Chirimen Hada

At a time when the Bizen School was enjoying great fame and success with the efforts of the Ichimonji schools and later the Osafune School in the neighbouring province of Bitchu the Aoe School were making something altogether different. I have previously described Aoe blades as combining Bizen material and Yamashiro technique. The result, which is altogether quieter and more conservative than that of their flamboyant neighbours, is a unique and very beautiful product. The jihada is a combination of ko-itame and mokume with jifu utsuri. This combination creates a result that the Japanese believed resembled crepe silk (Chirimen) in appearance. The hamon which in earlier Aoe work is nie deki is full of nie, sunagashi, inazuma and other activity. The nie in both hamon and ji is extremely bright and beautiful.



Yamashiro Rai and Enju ko-itame hada

In the second half of the Kamakura period The Rai School became prominent within the Yamashiro tradition. Such great names as Rai Kuniyuki, Kunitoshi and Kunimitsu produced a fairly high volume of work but maintained a very high quality. Their hada was a very fine ko-itame with a great deal of ji-nie and nie utsuri. In addition their hada had small areas of darker plain hada which became known as Rai hada. There is still much debate as to whether this intentional or core steel showing

through the surface and therefore a fault. I am inclined to believe the former and the overall appearance of Rai ji-hada is very attractive. The Enju School was heavily influenced by the Rai School producing an almost identical ko-itame. Typically if Enju smiths produced utsuri in their work it tended to be shirrake rather than nie utsuri. None the less Enju work at its best is comparable to Rai workmanship. It should also be remembered that early mainline Hizen Smiths such as Nidai Tadahiro and Sandai Tadayoshi were trying to recreate Rai and Enju hada when developing their iconic Konuka hada. The combination here of very uniform and tight ko-itame hada interspersed with very bright ji-nie and chickei produce something that is extremely refined and beautiful to study.



Oei Bizen Mokume and itame hada

Because the majority of my focus in the past has been on Yamashiro and Yamato work I have not had the opportunity to study many good quality Bizen blades in hand. Based on those I had seen and images of fine works by such smiths as Osafune Nagamitsu and Kagemitsu I knew these masters made some very fine blades with outstanding jigane. I believe Bizen smiths generally worked their blades at lower temperatures. As a result they are not noted for a great deal of ji-nie or other such activity within the body of their blades. However they compensated for this by producing a secondary hardened layer to further strengthen the blade in the form of utsuri. This feature is seen as a pale misty line above and following the hamon. At its best it greatly enhances the hada creating an exceptional overall appearance. The blade illustrated above is somewhat later being made in the Oei period by one of the leading Oei Bizen Smith's Yasumitsu. The hada is a combination of flowing itame and mokume and there is bo-utsuri. Overall the hada has a soft natural, almost organic look which is extremely beautiful. The quality of the forging is outstanding. The Ko-Bizen School and early Ichimonji Schools produced something different again and I hope to have an opportunity to study this work at some point in the future.





Mino Naoe shizu nagare and itame hada

The final example I wished to discuss was a Mino blade attributed to the Naoe-Shizu School. Naoe-Shizu was effectively the second generation of Mino Smiths formed when some of the students of one of the schools founders Kaneuji, moved from Shizu to Naoe in Mino Province. I am afraid the image seen above does not do this sword justice. The jihada is a combination of sinuous masame and ko-itame and is covered in ji-nie. It clearly illustrates the origins of the Mino School combining features of Yamato Tegai (Kaneuji's original school) and Soshu workmanship. The activity running throughout the hamon in the form of sunagashi is also very indicative of Mino workmanship. The reputation of Mino work has suffered through its association with the mass production of bundle swords in seki during the Muromachi period. However at its best Mino Jigane can be outstanding.



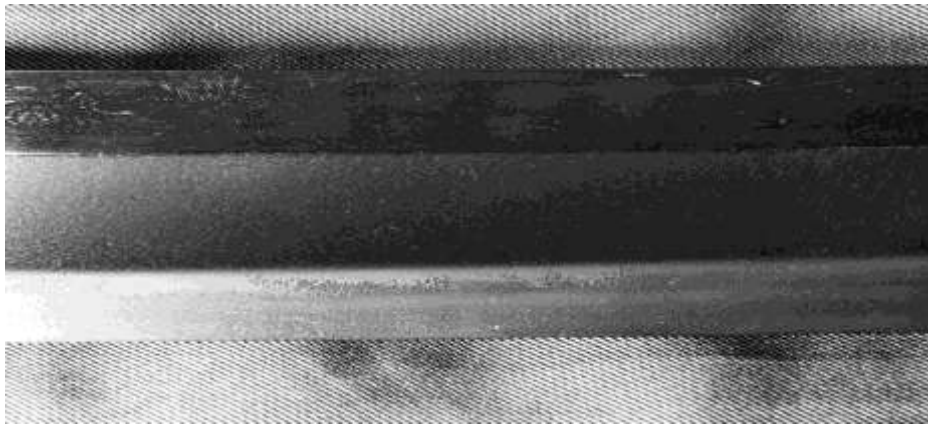
Chickei

Throughout the descriptions above I have frequently mentioned Chickei and the illustration above clearly shows this feature albeit in a rather exaggerated form. Chickei are formed by continuous joined lines of ne which create a very bright line of dark steel within the ji.



Kinsuji

Above is an example of kinsuji. This translates as “gold line” and refers to an extended continuous line of bright steel within the hamon. In this case it is in an Enju blade but the feature is often seen in High quality work of all five of the Gokaden.



Ara-nie

Finally the above illustrates an example of Ara-nie. When small nie is described as ko-nie when the particles become much larger they are referred to as Ara-nie which I believe translates as “wild boil”. As with the Masamune blade mentioned earlier these particles appear to explode from the border of the hamon. Ara-nie can also be seen in the ji and can be a very important indicator to specific schools when attempting to kantei a sword.

Look at the shape before you look at anything else



A good sword will never have a bad shape

I think virtually every presentation I have given about swords usually starts with the comment “look at the shape” and I couldn’t finish this piece without at least a small reminder to follow that advice. The shape can tell you a great deal about the sword before you start digging in to the fine detail of jihada and hamon. As said above a good sword will never have a bad shape. If the shape is bad so is the sword. However having a good shape does not necessarily mean the blade is a good one or of high quality. To determine that you need to look at all the other features relating to Jihada, hamon and activity within these. All of these features are dependent on the raw material, the way it was

worked, folded and welded and finally heat treated. As Michael Hagenbusch said in the quotation that started this piece “Jigane is the Key”



Jigane is the key.

In various To-ken gatherings the question “But who made the best swords?” or “which hada was the best?” frequently surfaces. There is very little evidence as to which form of hada, if any, was the best in terms of performance. There is opinion and some anecdotal references but very little published data; at least very little that I have found in English. Most opinion as to which is best is subjective and very much based on which is most aesthetically pleasing to the person making the judgement. To finish I thought I would compile my own league table. There is very biased and totally subjective. All of the names listed produced masterworks that have been greatly admired throughout history. I would be pleased to include any of them in a collection.

First division: Awataguchi Nashiji, Soshu Shintogo-Norishige.

Second Division: Chu-Aoe School Chirimen, Rai Ko-itame, Yamato Taima ko-itame/masame, Yamato Shizu running Itame.

Third Division: Inoue Shinkai Ko-itame. Hizen Konuka Hada. Bizen Osafune Nagamitsu and Kagemitsu Ko-itame .

Honorable mentions, combined ko-itame and Mokume of the Oei Bizen School. Combined itame and masame of Sa Yukihide.

Conclusion:

The above presentation/article was conceived as a reasonable choice for a first virtual meeting, relying as it does on a great number of visual aids. The subject of Jigane, ji-hada and activity within the Japanese sword is vast. This piece barely scratches the surface and is far from exhaustive. As said previously it is heavily biased and discusses forms that I find very appealing. There are many others of equal merit that I have failed to mention and I hope anyone whose favorite work failed to appear here will forgive me. I hope that if nothing else this brief work will stimulate curiosity and readers will want to study more. A reasonable understanding of this subject can greatly enhance the appreciation of Japanese swords and is very worthwhile.

In writing the original presentation and this article I needed a wide range of illustrations. I would like to thank the following people who have generously allowed me to use images to complete this story:

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Somewhere in Northern Isolation

May 2020.