

"Damascene" Patterns

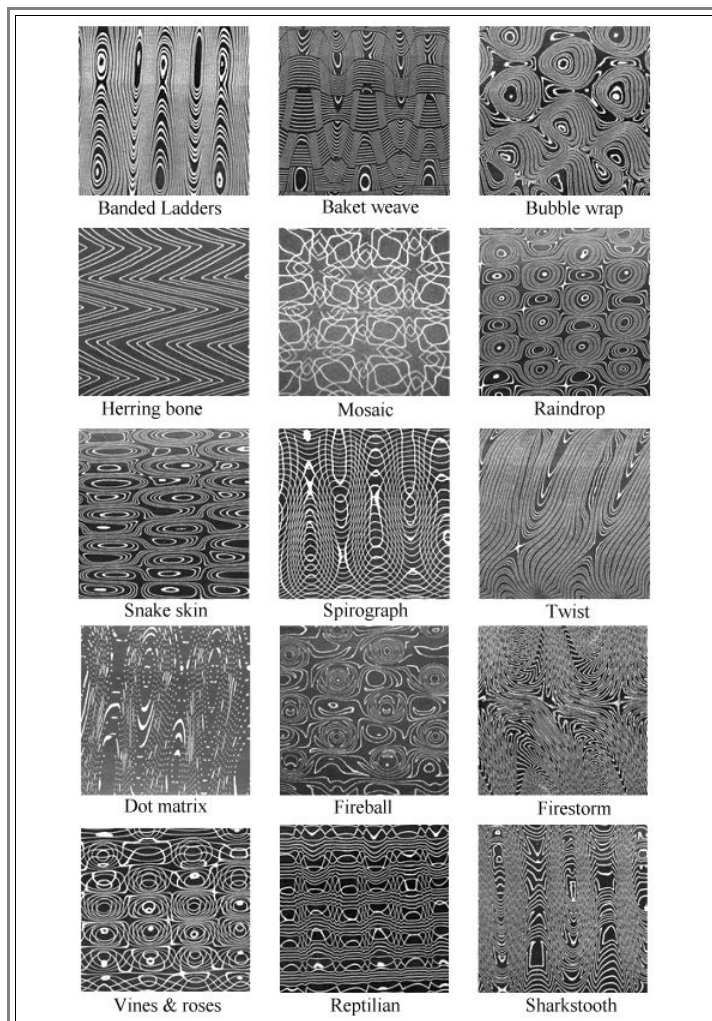
While I try to avoid the name "damascene" as far as possible for the reasons given [here](#). I cannot avoid it, however, as soon as "damascening" patterns come up. All and sundry talk of this or that damascening pattern so I will use the terminology, too.

This is a collection of patterns and names for patterns that I encountered while looking around. It neither claims completeness nor correctness. As far as names for patterns are concerned, there are no sanctified norms. What is a herringbone pattern for you might be a pinecone pattern for somebody else. .

● It is even worse because:

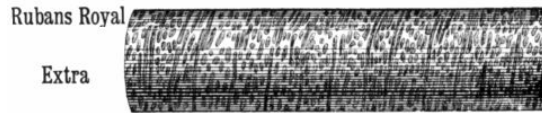
1. Discovering pattern welded old swords and realizing how they were made was originally a Danish / German enterprise with special words that are hard to translate. Alan Williams in his [book](#) uses German names like "Streifendamast" (stripe patterns or piled structure), "Winkeldamast" (otherwise known as herringbone) and "Doppelwinkeldamast" (double-herringbone).
2. It looks like people (including scientists) just make up names as they go along. One and the same pattern could thus have different names even in just one language.
3. There is a rapidly growing crowd of enthusiasts out there who make pattern welded objects with all kinds of patterns and self-invented names. Some of these objects, if I may say so, are really ugly, defying the purpose of the exercise.

Here are some examples of *modern* patterns made by Master smith Devin Thomas [1](#). You can look at (and buy) his products here: <http://www.devinthomas.com/>. How he makes these patterns I don't know. It just shows what is possible today. The names are from Devin Thomas and he can, of course, name his products any way he likes. The "herringbone" is classical, though.

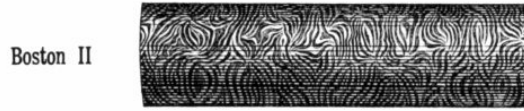


● Devin just continues the traditions. Gun and sword makers in the 19th century had tables illustrating the various kinds of "damas" you could get from them; examples are found in [Manfred Sachse's book](#) or here:

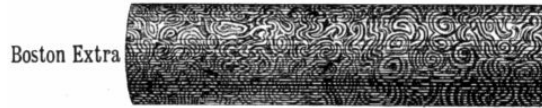
CANONS EN DAMAS



La paire de canons : brute, fr. 13.50 ; garnie, fr. 24.00



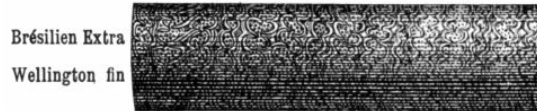
La paire de canons : brute, fr. 14.00 ; garnie, fr. 25.00



La paire de canons : brute, fr. 16.00 ; garnie, fr. 28.00



La paire de canons : brute, fr. 14.00 ; garnie, fr. 25.00



La paire de canons : brute, fr. 16.00 ; garnie, fr. 28.00

Les canons garnis avec choke-bored à gauche, en plus fr. 3.00

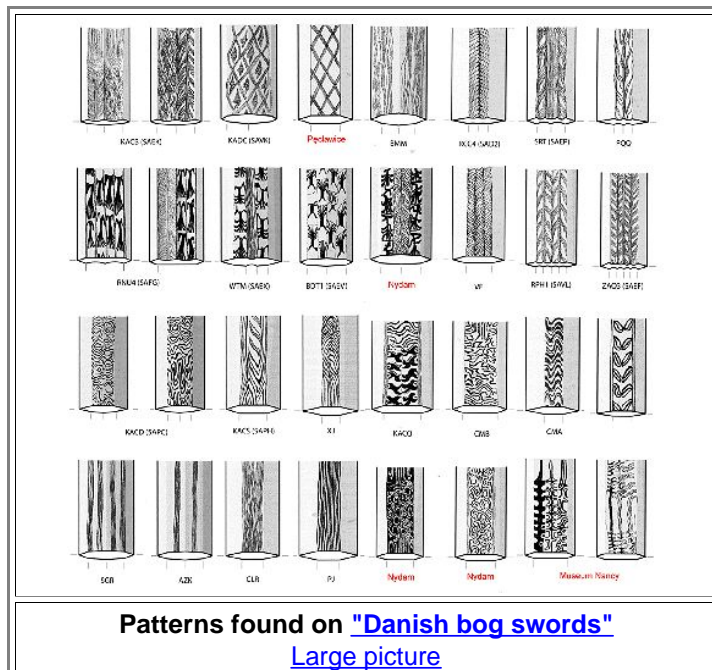
Catalogue page of the "Manufacture Liegeoise d'Armes à feu" from 1896

Source: [Manfred Sachse's book](#)

In what follows I will give you first a long list of names that I found in all the sources I studied - in German and English. Then I take a closer look at some of the more popular ancient patterns found on swords (and lance points).

What Kind of damascene patterns You Can Find

The [Illerup Adal books](#) provide a very nice compilation of the various patterns found in the "Danish bog swords" (and two other places):



Patterns found on "Danish bog swords"

[Large picture](#)

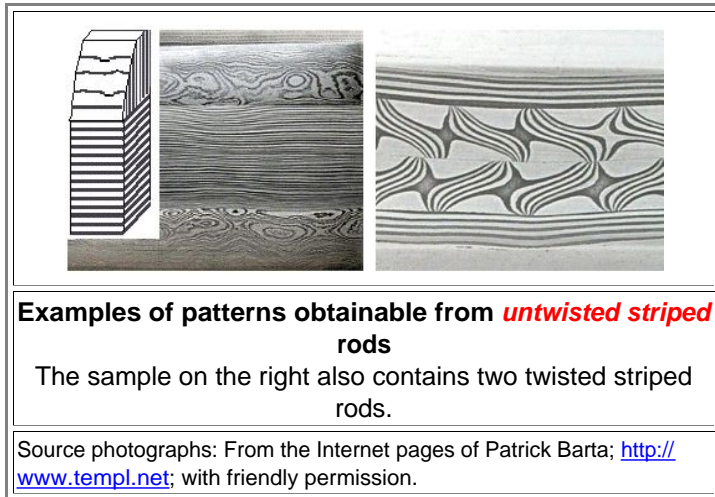
● All we need now are names for the basic patterns. I have started to make a little collection²⁾ but given up because it leads nowhere.

▸ So I'm going to use my own words, staying as close to the "mainstream" as possible.

Stripe and Woodgrain Pattern

▸ If you weld together a package of "bright / dark" steel and elongate it into an (untwisted) "striped rod", patternwise you can produce

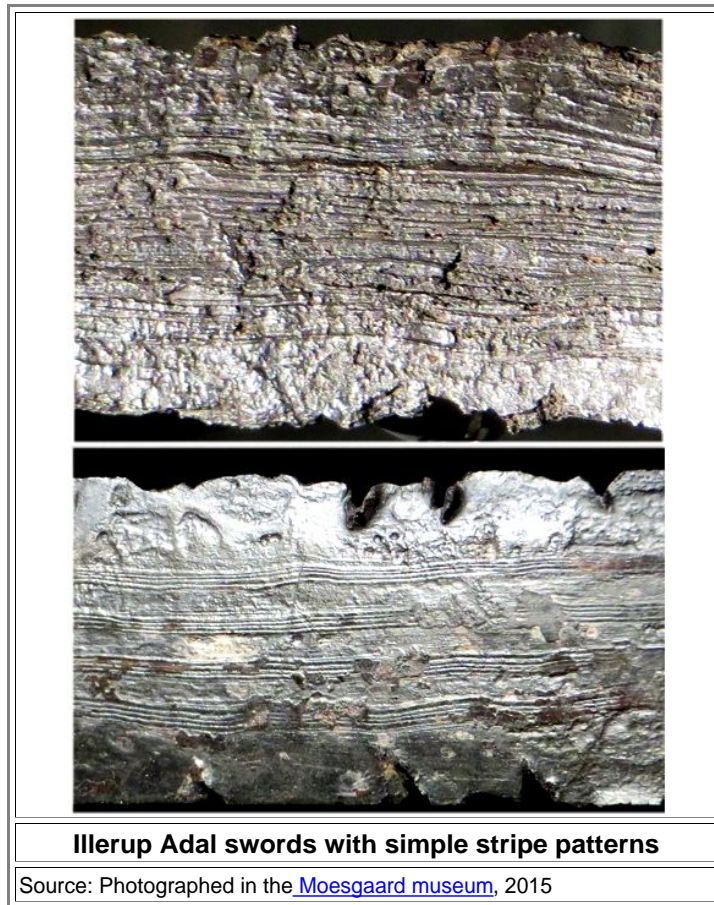
- Nothing (i.e. just the bright or dark steel) if you look at right angles to the striped side.
- Straight *stripes* close together if you look at the striped side of your striped rod.
- Stripes at larger distances if you cut a perfectly flat striped rod at some angle.
- A "*wood grain*" pattern if your layers aren't perfectly flat but a bit warped as shown below



● Here is an example from the Nydam treasure:

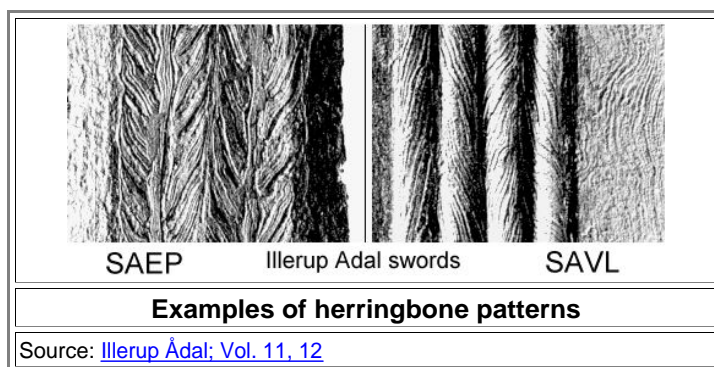


- The etched cross-section is from a different part of the blade but shows clearly that four 7-layer striped rods have been used, separated by some other brightish material. The rods make up the complete core of the sword. This is about the most simple pattern welded sword one could make. Here are some real blades from the [Illerup Adal](#) finds

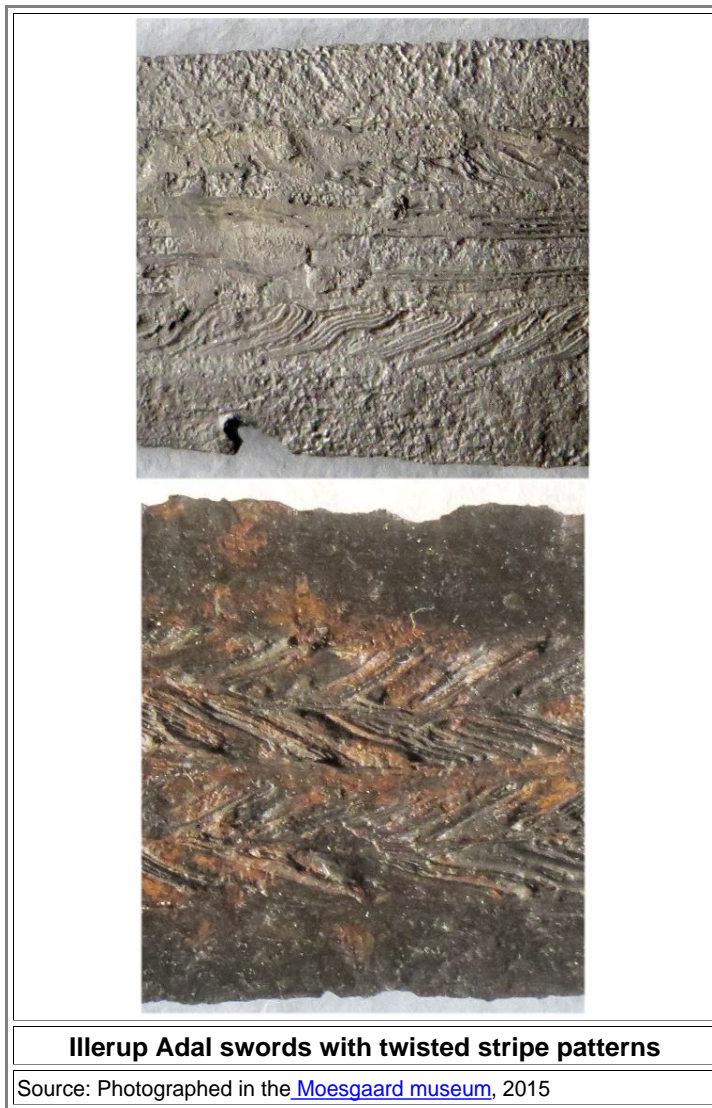


Torsion Damast and Some Tricks

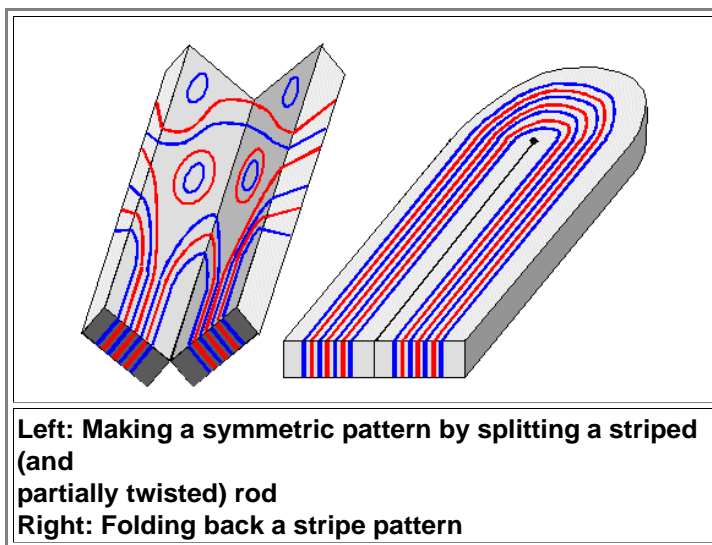
- Not much needs to be said; I have dealt with this most prominent pattern extensively in the [backbone](#). A very simple **herringbone pattern** can be produced by using just a few layers in your twisted striped rod; [two might be already sufficient](#). With a bit more cunning you may produce patterns like these:



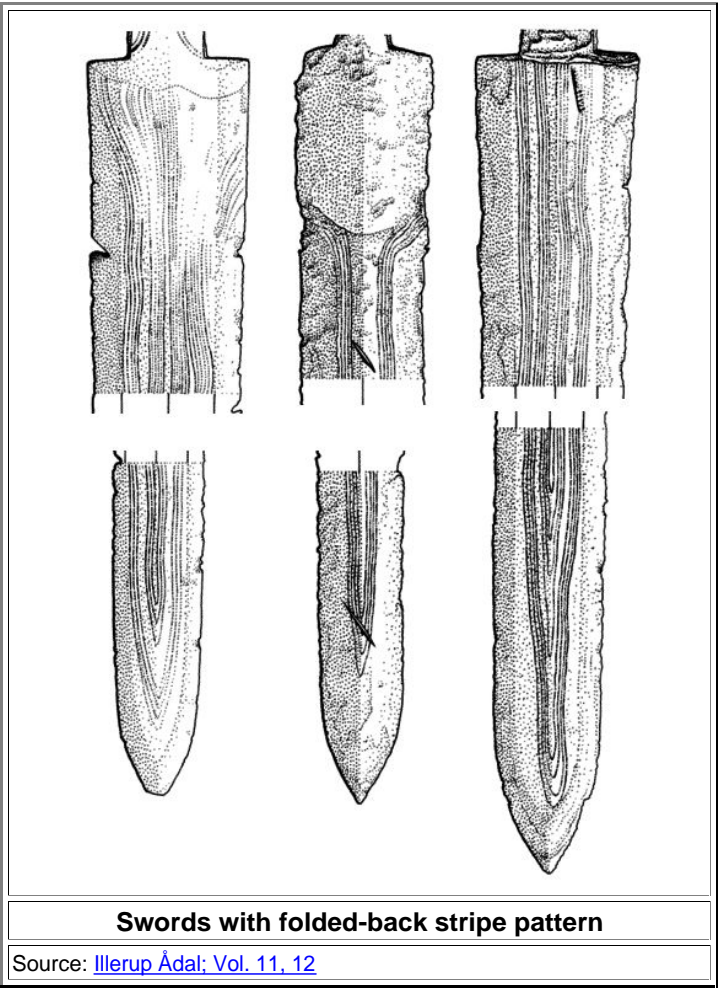
- The SAVL sword, incidentally, shows a nice wood grain pattern in the welded-on cutting edge part on the right. Here are pictures of real swords:



Combining striped rods that are partially straight and partially twisted - clockwise or counterclockwise - allows to produce a wealth of patterns, just look through the pictures already given. However, no smith - ancient or alive - can produce two twisted rods with *exactly identical* pitch that would produce an *exactly symmetrical* pattern if put side-to-side. Since some blades seem to have an astonishing symmetric pattern, the trick might have been to split a twisted rod down its center as noted by **Ypey**. Splitting a long rod down its center is probably not easy but can be done.



Also shown is an easier trick: folding back an untwisted striped rod on itself. This can be seen on a number of [Illerup swords](#):



It is clear that a broken pattern welded sword could not be mended without major pattern distortion, Nevertheless it was done on occasion:



Broken sword welded together again

Source: Photographed in the [Moesgaard museum](#), 2015

- This might have been a particular precious blade with a palmette pattern. Unfortunately the museum makes no mention of this blade and the illumination is so bad that no details can be seen.

Serpent / Snake Pattern

There is a lot of speculation about "the snake or serpent in the sword", suffice it to mention [Stefan Maeder's](#) (German) 330 page opus "Steels, Stones and Snakes". I give you a special module on the topic.

- There are, however, remarkably few old blades with "real" serpents made by pattern welding. "Real" means patterns as shown below and not just a certain waviness of the pattern as sometimes seen with twisted rods. The few "serpent swords" or "snake swords" that we know of, and the ways for making them, will be the topic here.

First a picture of parts of the (badly lit) "[Stuttgart](#)" **serpent sword**. The badly corroded original sword does not show much structure anymore; its composition was revealed by X-rays. A replica based on the X-ray findings was made and does show a nice "serpent in the sword".

[Special Module](#)

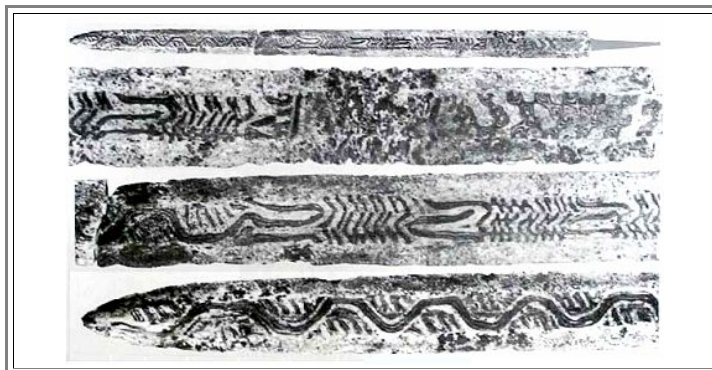
Serpent swords



The "Stuttgart Snake Sword". Replica and original

Source: Photographed in the [Stuttgart museum](#)

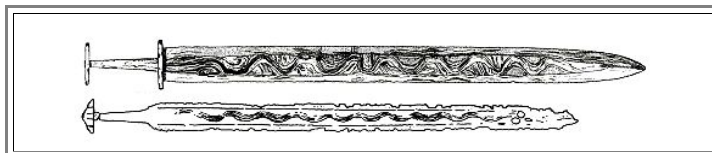
Another [replica of a "serpent sword"](#) was made by Patrick Barta; a close-up can be seen in one of the patterns shown [here](#). The original is a *6th century AD* sword found in **Vehmaa, Finland**. The snake pattern is only on one side, covering about 1/3 of the blade. Here is the "original":



The Finland Serpent Sword. Complete blade and enlargements

Source: Internet; origin not disclosed. Probably V.J. Leppäaho. "Späteisenzeitliche Waffen aus Finnland: Schwertinschriften und Waffenverzierungen des 9. - 12. Jahrhunderts". Suomen Muinaismuistoyhdistyksen aikakauskirja 61 (1964).

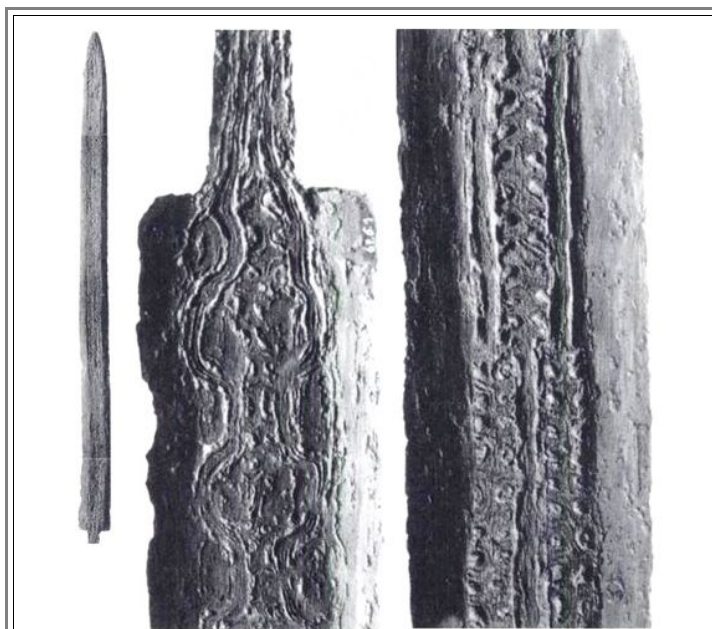
Two "serpent sword" drawings were provided by Ypey³⁾. The blades were found in **Nijmegen** and **Iversheim**, respectively, both in **The Netherlands**. These swords are from the **9th and 7th century**, respectively.



The Dutch Serpent Swords

Source: [J. Ypey](#); also in: "Europäische Waffen mit Damaszierung. Archäologisches Korrespondenzblatt 12 (1982) pp. 381 - 388.

Madeleine Durand-Charre in her 2004 book "Microstructure of Steel and Cast Iron" provides an example of a "double serpent", unfortunately without detailed data:



**Merovingian
Unknown date**



Serpent Swords

Source: Madeleine Durand-Charre; see above

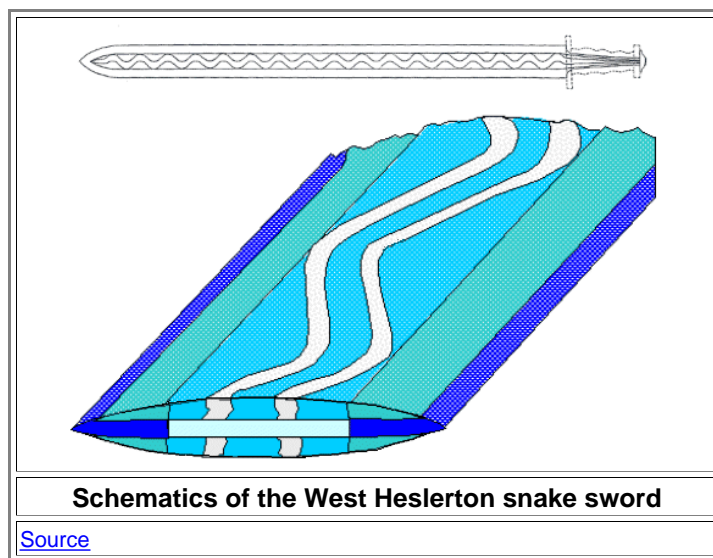
We have a "veneered" sword with two serpents on one side. Playing a bit more with the technique of veneering a all-steel blade with patterns made from twisted striped rods leads straight to the swords [shown here](#).

The latest find is perhaps the most illuminating one. A snake-patterned sword was unearthed in **West Heslerton, North Yorkshire, England** not that long ago (no precise date is given) and investigated in some detail. Dr. B. Gilmore reported the results in 1991⁴⁾.

The sword dates to the late *5th /early 6th century AD* and is thus the oldest one (discounting the undated Stuttgart sword). It is also the *only* one found in England so far. The metallurgical examination yielded the following results:

- Its composition is rather complex, see the schematic picture below. It is in particularly more complex than that of the older Holland / Finland swords.
- Slag inclusions and other coarse defects are seen, often in weld seams.
- The edges consist of a high carbon steel (around 0,5 %) sandwiched between two pieces of low carbon steel (around 0,1 %). The blade was quenched, indicated by martensite / bainite formation in the very edges of the high-carbon steel part. Microhardness values of up to 488 HV were found.
- The weld seams show the "white line effect", caused by an enrichment in Co and As. It appears that a "carbon based flux" has been used in welding (whatever that is supposed to mean).
- The center core piece was wrought iron but with substantial and varying amounts of phosphorous (up to 0.5 %). The pattern was made by twisting striped rods of welded stacks of very low carbon wrought iron and phosphorous iron (0.5 % - 0.8 %), respectively
- The exact building of the snake pattern was fairly involved and is not completely clear in detail. The windings of the snake, however are connected to changes in the twist direction.

Here is what that sword would have looked like:



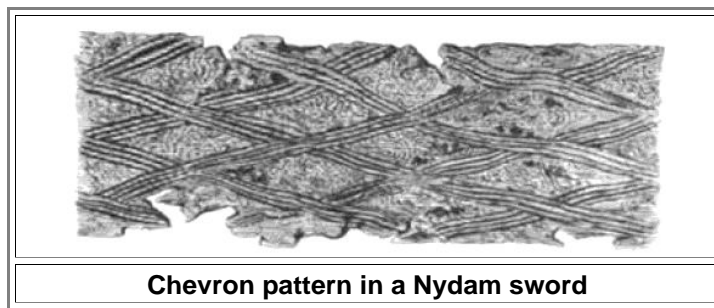
How are snake patterns made? Modern smiths have made a number of snake patterns and debate hotly in how many different ways that can be done. There is always the easy if uninventive way [described before](#): Weld three striped rods together, keep the center one untwisted. Forge the package into an undulating shape, followed by grinding the sides flat again. This is always possible - but wasteful since you grind off a good part of your rods, and labor intensive since grinding takes far more time than forging. So did the old smiths have some tricks up their sleeves that we don't know yet?

That is just one of the questions around "serpent swords" for which I do not know the answer. I also do not know the answer to these questions:

- Why do we have so few "serpent swords"?
- Was there any real significance to images of serpents as claimed by some (see the ["serpent in the sword" module](#))?

Chevron Pattern

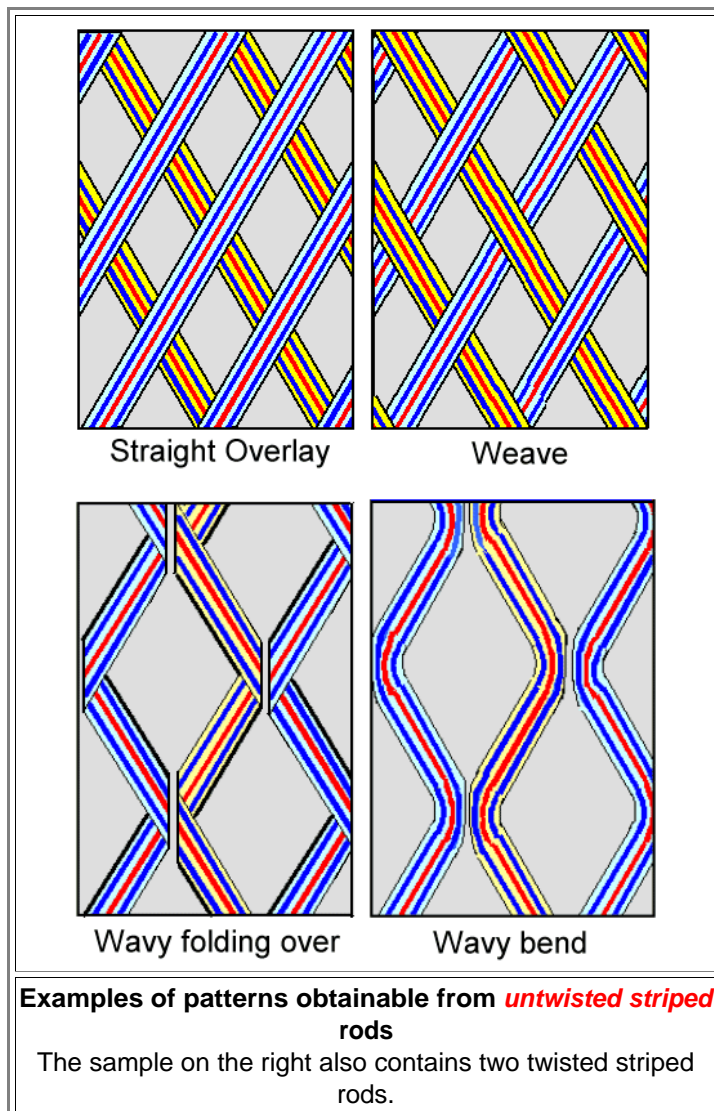
Here is the chevron pattern in a Nydam sword as drawn in [Engelhardt's book](#):



Chevron pattern in a Nydam sword

- Don't get your hopes up that you could see this pattern in the Moesgaard museum. First you need to find that badly illuminated sword among many others. After you found it you cannot really see the pattern; it's too dark. Only if you take a picture with a good camera and enhance it dramatically in your computer, you might get a picture. I didn't.

▮ There are several ways to make a chevron pattern with (striped) rods; below are four possibilities:



- Of course you could also make "knots" at the intersections and what not. Look at the examples provided and figure out for yourself, which method was used: Personally, I'm not sure (in contrast to some authors). It doesn't matter much, however, because you always need a more or less finished blade first that you then decorate with a chevron pattern. It can *only* been done by "veneering". In contrast, with twisted stripes rods you can make a complete patterned blade.

So far I haven't found a good recipe for making sword blades with a chevron pattern, possibly only on one side, and with some other pattern (typically palmettes) inside the chevrons.

Maybe its time to make a suggestion:

Chevron patterns could have been made by incrustation!

▀ **Incrustation** (or "damascening" in one [major meaning](#) of the word) in the context of swords usually refers to metals like copper, silver or gold "inlaid" into grooves cut into the steel of a sword. Here is a picture of what that looked like:



Incrustation (copper ?) on Illerup sword SAVL showing Mars

[Picture of the complete sword](#)

Source: [Illerup Ådal: Vol. 11, 12](#)



Color photography. This is copper?

Other pictures:

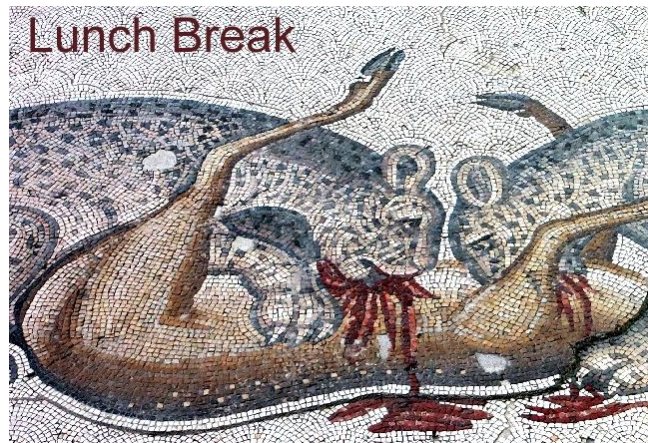
[Drawings and the complete sword](#)

[Large picture of incrustation](#)

Source: Photographed in the [Moesgaard museum](#), 2015

● It is clear that for the incrustations shown above you need to cut suitable grooves into which the soft metal is hammered. There is also another technique for decorating sword blades that we will meet whenever I get to wootz swords but here you need to cut and hammer.

▸ Now imagine doing it the other way around: Make a steel incrustation into a copper plate. You don't need to cut grooves into the copper. You can hammer the hard steel pieces right into the soft copper, just as you can "hammer" a pea into mashed potatoes, a cherry into a cream cake, or sink a tooth into a steak.



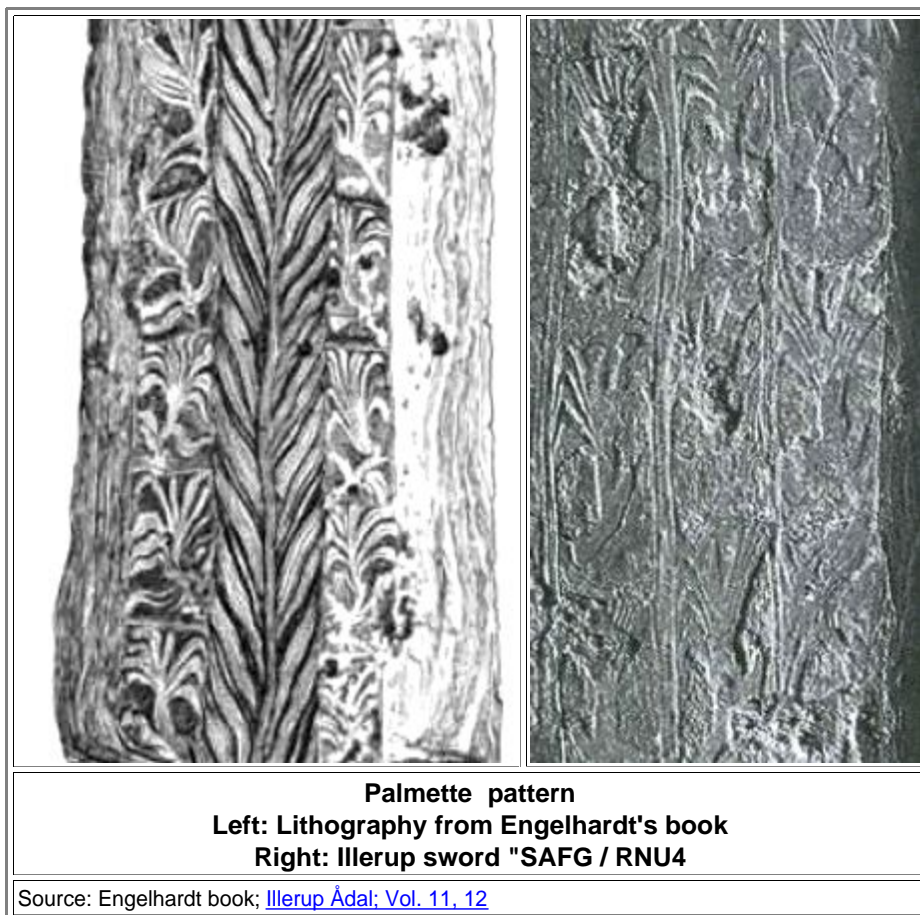
▸ So how about hammering a striped iron steel rod into a steel blade? They are both hard so it won't work - except if you heat up the blade, making it soft! That might just work. You can press a chisel point into hot steel, after all. It might work even better if you don't try to sink a whole striped rod deep into the blade but embed just some *wires* rather shallowly. Let's not forget that these guys knew how to make steel wires! They made whole [chain mail shirts](#), after all.

● Note that I'm *not* saying that chevron patterns were made in this way: All I'm saying is that there are possibilities here. There is a 1000 AD sword in the treasury of the Essen; Germany cathedral, that was made more or less in this way (involving some cutting of grooves and wires).

▸ I can see all these modern Master smiths' out there grinning to themselves. They might know exactly how to make chevron pattern blades, in contrast to me. Well; I'm open to suggestions, particularly for the next part.

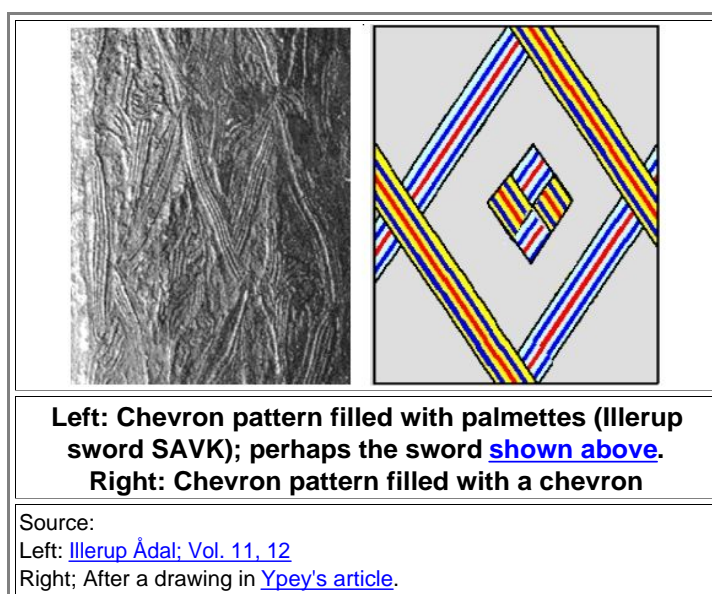
Palmette Pattern

▸ [Conrad Engelhardt](#) in his [opus magnus](#) supplied an [exquisite rendering](#) of a Nydam sword with a palmette pattern on both sides of a central herringbone besides the chevron pattern shown above. Here it is:



- [Engelhardt believed](#) that the palmette pattern was due to "damascening" = incrustations with iron /steel *wires*. Maybe he was right? I have nothing to add to what I have [said before](#). I do not know for sure how palmette patterns were made, but I have [some idea](#). More examples can be found [here](#)

▣ All that remains to be done is to look a mixes like "chevron filled with palmettes"; something mentioned a lot in the [Illerup Ådal books](#) but not really shown. Below is one of the few pictures I could come up with. More in [this link](#).



- Not knowing for sure how chevron or palmette paterns were made, not much can be said about "filled chevron" except that it cannot possibly be easy. One major conclusion is unavoidable:

These swords were major pieces of art!

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- 1) You can look at (and buy) Devin Thomas' products here: <http://www.devinthomas.com/>
 - 2) [Ypey](#) has: Flammendamast, Schlangendamast, Streifendamast, Tosiondamast, Mosaikdamast, Gittermuster, Welliger Streifendamast
[Sachse](#) uses: Gestirnter Damast, Inschriftendamast, Mosaikdamast, Hufnageldamast, Torsionsdamast, Rosendamast. and more
In the [Illerup Ådal; Vol. 11, 12](#) books we find: Winkelmuster, Steifenmuster, Zick-Zack, Rautenmuster, Weizenkörner Muster; N-Muster, Zellendamast, Komplizierte Muster, Spiralmuster, ...
I spare you the list of English words.
 - 3) **J. Ypey**: "Damaszierung"; in: Reallexikon der Germanischen Altertumskunde", Band 5, S. 191.
 - 4) B. Gilmore: "A Snake Patterned Sword Blade From West Heslerton, North Yorkshire. Ancient Monuments Laboratory, Report 129 / 91 (<http://services.english-heritage.org.uk/ResearchReportsPdfs/129-1991.pdf>)
 - 5) Engelhardt; Conrad: "Denmark in the early iron age illustrated by recent discoveries in the peat mosses of Slesvig". London 1856
<http://www.muenchener-digitalisierungszentrum.de>