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La talla lítica experimental

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Bifacial reductions from the recent prehistory of Northern Europe (axes and daggers)

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Abstract

This article explores the advanced bifacial thinning techniques used in the manufacture of Neolithic flint daggers and axes in prehistoric Scandinavia and northern Europe. Emphasis is placed on the unique technological mastery achieved due to extended Neolithic periods and abundant high-quality flint resources. The text focuses on the first five stages of dagger production, highlighting raw material selection, shaping, and thinning methods using hammerstones, antler hammers, and pressure sticks. The lenticular cross-section is crucial to successfully designing the dagger.

A comparative analysis with flint axe production shows similarities in bifacial reduction, while also noting key differences in shape, edge angles, and finishing techniques. Both processes demanded precision to avoid critical errors such as step fractures or overshots. Mastery in these techniques defined the true craftsmanship of northern European Neolithic flintknappers

Keywords: Flint technology; Neolithic; Dagger; Bifacial knapping.

Resumen

Este artículo explora las técnicas de retoque bifacial utilizadas en la fabricación de dagas y hachas de sílex del Neolítico en la Escandinavia prehistórica y el norte de Europa. El trabajo se centra en el conocimiento tecnológico único alcanzado gracias a la prolongación del período neolítico y a la abundancia de recursos de sílex de alta calidad. El texto se centra en las cinco primeras etapas de la producción de dagas, destacando la selección de la materia prima, el formateado y los métodos de retoque mediante el uso de percutores de piedra, martillos de asta y varas de presión. La sección transversal lenticular se muestra como un elemento crucial para el diseño exitoso de la daga.

Un análisis comparativo con la producción de hachas de sílex muestra similitudes en la reducción bifacial, al tiempo que señala diferencias clave en la forma, los ángulos del filo y las técnicas de acabado. Ambos procesos requerían gran precisión para evitar errores críticos como fracturas escalonadas o sobrepasamientos. El dominio de estas técnicas definía la verdadera maestría de los talladores de sílex del Neolítico del norte de Europa.

Palabras clave: Tecnología lítica; Neolítico; daga; talla bifacial.

Resum

Aquest article explora les tècniques de retoc bifacial utilitzades en la fabricació de dagues i destrals de sílex a Escandinàvia i al nord d'Europa durant el Neolític. Es fa èmfasi en el coneixement tecnològic únic assolit gràcies a l'allargament del període neolític i a l'abundància de recursos de sílex d'alta qualitat. El text es centra en les cinc primeres etapes de la producció de dagues, destacant-ne la selecció de la materia prima, el modelatge i els mètodes de retoc mitjançant l'ús de percussors de

pedra, martells de banya i vares de pressió. La secció transversal lenticular es mostra com a un element clau per al disseny correcte de la daga.
Una anàlisi comparativa amb la producció de destrals de sílex mostra similituds en la reducció bifacial, tot i que també destaca diferències importants en la forma, els angles dels talls i les tècniques d'acabat. Ambdós processos requerien una gran precisió per evitar errors crítics com fractures escalonades o sobrepassaments. El domini d'aquestes tècniques definia l'autèntica mestria dels talladors de sílex neolítics del nord d'Europa.
Paraules clau: Tecnologia del sílex; Neolític; Daga; Tallat bifacial.

The main subject in this article is not only the strategy of bifacial dagger reduction in prehistoric Scandinavia and northern Europe, but also the technology of manufacturing Flint axes and the way of reducing and thinning them in a very similar but also completely different way. The Flint technology in Northern Europe is probably the best it has ever been. This is because the Neolithic period lasted several centuries longer in these regions, than in the rest of Europe. Due to the great distance to the copper deposits, the Bronze Age was later developed there than we know it in other regions. In the meantime, a stone technology developed there that brought it to absolute mastery. In addition, there are incredibly large flint deposits in these areas, which provide raw material in almost unlimited quantities and in mostly high-class qualities. Time and raw material are both the main factors and the reason why such an excellent quality of flint processing could stand.

However, the rough outline of dagger manufacture, as shown in Fig. 1, only affects us in stages A to D. Processes I & F, namely grinding and parallel retouching, as we need it for example for the dagger types 1C, are no longer part of bifacial thinning, even if there again a little bit the material becomes thinner (Vang Petersen, 2008). That´s why the focus is on the first 4 stages of manufacturing. There are all in all 6 main types of so-called Danish daggers, which all have several sub-types. The today still valid typology has been defined the first time by Ebbe Lomborg in 1973 in his book about the flint daggers of Denmark and southern Scandinavia which was published in Copenhagen (Lomborg, 1973). Without wanting to go into more detail about the individual types, we can already see that the design of the handles in particular can be very different. But that shouldn't concern us any further, since the focus should be on the daggers blade. Our attention falls on type one and two, since especially these, like the blade itself, have more or less quite two-dimensional handles. Many other daggers have handles, that are much more three-dimensional, have triangular or square cross-sections in the handle and are often additionally marked with a stitching on the margins. But all these dagger types from 1 to 6 have one thing in common – they have to be bifacially thinned.

The crafting toolbox is just as simple and unspectacular, as the crafting techniques themselves. Hammer stones of different sizes, antler hammers of different sizes, pressure sticks with antler and copper tips and, of course, grindstones for the platform preparation are used (Fig. 2). This shows that the processing techniques consist essentially of the hard direct percussion, the soft direct percussion and the pressure retouching. At the same time, the focus is on generating working edges, isolating and stabilizing platforms, and avoiding a too heavy shock in the material. All in all, it's the same tooling techniques and manufacturing steps as any other flintknapping process too - just most time at the maximum of physical possibilities.

Our dear colleague Greg Nunn has shown the individual processing steps in a very detailed manner in his wonderful instructional video "Replicating the type IC neolithic Danish dagger" (Nunn, 2005). Since the order of his production steps is the only sensible one, I would like to stick to it, especially since I work according to these production steps myself too. The steps 1-5 are dealing with the question of

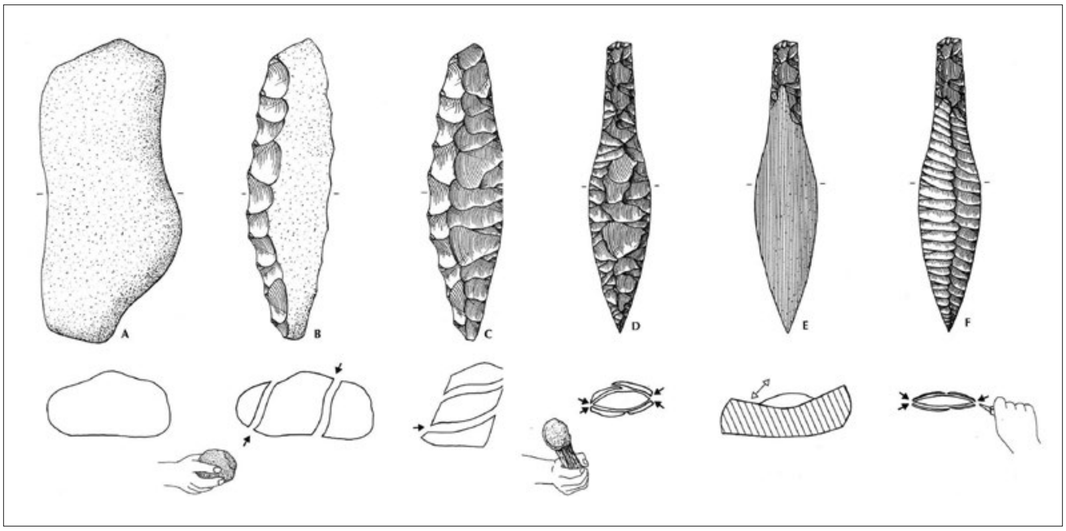

Fig.1: Simplified representation of the individual production steps of a flint dagger (Vang Petersen, 2008).

bifacial thinning. After that the steps start to divide depending on the individual type of dagger. This is why we will finish with step 5, even when in the real hard work like grinding and retouching just begins in the next level.

We start with stage 1 and the selection of the raw material. The right size is very important. Nodules, that are not too thick spalls can save a lot of work here. I usually select big and flat nodule, which are more or less already thin and have a real high raw material quality. If the raw material is too tough, you will need a lot of energy to process the flint and that may cause very hard shock waves during your knapping, which is super dangerous when your dagger is getting thinner and thinner.
Stage 2 is working on the raw material in a very rough stage. We usually use big hammer stones to remove rounded parts of the margin or problematical 90-degree angles, working with the zick-zack-technic. We also have a first sound check to see (or better hear), if there are any cracks in the flint.

Fig.2: Tool set for making daggers: pressure sticks, hammer stones, antler hammers and grinding stone (R. Graf).

Fig.3: Primary preform with cortex remains (R. Graf).

With the hammer stone we are creating a working edge and keep an eye on a straight line from the very first minute.

This is what makes us find the direction of our dagger. Depending on the individual working situation we change the size and the degrees of hardness of our hammerstones to switch sooner or later to antler hammers to come more in the surfaces of the material. Also, the antler hammers are changing their size, depending from situation to situation.

Stage 3 is one of the most important: We start to come more into the material and make it thinner through direct and soft percussion. By this we also give the dagger its general shape and we start lenticular cross section.

Lenticular cross section means, our dagger always has to have a lateral convexity and so the cross section has the form of a lens. If we lose that form – maybe through some kind of diving flakes or a too straight thinning, we will get step fractures in the middle of the surface, which will be a massive problem until the end. That also means, that parts of the cortex still may resist in the middle (Fig. 3) – they will disappear sooner or later in the next steps.

With the primary thinning we attack the high spots on the flint preform first. Never take too big flakes until the surface has no high spots anymore. Better work in smaller steps and repeat the process. We always stabilize and grind the platforms and working edges after isolating them. In the end of these process, we will remove our deltas to get a good margin.

Stage 4 is working on the secondary preform (Fig. 4a), which means that the thinning with different antler hammers is going on and the shape is getting more and more concrete. Again, the lenticular cross section is a very prominent task and the rest of the cortex is already gone.

In general, in stage 4 we generate large and long thinning flakes, which go close to the length of an overshot. It is also the time to watch for a good symmetry of the dagger and for removing the last high spots, that have been left. From now it is also very important to avoid too hard shocks while working and to stabilize the dagger for example on your leg, because now we are getting really thin and the danger of breaking is getting higher.

The thinning on the final preform stops with the stage 5, because it is senseful to change to the pressure stick to solve the last little problem remains. Finally, we finish the bifacial thinning and the shaping and clean up our margins to work on in a more individual way, that the dagger type we have chosen, is requiring. Mistakes like hinges or step fractures in this process will probably last forever. Change for antler hammers to pressure sticks and control the symmetry, the contour, the straightness, and the thickness of the dagger. After that we clean up the whole surface and remove the last deltas. Stage 5 is finished (Fig. 4b).

With the subtitle "Daggers and Axes" in brackets, now we come to something completely different, which is very similar at the same time. It is the bifacial thinning in the process of making north European flint axes. That means, that also flint axes, even when they are quite thick in comparison to the daggers, have to be thinned on both broadsides and mostly also on both narrow sides.
The main differences are Daggers need flat nodules, axes more rounded and solid ones. The dagger finish is a thin one, the finish of an axe is a more massive one. The edges of a dagger are acute angled, the edges of axes are almost 90-degree angles (regardless of the cutting edge) and a dagger has got a pointed tip while the axe has got a solid and long cutting edge. What they have in common is,

Fig.4a/b: Secondary and final preforms (R. Graf).

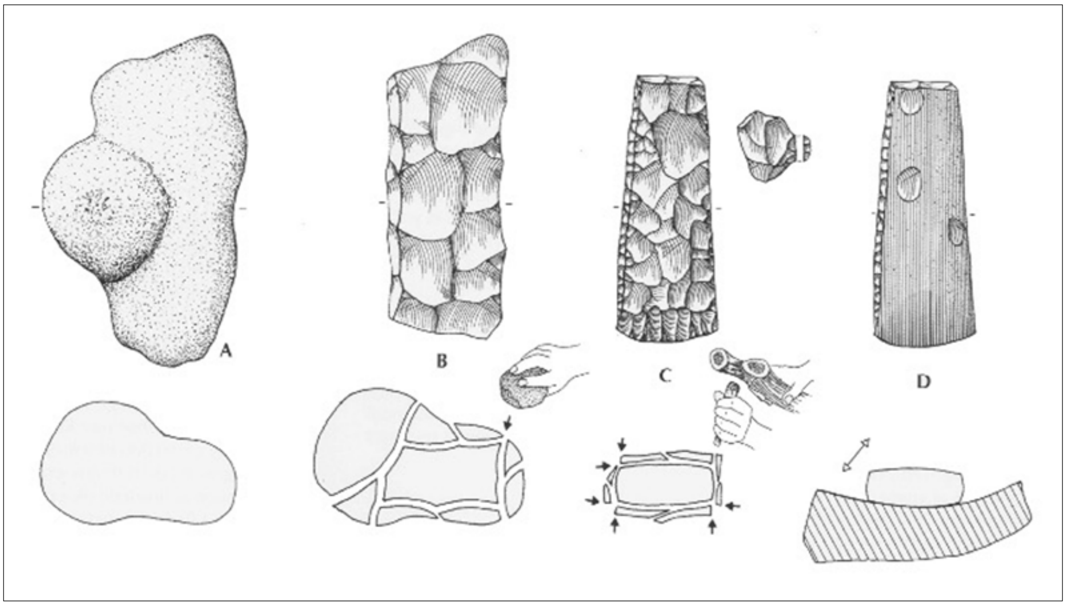

Fig.5: Simplified representation of the individual production steps of a flint axe (Vang Petersen, 2008).

both are bifacial thinned, both are endangered by over shots during the working process, and both will need all usual flint technics and the same tools.

Stage 1 again is the raw material obtaining. Again, we chose nodules but not thin once, but much more solid once, but also very big and thick spalls are possible.

The tools for gaining the very first preform and find the orientation of the axe is the same as before. It is necessary to work with huge hammer stones in the beginning and to switch to antler hammer and antler or copper punches in a later stage.

Copper tools make a stronger bulb and therefor also a stronger bulb negative than antler tools. That can be an advantage but also a disadvantage – it depends on the individual working situation and so there is no fixed rule, when to use what kind of tool material. We have the archeological evidence for both materials in the flintknapping processes in Scandinavia and so it is legal and ok, to work also with copper punches on flint axes.

The tricky thing in axe making is to generate 90-degree angles. As everybody knows, our usual working angle is from round about 65 up to 80 or 85 degree and everything beyond 90 degrees, usually just generates step fractures.

A very simple but also very effective trick is to work directly in the bulb negative from the flake before (Fig. 6). On the left you can see the situation, where the punch slips away and at least nothing happens or we ruin our working edge with a step fracture. On the right you can see that we got a completely different angle by using a bulb negative. The tool tip doesn´t slip away and gets a successful flake removal.

With that technic, very similar to the usual zick-zack-technic, we are working in stage 2, where we create a working edge and the initial shaping of the axe. At the same time, we prepare the edge for further flakes, that can be removed in the next steps.

In stage 3 we should usually put the hammer stone aside and switch to antler hammers, antler punches and copper punches. The right tool depends on the individual situation, which is a question of experiences. It is not a problem, if some parts of the cortex are still left – they will be removed in the next steps (Fig. 7).

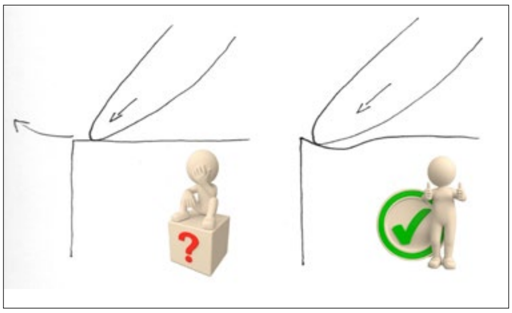

Fig.6: Avoiding the slipping at 90-degree angles by using the bulb negative (R. Graf).

Fig.7: Secondary Preform with cortex remains (R. Graf).

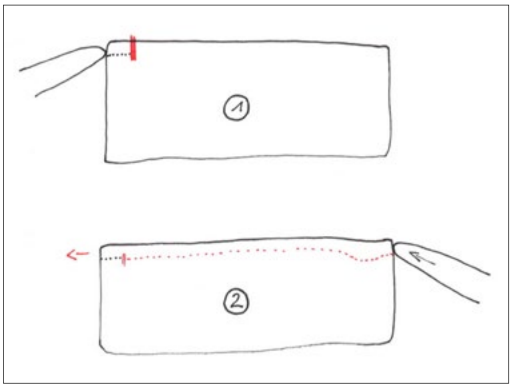

Fig.8: Avoiding an overshot by preparing a little hinge from the opposite side (R. Graf).

In stage 4 it is very important to avoid over shots, which are the very most common mistakes in axe making. It is really a nightmare when you are close to the final preform and somehow it happens, that one flake runs too far and kills your opposite side and removes the bulb negative there, that you would need urgently for working on. But how to avoid it in practical working? Directly bevor the final flake removal I create a small step fracture at the opposite edge, that remains in the material (Fig. 8 (1)). After that I can take the flake from the other side and it will end in the step fracture, taking it away at the same time (Fig. 8 (2)). It is a very elegant and absolutely save technic that keeps you working edge in the right angle.

In stage 5 we create the final preform of the flint axe. All high spots are removed now, the lateral edges are cleaned up with pressure retouches and the axe is thin and shaped in that way we want it. In the next step you can see, how skillful your work has been, because now every mistake you have made has to be grinded away. To grind a small high spot away is a work of maybe 15 minutes. But to grind a low spot away is a work of maybe a few hours, because you have to grind all the surrounding areas away.

All in all, the bifacial thinning of daggers and axes is a rather ordinary process. The real difficulty lies in the fact that you have to avoid as many mistakes as possible – in the best case of course ALL! This is what defines the true Master and in the neolithic northern Europe there have been the best of them.

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