

RITUAL LANDSCAPES AND BORDERS WITHIN ROCK ART RESEARCH

PAPERS IN HONOUR OF PROFESSOR
KALLE SOGNNES

edited by

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The method and physical processes behind the making of hunters' rock art in Western Norway: the experimental production of images

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With contributions, and based on experiments, by Morten KUTSCHERA

Abstract

The paper presents results from experimental production of rock art, and takes its point of departure in the imagery of the hunters' type, at the site Vingen, in Bremanger, Sogn og Fjordane, Western Norway. The discovery of a pecking tool of diabase under archaeological excavations at the site at the end of the 1990s gave new insight into the character of the tools involved in rock art production, the raw material they were produced from, and also inspired the author to produce experimental images. This led also to new knowledge about time consumption involved in the making of rock art – by indirect technique – and a number of other practical issues less focused on previously.

Introduction

The starting point of this paper lies in the border zone between experimental archaeology and the study of rock art, two areas that seldom meet, or cooperate. Its content is also the result of an interest in trying to gain more precise knowledge about the practical and physical aspects associated with the production of prehistoric rock images. Rock art studies are mostly occupied with theoretical speculation about what rock art means, when and why it was produced, and of course the detailed analysis of the form, type and style of images. From time to time, however, aspects related to the physical production of rock art become part of the debate where conclusions which also tend to be of a more theoretical character are made, but without, as I will claim, an adequate understanding of the nature of the production of these images. This accounts for how they were made, the technique and raw material that was in use, in addition to the time perspective involved in the production. On the basis of recent rock art production experiments, some experiences will be summarized in this paper, which also provides us with information that will add to our understanding of some of the hunters' images from Scandinavia. Nevertheless, it should be noted that there are a number of different ways to produce rock art.

The term normally used to describe rock art within our Norwegian context is *helleristninger*, a word derived from Swedish combining the expressions *helle* (literary meaning *rock panel*) and *ristninger* (literary meaning *scratches*), although this is barely descriptive, if at all, of the way rock art has been produced. In translations into English, the more all-embracing concept of *carvings*, or *rock carvings*, is used, but very few if any, have ever

been carved in our areas. There are a few examples of a somewhat related technique at Hell in Trøndelag in central Norway (Hallström, 1938; Sognnes, 2001) where the lines seem rightfully to have been carved or even cut by a sharp tool into the rock surface, which is of a much softer type, but there are few examples of this type of rock art on a very small number of sites. There are also examples of rock images that are polished, such as a type of hunter's rock art found within a limited area of Nordland in Northern Norway (Gjessing, 1932). However, amongst the most common type of rock art in Scandinavia we find what can be described as 'pecked rock art' – often in sandstone – which will be the main focus in this presentation, referring predominantly to the technique involved in its production, and where lines of varying thickness, forming the images, are built up by numerous pecking marks, and as I will claim involving *indirect* technique.

Background

The geographical and cultural starting point for the experiments is the hunters' rock art site of Vingen, located in the municipality of Bremanger in Sogn og Fjordane, Western Norway (Figure 1).

The site has a concentration of images on large rock panels, big boulders and on smaller stones, all distributed around a small fjord – and where the images are produced in Devonian sandstone. The majority of the images are red deer, followed by animal-headed staffs, geometric figures and anthropomorphic images (Figure 2).

It also seems feasible to consider many of the compilations of images on the different panels as narratives, left for us

RITUAL LANDSCAPES AND BORDERS WITHIN ROCK ART RESEARCH



FIGURE 1: THE NORTHERN SIDE OF THE VINGEN FJORD WHERE MOST OF THE DOCUMENTED ROCK ART CAN BE FOUND DISTRIBUTED ON ROCK OUTCROPS, PANELS, BOULDERS AND SMALLER STONES.



FIGURE 2: THE MAJORITY OF THE ROCK ART IN THE AREA IS HEAVILY WEATHERED, BUT PECKING MARKS CAN STILL BE IDENTIFIED. MANY IMAGES WERE ALSO FILLED IN WITH PAINT FOR MANAGEMENT REASONS, A CONTROVERSIAL METHOD THAT IS NOT PRACTISED ANYMORE.

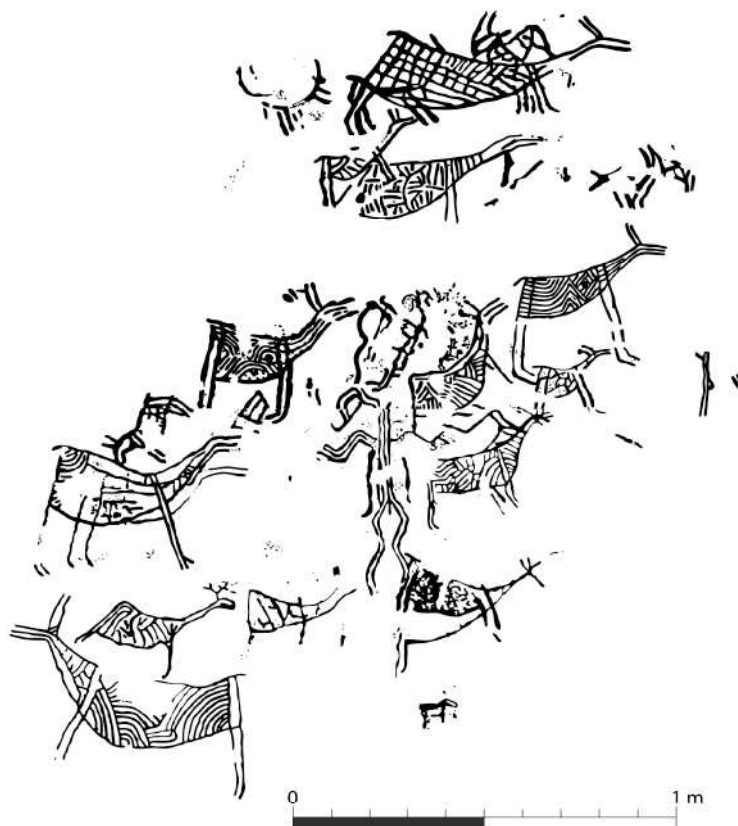


FIGURE 3: ONE OF THE MANY PANELS SHOWING THE COMPLEXITY OF THE ROCK ART, WHICH IS LIKELY TO BE INTERPRETED AS NARRATIVES FROM THE PAST (FIELD LOCATION LEITET 10) (LØDØEN & MANDT 2012: 308ff).

to interpret, but the organisation of the iconography and the syntax behind the images leaves us with the possibility of a wide range of interpretations (Lødøen & Mandt, 2010, 2012) (Figure 3).

The site first became known to the public in 1912 (Bing, 1912), which then led to a number of major contributions through time by Johs Bøe (1932), Gustaf Hallström

(1938), Eva and Per Fett (1941), Egil Bakka (1973, 1979), and others. In the 1990s many new discoveries were documented, which also led to the need to revise the former documentation, which was done by Gro Mandt and myself and published in 2012 (Lødøen & Mandt, 2012).

Rock art is difficult to date, and the chronology of the Vingen site has always been controversial. Most researchers that

have been dealing with Vingen and other contemporary rock art sites in Norway have based their chronology on stylistic comparisons with other sites and on geologically dated shorelines, and the assumption that the rock art was produced in the immediate vicinity of the shore (e.g. Bøe, 1932; Hallström, 1932; Bakka, 1973; Gjerde 2010). This has led to nothing but fairly vague chronologies and therefore an association with a number of different time periods and cultures. In the early 1970s the Vingen rock art was dated by Egil Bakka to the Early and Middle Neolithic (1973:173). At the end of the 1970s this was widened with a potential starting point at the end of the Late Mesolithic (Bakka, 1979), implying a production period of about 4000 years. Under discussions of the chronology of the Vingen site, the amount of rock art and its time consumption is brought into the debate, thus legitimising the dating of the rock art within time frames consisting of several hundred years if not millennia (eg. Gjerde, 2010:396).

Since the time the site was first documented, its function has formed a part of the debate, and a number of different suggestions have been made. The easily recognisable animal images have led many researchers to conclude that the site was used as a hunting ground (eg. Shetelig, 1922; Brøgger, 1925:78; Gjessing, 1932; Bøe 1932), while interpretations have completely ignored the ideological, cosmological or even religious role animals may have had in past societies, something that is frequently documented by ethnography (e.g. Guemple, 1994; Willerslev, 2007:32,105; Zwelebil, 2008: 44). Through the history of research this has also led to interpretations that the site should be understood as a place where different groups or bands would have met (Walderhaug, 1994:107-108). During the last few decades I have tried to relate the rock art to its contemporary context, through archaeological excavations and scientific analysis, in order to obtain a more nuanced background and acquire greater accuracy when it comes to the dating of the imagery and associated activity (Lødøen, 2003, 2013, 2012). In the last few years this has also convinced me that this and other associated sites, such as Ausevik in Flora, and Vangdal in Kvam, Hordaland were associated with mortuary rituals, which also helps to explain the many images of skeletons at these sites (Lødøen, 2014). I have also argued that the rock art of Vingen should be understood as the result of religious changes affecting hunter-gather-fisher societies at the end of the Late Mesolithic (Lødøen, *in press*). It is also my understanding that many of the same social, religious and perhaps ideological processes that are reflected in the many cemeteries in Southern Scandinavia, such as Vedbæk, Sealand, Denmark, and Skateholm, Scandia, Sweden, also led to the production of the rock art sites of the hunters' type, as both cemeteries and rock art sites can be shown to be associated with secondary burials (Lødøen, 2014, *in press*).

In order to better understand the past activity at the site and for a better dating of the imagery, several excavations were carried out in the vicinity of panels with rock art in Vingen during the 1990s and after 2000. These provided



FIGURE 4: A PREHISTORIC CHISEL OR HAMMER STONE DISCOVERED DURING ARCHAEOLOGICAL INVESTIGATIONS IN THE NEAR VICINITY OF SOME OF THE ROCK ART PANELS.

material exclusively from the Late Mesolithic period, and a number of results from radiocarbon datings have dated the occupation in the area to a time period delimited between 4900-4200 cal BC, with a potential start as early as 5400 cal BC (Lødøen, 2003, 2014). This production period is also supported by independent scientific and palynological investigations indicating activity within the same time frame (Hjelle & Lødøen, 2010). Here it should be noted that despite the fact that the occupation and use of the Vingen site could have covered 700 years or as long as 1200 years, as mentioned above, the rock art production in itself may have taken place over a much shorter time-span (Lødøen, 2013).

One of the above-mentioned excavations led to the discovery of a pecking tool in the vicinity of a number of panels with rock art (Lødøen, 2003). It was found associated with a cultural layer, dated to the Late Mesolithic (Lødøen, 2003:516, 2010:38ff.) (Figure 4).

Its form and shape led to the immediate assumption that it must have been a pecking tool for rock art. The elongated tool had a pointed tip, which corresponded with the width of the pecking marks making up the many lines that forms the images at the site. The tool was later geochemically analysed and shown to be made of diabase, and the analysis concluded beyond doubt that the material originated from the Mesolithic Rock Quarry at Stakaldeneset in Flora, to the south of Vingen (Olsen & Alsaker, 1984; Skjerlie, 1999; Lødøen, 2010). This also addressed the question of the material involved in rock art production, since material from the quarry was the source of raw material for axes and adzes found in numerous quantities at the habitation sites, but also frequently deposited as votive deposits. It has therefore been argued that the site was a sacred site, therefore suggesting that material of a more sacred nature was needed for the production of potentially sacred images at the rock art sites (Lødøen, 2014). This renewed knowledge has made a major contribution towards obtaining a better understanding of the cultural and historical background associated with the production of these images, at least in Western Norway (Lødøen, 2003, 2010).

Experimental archaeology, and material needs

Spurred on by the discovery of the pecking hammer, I was inspired to attempt to discover how the rock art was produced in the past in greater detail. The knowledge about

the shape and form of the Vingen hammer and the character of the corresponding pecking marks made it quite likely that the thin lines with numerous pecking marks, making up the images, must have been made by an indirect technique, something I will come back to. In recent years experiments from amongst others Sweden and Scotland has added considerable to our knowledge about rock art production although this covers another set of imagery much harder bedrock and a *direct* technique to produce the images. For the Swedish experiments on granite in Bohuslän, Southern Sweden, it has been argued that the images were first outlined by thin lines, and were then either ground, or first hacked and later ground by a tool made from quartz or quartzite (Hygen & Bengtson, 2000: 91). These experiments showed that it took almost an hour to produce a cup mark and a day to produce a small ship (Hygen & Bengtson, 2000: 91), first and foremost due to the consistency and hardness of the granite. Much more thorough analysis of rock art production, has been carried out associated with archaeological investigations of the Kilmartin rock art in Scotland recently (Lamdin-Whymark 2011: Jones *et al.* 2011). These have provided detailed knowledge about the different processes where hammer stones of quartz have been used to produce images in epidiorite. Apart from the detailed timing of image production a number of other observations has also been documented, such as the changing of the epidiorite color over time and the character and consistency of the hammer stones, how they are reduced and a number of other elements. Much effort have also been invested in the timing of the production of cup marks and concentric circles (Lamdin-Whymark 2011). Several other experiments have also been carried out elsewhere in the world previously, and most of these have also involved direct techniques (Sierts 1968; Bednarik 2001), very few seem to have been occupied with indirect technique. Some researchers have even rejected this technique for the production of rock art in the past (Bednarik 2001: 44). It was therefore most interesting to work in more detail with sandstone and this indirect technique.

Despite my detailed knowledge of rock art in general and the Vingen site in particular, it seemed more suitable to involve someone with greater skill in prehistoric handicraft and tool technology. This naturally led to cooperating with one of Scandinavia's most skilled experimental archaeologists, Morten Kutschera, who also has detailed knowledge of all of the tool-producing techniques used throughout the Stone Age in Western Norway, as well as long-term experience with different types of raw materials that were used during the same time span. We decided to try to collect suitable rocks of the same type used for the images in Vingen, with a smooth surface and of a similar character as the stones with images from Vingen. It was also decided to make tools out of diabase, the same material used to make the artefact documented at the site.

The search for suitable rocks

This led to a series of minor challenges, as the surroundings of the Vingen area are protected by the Cultural Heritage

Act due to the rock art and other cultural heritage elements, and also because this is a Protected Landscape. Clearly we had no intention of disturbing the site, which meant that all of the stones chosen for the experiments had to be found outside the protected area. Vingen is located within a larger geological area, often referred to as the *Devon area*, with sandstone that originated 400 million years ago and where the same type of rock as in Vingen covers several square kilometres, although the quality varies within this larger sandstone landmass (Lødøen, 2003). After carrying out surveying work, a number of stones were located along the shoreline outside of the larger area and from an equal environment as Vingen, where rock had been exposed to similar coastal abrasion and a most suitable polishing, which must have shaped and formed the many stones and rock panels used for images in Vingen. This also resulted in further challenges, as the stones had to be of a considerable size. They then had to be transported, first by boat and then by car, to the University Museum of Bergen and to Morten Kutschera's workshop. This meant dealing with the area's fairly rough coastal conditions, transporting the stones without them getting scratched or damaged. We also had to produce hammer stones of the same type and character as the one used in Vingen. Due to protective issues at the quarry from where the original tool originated – the Stakaldeneset quarry – another diabase source, at Stord in the County of Hordaland, Western Norway with fairly similar qualities as the original was chosen.

After discussions with Morten Kutschera about the different perspectives with these experiments, the stones and a number of relevant tracings of original images from Vingen were left in his and his assistant's hands (e.g. Figure 5). It was decided to try produce identical replicas of the original images varying in development types and of motifs and to try to identify the potential technique and also explore nuances in potential production methods used

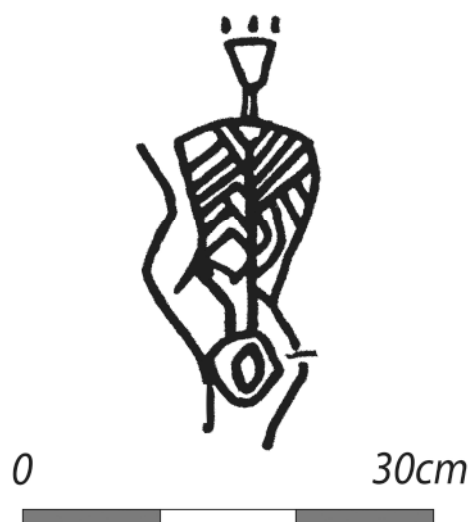


FIGURE 5: TRACING OF AN ANTHROPOMORPHIC FIGURE OR SKELETON, TO BE REPRODUCED BY THE EXPERIMENTS BELOW (REF FIG 10) (FIELD LOCATION BAKKANE 3) (LØDØEN & MANDT 2012: 341F).

in the past. Below the practical process will be described in more detail. All images that have been experimentally produced are based on original images from Vingen. References to the original images will be mentioned in the different captions.

Producing images in solid rock: Descriptive observations from experimental archaeology

For a flint artefact-producer who is used to applying precise punches several hours at a stretch, it seemed quite natural to make rock images. The most challenging thing, however, was to find the correct seating position, and he also had to vary between sitting on his knees and supporting his left elbow on the ground. He got the impression that it would have been easier to produce the images on a sloping rock surface, which is the case for most of the original images in Vingen. However, he quickly found a pace of pecking that was effective, four rapid strokes until he moved the chisel a few millimetres, followed by another four strokes (Figure 6). In the beginning it was also natural to mark the outline of the images and then peck between the lines (Figure 7).

This method was applied, in particular to the 'hook-images' or what are also interpreted as animal headed staffs



FIGURE 6: THE PROCESS OF PECKING ROCK ART, LITTERALLY IN THE HANDS OF MORTEN KUTSCHERA.



FIGURE 7: THE IMAGES WERE FIRST OUTLINED BY CHALK BEFORE THE PECKING PROCESS STARTED.

(Figure 9). The chisel or punch that was documented after investigations in Vingen seems as if it to some extent was roughly produced. Since it was most likely not hafted, it did not matter whether it was symmetrical or not. However, it is thickest in the middle, which probably gives the tool strength, with a tip that seems to be perfectly designed for the task. It is not clear whether the original tool was polished or not since the weathering is pretty extensive, but it seems to have been most important to produce a head that was suitable for hammering and a pointed tip. Therefore we spent no time and effort in polishing the tools needed for the experiments, but concentrated the production towards producing a fairly flat, slightly rounded head to better receive blows from a relatively light wooden mallet. All of the chisels were produced in a way that meant they were thickest near the centre, then narrowing towards a slightly rounded point (Figure 8).

The experiments showed that it was important to keep the tip of the chisel pointed at all times. As soon as it was worn flat, the tool was no longer able to penetrate the rock surface with the same effect. It is still possible to produce pecking marks, but these will be vague and shallow. Conversely, when a piece of the tip of the chisel was released from the point of the tool, this does not prevent it from penetrating the rock, but the marks left are then more crescent shaped. This also puts the chisel at risk of being completely damaged if it is not sharpened immediately. We found that one of the chisels which lost pieces at the tip during the experiments had a longitudinal vein or weakness. As it was sharpened, the weakness disappeared, which also extended the period of time between each time it had to be re-sharpened. For the smaller images, we used two different chisels, and it was necessary to sharpen the edge before the image could be completed. For the human figure, which was slightly more complex, three different chisels were used. Having pecked $\frac{3}{4}$ of the figure, one of



FIGURE 8: MOST OF THE TOOLS INVOLVED IN THE EXPERIMENTS. THREE CHISELS OF DIABASE AND THE SMALLEST OF THE MALLETS, WEIGHING 295 GRAMS.

the chisels became so flat that it did not cut properly, while the other two had only lost a few pieces at the edge.

Surprisingly, there was very little loss of material and length of the tool when the chisels were re-sharpened constantly. The same chisels were used to make four smaller images, and they are still highly intact and seem to withstand much more use. That said, this was written at an early stage, and the chisels are in the same condition after completing all of the images, after many hours of pecking.

Producing the chisels is probably the most time consuming process. To sharpen them again at regular intervals also takes time, but it is best to fix them regularly before they start to crack and need to be modified more thoroughly. The principle is the same as with flint producing tools. It is quite possible that they used a polishing plate or may have even used the rock to re-sharpen the chisels.

It took 45 minutes to produce the first 'hook' or animal headed staff, but the next one (which admittedly was a bit smaller) was produced after just 27 minutes (Figure 9). The time difference is probably because Morten was quite cautious at first, due to lack of experience and did not know where this led, and also had to re-peck the previous marks some places to get deeper. The small animal figure took just over 50 minutes (52), whereas it took 1 hour and 20 minutes to peck one of the more complex human images (Figure 10). The latter was however scaled down to 90% so that the image could fit on the stone block. The chisels had to be sharpened regularly, but the mallets were affected most during these experiments: they shattered because of the many hard blows on the head of the diabase tools. Most of the images were pecked with a four-sided mallet weighing 295 grams. In between, another one was used weighing 512 grams – where it was compensated with lighter strokes – although he preferred by far the lighter mallet even after it had begun to splinter. It was found that not much weight was needed as long as the blows are strong and precise.

Two human figures that were part of the experiments are quite similar, and we believe that these must have been produced by the same person in the past (Figure 11). They have the same expression, although their proportions are slightly different. However, we chose to divide this between Morten Kutschera and his assistant, Nicole, to check if we managed to keep the same similarity when produced by two different people. The anthropomorphic image or skeleton produced by Nicole took her 56 minutes to peck (Figure 11, right). It has a slightly different character than Morten's image, as it is produced by a lighter hand, and for this reason it seems to some extent to be in another style. This is a key issue in experimental archaeology, and indicates that differences between items that are made, or in this context images, could just as well be the result of different people being involved than time differences. Nicole had much the same pace as Morten, especially towards the end. The image is nicely executed, with denser and smaller pecking marks. It is, however,



FIGURE 9: TWO HOOK IMAGES, WHAT IS LIKELY TO UNDERSTAND AS ANIMAL HEADED STAFFS (FIELD LOCATION BAK VEHAMMAREN 22) (LØDØEN 2012: 208ff).



FIGURE 10: A MORE COMPLEX ANTHROPOMORPHIC IMAGE, ONE OF THE MOST TIME CONSUMING TO PRODUCE IN THESE EXPERIMENTS (FIELD LOCATION BAKKANE 3) (LØDØEN & MANDT 2012: 341f).



FIGURE 11: TWO ANTHROPOMORPHIC IMAGES WITH DIFFERENT APPEARANCES AND PRODUCED IN OUR EXPERIMENTAL STUDY BY TWO DIFFERENT INDIVIDUALS DISPLAYING INTERESTING DIFFERENCES (LEFT FIELD LOCATION LEITET 12) (LØDØEN & MANDT 2012:312) (RIGHT FIELD LOCATION VINDBAKKEN 2) (LØDØEN & MANDT 2012: 323).

not as deep as the one produced by Morten (Figure 11, left). Maybe it is not deep enough to last the necessary time period required? In any event, we chose to use this as an example of images produced by two different people without the same power or intensity behind the pecking. There was hardly any wear of the chisel after she finished the image, and she used only one chisel, and she did not affect the already worn mallet in any particular way.

The large-headed image took 27 minutes to produce (Fig 11). The chisel penetrated deep into the rock with ease. Because Morten's strokes with the mallet were harder than Nicole's it penetrated deeper into the rock. This could preferably be explored in more detail, and is something to focus on more closely in the future. One of the reasons why the pecking process is a relatively easy task is that the rock seems to be divided into layers, which chip off easily. It seems to be schistose to some degree, but it is probably caused by the fact that the surface layer actually has a weathering crust. It is therefore tempting to try the same chisels on other types of rock to see what the result will be. Maybe it does not matter, or perhaps it is essential? In order to penetrate deep enough, it seems that only a few strokes with the mallet on the chisel are needed, and then to move it to the edge of the previous pecking mark. Then the chisel easily reaches the desired depth, stroke after stroke.

When it comes to the images and their colour it is evident that the fresh marks make a distinct contrast on the rock's surface, much like a fresh grave. The question is how long this colour held up against weathering until the lighter colour faded. One idea would be to keep the experimental images outdoors for a few years to see what happens, preferably at Vingen in order to keep the conditions more or less the same. The red deer images with 'swellings' on their necks and the more blurred images surrounding them must be regarded as compilations or narratives that must have been produced as one episode, by the same person. The images seem to be part of the same subject or scene – they are most likely associated with each other – and are certainly not intended to be individual animals. The animal image with antlers and a 'swelling' on its neck took about 46 minutes to peck. For this reason it was decided not to peck the outline, but instead to leave all of the marks in the immediate vicinity of each other along the whole line, a method that proved to be very effective (Figure 12).

The last three images were produced without any need to sharpen the two chisels involved in their production. One of the chisels had a possible weakness – the diabase rock that it was produced from had several veins and several cracks – which probably affected the strength and consistency of the chisel, despite the fact that none of these were visible in the finished tool. Images were produced on both sides of the small stone, something that has also been the case amongst the many original stones documented in Vingen. However, it was difficult to find small enough images that could match some of the collected stones. Our first impression, after trying to produce the rougher of the two



FIGURE 12: RED DEER IMAGE WITH SWELLINGS, AN INTERESTING FEATURE AMONGST SOME OF THE IMAGES AT THE SITE (FIELD LOCATION VINDBAKKEN 5) (LØDØEN & MANDT 2012: 324).



FIGURE 13: A SMALL HIGHLY STYLISED IMAGE WHICH TOOK APPROXIMATELY HALF AN HOUR TO PRODUCE (FIELD LOCATION BAK VEHAMMAREN 10) (LØDØEN & MANDT 2012: 197f).

images (seemingly made in a less accurate way) is that it is difficult to try to reproduce other people's inaccuracies. The wavy lines are probably caused by the fact that it was cut quickly and perhaps a little carelessly. The first of the two – the less naturalistic one – took 29 minutes (Figure 13). The one that resembled a moose took just over 30 minutes (Figure 14). In practice, there was no wearing of either of the two chisels. The final image was produced in the rear side of the same stone as the animal headed staffs mentioned above (Figure 9) and displays a striking similarity with the original (Figure 15).

In the end, different paces were chosen, and it felt both comfortable and natural to use 3-5 strokes before the chisel was moved. The key is obviously to keep a steady pace. Since the sound of the pecking process was fairly intense, hearing protection was chosen, something that must have had a strong impact on the environment in Vingen, echoing between the rocky hillsides, something which has been tested at the site. During some of the experiments



FIGURE 14: ON THE REAR SIDE OF THE PREVIOUS ROCK (FIG 13) ANOTHER IMAGE WITH A DIFFERENT CHARACTER WAS PRODUCED, BUT WITH A SOMEWHAT SIMILAR TIME CONSUMPTION AS THE FORMER (FIELD LOCATION LYNGRABEN 2) (LØDØEN & MANDT 2012: 236).



FIGURE 15: THE FINAL IMAGE WAS PRODUCED AT THE REAR SIDE OF THE ANIMAL HEADED IMAGES AND HAS A STRIKING SIMILARITY WITH THE ORIGINAL (FIELD LOCATION TEIGEN 11) (LØDØEN & MANDT 2012: 275ff).

Morten listened to music. It came naturally to beat in time with the rhythm. This leads also to the question whether the producers of the past used music or chanted when they produced the images, or whether chanting, singing or rhythm was important for their creation, something that may have added to potential rituals or ceremonies associated with the production of the images?

A fundamental question dealing with schistose rock or rock consisting of many thin layers, or with a more weathered surface, is whether the same method will provide equally good results on any rock? It will therefore be interesting to continue this experiment and try to use other types of rock. Perhaps it will be possible to compare with rock types that have been used at other sites?

Evaluation of the results

The experiments produced a number of astonishing figures, surprisingly similar to the original figures, documented in

the photos above. Most of them stand out as better than the original, due to the authentic methods involved, that rocks of the same type and character as the original were used, that the images are exact copies of the prehistoric originals, and of course that they are not affected by thousands of years of weathering. The numerous lines of pecking marks – thin lines – and the precision would not have been possible with direct technique.

Previous rejections of indirect technique have amongst other reasoning's based their arguments on a number of excavations in the vicinity of rock art panels that have failed to document chisels' and hammers used for indirect technique (Bednarik 2001:44). It has also been argued on the basis of experiments where a hammer stone has been used in combination with a stone chisel, that indirect technique is unsuitable for rock art production (Sierts 1968; Bednarik 2001), thus failing to realise that soft hammers of wood or antler would have been proven much more suitable in combination with stone chisels. From our experiments it seems clear that if a stone chisel is used in combination with a mallet of wood the results are strikingly similar to the original. Besides our excavations have been successful in documenting a chisel that must have been used for indirect technique (Lødøen 2003), while the hammer stone or mallet of organic material that was found is no longer preserved.

The practical experiments argues also in favour of the character and form of the original pecking tool, with a thick body which have given the tool extra strength. Although polishing of the rock art panels have not been documented yet at the Vingen site, it is interesting to note that polished bedrock is frequently associated with cup marks in later periods (Broström and Ihrestam 2010:15). As previously indicated, the fresh lines made a very distinct contrast to the internal colour of the rocks involved in the experiments. This is a feature that is no longer visible on the original rock art panels in Vingen, but it clearly shows how much more visible the images must have been immediately after they were produced. It has been argued that the images were likely to have been filled in with paint or other substances in the past (sometimes to legitimize that paint has been added to make them more visible today). At least in terms of visibility the experiments have now indicated that such filling was not necessary since the contrast caused by the fresh grooves are most distinctive, and which it is likely to have lasted for many years. As mentioned, some of the experimentally produced images will be kept outdoors to test how long it takes before the fresh inner colour fades. Compared to the previous experiments discussed above and involving granite, the examples presented here have shown that this manner of production was much less time consuming, first and foremost because a much softer sandstone was involved. Taking less than half an hour for a single image meant that it was possible to produce many images during one day. All of the images may of course have been followed by a series of different rituals or taboos, but it may also have been possible to produce most of the images

in Vingen within a very short time perspective. Although previous attempts to create a typology for the rock art have not been highly successful (Bøe, 1932; Hallström, 1938; Bakka, 1973 and Lødøen, 2003, 2013, 2014), all of the images show a surprising similarity, which might be the result of the images being produced within a few years and also by a few individuals. This is probably something that needs to be explored more into detail, but the similarities between the images, and the consistency in repetitive narratives might be an indication in it self that the rock art was produced during a short time span. Since a number of experiments seem to conclude that the rock art production took much shorter time than expected (eg. Sierts, 1968; Bednarik 2001), including our own, it seems also clear that rock art understanding in general must have associated rock art production with more labour and higher time consumption, which consequently might have influenced the debate prior to the new understanding caused by the experiments. One might argue that it does not matter if an image took a week or a few minutes to produce. However, if each and every image was associated with a number of other tasks, rituals and other such considerations, it could be of relevance. Many of the images produced are so similar that it seems reasonable to consider large numbers of images as the result of the same individual, or at least the same 'school of rock art'. It also indicates that many rock art sites may have been part of more solitary actions related to rituals, cosmology or the results of visionary quests, something which I have claimed elsewhere as probably being associated with mortuary rituals (Lødøen, 2014; in press). It seems also reasonable to understand the compilations of rock art in Vingen as past narratives, and since the location, the choice of motives and the character of the images seem to follow a basic structure for the whole area, this may clearly indicate that most of the rock art was produced within a few years or very few generations. Then it might matter, after all, if an image took a week to produce or much less time. The experiments have no matter what provided us with a much better awareness of the time perspective involved in rock art production. In the archaeological record from Vingen approximately 2200 images have been documented, but re-discoveries are constantly being documented. If we imagine that less than half of the images that once was made have been documented, and that the amount of images at the site counted 5000 images at a certain stage in the past. With an average production rate of one image a week it would have taken approximately a century to accomplish this tentative amount, manageable during three to five generations. The more accurate knowledge the experiments now have provided us with makes it fully feasible to produce from 10-20 images and even more within a day and hundreds during a couple of weeks, which at least potentially makes it feasible to have been produced during a much shorter time span. This also opens up for much more detailed studies of similarities in the iconography with an aim to cast more light on how iconographical knowledge or skills were transferred between individuals and from one generation to the next, which might reveal more knowledge about the production of rock art within a time setting.

Despite the fact that archaeological excavations have indicated that the area may have been used for different purposes for 700 or 1200 years, the rock art itself may have been produced during a much more limited timespan, where the imagery might have had a function as a major cosmological, mythological or ideological narrative for a past society.

These narratives may have emphasised the character of the ideology or religion, and therefore may have been used without any additional contributions of images in the long term, such as ancestral cultic images. I have previously argued that some of the more contrasting images in the area may have been the result of later interference with former ideas, perhaps after many years with a prevailing ideology and the corresponding imagery (Lødøen 2013), and perhaps as an attempt to change the narratives and also the impact on cosmology. Most societies experience a number of continuous challenges, which may affect their ideology and at least cause the practical and symbolic part of their religion to be affected or changed. For the cultures that used Vingen, these potential changes may have caused the need for these additional images, and a need to change the character of the narratives. These additional images may have led to a contrasting set of images, as is occasionally documented in Vingen, and may represent final attempts to alter the cosmology, the ruling practise or religious activity, something that could also be understood as some of the final changes that took place in the area before the site was abandoned. However, the experiments therefore represent important objections to the frequent use of style studies and typology to legitimize and explain changes in the style and appearance of past objects. This seems to be a key problem in archaeology, demonstrating the influence of evolution and neo-evolution in having a tendency to explain most differences in the past as the effects of time, while paying less attention to differences between individual expressions. It is therefore interesting to see that a number of the different panels and outcrops in Vingen have their own, individual style, something which in the 1970s led Egil Bakka to identifying four different style types based on four different panels, the Hammaren phase, Hardbakken phase, Brattebakken phase and the Elva phase, following each other in chronologically order. Based on the time perspective for rock art production revealed in these experiments and the differences in individual expression, this could just as well have been the result of different contemporary producers, following the same syntax and structure for the location of the rock art, but with an according individual expression (Figure 16).

Another interesting result is the durability and persistence of the hammers. It was hard to believe how long they lasted when they were continuously re-sharpened during use. In principle, this tells us that a large number of images can be made by the same tool. However, it was difficult to decide whether they were approaching the end of their useful life. The chisels we produced were initially fairly similar to the original once found at Vingen in terms of their shape and size. They were sharpened a number of times, but most of

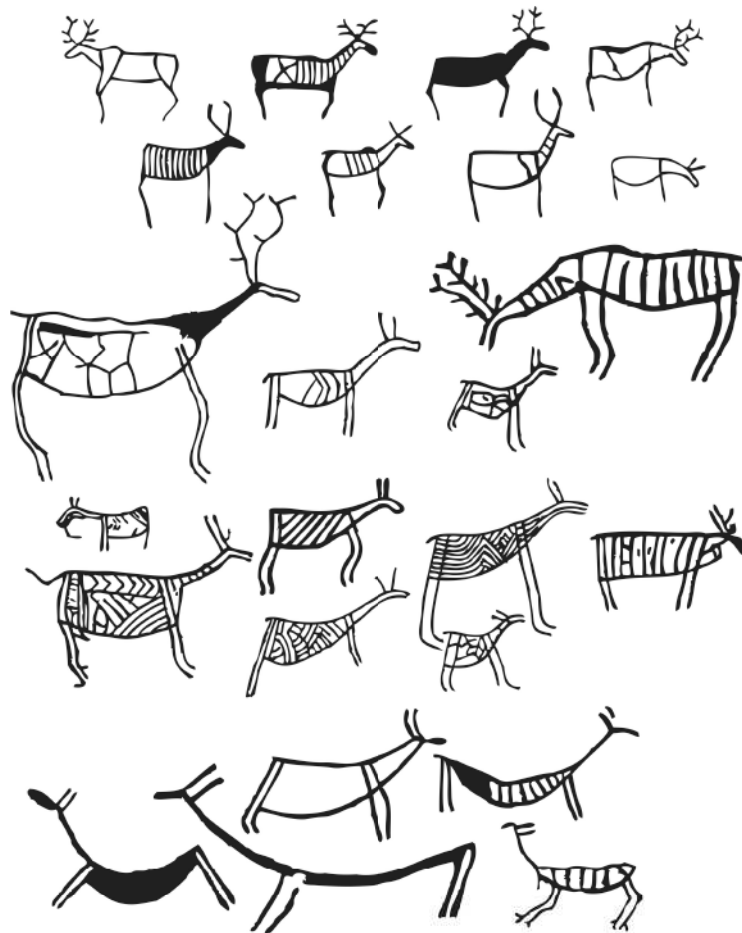


FIGURE 16: EGIL BAKKAS SUGGESTIONS OF THE STYLE DEVELOPMENT AT VINGEN, WHICH MIGHT ALSO BE THE RESULT OF INDIVIDUAL DIFFERENCES.

them could still be considered usable once the project was complete. Potentially, these chisels were used until they could no longer be held. This also helps to explain why this is not a commonly documented category of artefacts. Perhaps they were stored in strategic places from where they could be taken and returned. Combined with their potentially sacred or esoteric origin, this supports the idea that these tools were highly potent, magic or sacred. It is therefore interesting that a large number of chopped pieces of diabase seem to have been forced into cracks at the Ausevik site in Flora to the south of Vingen, which might add to such an interpretation. Some of them proved to be long lasting, which may have given a particular status to the material chosen and its provenance, adding to its believed potency and secrecy.

Conclusions

The experimental case study has produced a great number of new results. One particularly important aspect is the new knowledge obtained about the length of time taken in the production process. As many of the images produced required less than half an hour to be made, it seems less relevant to include the amount of labour time as an aspect for discussions of chronology. It is also revealing that the hammers were almost more difficult and time-

consuming to produce than the rock art itself. Since the rock art seems to follow a clear structure or syntax, on the contrary it would perhaps be more relevant to understand the production as something that was made during a much shorter time span. Some of the images may also have been added at a much later time in prehistory, although the experiment indicates that diverging styles could be the result of other individuals.

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