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Soapstone in the North Quarries, Products and People 7000 BC – AD 1700

Gitte Hansen and Per Storemyr (eds)



UNIVERSITETET I BERGEN

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University of Bergen
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Editors of this book

Gitte Hansen

Per Storemyr

Editors of the series UBAS

Nils Anfinset

Randi Barndon

Knut Andreas Bergsvik

Søren Diinhoff

Lars L. Forsberg

Layout

Beate Helle, Bergen University Museum

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Preface

This book has been a long time in the making. It is an outcome of the five Norwegian University Museums' joint research programme *Forskning i Felleskap* (FIF, 2010–2015), supported by the Research Council of Norway. FIF kindly facilitated a number of workshops and meetings between archaeologists, geologists and craftspeople, all with a common interest in premodern soapstone quarrying and use. The result is the chapters of this book, which are based on studies carried out over the last two decades and, for the most part, are published scientifically for the first time. We very much thank the authors for participating in this venture. We also thank several colleagues – archaeologists, geoscientists and craftspeople – that assisted the editors in peer-reviewing the chapters: Irene Baug, Birgitta Berglund, Laura Bunse, Poul Baltzer Heide, Richard Jones, Tor Grenne, Torbjørn Løland, Therese Nasset, Astrid J. Nyland, Lars Pilø, Kevin Smith, Lars F. Stenvik, Frans Arne Stylegard and Stephen Wickler; we are very grateful for the job you have done. Not least, thanks go to Tromsø University Museum, NTNU University Museum (Trondheim) and the University Museum of Bergen for their economic support in publishing the book.

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Gitte Hansen

Per Storemyr

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Soapstone Quarrying, a Stoneworker's Approach

Practical activities are best expressed and understood through practice. Present understanding of former times' crafts practice are mainly based on theoretical interpretations of the traces and products left behind. By contrast, a stoneworker sees the crafts' process as a source of knowledge. This is the thought behind The traditional quarrying project, carried out in the Klungen soapstone quarry, close to Trondheim, Norway in 2011. The project intended to achieve a more detailed insight into quarrying methods of the past. Main fields of interest were the methods themselves, time consumption, choice and use of tools and similarities/differences in techniques applied to shape the pieces to be quarried. One may rightfully ask if this project, carried out by a present day stoneworker, can provide answers relevant for aspects of past times' quarrying. The factors assessed were reduced to those essential in any stone working process; the material, the crafts person and the tools. Regardless of time and purpose, the material stands out as an unchangeable or static factor, and it sets the premises for what can be done and how. A material-related 'timelessness' is thus revealed and makes the crafts person's answers relevant for soapstone working in general.

Introduction

Crafts, like any kind of practical activity, are best expressed and understood through practice. During a process, both practitioner and observer are involved – although in different ways. When the product is finished, the process, with its entire contents, becomes history. Those who quarried soapstone for cooking pots and building materials in the past left a long time ago and their quarrying methods are forgotten. What they *did* leave behind are the traces of their activity. Through interpretations of these visible remaining traces, main features of soapstone quarrying in former times are revealed; the details, however, are often still hidden. Even if the exact process from soapstone outcrop to object is impossible to recreate (Stavsøien 2012:55), a process with similarities can be a suitable tool for exploration of soapstone working in prehistory and the Middle Ages. Today a few crafts persons are still working soapstone in what often is referred to as the *traditional way*; carving with old-fashioned chisels and hammer. This may represent a link backwards in time and thus provide a basis for extended knowledge of our predecessors' quarrying methods. In 2011 an experiment within *The traditional quarrying project* took place in the Klungen soapstone quarry, located 17 km from Trondheim in central Norway. The experiment was carried out as part of my Bachelor's studies at the Sør-Trøndelag University College. The aim of this paper is to provide a glimpse into a stoneworker's theoretical and practical approaches to soapstone quarrying in former times. Despite the incompleteness in written descriptions of practical activities, a tinge of the 'hidden' knowledge will hopefully be made available.

Background

Throughout history, soapstone resources have been utilized for various purposes in Norway, first in household and primary industries. To varying extents, this production continued into modern times; in the late 19th century, it was still possible to buy soapstone cooking pots in the Gudbrandsdalen area of eastern Norway (Helland 1893:107). Inspired by cathedrals and churches built in stone elsewhere in Europe, soft rocks such as greenchist and soapstone came into use as a building material in Norway during the early Middle Ages (Ekroll 1997). With the Reformation, and in time also due to lack of maintenance, many stone buildings decayed in the following centuries. During the 19th century, a growing national consciousness led to renewed interest in stone churches, and after centuries of neglect, large rebuilding and restoration projects were required. For the necessary supply of stone for these projects, some of the old soapstone quarries were reopened and new came into use. After all the years gone by, the basic quarrying technique was seemingly unchanged; channels were chiselled or picked around the desired piece of stone before the last connection with the solid rock was broken, for example, by wedging it out along a foliation plane; a technique similar to what can be observed in soft stone quarries all over the world (Storemyr 2000:13). In the years to come, however, the traditional quarrying methods gradually were replaced by less labour intensive and more efficient solutions. And during the first half of the 20th century, the old methods had basically disappeared. Today existing knowledge of soapstone quarrying in former times is mainly based on interpretations of the visible and tangible results of the utilization; artefacts, buildings and traces from working the soapstone outcrops. A different – theoretical and practical – approach can probably contribute to extend this knowledge.

A stoneworker's approach

All professions have methods and rules regulating the way their work should be done in order to attain their goals. The stoneworker's method is quite simply the craft's process. Under ordinary circumstances, the craft's complex content is used to transform raw materials into products. A visible and tangible object is the goal; the way towards this goal is, however, rarely found interesting or documented. In what follows, the primary focus is the *process* towards the finished product. During any process, numerous factors influence how the craft is performed. In this context, it will be far too comprehensive to pay attention to all of these. Numbers of factors will therefore be reduced to those considered essential in the process: the material, the tools and the craftsman (Stavsøien 2012:55).

The material

Soapstone is often described in general terms as a soft, dense and easily workable rock. In reality, like other natural materials, it is not a homogenous industrial product and appears in innumerable varieties and compositions. Some of these variations may be visible, such as colour differences; a wide range of shades from light to darker grey, sometimes with greenish, bluish or brownish-red tones. Differences in grain size and mineral orientation, as well as veins and fissures, can also be observed. This diversity is due to its origin and the following processes it has undergone, issues beyond the scope of this paper. Visible differences can sometimes be reflected in the workability. Dark colours often indicate a stone harder than the lighter coloured ones. With mottled appearance, hardness can be uneven and so on. Despite a certain relationship between appearance and properties, the true character of the stone is first revealed during the work. One of the important invisible factors is the soapstone's texture. Even if it consists of soft particles/minerals, these can be strongly interlocked, which can make the stone feel

tough and tenacious to work. To describe fully what the term workability includes is difficult – it has to be felt! Briefly and incomplete, it can be considered as the feeling of working the material and how this affects the effort needed to achieve the desired results. Even though the soapstone undoubtedly is easily worked compared to many other rocks, it still is a rock. Its nature implies lack of elasticity; the material cannot be squeezed, bent or stretched to the desired shape. Consequently, all working operations require parts of the material to be removed. Despite the soapstone's relative softness, it is impossible to do this by hands only; some type of tool is a necessity.

The tools

Primarily, the tools can be something as simple and primitive as a slightly sharp stone, harder than the soapstone. Although the needs and requirements related to the tools are basically modest, there has been a certain development. Edged tools made from steel with pointed or straight edges in different sizes and a hammer is the current basic equipment.

The craftsperson

What happens when working the soapstone and how does the performer experience this? It has to be taken into account that there are basic rules for what can be done and how it has to be done; these will not be discussed here. When working the material with the tools energy is transmitted. This mechanical impact contributes to break the connection between the particles in the material. How this is experienced depends not only on the quality of the material and the tools used, but also on whether the processing is rough or fine. Rough processing requires hard and fixed blows in a slow rhythm, the latter to give the energy time to affect the material before the next blow. This results in large fracture surfaces with few tool marks. The finer parts of the work require less energy, the blows are more cautious and the rhythm faster. Less energy transmitted needs less time to affect the material. Here, the ratio fractured surface/tool marks are opposite to the previously mentioned. One step in the working process primarily removes traces of the previous step.

The foundation of skills and knowledge in crafts are built on performance of practical activities under the guidance of experienced craftsperson(s). When a certain level is attained, you are qualified to work independently – this is when the experience-based learning process really begins. With time, the craftsperson develops a personal relationship to what is going on when working the material. This is rarely thought of, discussed or communicated; it is just too obvious and personal. For this reason, it is often termed tacit knowledge. In my opinion, this is quite simply based on sensory input and experience from these. When working the soapstone, something visible and audible indicates what is happening. In addition, the material is responding to what is done, which can be felt as more or less resistance. All of these signals are unconsciously saved and over time a large 'database' is built. When working, the new sensory inputs are continuously compared to what is already stored and further progress will be based on this. This happens without the craftsperson being aware of it and can be described as some sort of communication with the material. There are not many written sources based on experience relating to this, one of the few is a description of block splitting with wedges on Purbeck Island in Great Britain:

To an outsider looking on it is only six wedges standing in six holes across a stone, but the man using the hammer has felt vibrations which seem to come out of the stone up through the wedges and into his arms by way of the hammer and handle. Some men who have cut thousands of stones will say they never felt it, but even they know just when to apply the last blows, the blows which really break the stone (Benfield 1940:96).

Experience-based interaction such as this is the core in rational and successful processes. What can be achieved depends on the craftsperson's understanding and ability to interact with the material. This is what forms the basis for what to do and how, as well as for how to evaluate and interpret the outcome of the attempt at 'traditional' soapstone quarrying.

The traditional quarrying project

The Klungen quarry is one of the medieval soapstone quarries used for the construction of the Nidaros Cathedral in Trondheim and other medieval buildings in the Trondheim region. During the second half of the 1800s, the medieval quarry was reopened and a new quarry was also established just beside it, both to provide stone for the restoration work at the Cathedral. This activity came to an end in 1899, and it was not until nearly 100 years later that lack of stone for upcoming restoration projects led to a renewed interest. After geological investigations and archaeological excavations in the late 1990s, two attempts of test quarrying were undertaken: both with modern quarrying methods and with rather discouraging results. The quarried blocks developed many cracks and fissures, probably due to the release of remaining stress in the rock (Storemyr 2000).

Situated within the security zone surrounding the heritage listed quarry, the test quarrying left a part of the soapstone outcrop easily accessible for experimenting with 'traditional' quarrying methods. With permission from the cultural heritage authorities (Riksantikvaren), 3 x 3 x 3 m of the test area was put at my disposal for The traditional quarrying project (Figure 1). Permission was granted on the basis of the project's opportunity to attain new knowledge. The quarrying experiment was carried out



Figure 1. Part of the Klungen soapstone quarry. The framed part shows the area at disposal for The traditional quarrying project, with the author working. (Photo: Ø. Digre & H. Grøtt).

in the summer 2011. The purpose was primarily to achieve more detailed insight into past quarrying methods. Tools and their use, similarities and differences in technique related to the shape of quarried object and time consumption were of interest. My practical approach to this was to quarry angled and circular pieces from the rock, using suitable tools. As a side effect, with the discouraging results of the use of modern quarrying methods in mind, I hoped to discover whether the material would react differently with the use of a supposed slow quarrying method. It was not an aim to copy extraction marks from prior quarrying neither in this nor in other soapstone quarries. To recreate ordinary operating conditions was not the purpose, as attention was aimed at the process, not the product. Results obtained are thus limited to apply for the available material and tools.

Tools for quarrying

A practical study aimed at the performance of outdated working operations can give some challenges. One is the lack of suitable tools. The traditional way to quarry (and work) the soapstone is considered conservative and tools and techniques from the late 19th/early 20th century are assumed to shed light on how the Medieval stoneworkers performed their craft (Lidén 1974:17). For *carving* the soapstone, these tools and techniques are similar to what is still in use. Regarding the tools for quarrying one of the last glimpses of such is from the 1930s (Voldheim 1995:12), later these single stone axes (locally called *spetto*) and similar tools (NEG Varia 3389) used in the last days of traditional soapstone quarrying seemingly just disappeared.

When it comes to archaeological tool findings clearly related to soapstone extraction (and processing) in earlier times, the selection is limited. In this context, it is important to remember that only a small number of the quarries have been subject to archaeological excavations, so there may be more to find. What so far is found, however, are variations on the same theme as the current stonemason's tools; edged tools with a pointed or straight edge (e.g. Bergström's diary 2.12 1876; Bergström's sketches Gb-0159; Skjølsvold 1961:57, Fig. 16). The latter (straight edged) has significant similarities to woodworking tools. There may be several reasons for the meagre selection of archaeological tools (Stavsøien 2012:23): The tools could be durable and last for generations, the availability of tools/raw materials for those could be limited, which would be a good reason to take care of what you have. With time, the craftsperson develops a personal relationship with the tools; they become a 'part of the body'. The tools may also have been re-used for other purposes in primary industries or recycled; damaged tools were (and still are) a raw material in the production of new tools or other items.

Without being familiar with the archaeological tool findings, one might imagine the axes/adzes as large and heavy. Apparently it was not so, the 'large' ones seem to be 20–30 cm long with a weight around 1 kg. Nevertheless, their shaft holes are quite large and their necks solid, indicating that the tools were designed for rough use. While the tools are mostly lost, the marks they left in the quarries sometimes can be a valuable source of knowledge. The tool marks indicate use of straight or curved axes/adzes or chisels with a pointed or straight edge. Interpretation of tool marks suggests that various types of tools were used at different times during history (Heldal 2006:20). In my experience, the axes/adzes can be divided into three categories: 1) Celts or slightly curved adzes (sometimes with curved/rounded edges), 2) double pickaxes and 3) single pickaxe/stone axes (about the same size/weight as the double pickaxes).

The single stone axe is only slightly different from the single pickaxe in shape, but it has a narrow straight edge instead of a pointed one. Chronologically, the tools seem to have appeared in the order mentioned above. Tool marks in the pre-Roman Iron Age quarry of Sandbekkdalen (previously referred to as *Bubakk*) quarry, at Kvikne in south central Norway, seem to stem from tools in category

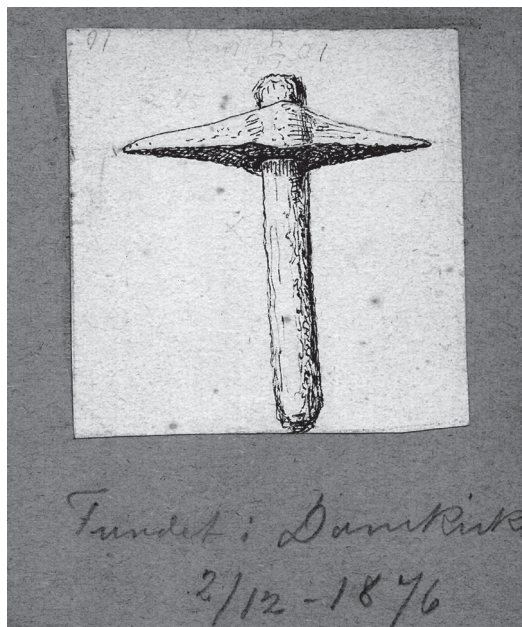


Figure 2. The 12th century pickaxe found in the Nidaros Cathedral, Master Builder Bergström's sketch. (The Restoration Workshop of Nidaros Cathedral, historical archives, Gb-0159).



Figure 3. The tools used during The traditional soapstone quarrying project at the Klungen quarry (Photo: E. Stavsøien & H. Grøtt).

1 (see Skjølvold 1969:210; Grenne et al. this vol.). A double pickaxe (Figure 2) found inside a wall at Nidaros Cathedral has, from the archaeological find context, been dated to the 12th century (Bergström's diary 2.12 1876), and the single stone axes can be seen in photos from the last days of traditional soapstone quarrying (Voldheim 1995:12). This does not necessarily mean that one type replaced another; the selection of tools was rather broadened.

For The traditional quarrying project, tools representative of a time with extensive cooking pot production as well as for the early quarrying of soapstone for building purposes were desired. Temporally, this means the late Viking Age/early Medieval period. It was decided to reconstruct and produce one double pickaxe and two adzes, all found inside the Nidaros Cathedral during the early years (1870-80s) of the restoration period (Figure 2). Selecting tools that were found in a building and comparing them with tools used for quarrying may seem somewhat strange. However, the rough dressing of stone in the construction process can have similarities with what happens when stone is extracted from the solid rock. In addition, the find contexts gave good indications for use connected to soapstone working and at least the pickaxe had close to appropriate dating. The chosen tools have remarkable similarities in shape (not size and weight) with tools found in Børda, Telemark County (Skjølvold 1961:57, Fig. 16). With this choice, the blacksmiths also had the benefit of available originals during the reconstruction process. In this process, weight, size and shape were taken into account; similarities in material quality and forging were not emphasized.

Tools from the distant past rarely have their shafts intact. The pickaxe from Nidaros Cathedral was an exception; according to the master builder's sketches and diary, it was found with a wooden shaft, but unfortunately it fell apart when touched (Bergström's diary

2.12 1876). If the sketches are correctly proportioned, this shaft was short (Bergström's sketches Gb-0159).

When it comes to shape of shafts, other shapes than the straight were seemingly (from historic illustrations) not an option before it appeared on timber axes in modern times. Length and design of the shafts were discussed before the choice fell on a long and straight variant. A long handle delivers more power and extends the reach, in addition, it could easily be shortened if necessary. With these axes/adzes, the basic equipment was in place. A large pointed chisel, a hammer and a couple of steel wedges completed the supposed need (Figure 3).

Pre-assessment and planning

Before the quarrying experiment could commence I had to map the test area in the Klungen quarry and make a plan for how to approach the rock. The modern quarrying methods had left a vertical, sawn surface/'a wall'. And combined with a relatively steep slope up-/backwards from this (see Figure 1) it was a challenge to find a foothold while working. A simple working platform beside the 'wall' and small steps hewn out of the rock seemed to be an appropriate solution. Scaffoldings might have been more comfortable but as work progressed, rebuilding would be required and the resources this would take made me consider the disadvantages greater than the benefits.

In a soapstone outcrop surface material is often considered to be of poorer quality than the parts protected by overlying rock and soil. This is due to the influence from natural weathering processes. Under regular operating conditions, most of the available material would most likely be considered unusable and removed. Without experience, it was impossible to estimate time consumption for this work. Therefore, it was decided to quarry from existing surfaces.

Basically, stone quarrying is to free the desired part of the material from its surroundings. Prior to the quarrying, an evaluation of the materials' visible characteristics, such as cracks and fissures in the stone, should take place to estimate how these can affect the working process. While some characteristics provide opportunities to ease the work others may restrict what can be done. Cracks and fissures hold water; they dry slower than the homogeneous parts of the material and appear as dark veins at the surface. So when a surface dries up after being wet, it is easy to 'read' the stone. Furthermore mineral orientation is often more visible on fractured surfaces.

The test area at my disposal is strongly foliated and fractured. Distinctive foliation or bedding planes (in the continuation the latter term will be used), partly open, appear 20–30 cm apart from each other. They are parallel, following the slope backwards from the sawn surface. With additional intersecting cracks, the size of the blocks to be quarried is limited. The seemingly most rational way to start the quarrying was to take advantage of the bedding planes and think of the stone between these as huge slabs; the width of the slab being defined by the intersecting cracks. To follow a slab in-/backwards from the sawn 'wall' while dividing it into suitable blocks seemed to be a quite efficient approach. By doing it this way, the blocks could be easily slid out and allowed to fall down by the wall onto the spoil heap that would be built up during the work. The spoil heap would serve as a shock absorber, protecting the blocks from damage. Finally, after this mapping and planning, the work could begin.

Quarrying angled objects

To make the first square block two *channels*, angled at each other were marked up (Figure 4). For this task, the pickaxe was chosen. In principle, one cannot cut directly (at right angle) into the stone, this will only create a small hole surrounded by uncontrolled crushing. To break the stone surface, the pickaxe had to be slightly tilted and the blows directed *away* from intended edge of the block. After doing

this through the full length of the planned channel, the pickaxe was tilted in the opposite direction and the blows were directed towards the bottom of the first row of tool marks. This resulted in a narrow and shallow v-shaped trace, impossible to make much deeper. I realized that there had to be a relationship between width and depth of the channels. After a couple of attempts, the code was broken; the width of the channel had to be roughly half of its intended depth. When making the channel wider, the two rows of tool marks were situated too far apart from each other to meet in a v-shape; a 'ridge' was left in between. The next step was to dispose of this ridge and make the channel deeper in a controlled way, without causing damage to the intended block. The systematic and assumingly most efficient way was to make tilted cuts down by the ridge towards the bottom of the channel-side tool marks. As a result of this operation, the ridge became smaller and triangular with a v-shaped trace on both sides. This made the channel profile appear as w-shaped. By now it was impossible to make the channel deeper without removing the middle part. For this job, the tiny adze was a better choice than the pickaxe. Having removed this middle part, the channel's profile became u-shaped and the work to increase the depth could continue. The pickaxe was first used down the channel's walls and then from the middle of the flat bottom towards the walls, by this a new w-shape appeared and had to be removed. The described procedures were alternately performed down to the bedding plane. Finally the channel was v-shaped, resulting from the impossibility of keeping the walls vertical throughout the process. With increased depth, the channel walls limited the tilting of the pickaxe, the side of the axe not in use conflicted with the channel wall opposite from the one worked. A possible solution could be a wider channel, but this was rejected because it would be more labour intensive and waste more material. Due to the surroundings, the channel was worked only from one direction; working also from the opposite direction could have been a benefit in keeping the walls straighter.

Perpendicular to the first channel another one was made, using the same tools and technique. At

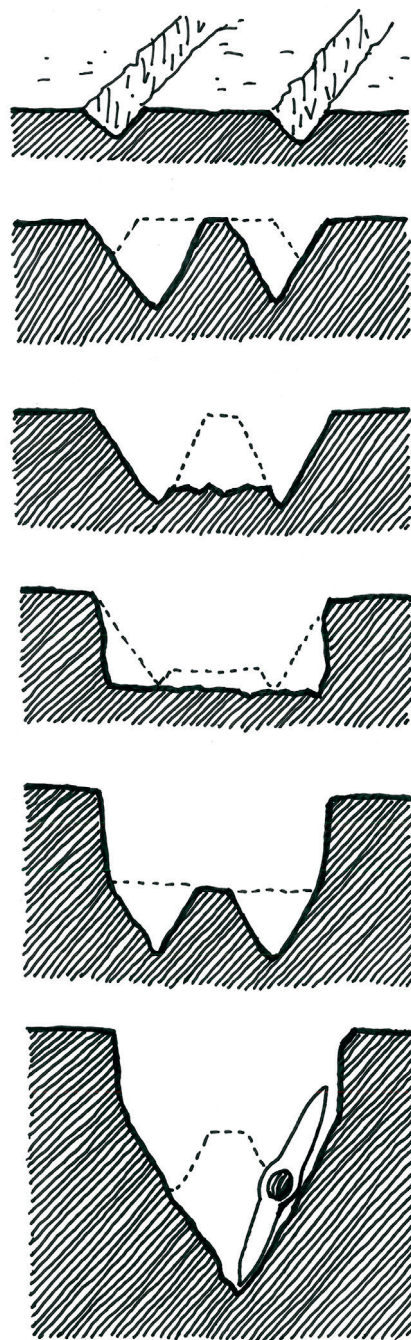


Figure 4. Stepwise development of the channel during the quarrying of angled objects. (Drawing: E. Sørburø).

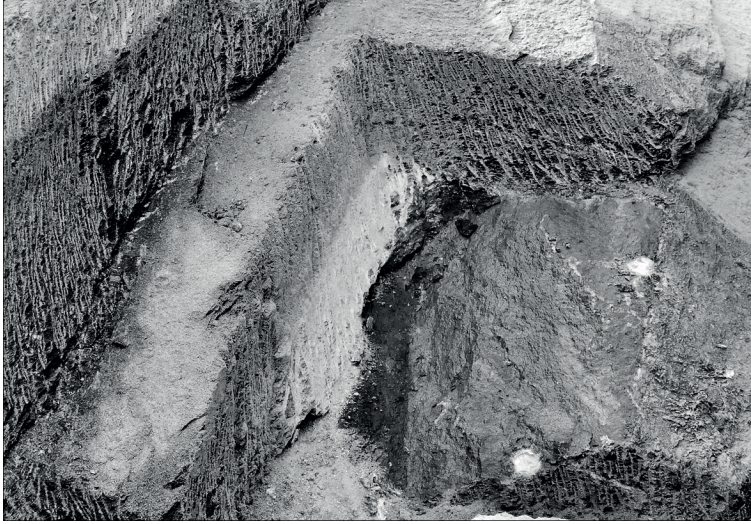


Figure 5. The stone will always break at its weakest point; here this is the channel's depth. (Photo: Ø. Digre & H. Grøtt).

their meeting point some challenges appeared, it seemed to be impossible make the channels deep enough in this area. Again, I wished that the surroundings had allowed working the channel from both directions. To make the channels slightly longer and let them cross each other turned out to be somewhat helpful. The distinct bedding planes made it possible to use the wedges without carving holes. Two wedges were used, one at each of the free sides of the block. Only a few blows with the hammer were needed to break the last connection with the solid rock. Where the channel was too shallow (did not go down to the bedding plane), the breach would follow the channel depth rather than the bedding plane in the parts of the block bordering the channels (Figure 5). The stone will always break at its weakest point and here the channel depth is a created weak point working as a breaching guide. Due to the challenges in keeping the channel walls vertical, the bottom side of the quarried blocks was larger than the top side (Figure 6).



Figure 6. The slanting channel walls resulting in blocks with a larger bottom than top side. (Photo: E. Stavsoien & H. Grøtt).

Quarrying circular objects

Quarrying stone for a circular object can be done in a manner similar to the angled ones, but is this the most efficient way? A soapstone vessel for cooking or other purposes often has a rounded bottom. What can be seen in some quarries are half finished objects with a rounded surface still connected to the solid rock, indicating that the rough shaping was done during the quarrying.

After marking a circle on the surface, the pickaxe was used to cut a v-shaped channel (as formerly described) all the way around the circle (Figure 7). At this point, some challenges in making the channel deeper were expected to occur. However, as stone was chiselled away in order to create the rounded shape, it was neither a problem to work the channel deeper nor to keep the outer wall of the channel vertical (if desired). The rounding of the object to be quarried actually removed the material that would have hindered the blows of the tilted pickaxe. Another benefit from this approach to the object's shape was its function as an additional quality control of the material. Due to a wider v-shaped area of waste removed, the ridge in the channel never occurred and the channel was v-shaped during the entire process. Also here the channel was supposed to meet the bedding plane and to make wedging possible, some of the surrounding stone had to be removed. What was noticeable in the quarrying of rounded objects was their tendency to loosen during the process.

Clearing and facilitation

As so far described, the quarrying process was fairly uncomplicated and not too labour intensive. However, disposing of dust and debris and the preparation for the next piece to be quarried proved to be rather time-consuming tasks. Stone quarrying produces a large amount of broken stone; from quite big fragments to dust. The larger pieces slid down the sloping surface by means of gravity whereas dust and smaller pieces had to be removed manually. The debris affects visibility when working and absorbs energy from tooling, reducing its effect. In moist conditions, the dust is transformed into slippery mud. Luckily, there was a pond close to the working area, and by pouring water over the rock, the 'problems' were washed away. Preparation for further quarrying had to be made after each piece had been extracted. This included making the remaining channel side (which would also become one side of the next block to be quarried) vertical and to clear the bottom foliation plane. Sometimes larger quantities of poor quality stone had to be removed in order to gain access to material of better quality. By taking advantage of bedding planes, foliation and cracks, parts of unwanted material could be wedged out, and if this was impossible the pickaxe was used.

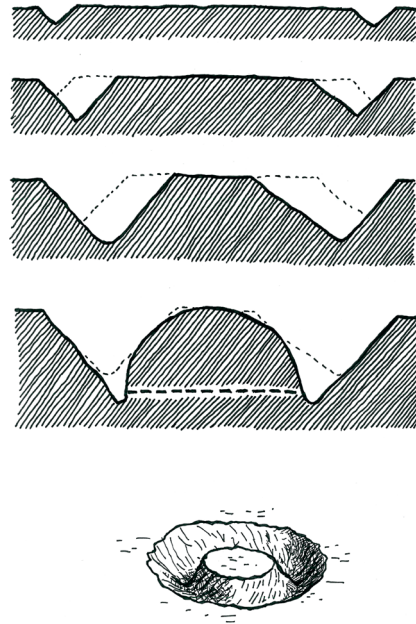


Figure 7. Stepwise development of the channel during the quarrying of circular, rounded objects. (Drawing: E. Sørburø).

Results/discussion

Similar rules for what can be done and how apply to all soapstone working processes. Quarrying or extraction of soapstone can be considered as the roughest working operation the material is exposed to. Working operations that appear very different, such as making channels in the block quarrying process or carving letters in an inscription, are basically the same.

It is all about how to remove parts of the material into its depth, the only difference is the dimensions. Due to the nature of the material, one has to start out by making a v-shape to break the surface in a controlled way. This v-shape can be further processed into a u-shape. With an increased channel width, the tool marks do not meet in the middle; a ridge is formed. This remaining ridge will form the basis for two parallel v-shapes: a w-shaped channel profile. Under the current experiment, the width of the channel had to be approximately half of its intended depth. Working soapstone (and other rocks) with different properties could affect this ratio.

In the course of extraction stone for circular, rounded objects, the channel will be v-shaped during the entire process, regardless of depth. The reason for this is the angle or curving of one of the channel walls when approaching the intended shape of the object.

When it comes to the final step, breaking the object's last connection with the solid rock, circular pieces are seemingly easier to loosen than angled. The circular shape can be seen as an unbroken line or 'closed form' that gives the piece a strong internal cohesion. Wedging from any point of the circle will direct the energy towards the middle of the piece and further on to its opposite side. A quadrilateral object, with several meeting or crossing lines creating protruding parts, will have a weakness in its corners as well as a stronger connection with the solid rock. When wedging from a straight side of a block, the energy still is directed towards the middle and further on to the opposite side. To bring enough energy to the corner in the channel's meeting point, wedging at, or very close to, the accessible corners is required. This will most likely cause damage to these and is therefore not recommended.

Compared to modern quarrying methods, the traditional extraction of soapstone is considered a rather slow activity. Surprisingly, it turned out to be less time consuming than expected. In a little less than two hours a rectangular block was quarried, this included working two channels 30–40 cm long, 13/25 cm wide/deep and wedging. A circular piece with a rounded shape, a diameter of 25 cm and 15 cm high, was extracted in a little more than half an hour. What turned out to be the most laborious and time consuming was removal of useless material, clearing of surfaces in preparation for further quarrying, and to carry large quantities of water. Probably, the time consumption could be reduced by training, better organization and improved logistics (for water supply).

The chosen tools proved to work well. Both the pointed and straight edges turned out to be durable, within 80 hours of use sharpening was not necessary. The tools' long shafts and thus extended reach were at great advantage when a foothold close to the working area was impossible to find. Unfortunately, the big adze developed a crack (due to a mistake in the curing process) and became damaged before its uses were properly tested. The adze, however, seemed to be useful in the clearing of the sloping surfaces and worked well for hewing steps for the foothold. The chisel and hammer were found less appropriate for making channels; tools for double hand use are more efficient and less tiring to use for such tasks. However, without other tools available, chisel and hammer would be better than nothing.

In the quarrying process, the Klungen soapstone seemed to respond better to pointed- than straight-edged tools. Experience indicates that this can be the opposite when working soapstone with different characteristics. Such conditions, in addition to local traditions, may have influenced the choice of tools and differences in technique from one quarry to another in former times. It is

worth noting that one single tool can leave marks/traces appearing quite different. Some factors contributing to this are; the craftsperson, working position, quality of materials, purpose of the work and amount of force used.

As already mentioned many cracks and fissures developed while working the Klungen soapstone outcrop by modern methods. Whether the outcrop would react in a different way when extracted in the somewhat slower, traditional way is a question difficult to answer, as the material at my disposal was fractured already before the work began. The test quarrying in the late 1990s possibly influenced not only what was extracted but also the remaining adjacent stone. Further fractioning during and after quarrying was, however, not observed and the objects withstood further breakage when they hit ground, or the preferred spoil heap, at the end of a two-metre drop.

One may ask if theoretical and practical experiments by a stoneworker of our time can provide answers relevant for aspects of former time's craft practice? The quarrying *methods* represent one of the primary differences between current and past times soapstone working.

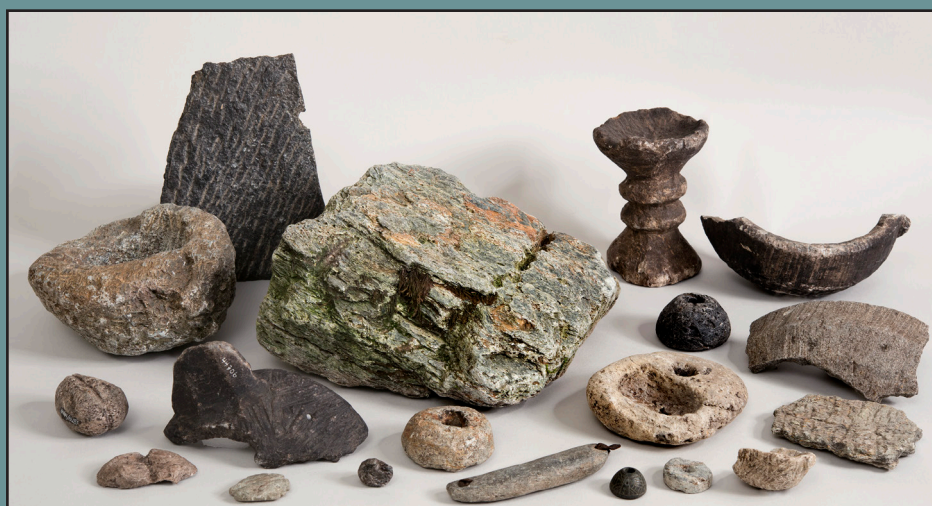
As previously mentioned, the stone working crafts are referred to as conservative. In the present assessment of three factors essential in stoneworking; the material, the tools and the craftsperson, the material stands out as the only unchangeable factor – static in all its diversity. From this, the material can be said to set the conditions for what can be done and how. Regardless of time, place and purpose, this is what the craftsperson has to deal with and what the tools must be adapted to. Our predecessors established the methods and developed the tools for this. It still works well; there is no need for change. Thus, the basics of all soapstone working can be described as timeless when performed the traditional way. There certainly is a risk of subjectivity in assessments and interpretations. Despite this, the material-related timelessness makes the craftsperson's answers relevant for soapstone working in general.

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Soapstone in the North. Quarries, Products and People. 7000 BC – AD 1700

Soapstone is a remarkable rock. While it is soft and very workable, it is also durable and heat-resistant, and with a high heat-storage capacity. These properties have been recognised and valued around the world since prehistoric times, and soapstone has been used for a multitude of purposes, ranging from everyday household utensils to prestigious monuments and buildings. This book addresses soapstone use in Norway and the North Atlantic region, including Greenland. Although the majority of the papers deal with the Iron Age and Middle Ages, the book spans the Mesolithic to the early modern era. It deals with themes related to quarries, products and associated people and institutions in a broad context. Recent years have seen a revival of basic archaeological and geological research into the procurement and use of stone resources. With its authors drawn from the fields of archaeology, geosciences and traditional crafts, the anthology reflects cross-disciplinary work born of this revival.



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