Traditional Craft Skills as a Source of Historical Knowledge

Reconstruction in the Ashes of the Medieval Wooden Church of Södra Råda

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Introduction

Today only ten corner-timbered medieval churches exist in Sweden. In November 2001, the medieval church of Södra Råda burnt to the ground in an act of arson. The church had a corner-timbered structure dating to around 1309, with world famous wall paintings from 1323 and later paintings from 1494 by Master Amund[1]. Hence, the Swedish National Heritage Board initiated a process, which is still ongoing, proclaiming that the church should be reconstructed 'as a pedagogical example to enhance craft practice and historical knowledge of medieval churches'.[2]

The full-scale reconstruction serves different purposes. In January 2002, after the devastating fire, the local community in Södra Råda met representatives from the county administration, the regional museum and the National Heritage Board to discuss the loss and what to do. An agreement was reached to reconstruct the church in its original fourteenth-century form with the objectives of educating craftsmen in medieval techniques, gaining new knowledge about medieval building history and developing a new local community venue and destination for tourism. Research thus represents one of several stakes in the project. The full-scale reconstruction started in 2007, after several years of excavation of the remains, church grounds and cemetery. The project is ongoing, in a pace depending on financing, currently with an end date set to 2019.

The decision to reconstruct the church raised many critical questions

[1] Hans Peter Hedlund, *The Chancel paintings of the Old Church at Södra Råda*, Riksantikvarieämbetet: Stockholm 2007; Åke Nisbeth, 'Mäster Amund och långhusmålningarna i Södra Råda', in Gunnar Olsson, Erik Bohrn et alii (eds), *En bok om Södra Råda gamla kyrka*, Värmlands Museum: Uppsala 1963.
[2] Gunnar Almevik, 'Södra Råda och rekonstruktion som hantverksvetenskaplig metod', in Eva Löfgren, ed., *Hantverkslaboratorium*, Hantverkslaboratoriet: Mariestad 2011, 156–174, at 157, http://craftlab.gu.se/digitalAssets/1328/1328263_antologin-hantverkslaboratorium-2011.pdf (last consulted 22 December 2014).

within the field of heritage conservation: why reconstruct lost heritage when resources are lacking for the maintenance and restoration of still standing historically valuable buildings? What is the cultural historical value of a full-scale replica? In this article we will not deal with the questions of authenticity or prioritizing of resources within heritage conservation. Our interest concerns the methodology of a full-scale reconstruction, and the potential for new scientific contributions to the history of medieval church buildings.

Initially in this article we will present the theoretical concepts that we use to reflect upon the methodology of reconstruction. To orientate the reader, we will then give a brief presentation of the early wooden churches in current Sweden. Next, a more thorough review of the general results from the reconstruction of Södra Råda is outlined along with the recent investigations of the still preserved medieval corner timbered buildings. An in-depth case study concerning cleaving of roof boards is discussed in order to elicit the trans-disciplinary, multi-methodological and source pluralistic path of inquiry of a single reconstructive experiment. Finally we will reflect upon the experiences from Södra Råda in the context of experimental archaeology, and argue for the great possibility or even necessity to expand the field of archaeology and building history by recognizing the makers' perspective on material culture.

A Paradigm of Clues

A full-scale reconstruction has a great physical and visual impact. For a tourist attraction this may be enough. A scientific reconstruction needs to have a consistency to the type of proof behind each and every element and choice, even though the level of consistency spans from strong proof and vague hypotheses.

The Swedish Pompeii Project investigates digital archaeology and presents a model in 3D GIS environment for managing the various references in a reconstruction. [3] The research team underpins the reconstruction of the house of Caecilus Iucundus by colour-coded digital layers distinguishing what is objective information and hypothesis, and what is consistent to the style, to the sources or by deduction. The historian Janken Myrdal also proclaims the necessity to accept yet manage the use of a multitude of sources and to combine circumstantial evidence in this type of

[3] Giacomo Landeshi, Nicolò Dell'Unto, Daniele Ferdani, Stefan Lindgren, Anne-Marie Leander Touati, 'Enhanced 3D GIS: Documenting Insula V 1 in Pompeii', in F. Giligny, F. DjinDjian, L. Costa, P. Moscati, S. Robert (eds), *Proceedings of the 42nd Annual Conference on Computer Applications and Quantitative Methods in Archaeology*. Archaeopress: Oxford 2015, 349–360, at 354.

research on pre-historic periods and inaccessible phenomena.[4] It is partly a question of 'material accuracy', advocating the scholarly legitimacy of the built product, but also a vital part in developing the research methodology: what sources and methods are useful to the different elements and inquiries in the reconstruction?

The investigations of preserved medieval churches, deposited building materials and historic tools, building the body of knowledge to the reconstruction of Södra Råda, are made within an emerging scholar field that combines craft research and building archaeology, using close up investigation, interpretation of toolmarks and craftsmanship in combination with the horizontal excavations of the building historical layers.[5] The historian Carlo Ginzburg frames the methodology, calling it *a paradigm of clues*.[6] The research procedure is not strictly inductive or deductively driven by hypothesis but rather *abductive*. Ginzburg bases the abductive method or retroduction of clues in semiotic pragmatism, making the best possible inference in account of an observation. Abductive building archaeology presents a dialectic process, interlinking theory and observation, by testing and contesting possible causes or complex relations in dialogue with observable effects. A key is the recognition of the seemingly negligible details. The question is what traces may be combined and used to draw conclusions about medieval wooden church building?

[4] Janken Myrdal, 'Källpluralismen och dess inkluderande metodpaket', *Historisk tidskrift* 127 (2007), 495–504, at 502, http://www.historisktidskrift.se/fulltext/2007-3/pdf/HT_2007_3_495-504_myrdal.pdf (last cosulted 22 December 2014); Janken Myrdal, 'Source Pluralism and a Package of Methods: Medieval Tending of Livestock as an Example', in Marko Lamberg, Jesse Keskiaho, Elina Räsänen and Olga Timofeeva, with Leila Virtanen (eds), *Methods and the Medievalist: Current Approaches in Medieval Studies*, Cambridge Scholars Publishing: Newcastle upon Tyne 2008, 134–158, at 134.

[5] Barbro Sundnér, *Maglarp: en tegelkyrka som historiskt källmaterial*, unpublished PhD thesis, University of Lund 1982; Peter Sjömar, *Byggnadsteknik och timmermanskonst: en studie med exempel från några medeltida knuttimrade kyrkor och allmogehus*, Chalmers tekniska högskola: Göteborg 1988; Per Ole Schovsbo, *Oldtidens vogne i Norden: arkæologiske undersøgelser af mose- og jordfundne vogndele af træ fra neolitikum til ældre middelalder*, unpublished PhD dissertation, University of Odense 1987; Harald Bentz Høgseth, '*Håndverkerens redskapskasse': en undersøkelse av kunnskapsutøvelse i lys av arkeologisk bygningstømmer fra 1000-tallet*, PhD dissertation, Norwegian University of Science and Technology: Trondheim 2007, http://www.diva-portal.org/ntnu/abstract.xsql?dbid=1788 (last consulted 17 June 2015); Gunnar Almevik, *Byggnaden som kunskapskälla* (Gothenburg Studies in Conservation 27), Göteborgs universitet: Göteborg 2012, http://hdl.handle.net/2077/28072 (last consulted 22 December 2014); Tomas Karlsson, *Ramverksdörr: en studie i bänksnickeri*, Institutionen för kulturvård, Göteborgs universitet: Göteborg 2013.

[6] Carlo Ginzburg, *History, rhetoric and proof*, University press of New England: London 1979, 273; Carlo Ginzburg, *Ledtrådar. Essäer om konst, förbjuden kunskap och dold historia*, Häften för kritiska studier: Stockholm 1989, 117.

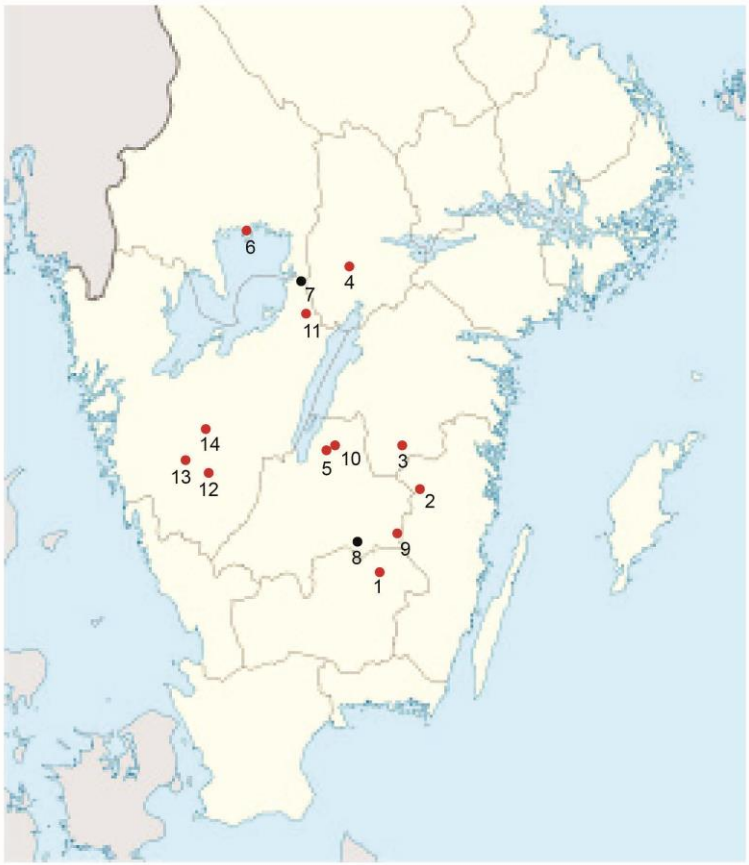


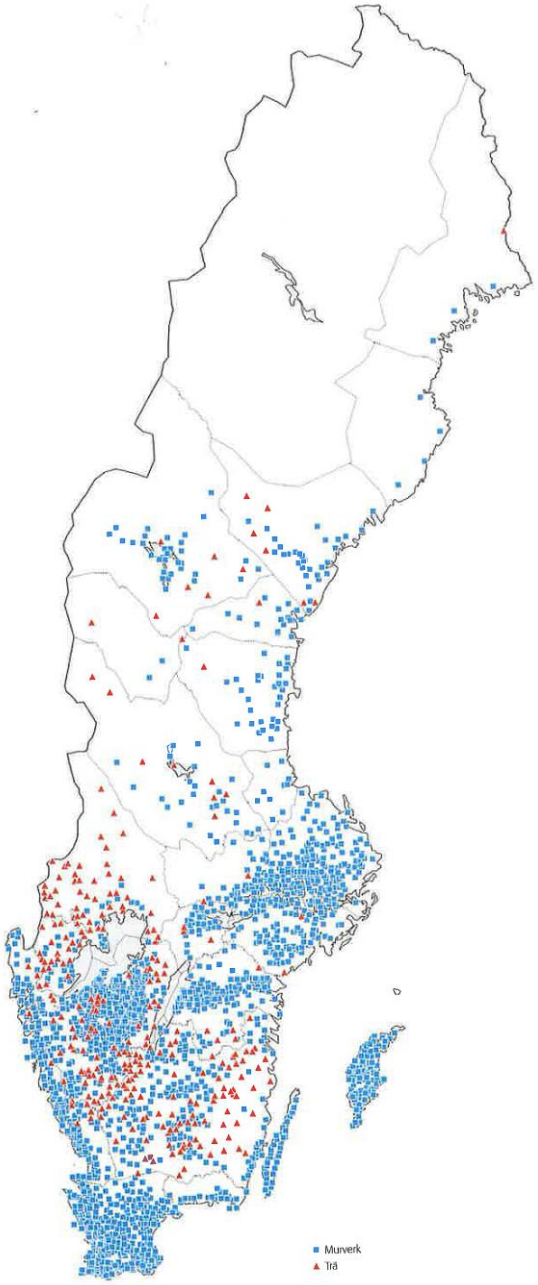
Fig. 1. Medieval wooden churches in current Sweden. Map of the ten preserved medieval corner-timbered churches, and also the stave church in Hedared (13), a probable rediscovered medieval church in Jällby (14) and the burnt down churches of Södra Råda (7) and Bäckaby (8). Listed (churches, dates, municipalities, counties and dioceses): 1. Granhult, the 1220s, Uppvidinge, Kronoberg, Växjö; 2. Pelarne, thirteenth century, Vimmerby, Kalmar, Linköping; 3. Tidersrum, the 1260s, Kinda, Östergötland, Linköping; 4. Tångeråsa, the 1290s, Lekeberga, Örebro, Strängnäs; 5. Haurida, thirteenth century, Aneby, Jönköping, Linköping; 6. Hammarö, 1320, Hammarö, Värmland, Karlstad; 7. Södra Råda, 1309, Gullspång, Västra Götaland, Skara; 8. Bäckaby, the 1320s, Vetlanda, Jönköping, Växjö (moved to the Jönköping city park in 1902); 9. Stenberga, 1330, Vetlanda, Jönköping, Växjö; 10. Vireda, 1344, Aneby, Jönköping, Linköping; 11. Älgarås, fifteenth century, Töreboda, Västra Götaland, Skara; 12. Brämhult, fifteenth century, Borås, Västra Götaland, Skara; 13. Hedared, 1498–1503, Borås, Västra Götaland, Skara; 14. Jällby, not dated with certainty, Herrljunga, Västra Götaland, Skara.

Reconstructive Experiments and Embodied Skills

Reconstruction is a process shaped in a dialogue between investigations of preserved authentic material and, as phrased by James Mathieu, 'imitative experiment to replicate the past phenomena'.[7] However, we prefer to describe the inquiry as reconstructive experiments that step by step form the reconstruction.

The phenomenon in this case is the making of a church building. In the reconstruction of Södra Råda crafting knowledge is not only a means of

[7] James R. Mathieu, *Experimental Archaeology: Replicating Past Objects, Behaviors, and Processes*, Archaeopress: Oxford 2002, 1.



production. The project is informed by the research practice at Roskilde Viking Ship Museum in Denmark, where archaeologists, shipbuilders, sailors, and other experts have collaborated following a practice-led methodology, utilising excavation data, reconstruction and full scale tests with the objective to sail the ships. Skilled craftspersons participate as research agents. The research is *practice-led*, meaning that the researcher is a subject undertaking actions in the very field of inquiry. Analytical friction is created by moving between the observation of matter in the investigations, self-observation *in action* and self- and participatory observation *over action*.[8]

Fig. 2. Churches at the end of the Middle Ages in current Sweden (blue = stone, red = wooden church)[9] (from Bonnier 2008, 165).

Manual labour may seem to follow simple procedures, but from a practice-led research perspective this is an illusion. For each procedure,

[8] Donald Schön, *The Reflective Practitioner. How Professionals Think in Action*, Temple Smith: London 1983, 68; Bengt Molander, *Kunskap i handling*, Daidalos; Göteborg 1996, 131.

[9] At the end of the fifteenth century, approximately three hundred and thirty of the 2350 parish churches that existed in Sweden were wooden, mainly corner-timbered constructions (Ann Catherine Bonnier, 'Sockenkyrkorna under medeltiden', in Markus Dahlberg and Kristina Franzén (eds), *Sockenkyrkorna: kulturarv och bebyggelsehistoria*, Riksantikvarieämbetet: Stockholm 2008, 129–176, at 132, 165–167, http://www.raa.se/publicerat/9789172096141.pdf (last consulted 20 December 2014). Of these wooden churches, about a hundred were located in Småland, 75 in Västergötland and fifty in Värmland. During the nineteenth century many of these small wooden churches were torn down and replaced with bigger churches in stone or brick, as a result of population growth and enlarged parishes. Angerdshestra, Hornaryd and Pjätteryd are examples of churches that were torn down or neglected until they fell into decay (see lists in Erland Lagerlöf ed., *Medeltida träkyrkor 2. Västergötland, Värmland, Närke*, Riksantikvarieämbetet: Stockholm 1985; Marian Ullén ed., *Medeltida träkyrkor 1. Småland samt Ydre och Kinda härader i Östergötland*, Riksantikvarieämbet: Stockholm 1983). The Södra Råda church might have faced the same destiny had it not been declared to be of national interest by *Vitterhetsakademien* and turned into one of the first existing museum churches, dating back to the 1850s.

there are a multitude of circumstances and problems, as well as variations and alternative solutions. All choices affect the subsequent procedures in the building process. The cutting, lifting, hewing, timbering, scribing, fitting, dowelling and cleaving are interrelated procedures that form the building as a whole. As Tim Ingold argues, this type of medieval building project is no brainchild of a lone genius. The design of the building as a whole is partly conceived in the process of making. 'It is rather a composite of many parts, imperfectly integrated, every part conditioned by ways of doing things peculiar to each of the teams that have contributed to its development, and patched together thanks to communicative exchanges between them'.[10]

The makers' perspective in the reconstructive experiments in Södra Råda coincides with the ecological approach of Tim Ingold and James Gibson. They take an interest for the practitioners' skills in a context of active engagement with the constituents of their environment. Gibson's concept of *objects affordances* disputes the representational discourse of things and states that we do not have to classify and label everything in order to learn to use things or perceive their uses.[11] This non-representational theory opens the reconstructive experiments to present the makers' perception and affordances of historical objects and procedures.

Tim Ingold argues for a study of material culture that upholds the correspondence to the world, 'to allow knowledge to grow from the crucible of our practical and observational engagements with the beings and things around us'.[12] The critique takes on the overwhelming focus on 'finished objects and on what happens as they become caught up in the life of histories and social interactions of the people who use, consume and treasure them'.[13] What is lost and needs to be enhanced is 'the creativity of the productive processes that bring the artefacts themselves into being: on the one hand in the generative currents of materials of which they are made; on the other hand in the sensory awareness of practitioners'.[14]

The reconstructive experiments in Södra Råda present a theoretical shift that may seem to combine incommensurable methodologies, from a semiotic to a phenomenological approach. However, it is through this fluoroscopic oscillation that we experience new thoughts and ideas, between the investigations' semiotic paradigm of clues and the reconstructive

[10] Tim Ingold, *Making: anthropology, archaeology, art and architecture*, Routledge: London 2013, 57; see also David Turnbull, *Masons, tricksters and cartographers: makers of knowledge and space*, Harwood Academic: Amsterdam 2000; James Ayres, *The artist's craft: a history of tools, techniques and materials*, Phaidon: Oxford 1985.
[11] James J. Gibson, *The ecological approach to visual perception*, Psychology Press: New York 2015, 119.
[12] Ingold 2013, 7.
[13] *Idem.*
[14] *Idem.*

experiments' creative approach that encompasses the makers embodied mind.

Fig. 3. Södra Råda. Photo ATA.

Södra Råda and the Medieval Wooden Churches in Sweden

The parish of Södra Råda, to which the medieval church once belonged, is part of the Diocese of Skara (Fig. 3). It is located in the Municipality of Gullspång in the province of Värmland and the administrative region of Västra Götaland. In 1858 a new stone church was built in the parish, and the old wooden church was taken out of use. When the open-air museum of Skansen in Stockholm was established, plans were made to disassemble the wooden church and re-erect it there. The initiative was contested and led to protests from local inhabitants, and the church was finally preserved *in-situ* as a museum.

The archaeologists who carried out excavations after the fire in 2002–04 found traces of a previous stave church assumed to date from the mid-twelfth century. It was about twelve metres long with a 4 x 4.5 metre chancel.[15] The new church was partly built upon the old church ground, and

[15] Rickard Hedvall, 'Den äldre träkyrkan i Södra Råda', in Ebba Knabe, ed., *Arkeologi i Södra Råda*,

corner-timbered logs replaced the old staves. The new church building was larger than the old one, with a 10.6 x 8.5 metre nave, a 5.3 x 5.6 metre chancel and a total length of sixteen metres (Figs. 4, 5).

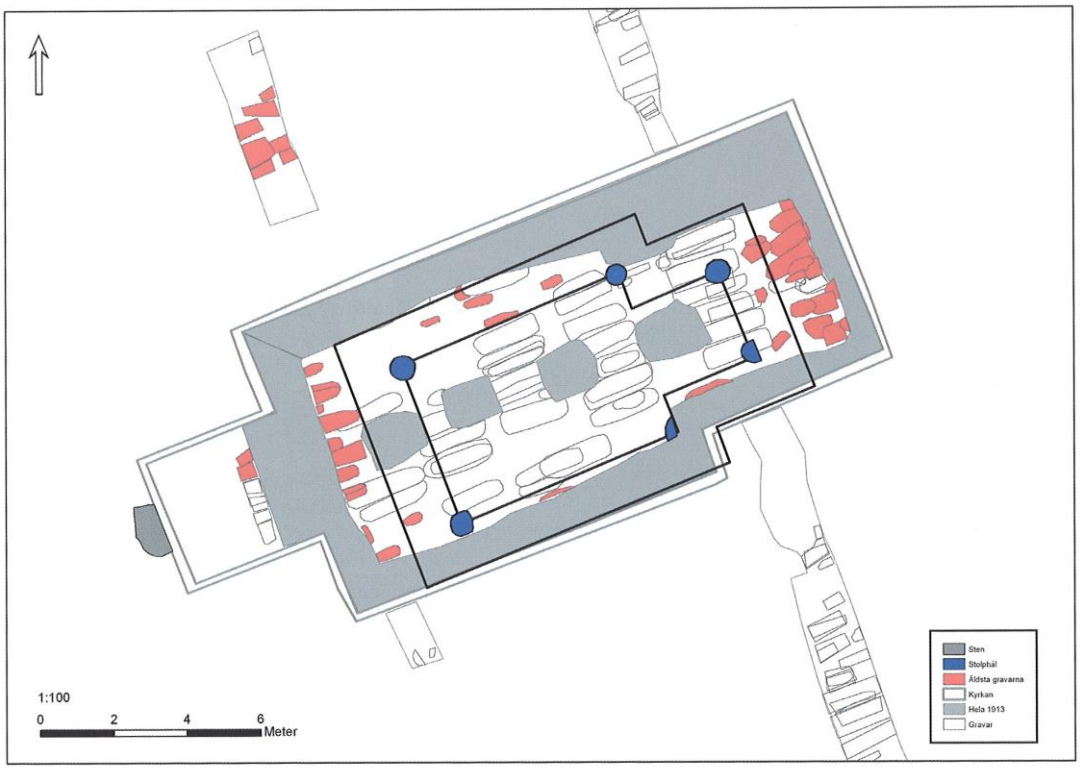


Fig. 4. Excavation plan. Proposed ground plan of the previous stave church related to the log timber construction from the fourteenth century (from Hedvall 2009, 74).

What we know about the earliest wooden churches in current Sweden is mainly based on archaeological excavations, or in some cases building material that has been reused in later buildings. Until the thirteenth century, stave churches represented the predominant type of wooden church buildings.[16] Archaeological excavations have determined the locations and traces of them but only one of them remains, namely the Hedared church dating from the early sixteenth century.[17] Starting around the year 1200, stave construction was increasingly abandoned in favour of corner-timbered technique.[18] The motive has not been identified with certainty, but the shift in technology coincides with the development of parishes and the introduction of tithing as a basis for the strengthening of Church power in

Riksantikvarieämbetet: Stockholm 2009.

[16] In the term *stave church*, we here include what can be divided into sub-groups like palisade churches.

[17] Emil Eckhoff investigated Hedared and all the remains of Swedish medieval stave churches known at the time; Emil Eckhoff, *Svenska stavkyrkor jämte iakttagelser över de norska samt redogörelse för i Danmark och England kända lämningar av stavkonstruktioner*, Cederquist: Stockholm 1914–1916; see also Lagerlöf 1985; Ullén 1983.

[18] Bonnier 2008, 132.

the thirteenth century.[19] The sacral corner-timbered technique was preferred when stone was not an option, for small parishes in the forested districts.[20] It is even suggested that the sharp-edged timbers made a flat surface as an imitation of plastered stonewalls.[21]

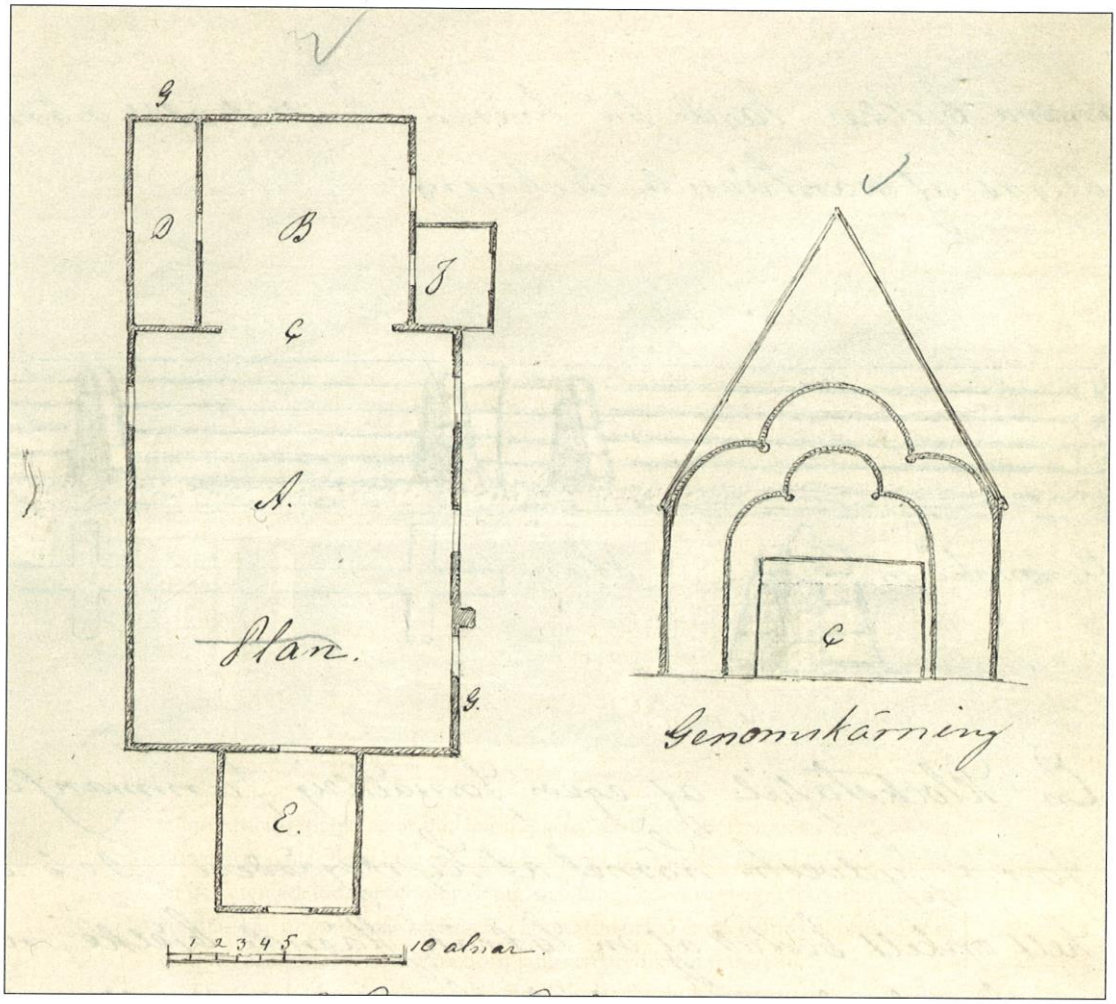


Fig. 5. Södra Råda. Documentation drawings of the Södra Råda church from ATA.

The ten remaining churches preserved *in situ* are located in a concentrated geographical territory in the south of Sweden within three hundred kilometres of each other.[22] The Norwegian Fløan chapel from Skatval, and

[19] Dick Harrison, *Sveriges historia medeltiden*, Liber: Stockholm 2002, 121; Marcus Dahlberg, 'Socknar och församlingar over tid', in Markus Dahlberg and Kristina Franzén (eds), *Sockenkyrkorna: kulturarv och bebyggelsehistoria*, Riksantikvarieämbetet: Stockholm 2008, 129–176, at 29, http://www.raa.se/publicerat/9789172096141.pdf (last consulted 20 December 2014).

[20] Bonnier 2008, 131.

[21] Arne Berg, *Norske tømmerhus frå mellomalderen 1. Allment overseen*, Landbruksforlaget: Oslo 1989, 35; Anders Åman & Marta Järnfeldt-Carlsson, *Träkyrkor i Sverige*, Natur och kultur/LT: Stockholm 1999, 30.

[22] According to a recent building investigation, the wooden parish church in Jällby, previously dated to the mid-sixteenth century, may be one of the oldest remaining corner-timbered churches. Recent field research has also rediscovered medieval storage buildings in corner-timbered techniques, for instance the tithe barns

Fiskerkapellet at Maihaugen in Lillehammar are the only corner-timbered medieval churches that have been preserved in Scandinavia outside this specific territory.[23] The oldest of these churches is Granhult, which dates from sometime after 1217.[24] This might be the oldest still-standing original corner-timbered church in Europe and possibly in the whole world.

Previous Documentation and Excavation Data from Södra Råda

The medieval church of Södra Råda was supposed to be one of the best documented churches in Sweden and therefore easy to reconstruct. The documentation and previous research is indeed extensive and authoritative, but not precise enough to answer all the questions raised by a 1:1 reconstruction. From concept to practice we need to know not only the general shapes and measures, but the specific craft procedures, material properties and construction details.

As for many medieval buildings, specific contemporaneous sources are non-existing. The remains of the church contain some preserved, badly burnt, original pieces of the timber construction and roof structure that provide detailed if limited information. Many questions need other sources to be answered.

The previous documentation mainly focused on the medieval paintings. However, the extensive photographical documentation of the interior of the church and the documentation from a restoration carried out in 1913 have been useful for interpreting the qualities of the timber and the probable character of the historic forest they had grown in. For instance, by counting and measuring the twigs from seasonal branches, it has been possible to estimate the growth of the trees and nature of the original forest.[25] By combining information from previous documentation and dendrochronological analysis of the surviving wood residue we could form criteria for the forest and timber to be used in the reconstruction.

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in Ingatorp and Hult, see Gunnar Almevik & Karl-Magnus Melin, 'Ingatorp. A corner timbered tithe barn from the 13th century', poster at the conference *Church Archeology in the Baltic Sea Region*, 26–28 August 2013, University of Turku.

[23] The Fløan chapel is dismantled and preserved parts are stored in Trøndelag Folkemuseum in Trondheim, see Berg 1989, 217. Fløan is situated about seven hundred kilometers north of Södra Råda and built with the same type of sharp-edged timber. The provenience of Fiskerkapellet is unknown. The chapel is dated to 1457 and timbered with round logs, see Linn Willetts Borgen, *Et capell paa øren i Lougen elv. Om fiskerkapellet fra 1459*, unpublishes MA thesis, University of Oslo 2013.

[24] Ullén 1983, 30.

[25] Göran Andersson, *Material – dimensioner och kvaliteter. Södra Råda gamla kyrka. Förundersökning 1*, Timmerdraget & Dacapo Hantverksskola: Mariestad 2004; Göran Andersson, *Timmerstommen. Södra Råda gamla kyrka. Förundersökning 3*, Timmerdraget & Dacapo Hantverksskola: Mariestad 2006; Robert Carlsson, *Timmerdimensioner och vedkvaliteter*, Timmerdraget & Dacapo Hantverksskola: Mariestad 2002.

Through archival studies it has been possible to trace the building history back to the seventeenth century. We know for instance that the west porch existing in 2001 was built in the seventeenth century, when the main entrance was moved from its original location on the south side. Archaeological data informs us that there existed a previous porch on the south side but we do not know when it was built. Furthermore, we know by the written sources when the windows and the presbytery arch were enlarged, but their original shapes are unknown. This information is essential as the reconstruction aims at recreating the church as it looked around 1320 when it had recently been erected.

The 'Twin' Church in Hammarö

All evidence and indicia from written sources and remains of Södra Råda have been triangulated with the preserved wooden churches, and tested in many reconstructive experiments alongside the reconstruction process. One of the still preserved medieval wooden churches has been more thoroughly investigated than others, and that is the nearby wooden church of Hammarö, built around the same time as Södra Råda.[26] The relationship between the two churches in terms of style, form and craftsmanship is obvious. Their measurements and layouts are almost identical; a narrow chancel with a parallel sacristy on the north side added to a broader nave. The characteristic trefoil-shaped inner roofs were the same, as the decorative arch portals with rose ornaments on the south façades.

Some unanswered questions regarding Södra Råda were enlightened by investigations in Hammarö. The presbytery arch in Hammarö has been enlarged in the same manner as in Södra Råda. The original measure of 1690 millimetres could be traced from marks in the transverse sill between the nave and chancel. The presently closed-in original portal in Hammarö has been uncovered and examined, to serve the reconstruction of Södra Råda.

Craftsmanship in Medieval Wooden Church Building

The preserved medieval corner-timbered churches and tithe-barns, and a qualitative selection of the about 270 preserved medieval roof constructions, have been the object of in-depth investigations in order to serve as a knowledge base to the reconstruction of Södra Råda. To sum up the results from these investigations, there are some general observations that pertain

[26] Re-used material from a third church building of this particular type has been found in the bell tower construction in the nearby Visnum parish. The layout has been archaeologically confirmed to follow the plans of Hammarö and Södra Råda churches, Lagerlöf 1985, 206.

to a culture and craft tradition of religious wooden building.

Fig. 6. Axe from Lödöse (Lödöse Museum, inv.no. 27600:443:H:345). One of the initial investigations concerned hewing techniques in the Södra Råda and Hammarö churches and finding axes in museum collections that corresponded in age and resulting tool marks.[27] The axe from Lödöse was found in 2010 and is of a type hitherto found in nine specimens, from Denmark in the south to Lödöse in the north. Two of these axes have been stratigraphically dated to the period 1300–1350, and the axe from Lödöse has been dated to the period 1200–1400. The axe, which was copied for use in the reconstruction, is well balanced and works well for hewing the timbers (*sprätthuggning*) and the making of medieval-type shingles. Photo Karl-Magnus Melin.

One of the distinct characteristics of a medieval sacral building is the flat surface of the walls, a quality which has been well described in previous research.[28] The timber logs were shaped by axe into a rectangular cross-section with sharp corners. The edges of the boxed logs meet up corner-to-corner forming a flat surface on the church-walls. All the other timber used in the construction, such as roof trusses and ridge beams, is likewise boxed. This characteristic is common to all preserved medieval corner-timbered churches in Sweden, but differs from the preserved contemporary secular timber buildings that were built with round logs.[29]

[27] Karl-Magnus Melin & Olof Andersson, *Behuggningsteknik i Södra Råda och Hammarö kyrkor. 1300-tals yxor i litteratur och magasin. Södra Råda gamla kyrka* (Knadriks Kulturbygg rapport 2008:18), Kristianstad 2008, http://craftlab.gu.se/digitalAssets/1334/1334319_knadriks-kulturbygg-rapport-2008.18-sr-forunds.pdf (last consulted 20 December 2014).
[28] Sjömar 1988, 46; Åman & Järnfeldt-Carlsson 1999, 30.
[29] Sjömar, 1988, 92.

Fig. 7. The trefoil of the nave at Södra Råda. In the middle of the nave, the boards are jointed and this seam is hidden by a carved rope moulding. We have examined photos of the boards in the Södra Råda church, and all of the boards are approximately 6 metres long. Photo National Heritage Board, ATA.

As many of the wooden churches were originally painted, a possible interpretation is that the timber structure should serve as a panel. In the old church of Granhult, the inner walls have been planed with a broad axe after their erection and the marrow cracks in the surface have been filled with wooden sticks or dowels.[30] Another interpretation is that the use of boxed timber derives from a continental building tradition that utilised both pine and deciduous timber.[31]

The craftsmanship of the fourteenth-century or earlier churches has a personal imprint.[32] The material and surfaces have been planed with impressive amounts of work and care. The joints in the roof trusses have been shaped in apparently situational manner. The heads of the dowels and visible nails may be carefully shaped into trapezoids. The craft is refined and

[30] Karl-Magnus Melin, Gunnar Almevik, Bengt Bygdén, Daniel Eriksson, Mattias Hallgren & Therese Melin, *Seminarierapport från taklagsundersökning i Granhults kyrka*, Rapport av Södra Råda akademien i samarbete med Hantverkslaboratoriet 2014, http://timmermanskonst.files.wordpress.com/2015/02/granhult-rapport-taklag-klyv-seminarie.pdf (last consulted 17 June 2015).

[31] Sjömar 1988, 45; Finn Werne, *Böndernas bygge: traditionellt byggnadsskick på landsbygden i Sverige*, Wiken: Höganäs 1993, 173–175.

[32] Daniel Eriksson, 'Medeltida taklag i kyrkor samt klockstaplar i Skara stift – undersökning, verktygsspår & documentation', Presentation at the Conference *Medeltida timmerbyggnader*, 22–23 May 2015, Hantverkslaboratoriet & Dalarnas museum, Rättvik, a-b.

lightsome. The woodwork differs from the later fifteenth-century constructions that have larger dimensions and appear to be more standardized.

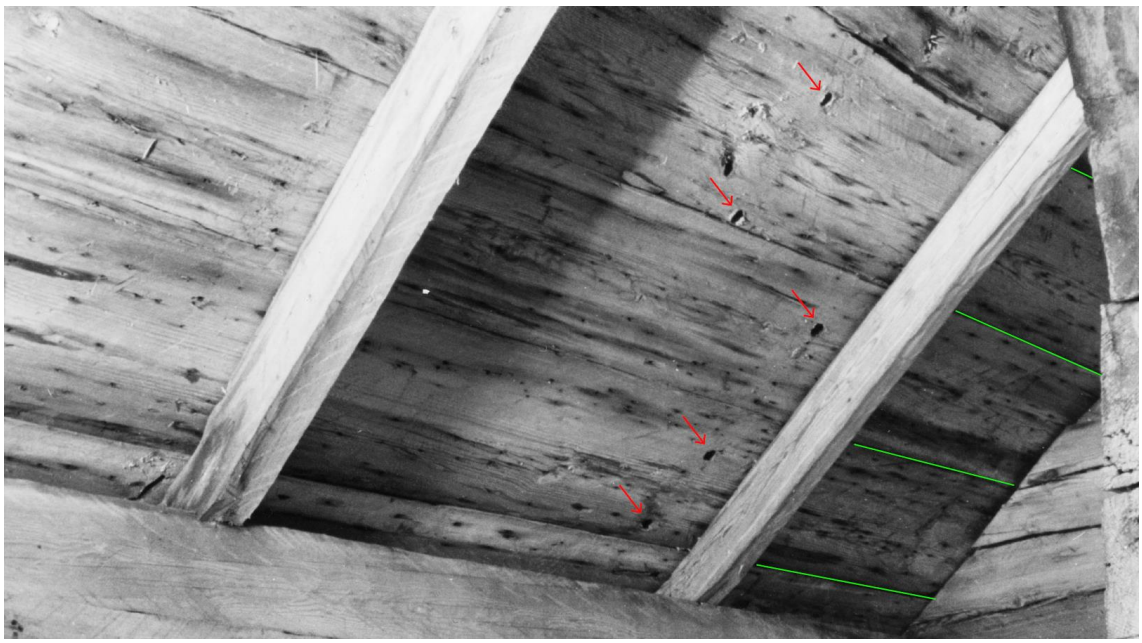

Fig. 8. Roofing and trefoil boards from the Södra Råda church. The photo shows the roofing boards of the sacristy of Södra Råda. At first glance, they seem to be original since it is clear that the *sprätthuggning* technique has been used. Closer examination makes it possible to see that they most probably are original but displaced. The red arrows point at holes where nails or pegs were used to fasten the boards to a rafter. The green lines illustrate the width of the boards. From the picture, the width of the boards can be determined to be around 35 centimetres. Photo National Heritage Board, ATA.

Architecture and craftsmanship may be considered as being fully integrated. In the preserved wooden churches and even tithe-barns the roofs are notably tall, even taller from eave to ridge than the height of the facades. One interesting characteristic that has been observed in several of these buildings is that the timber façades lean inwards to the eave, and the gables lean outwards. This makes the building look more monumental, while the person standing in front of it feels smaller.

What seem to be intentional visual effects are thus achieved through the wooden structure, not by secondary constructions and furnishings. We know that many of the elaborated roof trusses in the twelfth-century stone churches were originally visible.[33] The roof structure was a vital part of the

[33] Kina Linscott, *Medeltida tak, bevarade takkonstruktioner i svenska medeltidskyrkor. Del 1: Rapport om kunskapsläget 2006*, Göteborgs Universitet: Göteborg 2007, http://hdl.handle.net/2077/19106 (last consulted 20 December 2014); Carl Thelin and Kina Linscott, *Structural Definition and Comparison of Early Medieval Roof Structures*, Paper at the 6th International Conference on Structural Analysis of

creation and perception of the interior space. The inner trefoil roof in Södra Råda was acknowledged as extraordinary, but one significant detail had not been recognized. The roof of the nave was leaning downwards with a lowest point at the arch to the chancel. This irregularity had previously been disregarded as insignificant. We have examined the premises and claim that it is was a deliberately created perspective in the crafted architecture, with its focal point at the sacral altar.

The Makers' Perception of the Past

The procedure of reconstruction creates a tension between the observation of the authentic medieval buildings and the perception of affordances in the making of a reconstruction. By embracing tools, materials and procedures, the craftspersons may elucidate aspects of the past that have been overlooked by earlier academic research, or even contest previous interpretations. On the other hand, craftspersons are also used to performing their work in established ways that calls for self-reflection and critique.

The craftspersons are authorized members of a trans-disciplinary team of experts, where each participant contributes with particular skills and methodological know-how, adding to and also criticising each other's hypothesis and statements. In this section we will present examples of what type of knowledge is generated by 'the creativity of the productive processes that bring the artefacts themselves into being'.[34]

Previous research emphasizes that it took a long time to dry the timber, at least one or two years, before construction work could start.[35] However, experience from the reconstruction indicates otherwise. In order to prevent the twisting of the long timbers that might occur in the drying process, the wood should not be more than semi-dried. The best time for cutting down the trees and cleaving and hewing the timber in rudimentary dimensions is in March and April, between winter and spring. In this period there is enough daylight to work fairly long days, good snow to ease transportation and workable timber that is not completely frozen. The fine adjustments of the building material and the corner-timber work should be

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Historical Construction: Bath 2008, http://www.conservation.gu.se/digitalAssets/1091/1091837_Thelin___Linscott_Structural_definition_and_comparison_of_early_medieval_roof_structures.pdf (last consulted 20 December 2014); Peter Sjömar, 'Romanska takkonstruktioner: ett värdefullt och outforskat källmaterial', in Marian Ullén ed., *Från romanik till nygotik*, Riksantikvarieämbetet: Stockholm1992, 56–66.

34 Ingold 2013, 7.

35 Johan Söderberg, *Sveriges ekonomiska och sociala historia*. *Medeltiden*, Liber-Hermods: Malmö 1996, 171; see also Sigurd Erixon, 'North-european technique of corner timbering', *Folk-liv*: *acta ethnologica Europaea: svensk årsbok för europeisk folklivsforskning* 1 (1937), 13–60; Robert Carlsson & Johan Mårtensson, 'Knuten tät väggen slät', *Byggnadskultur* 2 (2001), 22–27.

made the very same year for a good workflow and to obtain a good building result.

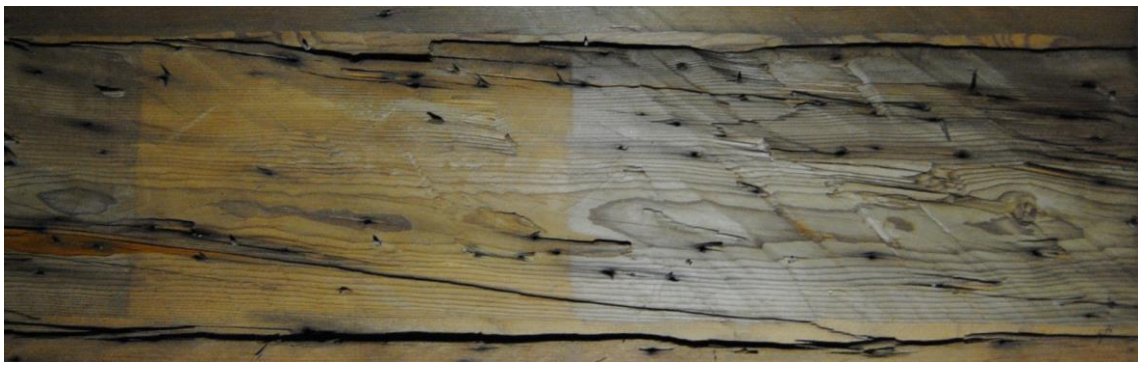

Fig. 9. Roof board from the Tångeråsa church. The board has very warped fibres. It was necessary to use a controlled cleaving technique to succeed with a tree like this. This type of material was tested, with good results, in the practical experiments. Photo Christina Persson.

In the previous section, several interpretations of the flat surfaces in the medieval sacral buildings were given. The reconstructive experiments do not contest the theoretical interpretations but reveal consequences and possible interdependent or supplementary processes in a context of making. A general conclusion based on the experience is that plane surfaces in boxed timber call for extended skills in craftsmanship. The longest timbers in the nave construction of Södra Råda, 10.4 metres long, can weigh up to 250 kg. Furthermore, the length also causes problems in terms of incurvature, requiring compensating actions in the dowelling. The dowelling technique serves not only to fit the logs together vertically but also to adjust incurvature. The different methods of dowelling and wedging the logs together (in Swedish *dymla, dubba* and *lusa*) are necessary, efficient and highly sophisticated.

Fig. 10. Cleaved board from the Hammarö Church. The Hammarö church trefoil board SHM 23700:6. Note the almost horizontal growth rings, which strongly indicate that four boards were produced from one timber. Photo Karl-Magnus Melin.

In the secular medieval timber buildings there are a variety of corner joints

with extended logs[36], while the medieval timber churches have either half joints or variants of dovetail joints without extensions. The corners in Södra Råda as well as in the twin church of Hammarö are held together with simple half joints fixed by dowels. Were the choices of joints aesthetical to a sacral building program or were they connected to the craft skills, materials and particularities of construction? We know that the length of the logs complicates the precision in meeting and fitting the corner joints, as the timbers are naturally tapered. Traces show that the craftsmen had problems handling these conditions in both Södra Råda and Hammarö.

Another experience from the reconstruction concerns the peculiar hewing technique used in Scandinavia, which more or less vanished after the plagues of the fourteenth century.[37] The technique has been called *slinthuggning*, *krushuggning* or *sprätthuggning* and serves as an attribute for researchers to identify early medieval building constructions. The distinctive character of the technique is the cutting with an axe in the direction of the wood fibres. Sometimes the surfaces can be in controlled parallel bands and eventually formed in a decorative fish-bone pattern.[38] In Norwegian stave churches this specific pattern has been interpreted as a decorative expression. Our observations of medieval corner-timber buildings show that the interior wall timbers up to man's height are commonly finished with some kind of shaving (probably by the tool named *skave* in Swedish).[39] Close to entrances and openings the timber is also shaved and often adorned with a profile.

It seems that *sprätthuggning* commonly was not intended as decoration. The preferred surface close to the human body and visual scope was the shaved surface.[40] However, behind the well-recognized and peculiar surfaces of *sprätthuggning* one may occasionally observe fissures and flaws on roofing boards and rafters from the previous cleaving of the raw timber. From a maker's perspective the procedure of cleaving constitutes an important part of the whole building process.

The Cleaving of Roof Boards – Tracing a Historical Work Process

The processes of cleaving roof boards and shingles constitute a large part of

[36] Daniel Åkerman & Stefan Östberg, 'Den medeltida timringsteknikens särdrag', Presentation at the Conference *Medeltida timmerbyggnader*, 22–23 May 2015, Hantverkslaboratoriet & Dalarnas museum, Rättvik 2015; see also Jan Raihle, *Medeltida timmerhus i Dalarna*, Dalarnas museum: Falun 2005.
[37] Sjömar 1988, 266.
[38] Berg 1989, 21–24; Håkon Christie, *Urnes stavkirke*, Pax forlag: Oslo 2009, 184.
[39] A similar type of window with fittings semi-integrated into the log timber construction is found in the nearby church in Tångeråsa.
[40] Mattias Hallgren, Bengt Bygdén, Elisabet Orebäck Krantz & Daniel Eriksson, *Klockstaplar i Skara stift*, Västergötlands museum: Skara 2014, 31.

the total labour in building a corner-timber church like Södra Råda. An assumption based on the reconstructive experiments is that Södra Råda church is the result of about twenty thousand work hours and that it was erected during a period of at least two years. The building process was certainly dependent on specific circumstances like funding and the logistics of the parishioners' usual obligations. We have no specific sources to access information on the funder, the builder contractor or the participating craftsmen,[41] but we may approach the actual process of building.

According to the reconstruction, to prepare the corner timber logs takes two thousand hours and cutting the joints and scribing and dowelling the logs additional three thousand hours. This comes to a quarter of the labour needed. The largest amount of time was spent on cleaving rafters, boards and shingles for the roof construction. Making the roof was more time-consuming and challenging than making the corner timber case. The roof requires 21.000 wooden shingles that are to be cleaved and shaped by axe. The production of this typical medieval church-roof material requires at least five thousand work hours, a quarter of the required labour.

The outer roof and inner trefoil vault in Södra Råda consisted of about 280 boards that were cleaved in 6.2 metres-long pieces and shaped by axe into about 25 millimetre-thick rectangular plane surfaces. Previous research and reconstructive experiments that deal with the Scandinavian conifers have suggested that only two boards could be made from one log.[42] That means that more material was needed for the boards that was needed for the whole timber structure. Which methods did the craftsmen of the early fourteenth century use to produce this amount of long cleaved boards? What is significant in the work process? What was required in terms of material, procedures, and tools? How much time did they need? And, what skills were required?

Review of Previous Experimental Research on Cleaving

The cleaving of long boards is an obsolete technique in contemporary building, and has been so ever since the expansion of saw mills in the eighteenth and nineteenth centuries, when sawing became the predominant

[41] The masons are sometimes found in written sources. The *logtimebermen* are anonymous except for a few existing references, see Jan Svanberg, *Medeltida byggmästare i Norden*, Signum: Stockholm 2013, 7.
[42] Pehr Kalm, *Menlöse tankar om bräd-sågning, yttrade med wederbörandes samtycke, under [...] Pehr Kalms inseende, af [...] Carl Gerhard Widqvist, norr-finne, år 1772 den 22 februarii i Åbo*, dissertation, Åbo akademi 1772, 6; Werne 1993, 280; see also Jon Bojer Godal, *Tre til tekking og kleding: frå den eldre materialforståinga*. Landbruksforlaget: Oslo 1994; Gotthard Gustafsson & Arne Biörnstad, *Skansens handbok i vården av gamla byggnader*, Forum: Stockholm 1981; Anders Sandvig, *Om bord og plankehugging før vannsagens tid og litt om hvad de gamle brukte skogen til*, Maihaugen: Lillehammer 1931.

production method. Today the tradition has been broken and the unique skill forgotten.

Within experimental building archaeology, shipbuilding, building restoration, and heritage craft there have been attempts to find out how cleaving may have been performed in historic production.[43] The context of previous studies and experiments has varied, but some general assumptions and statements can be concluded.

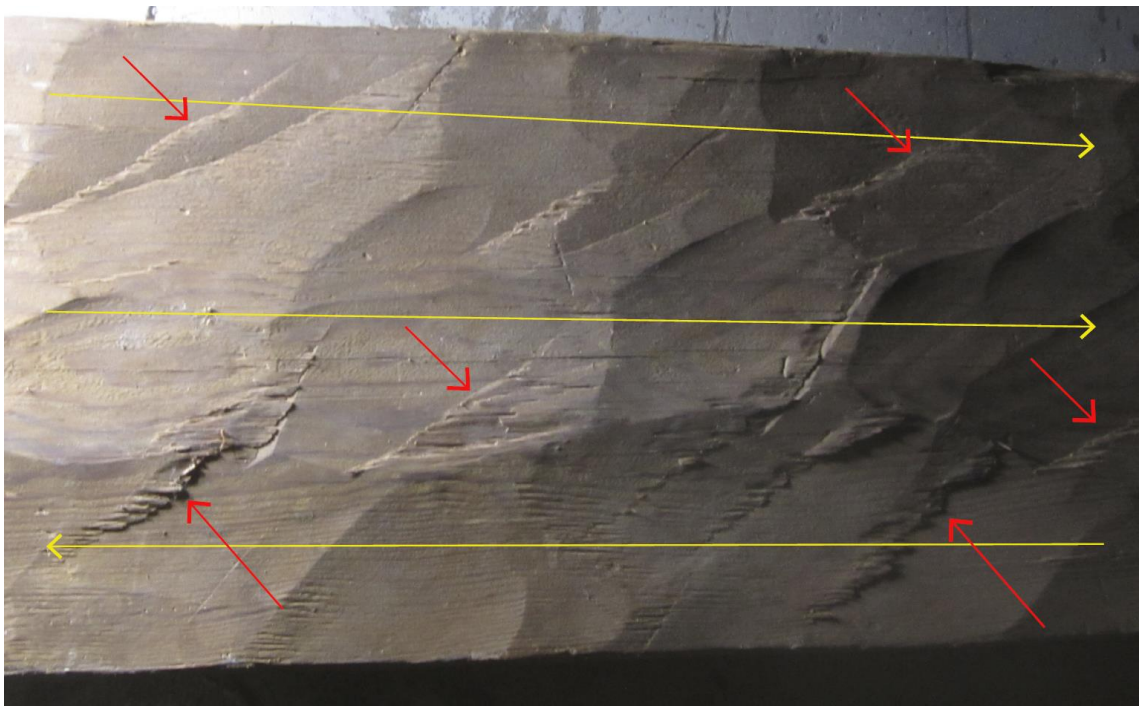

Fig. 11. Board with *sprätthuggning*. The Hammarö church trefoil board SHM 23700:9. The board shows marks of *sprätthuggning* in rows that are mainly functional and not intended to be decorative. The yellow arrow shows the direction the rows were hewed in. The red arrow shows, with two examples on every row, the angle at which the axe hit the board. When the row lowest in the photo was made, the board was turned around. Photo Karl-Magnus Melin.

One undisputed fact is that cleaved boards are stronger than sawed boards since the fibres are whole and not cut. This fact has led to the assumption that the historical practitioner intended to preserve the fibre structure in all cleaving procedures. Another assumption is that the practitioners knew

[43] Sandvig 1931; Godal 1994; Erik Andersen, ed., *Roar Ege: Skuldelev 3 skibet som arkæologisk eksperiment*, Vikingeskibshallen: Roskilde 1997; Helena Åberg, *Att utforska historisk slöjdkunskap genom klyvning och svepteknik ett exempel på forskning i hantverk*, MA thesis, University of Gothenburg 2009, http://hdl.handle.net/2077/19100 (last consulted 22 December 2014); Magnus Sjöholm, *Projekt förhistoriska och medeltida resvirkes- och stavkonstruktioner: en studie ur ett praktiskt perspektiv*, Duplic 2012; Roald Renmælmo, 'Kløyving av tømmer med Konrad Stenvold', in *Tekking og kleding med emne frå skog og mark: frå den eldre materialforståinga*. Maihaugen: Lillehammer 2012, 36–48; Stig Nilsson, *Kungsladan i Rankhyttan, Dalarna – spräckning till takved*, s.a., http://www.stignilssonbygg.se/kungsladan.html (last consulted 22 December 2014).

exactly which trees to use, and that timber forests were frequent and good quality of wood was easy accessible in pre-industrial times. Concerning the cleaving of pine to make long boards, the technique was a wasteful since only two boards were produced from every timber. In light of these assumptions, what do the traces and remains of cleaved boards in the historic buildings tell us?

Cleaved Roof Boards in Historic Buildings and Museum Collections

Original cleaved boards have been found and examined in the medieval corner-timbered churches of Tångeråsa and Granhult, and the stone churches of Asby, Värna, Grevbäck and Sjösås (Figs. 9–13). Since the extant inner roof boards from Hammarö are stored at the Swedish History Museum they were documented in detail.

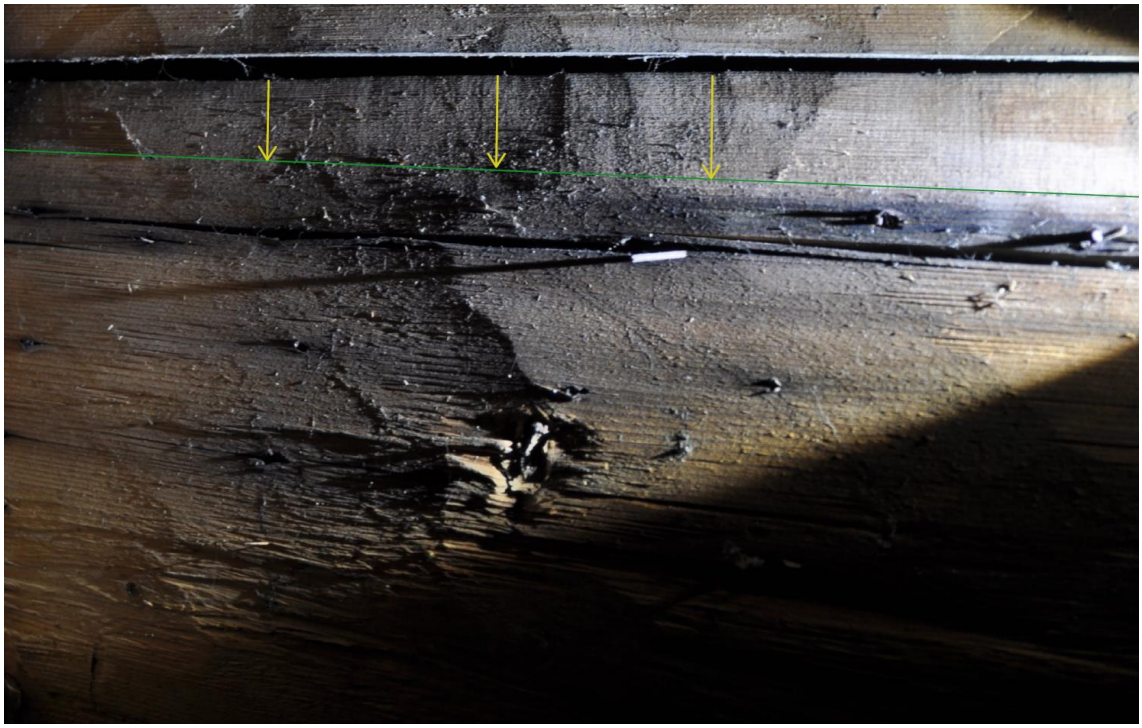

Fig. 12. Traces of *spårning*. In the Sjösås church, Daniel Eriksson has documented tool marks from *spårning* on a cleaved roofing board. Usually these marks were cut away in the later steps of the *sprätthuggning* process. The yellow arrow shows the direction the axe was driven down plumb, and the green line shows the depth of the *spårning*. Photo Daniel Eriksson.

In the trefoil of the Hammarö church, the painted side is shaved and the backside hewed using the *sprätthuggning* technique. The core side is sometimes the painted side and sometimes not. The quality of wood of the boards from Hammarö varies a lot, ranging from knots up to 45 millimetres

in diameter and very warped fibres to almost knot-free and straight-fibred boards. In Granhult and other medieval churches there is also large variance in the quality of the wood and the use of both pine and spruce. Concerning spruce, the growth of the tree was rapid with large growth rings. According to these observations it seems like the craftsmen who built the medieval churches aimed at producing straight boards regardless of whether the natural fibres had to be cut. It is notable that some boards in the examined churches have horizontal growth rings, which strongly indicates that they are the outer boards from a timber that yielded four boards.

The boards were generally hewed by *sprätthuggning* after the cleaving process. The interpretation of the process of production is difficult as traces from the previous procedures in the cleaving were cut away. Tool marks from a pre-cut to direct the cleaving, in Swedish *spårning*,[44] have been noted in the Sjösås church in Småland. The traces of *spårning* and the fact that the quality of the material varies indicate a controlled cleaving process, including *spårning* with axes and the use of wedges. The method used was effective in making four boards out of one log.

Fig. 13. *Spårning* and cleaving. This picture from a twelfth-century Citeaux manuscript of the *Moralia in Iob* (Dijon, Bibliothèque municipale, 170; Wikimedia Commons, https://commons.wikimedia.org/wiki/Category:Moralia_in_Job_of_Citeaux#/media/File:Cistercian_monks.jpg) has been used to illustrate cleaving.[45] We interpret that the picture actually shows monks in the process of *spårning*. The picture can be compared with the description made by August Holmberg. Note that they used a mallet to hit the axe in order to have full control and gain more power.

Historical Records and Recent Interviews with Craftsmen

There are but a few records from tradition bearers in questionnaires collected by the folklore archives. Lars Levander refers to information from interviews with craftsmen in Dalarna which concerns in particular dry pine.

[44] For lack of a good translation, we use the Swedish word *spåra*. Unlike in *grooving*, no material is removed in *spårning*.

[45] See for example Søren Vaadstrup, *Vikingernes kølvand: erfaringer og forsøg med danske, svenske og norske kopier af vikingeskibe 1892–1992*, Vikingeskibshallen: Roskilde 1993.

According to the craftsmen the fibres should be ’quite straight‘. ’If a tree was warped inside, it was left aside. However, the trees were used if only the sapwood was warped’.[46]

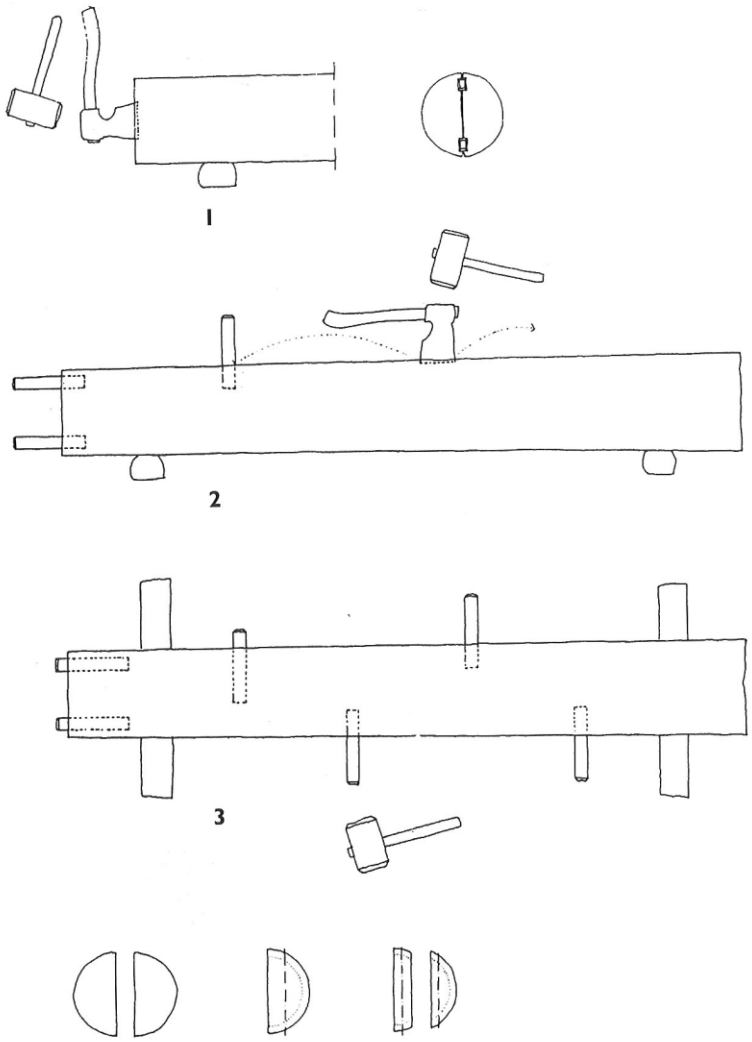

Fig. 14. Interpretation by Peter Sjömar of August Holmberg’s text-based narration. The reconstructive experiments show that the *spårning* and use of wedges is far more extensive than what this illustration shows. Holmberg’s explanation follows: ’In the small end a wide edged hand axe was beaten with a wooden mallet to gain a plumb fissure in the middle of the log. Half a dozen wedges of dry beech, twelve to fourteen inches long and about two inches wide and one and a half inches thick in the thick end had been prepared. Two wedges were forced into the opened end. They were not put close to the core but further out, about one inch behind the bark. When the beginning of a fissure could be seen on the log, one man put the edge of the axe onto the bark on the middle of the tree, simultaneously as another man with the wooden mallet made, not too hard, blows on the axe hammer. This went on until they reached the other end of the tree. Then the tree was rolled over and underwent the same procedure on the opposite side. The axe was as far possible held plumb to the marrow of the tree’.[47]

The carpenter August Holmberg provided explicit information from

[46] Lars Levander, *Övre Dalarnas bondekultur under 1800-talets förra hälft 3. Hem och hemarbete*, Jonson & Winter: Stockholm 1947, translation by the authors.
[47] Holmberg 2006, 79, translation by the authors.

Blekinge. He was born in 1860 and reported his memories of traditional building crafts to *Nordiska museet* in the 1930s (Fig. 14). In the questionnaire he claims that it is possible to make eight boards from one log, if the log is large enough. He does not relate the number of boards to the quality or the length of the log. The process of cleaving includes *spårning* with an axe and a mallet and the use of wedges of dry beech. Holmberg informs us on the extensive use of *spårning* and wedges rather than a particular quality of the tree:

> The procedure was called *spårning* and the thin fissure that first appeared, using an axe and a wedge, was referred to as 'awakening the tree'. Now the wedges were beaten in with force. When the wedges had been fully driven, new wedges were inserted in the more widened crack on the bark side. Some fibres that went across the crack were cut off with an axe.[48]

Figs. 15–16. Boxing the log. To box the logs, first the corners were marked with soot lines and then the log was turned and scores were made about one to two feet apart, almost touching the soot lines. Then the log was turned back and the segments were cut and cracked away (*klamphugg*). Photos Ola Hugosson and Karl-Magnus Melin.

Key information was also given by an old craftsman, the carpenter Evert Jönsson, in a documentation project on wood-working traditions in Skåne.[49] He was born in 1917 and worked as a carpenter all his life. As a young boy, he accompanied his father and observed and learned old techniques before

[48] August Holmberg, *August Holmbergs byggnadslära*, Nordiska museets förlag: Stockholm 2006, 79.
[49] Karl-Magnus Melin, *Hantverkskunskap rörande skånsk träbyggnation på landet*, Knadriks Kulturbygg rapport 2009:3 (Reviderad 2010-02-05), Kristianstad 2009, http://www.knadrikskulturbygg.se/files/Hntvrksknsk_rappREV20100205.pdf (last consulted 22 December 2014).

they became obsolete. When interviewed about hewing techniques, he described how they used a big asymmetrical broad axe to make the logs square. Then, unexpectedly, he described how, after the log was blocked into a timber, they cleft it with an axe and wooden wedges. When asked about the quality requirements, he said that his father did not choose the trees, as it was either the farmers or customers who provided the logs. If they themselves felled the trees, there was a forest guard who told them which trees to fell.[50] The cleaving started off from a hewed and boxed timber, *spårad* and cleaved in half, and then eventually *spårad* and cleaved again.

Figs. 17–18. Use of wedges and *spårning*. After initial *spårning*, a lot of wedges were used to get an even pressure. After a while we could concentrate more on *spårning* and used fewer wedges. The wedges we used were made of aspen. A good width of the wedges is two to three inches and thickness around one and a half inches, and the length approximately twelve inches. Photos Karl-Magnus Melin.

Based on these initial investigations, that is, reviews of previous studies and experiments, investigation of historic timbered buildings and interpretations of old craftsmen's cleaving instructions, we have been able to reach new knowledge on procedures. In conclusion the requirements of this technique are that the cleaving was mastered by the craftsmen and did not depend on the quality of the timber. The selection of wood cannot have been crucial for the mission, neither the choice of conifer species nor the quality of the wood. Furthermore, the

[50] This might have been the case in a medieval church building, as members of the parish may have provided the raw material. By dendrochronology, we also have indications that trees could be transported by sea very far from the building site. For example, Tångeråsa in the province of Närke has wood originating in the province of Östergötland.

preservation of fibres was not a fixed criterion. The procedure with *spårning* seems to have been an essential part of the process. Finally, it is possible to obtain more than two boards out of one log in most circumstances.

Practical Experimentation

A series of reconstructive experiments has been performed since the winter of 2012. The following discussion concerns an experiment from 2013, guided by our observations and sources. The aim was to test a controlled cleaving process with *spårning* and extensive use of wedges, starting with a hewed boxed timber, to make four boards 6.2 metres long and twenty five to forty centimetres wide from each log. The trees were felled and the cleaving was performed in the area of Hökensås.[51]

Fig. 19–20. Grooving. The cleaving technique was improved by making a v-shaped groove. Remains of the groove can be seen in the picture. The grooving was only done on the second (tangential) cleaving in order to minimise the risk of cracking the thin boards produced. In the picture on the left, the cleaving is made from one end to the other. The one on the right shows the cleaving made from both ends simultaneously. In the experiments made in 2014 and 2015 we have rationalized the grooving procedure away since we on these later occasions did not cleave frozen wood. Photos Karl-Magnus Melin.

The procedure was initiated as follows (Figs. 15–23): Straight trees without too many branches were selected, felled and shortened with an axe. If a tree

[51] The craftsmen involved in the cleaving of boards were Daniel Eriksson, Mattias Hallgren and Karl-Magnus Melin. Additional help was provided by Bengt Bygden, Börje Samuelsson and Ola Hugosson.

was not perfectly straight, the ridge was placed upwards. The log was debarked where the soot line would be made. The log was then turned to make corresponding lines. Since the first cleaving would go through the marrow, this step was important. The log was placed on its side and the scoring was made, first on one side and then on the other, after turning it around. The log was again placed with the ridge upwards. The wood between the scores on both sides was cut away. The sides were hewed to a smooth surface using the *sprätthuggning* technique. If necessary, the log was turned around to facilitate the *sprätthuggning*. The timber was turned on its side and the same procedure was used to get a boxed heart.

Now the actual cleaving process started. A soot line was made on both small sides to mark the position for the first cleaving. The *spårning* started and was done at least twice on each side. Wedges were inserted all along the incision, and were then driven in little by little to create an even pressure along the whole length of the timber. The wedges were removed and the same procedure was performed on the opposite incision. The procedure was repeated several times, cutting the fibres that crossed the crack until the timber was cleaved into two parts. Finally, the cleaved marrow sides were hewed using *sprätthuggning* so that the process could start over with the second cleaving.

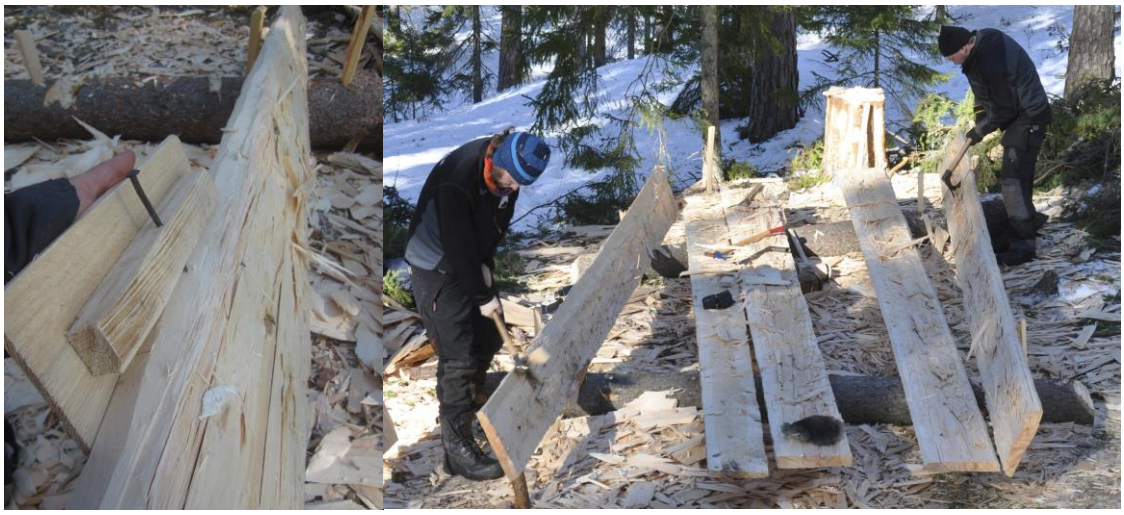

Fig 21. The second cleaving and final *sprätthuggning*. When doing the second cleaving, it was not possible to use the soot line. We therefore made a simple scribble line to mark the thickness. Photos Mattias Hallgren and Karl-Magnus Melin.

The Knowledge of Cleaving Roof Boards

In a philosophical critique of the hylomorphic duality of form and matter, Gilles Deleuze and Félix Guattari describe the splitting of wood. They argue that this operation is guided by 'the various undulations and torsions of the

fibres', and 'at any rate, a question of surrendering to the wood'.[52] To sum up the reconstructive experiments in Hökensås, the ambition was not to *split* yet to *cleave* the wood. The craft of cleaving this type of building material follows a method that does not mean to surrender to the wood. The team succeeded in making four boards out of one log and in producing boards even from timber with large knots and very warped fibre. The boards produced have dimensions and bore marks and characteristics similar to the historic originals in the medieval churches.

Fig 22. Board from a practical experiment. An outer cleft board from experiments in February 2013, very similar to the board SHM 23700:6 from the Hammarö church. Photo Karl-Magnus Melin.

On the other hand, the effort had to be very focused and responsive to the quality and behaviour of the wood: making the *spårning* with an axe and using wedges, not hitting the wedges too much, and turning the timber often so as not to ruin the planks. If the timber was not turned, cracks would appear that could ruin the whole process. Cleaving roof boards could be referred to as what David Pye calls *workmanship of risk*. The quality of the result cannot be fully predetermined 'but depends upon the judgements, dexterity and care which the maker exercises as he works.'[53]

From a contemporary builder's point of view, the work was extremely time-consuming. The work-team spent about fifteen hours on one 6.2 metres long and thirty centimetres wide board.[54] The Södra Råda church had a roof area of 290 square metres covered with shingles. The boards underneath the shingles were twenty five to forty centimetres wide, fifteen to twenty millimetres thick and about six metres long. In addition, the trefoil-shaped inner roof was lined with 190 square metres of cleaved boards. The boards were not sawed but cleaved by hand. Producing this amount – a total of approximately 280 boards – was the result of four thousand and two hundred hours of labour.

[52] Gilles Deleuze & Felix Guattari, *A thousand plateaus: capitalism and schizophrenia*, Continuum: London 2002, 408.
[53] David Pye, *The nature and art of workmanship*, Herbert: London 1995, 4.
[54] Everything from the felling of the tree is includedin this time count.

Fig 23. Boards resulting from a successful cleaving. Note that all of the boards are of the same length in all photos. Photo Mattias Hallgren.

Re-Theorizing Reconstruction

Reconstruction is an essential component in the methodology of experimental archaeology. [55] The practice and scholarly thinking of reconstructive archaeology have changed over time and between projects, but there is a common ground in hypothesis-driven and 1:1 scale experimentation. [56] Peter Reynolds stresses the scientific nature of experimental archaeology and focuses on the inner logic of the controlled experiment conceived by site-specific excavation data. Scientificity is affirmed by disciplinary expertise in response to the outstanding questions raised by archaeologists: '[s]hould an experiment be agricultural, it should satisfy an agricultural scientist; if a building, it should satisfy a structural engineer'.[57]

The reconstructive experiment of Södra Råda seeks another path that does not involve removing the human element as far as possible from the equation. The applied methodology contrariwise depends on the researcher's ability to skilfully perform the procedures and control the processes that are investigated, as opposed to merely having the ken of how they are performed or controlled.[58]

[55] John Morton Coles, *Experimental Archaeology*, Academic Press: London 1979.
[56] Peter J. Reynolds, 'The Nature of Experiments in Archeology', in A. F. Harding ed., *Experiment and Design. Archaeological Studies in Honour of John Coles*, Oxbow: Oxford 1999, 156–162.
[57] Peter J. Reynolds, *Experimental archaeology. A perspective for the future* (Reuvens Lecture 5), Stichting voor de Nederlandse Archeologie: Alphen aan den Rijn 1994, 1.
[58] Gunnar Almevik, Patrik Jarefjäll & Otto Samuelsson, 'Tacit record. Augmented documentation method to access traditional blacksmith skills', paper in the conference *Beyond Control. The collaborative*

Fig. 24. The sacristy. The boards are put on the roof of the sacristy in June 2013. Compare with Fig. 8. Photo Karl-Magnus Melin.

Human experience in archaeology is still associated with re-enactment and living-history. [59] The great physical and visual impact of a full-scale reconstruction provides an opportunity to profit from public involvement beyond the purely scientific endeavours. Reconstructions at open-air museums are easily perceived as true testimonies rather than as materialized hypotheses and active methodology. Previous research has elicited goal-conflicts in managing both an open-air laboratory and a touristic destination.[60] The critique of the scientific approach of reconstructions has followed a general scepticism towards positivism, reductionism and rigid hypothetical deductive methodology.[61]

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museum and its challanges, 1–3 December 2013, Nordic Organisation for Digital Excellence in Museums, Stockholm, 145.

[59] Bodil Petersson, *Föreställningar om det förflutna: arkeologi och rekonstruktion*, Nordic Academic Press: Lund 2003, 23.

[60] *Idem*.

[61] Anna Beck, 'Working in the Borderland of Experimental Archaeology. On Theoretical Perspectives in Recent Experimental Work', in Bodil Petersson and Lars Erik Narmo (eds), *Experimental Archaeology. Between Enlightenment and Experience* (ACTA Archaeologica Lundensia Series in 8º 62), Lund University: Lund 2011, 167–194, at 167; Marianne Rasmussen, 'Eksperimental arkæologi. Her og der og alle vegne...', *Arkæologisk Forum* 17 (2007), 13–18, at 13.

Fig. 25. The reconstruction in 2013. The nave and chancel timbered to the level of the sacristy, where the cleaved boards are placed. Photo Karl-Magnus Melin.

In this article we have presented research outcomes from a methodology where the present makers' attentiveness and embodied skills disclose new information on historical working procedures, intentions and affordances. The craftspersons' experiences also contribute with focused observations on the traces from the past makers, like tool-marks, construction details and procedural leads. The project has by the systematic use of source pluralism, ecological dynamics, and reconstructive experiments brought new light on the oldest corner-timber church buildings in existence. The reconstruction of Södra Råda offers more than a scholarly gaze on material culture and the 'pastness of things'. The practice-led methodology and involvement of the many experts, communities, and media have also activated values and generated know-how to restore and manage and to connect with the present.

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