Carpentry art, excursion to England

The search for comparison of Scandinavian craftsmanship in medieval English carpentry art

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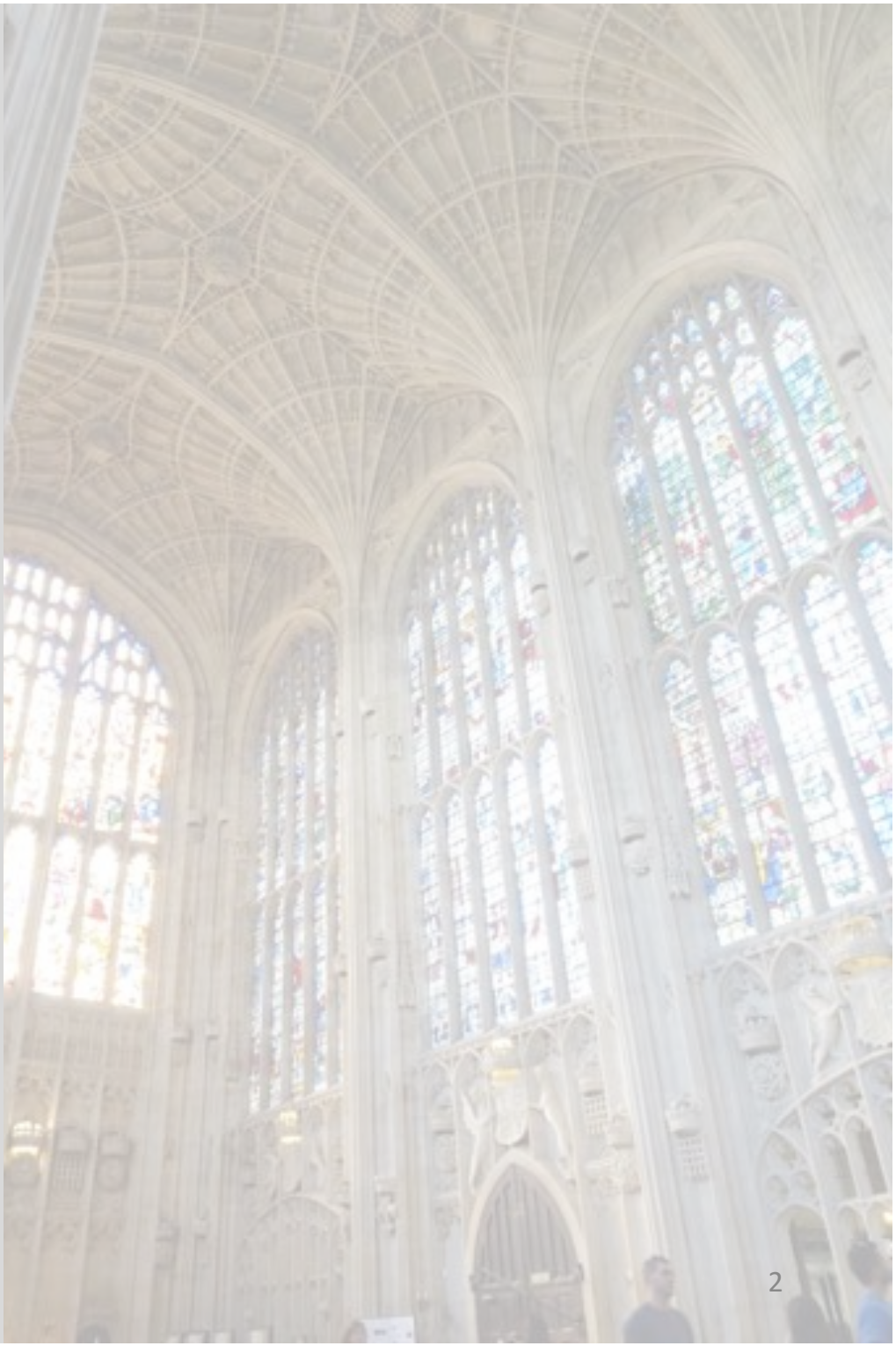
Photografies taken by Mattias Hallgren and Karl-Magnus Melin when not else is mentioned.



Purpose and background

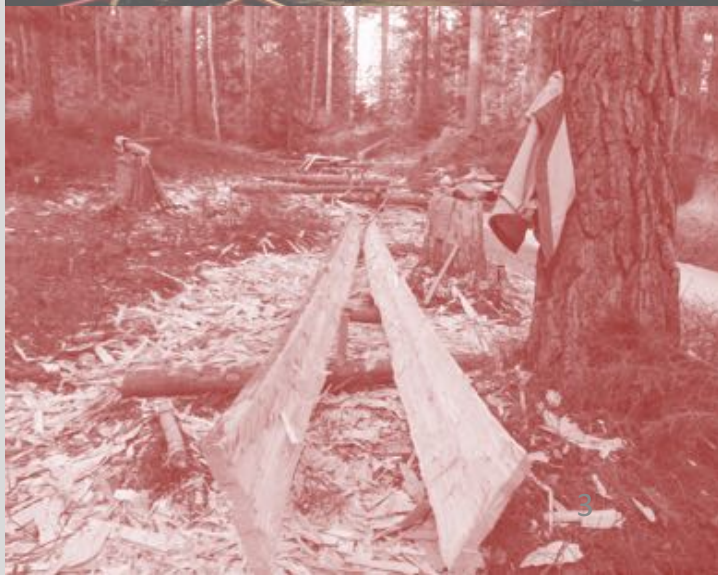
This PM is the result of a carpentry art excursion made by Karl-Magnus Melin and Mattias Hallgren in april 2017. Karl-Magnus works as a carpenter and craft researcher at Knadriks Kulturbygg, is project leader for the diocese project Historic carpentry art in the diocese of Lund and is a doctoral student at the University of Gothenburg.
Mattias is a craft researcher affiliated to the University of Gothenburg and a carpener specialised in medieval carpentry as well as in technical carpentry as windmills, waterwheels etcetera. Both work with the reconstruction of the corner timbered church in Södra Råda.

The main reason for this trip was the attendance on the Construction History Society annual conference in Cambridge 2017, where Karl-Magnus Melin presented a paper about the reinvention of medieval cleaving techniques used in the reconstruction of Södra Råda corner timbered church in Sweden.[1]
Mattias Hallgren in cooperation with dr Gunnar Almevik Gothenburg university presented a paper about the analysis of the Grevbäck wooden bell tower, erected around 1304.[2]

Other reasons were:

- to visit the stave church in Greensted to search for original toolmarks and compare them with toolmarks in oak stave churches from the Diocese of Lund, Sweden (former Denmark),
- to examine the medieval door and window oak frames in Hadstock church and compare these with the doors and frames in the Diocese of Lund,
- to document the scaffolding in Salisbury cathedral's spire as a reference for possible scaffolding to be used in Södra Råda,
- to visit the freestanding wooden Bell Tower in Brookland and compare it with the bell towers in the Diocese in Lund and the Diocese in Skara.

And finally, our insatiable curiosity and eagerness to gain synergy effects in sharing knowledge and ideas with colleagues with different points of view.



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[1] Melin 2017. http://timmermanskonst.se
[2] Hallgren & Almevik 2017. http://traditionsbararna.se/uncategorized/vetenskaplig-artikel-om-medeltida-tornstapeln-i-grevback

Acknowledgements

Mattias Hallgren got a scholarship from Isak Hirsch to cover the travel costs and the participation on the CHS conference.

Karl-Magnus Melin attended the conference representing the reconstruction of Södra Råda medieval church. The visit to the churches was done with funds from the diocese project *"Historical carpentry art in the diocese of Lund"*.

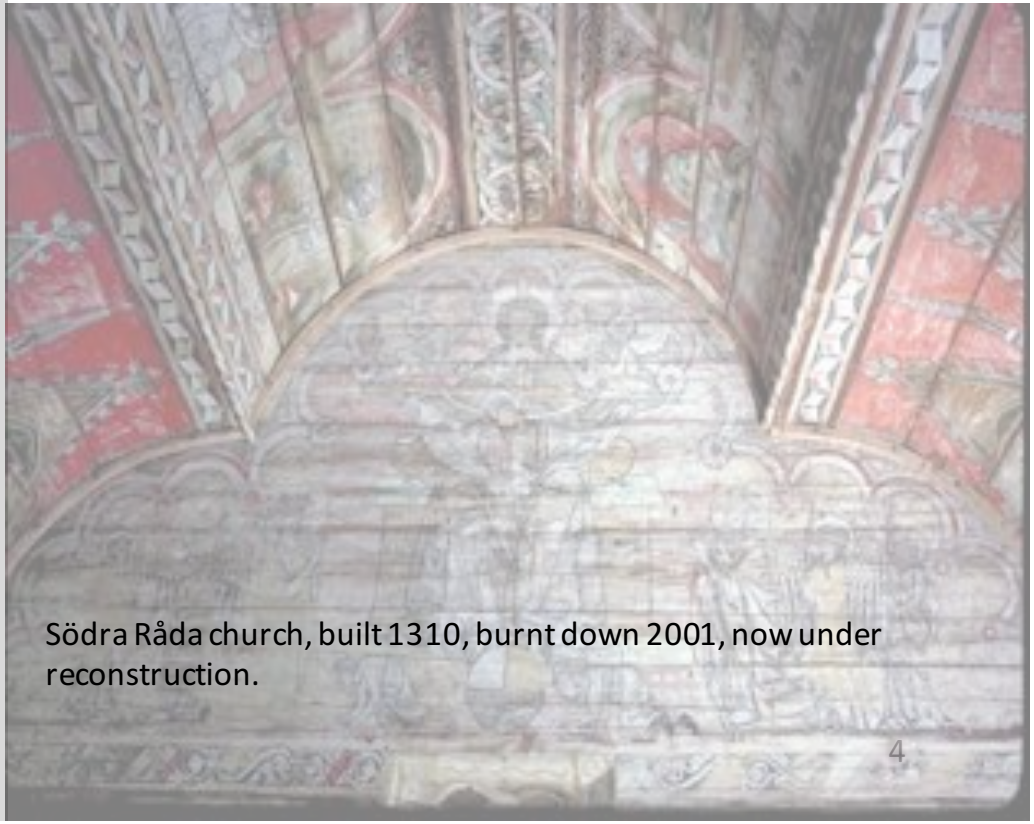
We want to thank: James Campbell and his colleagues who organised the interesting CHS conference, all the helpful guides and other people who helped us to get access to the churches and the wooden constructions, dendrochronologist Martin Bridge for the papers and reports.

Method

The wooden constructions were surveyed with raking light from strong battery LED lamps.
Greensted church and Hadstock church, among others, were selected before the trip in order to compare the carpentry art in England with the carpentry art in the diocese of Lund. Some of the churches were selected on the road.

Building history

In this PM we don´t have the possibility to go into the history of each object. In some cases we make a note about where to get more information. This PM is to be considered as a preliminary report and some of the subjects will be presented under other circumstances in the future.



Södra Råda church, built 1310, burnt down 2001, now under reconstruction.

Roadmap for the excursion in England, April 2017.

One reason for our trip to England was our participation and contribution of papers about craft research in the CHS conference.

The topics, we presented, were about methods of controlled cleaving of roof boards and the construction of the medieval campanile of Grevbäck, Sweden.

CHS link: http://www.constructionhistory.co.uk

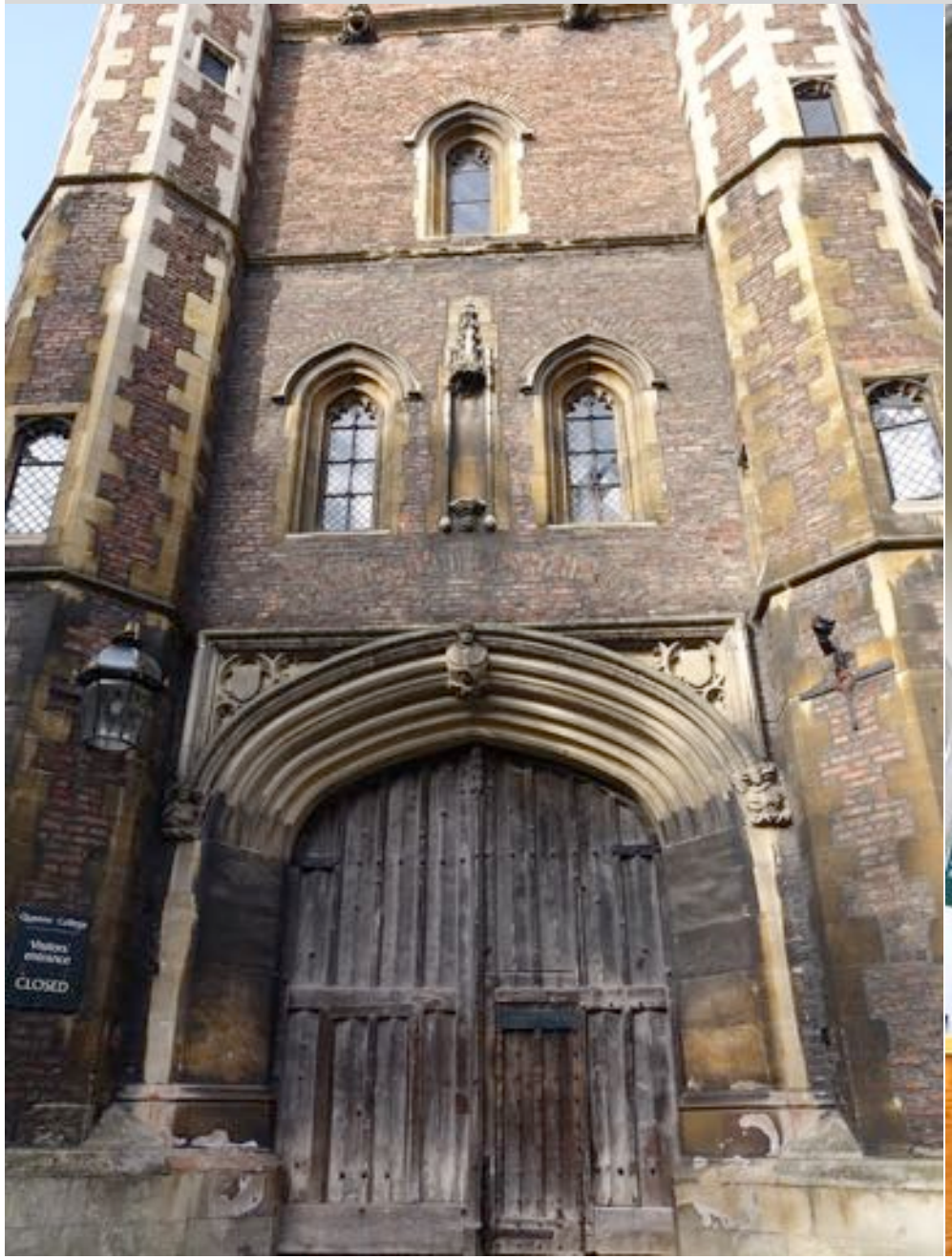
The conference was held in Cambridge at Queens College.

Mattias (left) talking about the wooden tower campanile in Grevbäck and the craft methods used in construction of historic tower campaniles.

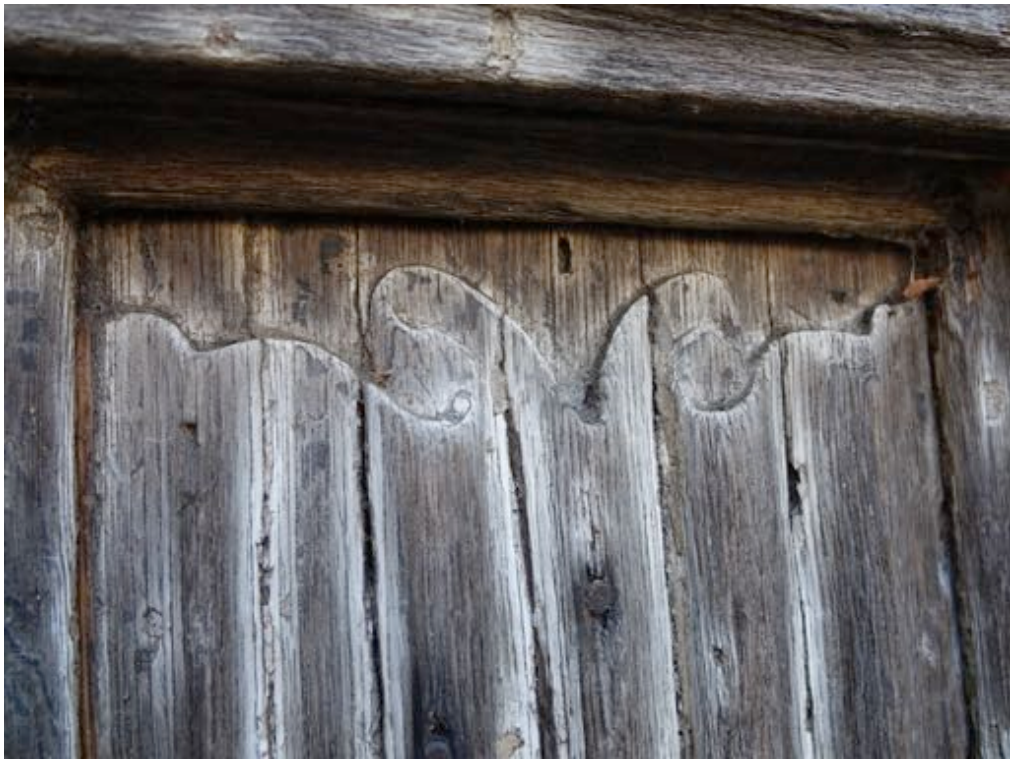
Karl-Magnus talking about the reconstruction of a lost medieval technique to cleave timber with axe and mallet.

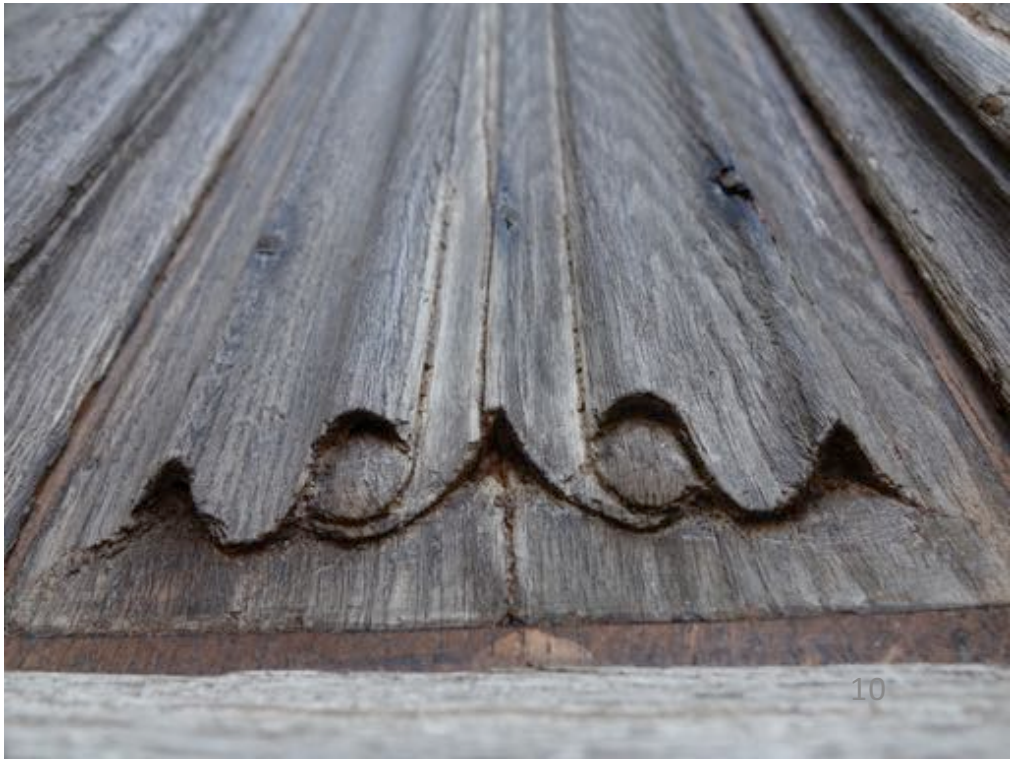
Queens college in Cambridge, where the CHS conference was held and we were accommodated.

Below, the entrance door to Queens College, one of many medieval doors we examined during this trip.



At Trinity college there was another medieval door with very fine woodwork. For more info see Yeomans et al 2013.





Yet another interesting door on the backside of Trinity college, next to the beautiful Trinity park.

The chapel of Kings College in Cambridge with its famous inner roof.

Breath taking interior and a magic light in the late evening sun.

It has the largest fan vault in the world and some of the finest medieval stained glass.

An old lifting device, a faucon, has been saved. According to Cecil Hewet the faucon might be from 1510 when work was carried out on the chapel, (Hewett 1985:192).
It has a casted bronze wheel.

Kings College Chapel by 1461

Henry VI was deposed by Edward IV in 1461

Reginald Ely, master mason, had laid out the whole plan and built it up to about two metres above the ground throughout, and the seven eastern bays higher

Architectural Ancestors
The chapel is large because it is royal: **'built in more notable wise than any of my roiame of England'**
It follows the example of the Sainte Chapelle of St. Louis XI of France, which Henry VI had seen when in Paris for his coronation. It resembles St. Stephen's chapel at the royal palace of Westminster which was burned down in the nineteenth century.

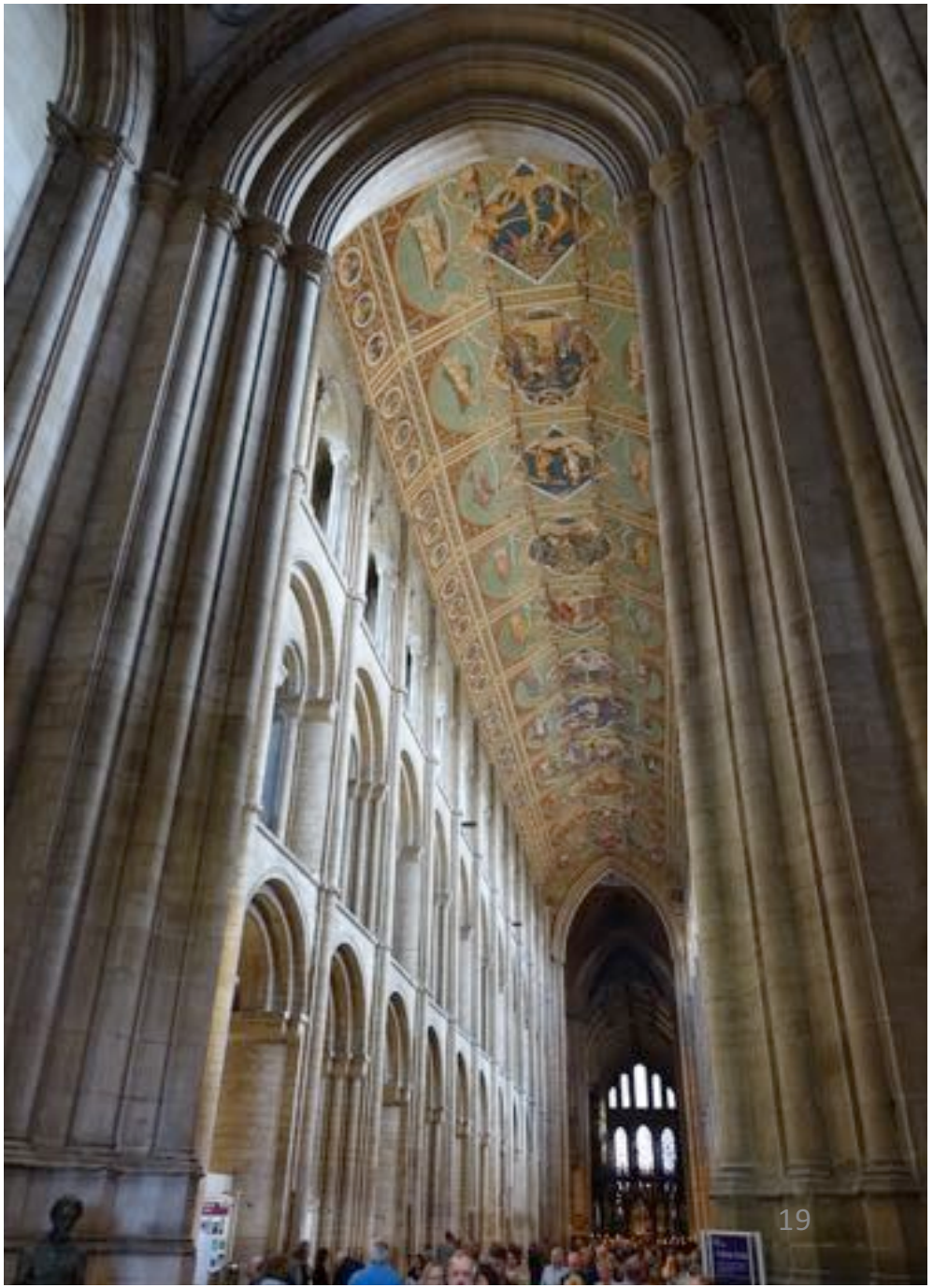
Henry VI wanted King's College Chapel to be **'in large fourme, clene and substancial, setting aparte superfluite of too gret curious werkes of entaille and besy moldyng'**

The last day at the CHS conference there was a trip arranged to the cathedral of Ely. It has a lantern with an inner vault made of 200 ton oak covered by 200 ton lead on the outside. The church was built in 1083-1109. The octagon collapsed 1322 and was rebuilt and completed in 1340 (Hewett 1985)

We tried to examine the counter rebated doors, but they were huge and we couldn´t find any tool marks in the lower part, which had been restored.

The nave in Ely cathedral has original ceiling and vaulting made of wood, from early 12th century. Fantastic and monumental.

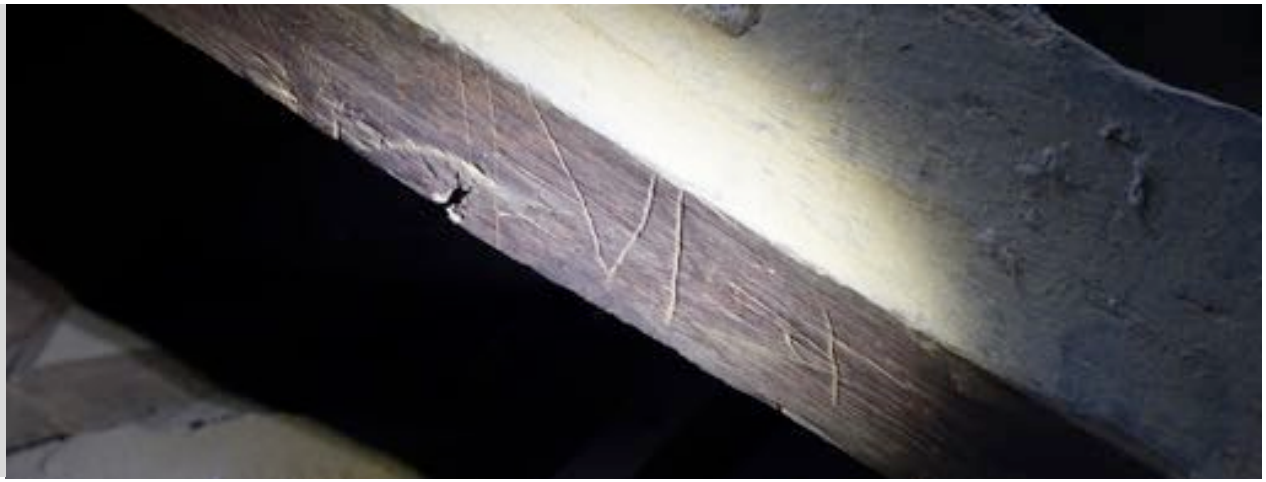
Inside the lantern, from the 14th century, there are pictures of angels painted on hatches. Later we opened the hatches and looked down.



At the top ceiling of the lantern in Ely God himself looks down from a cloud in 3D.
The ceiling of the north and south arms are also decorated with wooden panels with 28 angels looking down at you. Magnificent!

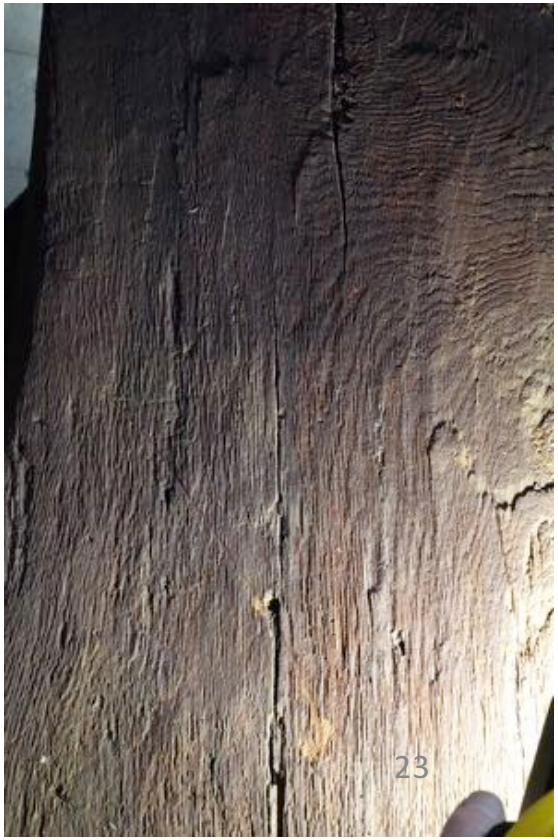
To reach the lantern we had to climb the outer roof. To the left, Lady chapel looking east.
To the right, the structure of the lantern. Many parts had been replaced in the original wooden construction. There was limited access so we had to quickly find out which pieces were the oldest and most interesting ones for our questions

We had looked at Cecil Hewetts drawings of the wooden construction and knew there were assembly marks done with race knife, (Hewett 1985).

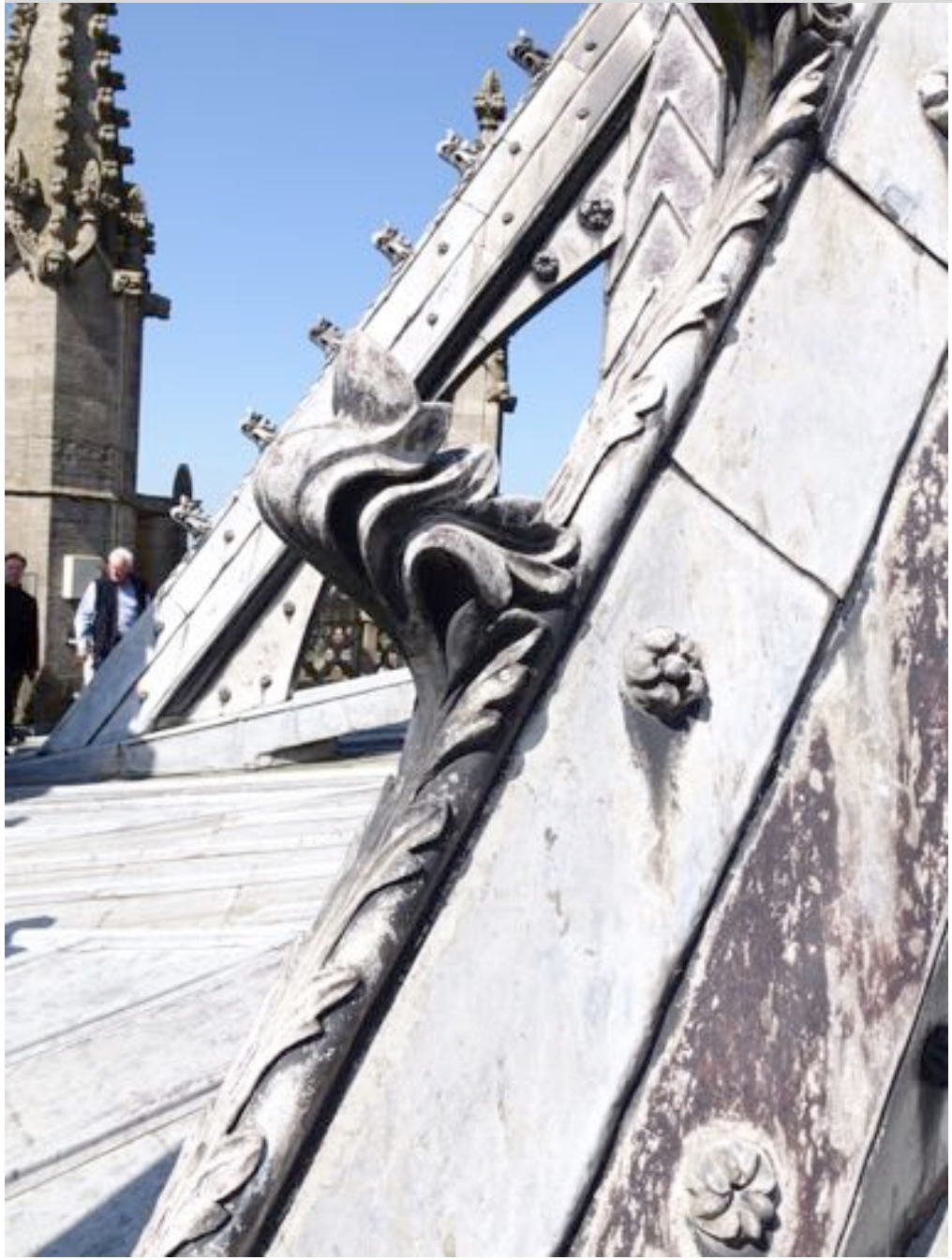


The timber in the Ely lantern is hewn with a straight edged broadaxe. The surface is very smooth. A fine work.

Picture below, showing a mix of old and new beams together.



The outside leadwork on the Ely lantern is extraordinary.



Hadstock church, from the 11th century**,** was the next stop on our trip. The church has the oldest door in the UK, dated to the period 1044-1067. The reason for us to visit Hadstock church was to investigate the church door and the oak window frames. On the door we hoped to find tool marks that could be interpreted.
The outside of the door used to be covered with skin and has a lot of nail holes. The folklore tells that Daneskins were used to cover the door, but DNA analysis revealed it was cowhide, (Andrews 2003). The door was repaired in 1830 and the ironhinges were probably replaced with new ones. Some of the original ironwork and the "daneskin" are in the collections of Saffron Walden museum, (Geddes 1999:54).

The door is made of four cleaved oak boards that overlap each other with splayed rebates. On the inside there are 3/4 rounded ledges fixed by clinched nails and roves. The frame around the door has the same cross section as the ledges. This frame consists of several parts that join each other with splayed scarfs. Only two doors with clinched nails and roves are known in Scandinavia, one from Skanör church in the Diocese of Lund - that used to be part of Denmark until 1658 but now is a part of current Sweden - and one door from Hafslo church in Norway.

Luckily we met the local historian Pat Croxton-Smith, an 87-year-old lady with a big german shepard, who could give us all the information we needed. What a coincidence!

The door is weathered and there were not so many visible tool marks. On the end grain at the top, where dendrochronologists had cut with a razorblade, we could see that the boards had been radially cleft. Small tool marks from a broadaxe could be seen on the inside of the door blade.

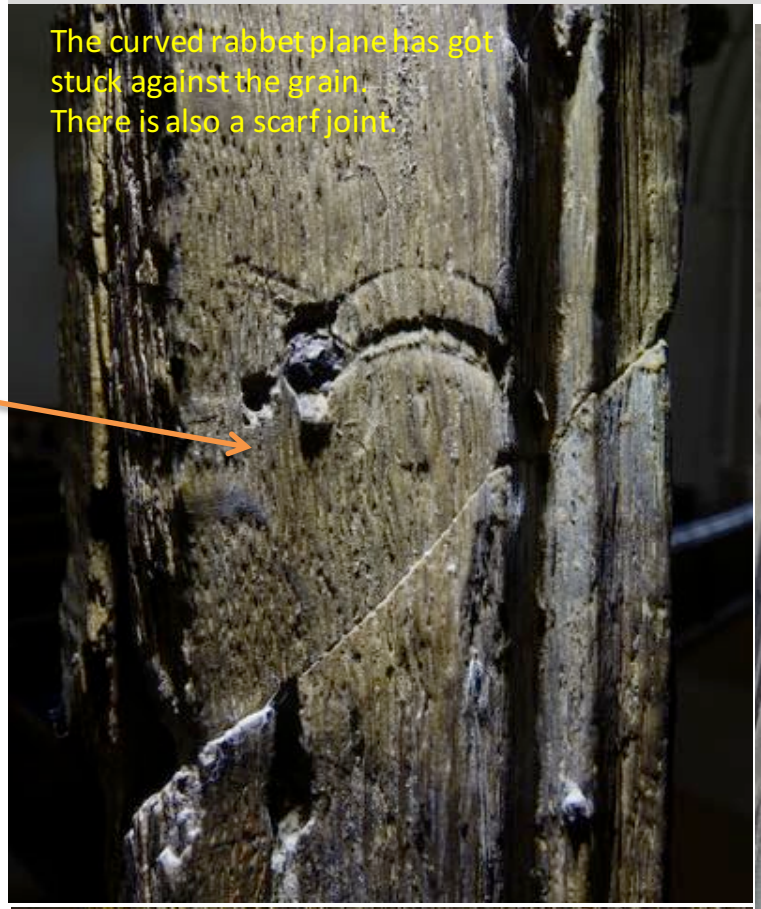
Parts of the boards had been changed over the years, but most of the original construction was intact.

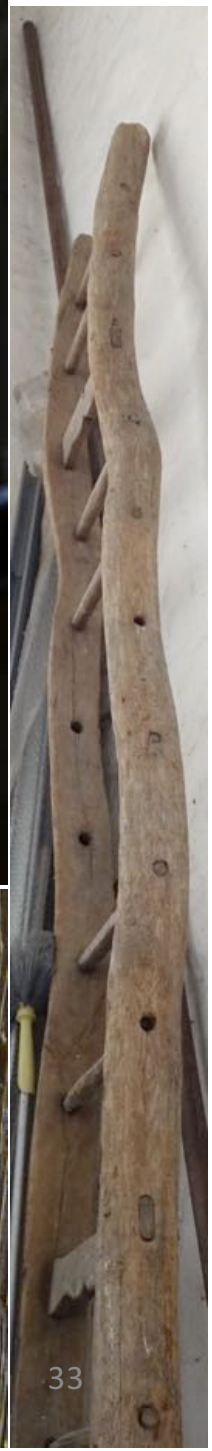
Below, the door is seen from above. The photos shows how the boards overlaps with splayed rebates.
We noticed many other interesting details. A valuable construction from a time with a different logic.

We made a video about our examination of the door that will be uploaded on the Youtube website of Craft laboratory.

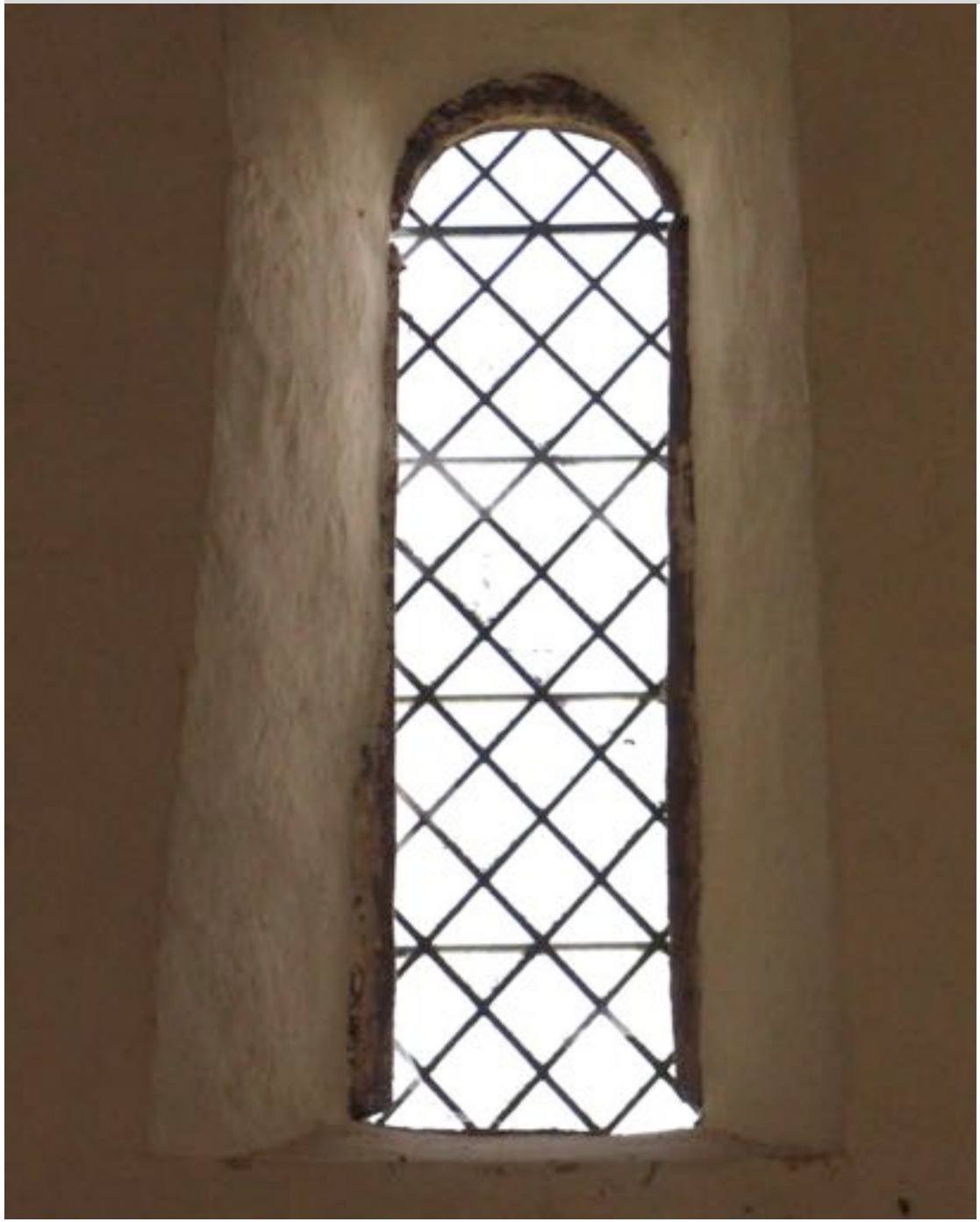
Left, a scarf joint with a clinched nail and row. Right, toolmarks, made against the grain with a straight edged broad axe,.

Some other interesting details in Hadstock church.





The oak frames in the double splayed windows are of the same age and building phase as the dendrochronological dated door, (Rodwell 1974:13).[6] There are four intact frames and each frame is made of four parts. Similar frames have been recorded in Framlev church in Denmark. Since we had no ladder we could not make a close inspection.



On our journey south we stopped at some interesting churches with old constructions.

Greensted church

The main reason to visit Greensted stave church was to search for original tool marks. The original oak timbers have been dendrochronologically dated to after 1063 - before 1100. The dendrochronological analysis was done on 20 of 53 possibly original timbers. We did not have access to the dendro report when we went to Greensted but it was easy to see which staves were ancient and which were added later. The weathered outer surfaces did not have any distinguishable original tool marks. Our hope was to find original tooltraces on the inside. But after investigating both old and newer staves and toolmarks on repairs on the original staves, we came to the conclusion that there are no original tool marks left. After our visit we read in the dendro analysis report that none of the sampled 19 original staves came from the same tree. One suggested explanation was that the staves were round originally and were later cut down to the present state, (Tyers 1996:9).

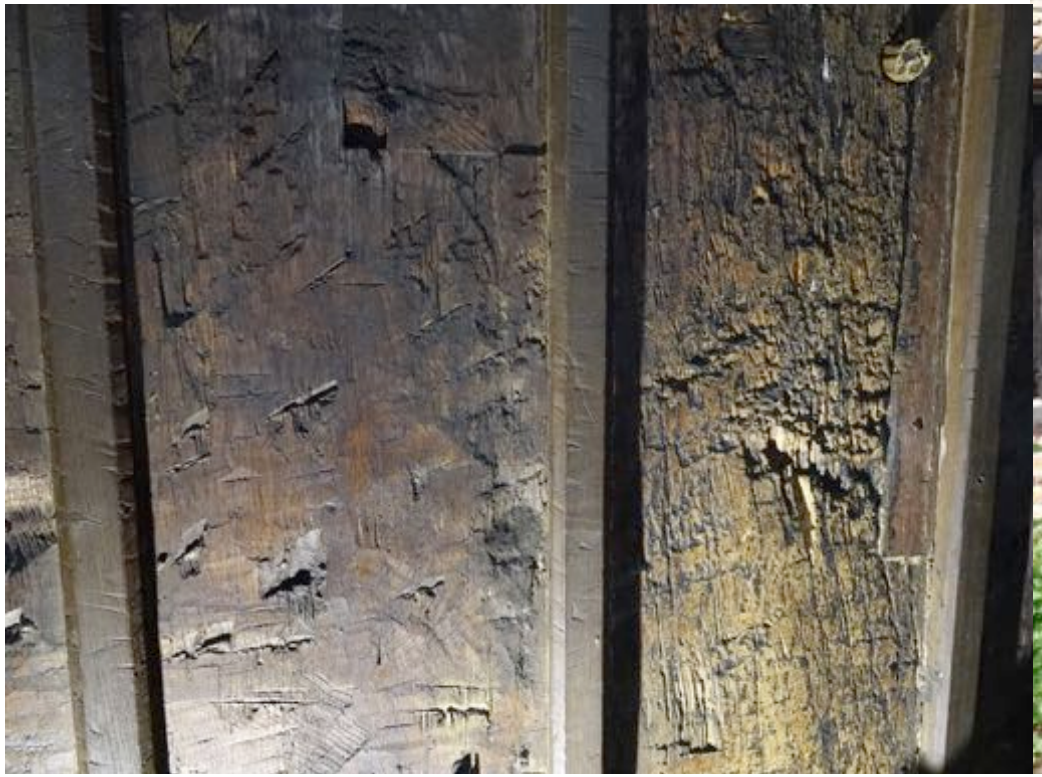
The dendro report is available on the internet: http://services.english-heritage.org.uk/ResearchReportsPdfs/014-1996.pdf. The report is highly recommended as it discusses the results thoroughly and also discusses the previous unscientific dating of the church done in the 1960s.

Some of the staves had their original upper beveling left, others were shortened and recut. All staves had been cut off at the bottom and the sill was replaced with a brick wall. The roof construction had also been changed.

It could also be debated if this is the oldest stave church still standing or a church built 1848 with a lot of reused medieval timbers. Most probable all the staves are rearranged more than once, they are surely shortened (probably a lot), the ground- and roof- constructions are from 1848.
We believe it is more correct to say it is a church from 1848 with reused medieval material.

There were a mix of reused parts, original and new ones. Interestingly some of the older repairings had almost the same patina as the assumed original parts.

The northwest corner post is supposed to be original. Though it is not as weathered as the other original staves.



To the left, the inside of the staves that we believe are cut flat. How the staves looked originally is hard to tell.
Some strange cutting marks from a very damaged axe can be seen in deeper dens here and there.

The tool marks are done with the same axe and at the same time on the old staves and the inserted repair wood. Therefore it is safe to conclude that the tool marks are not original but done later.

After Greensted we drove down to Brookland church in the south east. We wanted to examine the medieval bell tower, dendrochronologically dated to 1264-71 (Bridge 2012), and compare it with free standing campaniles in Sweden and Denmark.

Together with the Scandinavian National Heritage Boards, we are planning a future project concerning medieval campaniles in Scandinavia and northern Europe. It will be a crossover scientific project looking at traditions in crafts.

The church has many old artefacts that caught our interest. The carvings around the porch were from early 14th century. It has some similarities with Södra Råda in Sweden.

Södra Råda church in Sweden built around 1310.

Brookland church.

The bell tower has at least three generations of building periods. The original oak tower has four large corner posts 22”x22” standing on even bigger sills. It is worrying to see the concrete that has been poured out around the sills. This is a very bad solution, especially over time. It would be better to lift the tower up, create a new stone grounding that is ventilated. The sills are probably rotten and need to be repaired. It is of great importance that this unique construction will be preserved and taken care of in a proper manner.

BROOKLAND, St Augustine's Church (TQ 989 258) **Dendro reports (Bridge 2010 & 2012).**

(a) Bell tower inner structure *Felling date range*: 1264-71 (OxCal; unrefined 1266-87)
(b) Bell tower aisles *Felling date range*: 1394-1414
(a) Main posts 1238(h/s), 1247(h/s), 1251(h/s+14NM); Braces 1244(h/s), 1247(h/s). *Site Master* 1064-1251 BRKLND1 (t = 16.9 LONDON; 11.3 BLLNGSGT; 10.9 SWANMED). (b) Posts 1366(h/s), 1374(1), 1379(11), 1385(h/s). *Site Master* 1312-1385 BRKLND3 (t = 7.4 HALDEN; 6.4 KGDASQ0;, 6.1 WYMNDBRY).

"The campanile at Brookland consists of a detached timber tower roofed and enclosed from the outset as a three-stage spire. The structure consists of a base frame of four massive canted posts linked by three tiers of tenoned horizontal rails and stiffened by a system of lattice braces open notch lapped to the posts. At the head a ring beam and cross beams are surmounted by a smaller upper frame having the same system of rails and lap jointed lattice braces. Both frames incorporate tenoned timber uprights to which are tenoned short brackets and braces which support octagonal ring beams which in turn carry the heads and feet of the rafters of the three roof stages. An original aisle structure was replaced later in the medieval period by an arcaded open octagonal aisle forming the present bottom stage of the roof. The head of the spire was probably always supported by a mast. Extensive modern replacement of the structure has been carried out. "
(Miles and Bridge 2010, *VA* **41**, list 224)

Grevbäck campanile Sweden dendrochronologically dated 1304.

Kliplev campanile Denmark dendrochronologically dated 14th century.

Mattias is euphoric finding this fantastic campanile. To the right, branding marks, protective fire. This is often seen in medieval buildings in Scandinavia.

All the red marked posts and braces are a secondary construction, put in to support the new heavier bells. The original construction stands outside the new inner tower.

The older tower seen from its former outside. Red lines mark the new added tower construction.

Originally the bell tower might have had some kind of skirt, similar to the one it has today or just a protection for the sills. There are several mortices left open that reveal that parts have been removed. The tower is stabilized by a system of lattice braces, open notch lapped to the posts outside. (On bell towers in Denmark and Sweden the braces are generally on the inside.) It is interesting to see that the original bell tower has sharp canted corners on the posts, compared to the younger tower. This can be compared with what we know from the Scandinavian towers. They had a different logic and preferred irregularities and sharp corners on the hewn timber instead of regular dimensions and round corners. The older braces have sapwood that has rotted and fallen off. Originally they may have had canted corners.

The lattice braces has been connected to the posts with open notched laps. Te curved ends on the laps is a craft phenomena that we find occasionally all over Europe on campaniles and belfrys dating from 1250-1510.

There are assembly marks on the old tower. One beam is full of other markings, we don't know if they are grafitti or not.

One very valuable piece is the only survivor of the octagonal ring beams, which have carried the heads and feet of the rafters of the three roof stages. If this 1/8 of the ring beam hadn't been there, the original roof construction would have been difficult to explain.

Left, seen from north and right, seen from south.

Left, the octagonal frame seen from underneath, supported by the tiebeams hanging out.

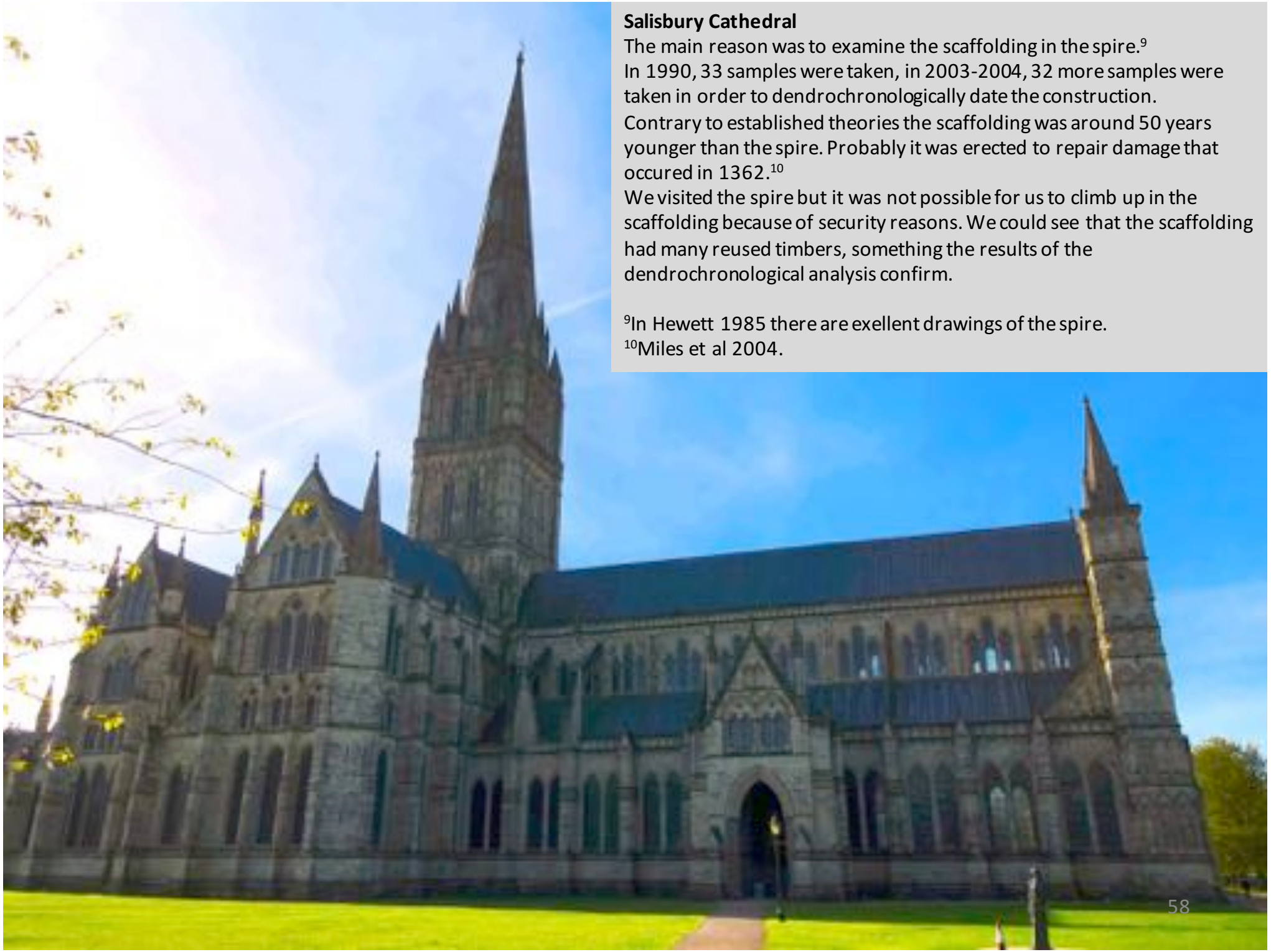
Right, Karl-Magnus searching for toolmarks in the dusty environment.


The upper end of the corner post ends with a 4”x4” tenon that holds the beam frame half lapped over each other.

Salisbury Cathedral

The main reason was to examine the scaffolding in the spire.[9]
In 1990, 33 samples were taken, in 2003-2004, 32 more samples were taken in order to dendrochronologically date the construction.
Contrary to established theories the scaffolding was around 50 years younger than the spire. Probably it was erected to repair damage that occured in 1362.[10]
We visited the spire but it was not possible for us to climb up in the scaffolding because of security reasons. We could see that the scaffolding had many reused timbers, something the results of the dendrochronological analysis confirm.

[9]In Hewett 1985 there are exellent drawings of the spire.
[10]Miles et al 2004.



The main body of the Salisbury cathedral was completed in only 38 years, from 1220 to 1258.

Tool marks from a pitsaw on the backside of the filling panel in the chancel arcade.

A very pedagogic model of the cathedral under construction.

World's oldest working clock

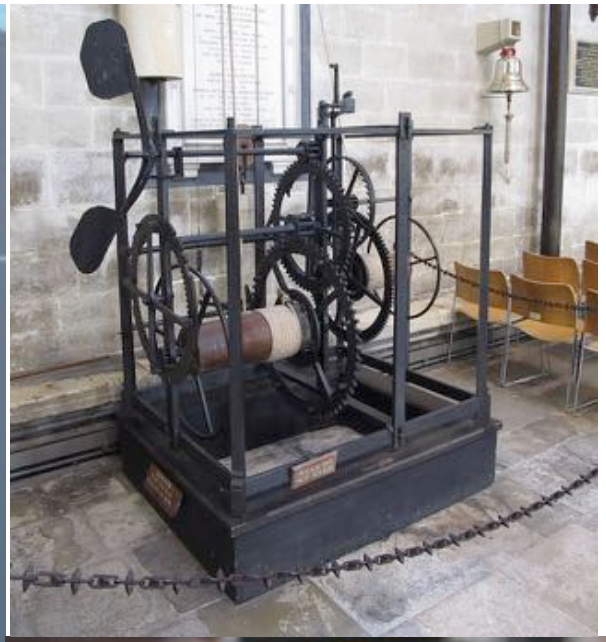
In use since 1386

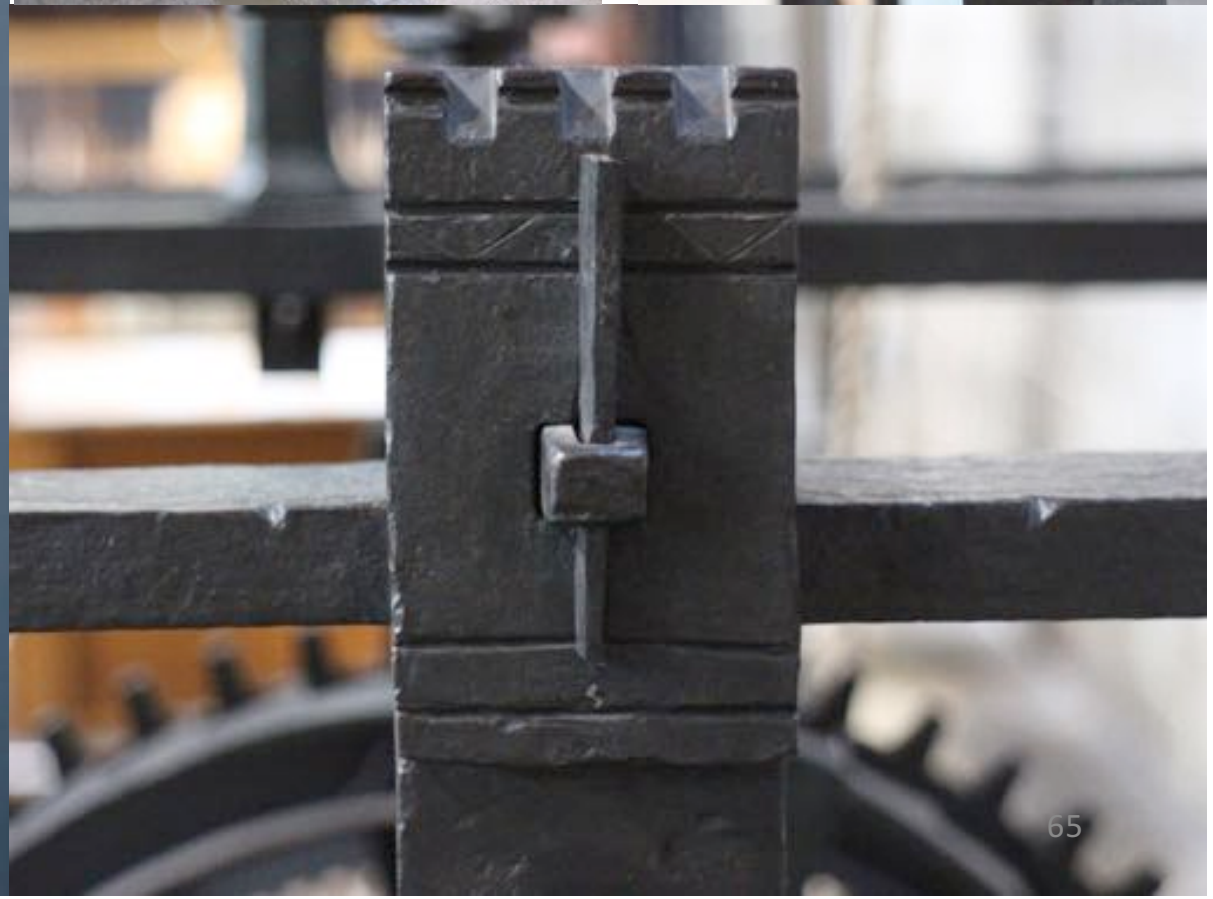
Believed to be the oldest working mechanical clock in the world. Powered by weights, it has no hands or face - the right side of the clock powers it and left strikes the hours although the bell mechanism is now disabled except for special occasions.

Commissioned by Bishop Ralph Ergham in the 14th century and built by three clock makers from Delft (Netherlands), the clock was originally installed in a bell tower between the Cathedral and the gate into the city. The tower was demolished in the late 18th Century, so this clock was moved to the Cathedral tower where it worked until 1884 when a new clock was installed. The old clock lay unused until 1929 when was moved into the Cathedral. It was restored to working order in 1956.

Tick Tock!

It is estimated that this clock has ticked a total of 4.4 billion times between 1386 - 1884 and 1956 - 2013.





There were lots of graffiti and craftsmens ”discussion sketches” on both wood and stone surfaces.

To the right, a curved piece of wood, naturally bent and selected for this specific use.

A profiled timber in the northwest corner over the vault.

Some of the posts were nicely shaped and it was still possible to see the guiding lines scribed on the surface.

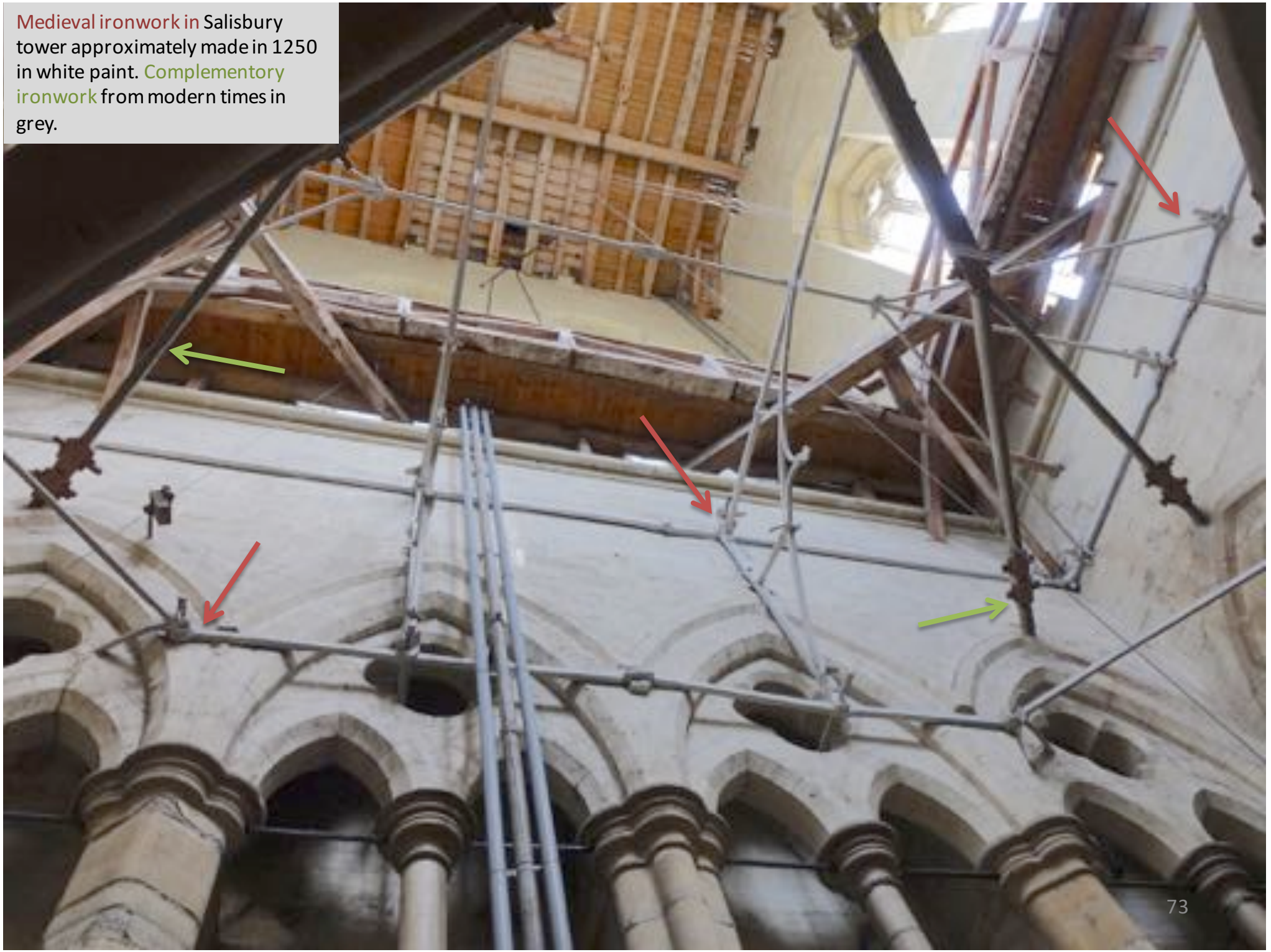
To the right, the nave seen from west.

Graffiti and a daisywheel flower and a roof constructions scribed on the stone walls.

Drawing of rooftrusses.

There are lots of reused timber in the roof over the Salisbury nave.
Some of the wood have been hewed into square blocks and then sawn in half with a pitsaw.
Some of the beams have a cutting pattern that are similar to swedish medieval timber, with a smaller axe diagonally along the fibers.

South side of the nave roof with lots of reused timber.


Medieval ironwork in Salisbury tower approximately made in 1250 in white paint. Complementory ironwork from modern times in grey.

The scaffolding from the 14th century left standing inside the tower. Built of a mix of new and reused timber.

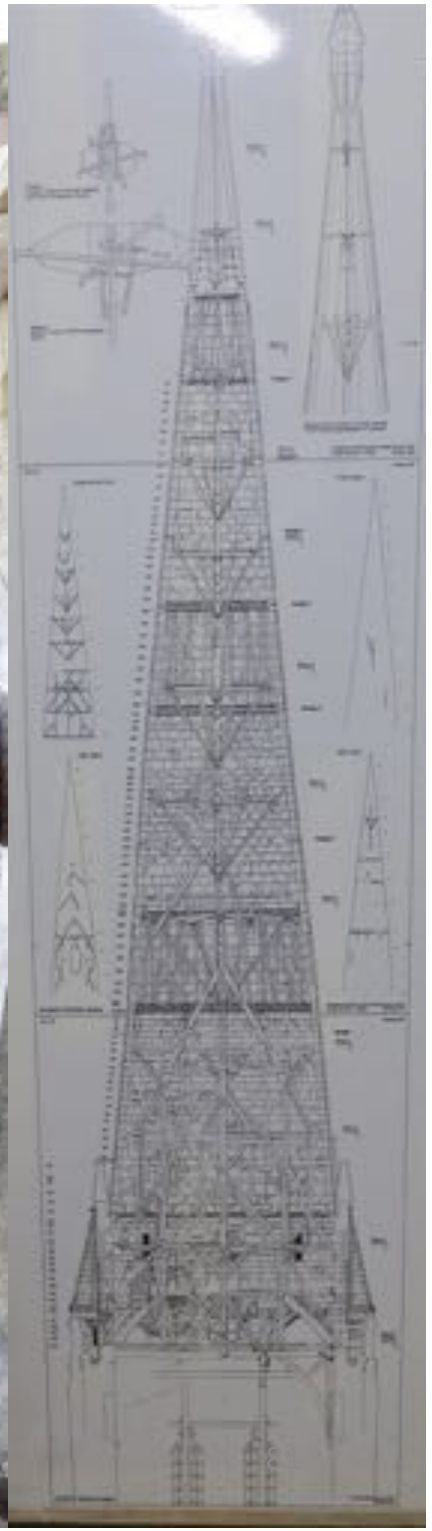
Same scaffolding, upper section.

Detail of upper section.

Scaffolding inside the stone spire. Some wood is changed in modern time.

In the tower, the medieval windlass is still in function. It is tested yearly for winching down injured people at emergencies.

To the right, a drawing of the spire and the scaffolding inside.



Close ups on some interesting details.

Pictures below showing trademarks from a shipping harbour, probably age 16th-19th centuries.

To the right, Karl-Magnus is enjoying the view over Salisbury skyline.

After the cathedral, we went to St Thomas Becket church, 15th century, in Salisbury with a wooden panel roof.

There is a very decorated cover for the font and also an old port on the west side.

New day, new cathedral! This time Winchester.

To the left, the vault in Winchester nave.
To the right, the wooden cassette roof from the 13th century.

In the chancel most of the floor tiles are from 13th century.

The bishops graves in the chancel.

Luckily we got the opportunity to visit the attic and the tower, thanks to Eleanor Lewiston, one of the cathedral guides.
The central tower was built in the first decade of the 13th century.

There are lots of graffiti and scribings in the tower.

The stool that the bells are hanging in, is made of reused beams, probably parts from the elder tall bell tower that once stood inside the stone tower.

There are deep cuttings for the swinging bells in the former bell beam (now upside down). Markings for assembly, resembling runes, can be seen here and there. It would be possible to figure out how the standing bell tower looked like, by making a deeper examination and drawings of all the parts. Making a digital or a scale model of it could give a better understanding. We visited similar belltowers in Liege, Belgium, in 2016.

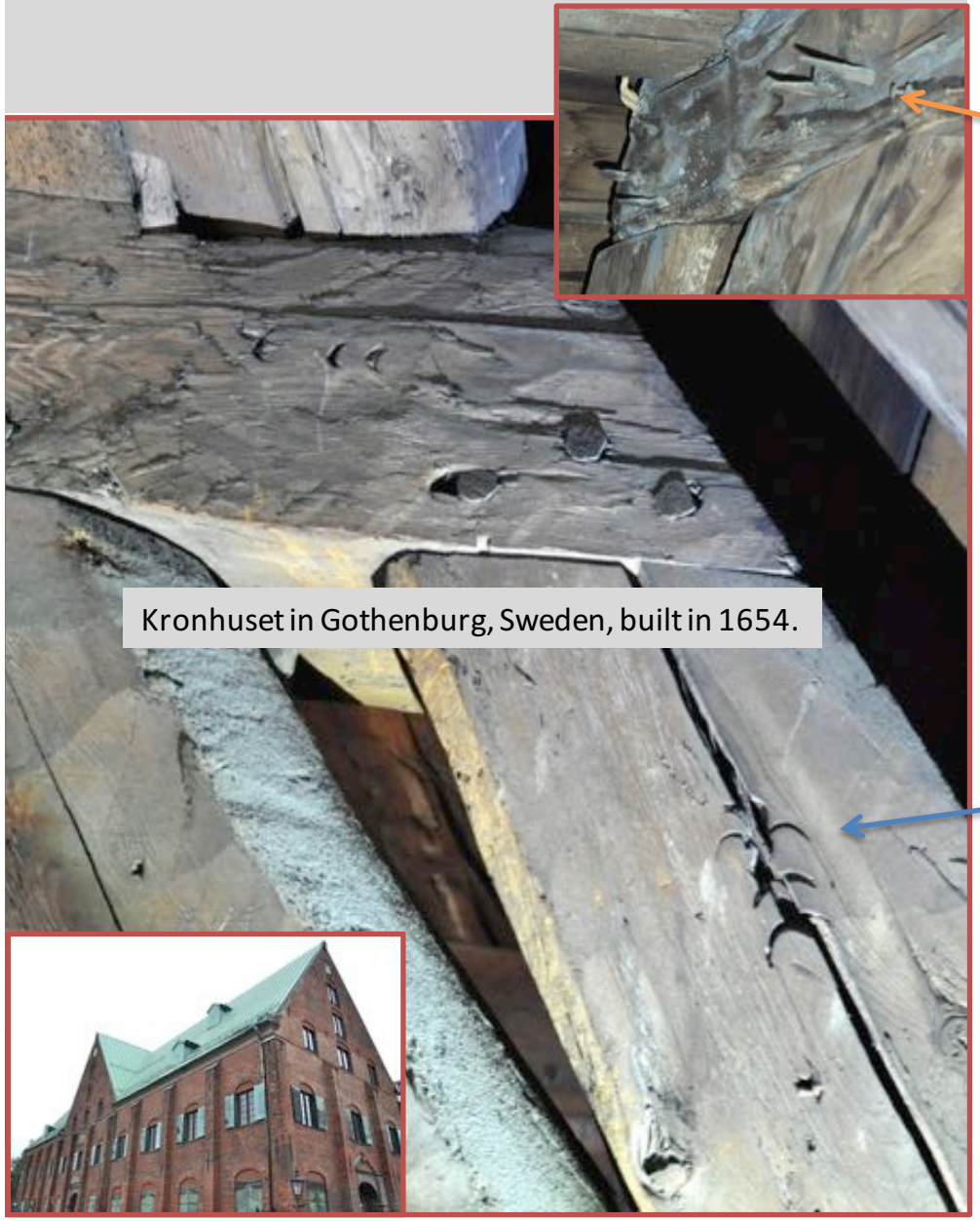
In one open notch from the former bell tower, there are toolmarks from a chisel the carpenter used. There are many cutting marks from cutting off the bark on the round surface of the beam.

For comparison, Bell tower in St Paul, Liege, Belgium. Probably from 13th century.

Bell tower in St Denise, Liege, Belgium. 1250s.

In the roof of the stairway, in the tower of Winchester cathedral, there are marks from the molding planks that show they were cleaved, not sawn.

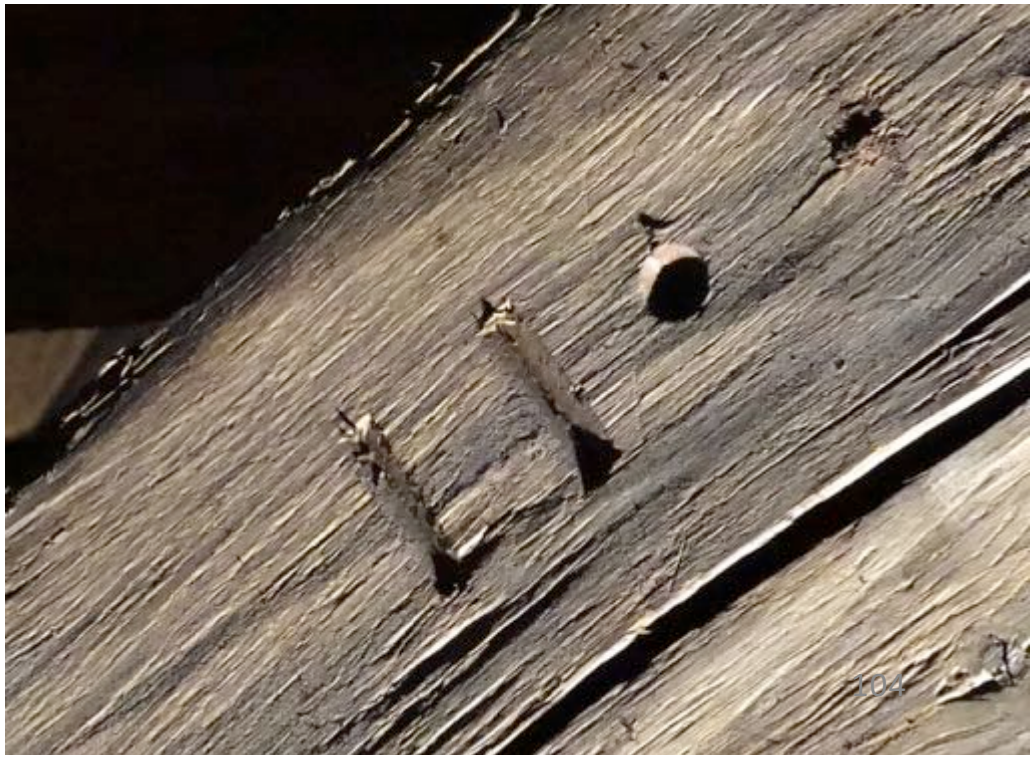
The roof construction over the nave in Winchester cathedral has been rebuilt several times and therefore it is a mix of all kinds of timber, new and reused.
The western part should have been rebuilt after a fire in the 17th century. The carpentry, assembly marks and ”vampirepegs” is very similar to what we see in Sweden from this time.



Kronhuset in Gothenburg, Sweden, built in 1654.

Winchester cathedral

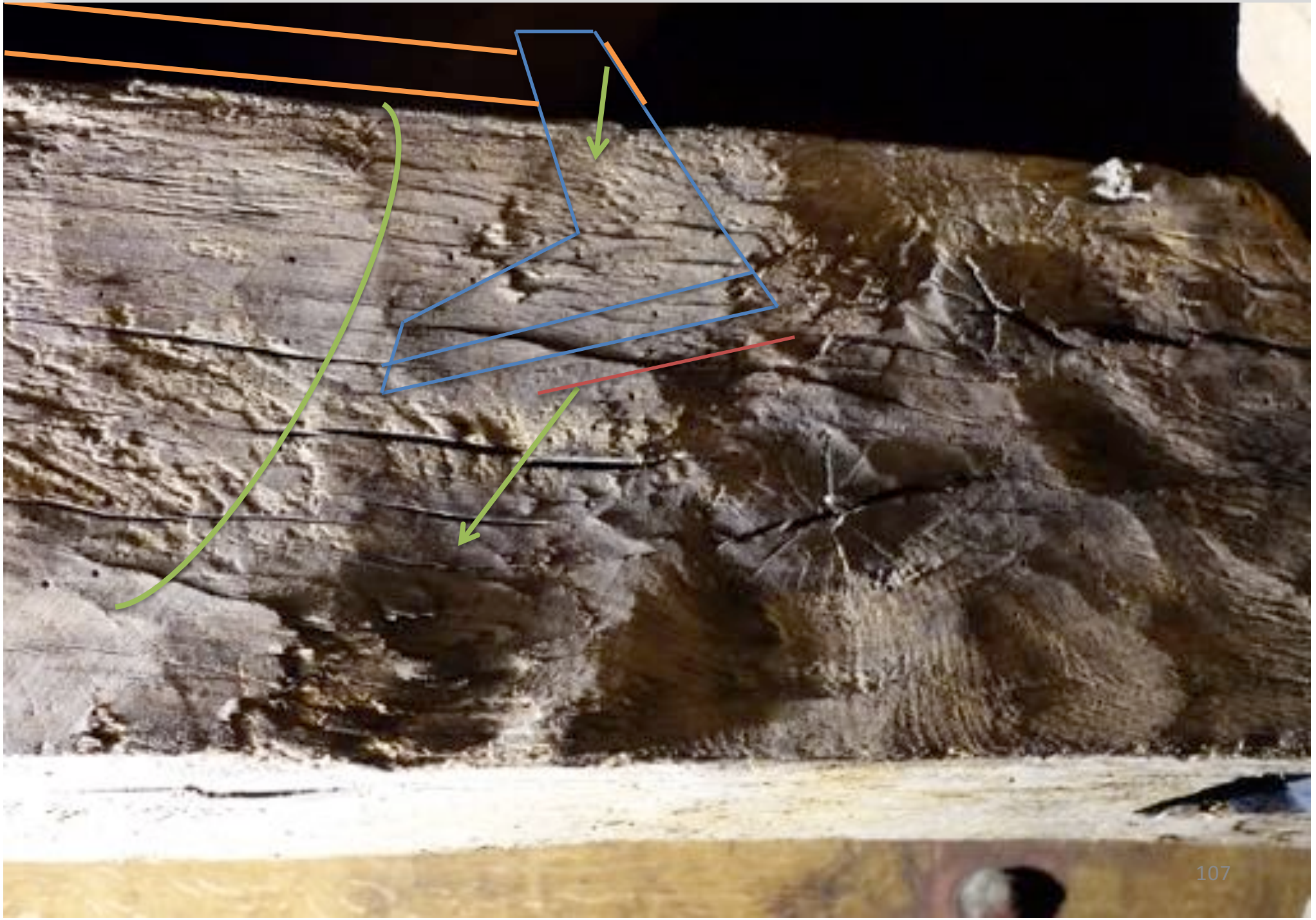
Some interesting assembly marks on the naves roof construction. There is also one beam that is half burnt off.



On the south side of the nave in Winchester cathedral the inner plate is reused and has both vertical mortices and horizontal dovetail joints. All elder pieces from the roof construction can tell about how it was made. A gigantic craftsmans puzzle.

Far left, a timber that first has has been hewn to a square beam, and then cleaved into two pieces with a pitsaw. Middle, a beam that has been used as a workbench before it was put up. Far right, an older mortice not in use, where the scribing lines for the layout can be seen.

One of the beams has clear tool marks from a hewing axe going forward. The scratches on the edge of the axe and the direction of the cuts reveal that.



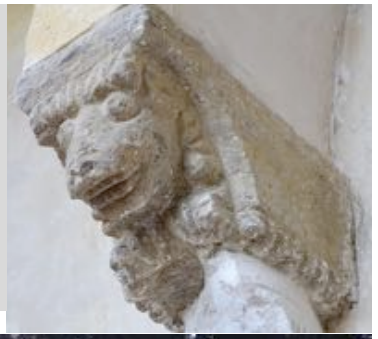
The Winchester cathedral's roof is covered with 3-4 mm lead plates. On one old roof board we found an old leadnail with a piece of lead still underneath. These leadnails sometimes have small "dots", under its head, to better grab the lead sheet, so the hole for the nail doesn't grow and cause leakage when temperature changes and the sheet expands/shrinks.

South of the cathedral in Winchester there are an old city port, and two more at Winchester College. They are still in good health and are definitely worth taking a closer look at.
There is a lot of work behind building doors like these, with fine precision and advanced carpentry.

The last stop of our roadtrip was in the contryside at a small church in North Stoke. Then we drove up to Guildford castle and enjoyed the summer flowers in the park.

It was a few lovely days driving around, but the closer to London we got, the more intense was the traffic. The peak was when we were trying to reach Heathrow rental car deport.. Never again!!

Good bye England for now. See you again soon.



Summary:

With this PM we hope to inspire others to go out there and seek information that is hidden in the buildings.

It would be very interesting to continue the investigations and make a deeper comparison, with detailed examinations, drawings and scale models or 3D models, of bell towers, free standing and inside cathedral towers, across the borders in northern Europe.
We have already awakened this thought in Sweden, Denmark and Norway. Perhaps other countries could be involved in a cross over border project in the future.

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