

## Rib vaults in Italy

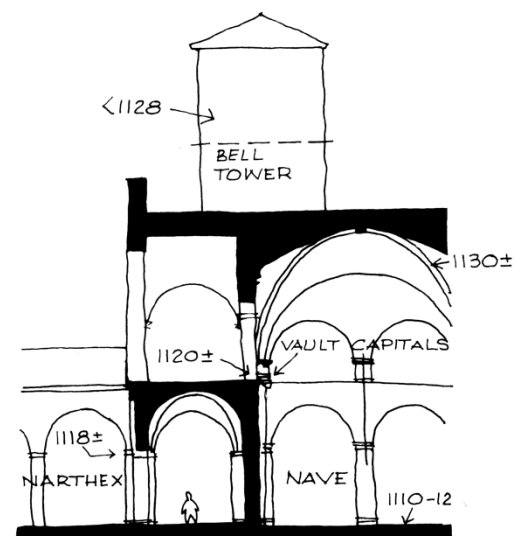
Adapted from *Avista Forum*, vi 1993, 5-6.

From the time of Kingsley Porter and Richard Krautheimer it has been argued that rib vaults were invented simultaneously but separately at Durham and in Lombardy, around 1100.<sup>1</sup> The five buildings from which stem the dating for all the other ribbed vaults in the region are San Ambrogio and San Nazaro in Milan, San Michele in Pavia, SanSavino in Piacenza and Rivolta d'Adda [below left].

Jane McKinne's doctoral thesis on Rivolta suggests a later date, around 1130 for its rib vaults.<sup>2</sup> Through a sensitive analysis of the carving on capitals and panels she identified a number of sculptors and ordered their work by style to show that these vaults could be placed in a chronological relationship with San Ambrogio. The dating of San Ambrogio then became the key to dating the others. From the at times ambiguous documents but from impeccable toichological observations she dates the San Ambrogio narthex, and the nave vaults that followed on, after 1128.

Documents suggest that the atrium and nave foundations were begun just before 1098.<sup>3</sup> Another of 1123, concerning the use of a bell by the canons, implies that the tower in the northeast corner of the narthex had been begun, but was not yet ready for the bell [below middle]. A document of 1128 indicates that the bell room at the top of the tower was complete.<sup>4</sup> The bell tower, the narthex and the nave aisles were built together from the footings to the gallery, evidenced in the brick coursing of the arches and the arrangement of stretchers and headers at the junctions between them.<sup>5</sup>

The section through the western wall [below, right], shows that the ribs in the narthex were built with or just after the groin vaults in the aisles, possibly just after the earthquake of 1117. By 1120 the walls could have risen to the level of the capitals under the nave ribs. This marks the last moment for the decision to build ribs over the nave, though the erection of the ribs and cells had to wait until the gallery walls had been constructed and the roof erected. It is then reasonable to see the ribs, bosses and cells being in place by or just after the bell room, in 1130.



However, there are no documents for Pavia, Piacenza or San Nazaro that would securely date their rib - vaults. Only two Italian vaults may be half-convincingly dated to the years before 1120: the Casalvolone nave clerestory and the first bay in the south aisle in San Giovanni, Tarquinia.<sup>6</sup> Both lie outside the earthquake zone of 1117.

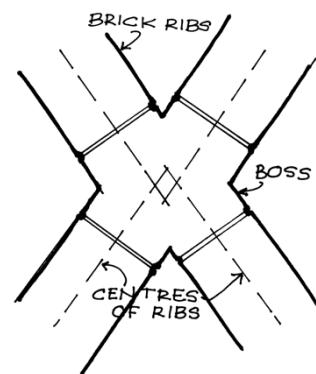
From the interlocking connections between the capitals at San Ambrogio and the adjacent churches, McKinne dates the Rivolta-d'Adda and San Eustorgio rib vaults just before those of San Ambrogio.<sup>7</sup> She places San Michele in Pavia a little earlier and, earlier still, San Savino in Piacenza.<sup>8</sup> The Milan narthex is slightly domical; otherwise all have level crowns, circular ribs and non-structural bosses. Most of these vaults have been restored or replaced. The cells of the easternmost bay at San Nazaro were replaced, though the most important part for this hypothesis, the ribs, were preserved. The San Savino vaults were partially reconstructed by Martini in 1902-3. The Rivolta vaults were reported as being in poor condition by its restorer, but we have no details of what work he did other than lining them with Portland cement.

In four of these five buildings it is unlikely that ribs were intended from the beginning, for their pier bases and the capitals under the ribs are set square to the walls. The awkward junctions between the capitals and the ribs suggest that in all four the decision to have ribs was not made until after the walls had reached the height of the capitals. At Rivolta a Burgundian-type barrel vault had already been constructed over the two eastern bays before ribs were installed over the next two.

It is only in San Ambrogio that the capitals were set at 45° to the walls, in both the high vaults and the narthex. The nave is in stark contrast to the other churches. It is among the most domical in Europe, with steeply pitched peaked ribs. Yet, mistakenly, it has been considered typical of the earliest Lombard vaulting style.

There is a document which states that the tower in the north-west corner was "largely built" (*in maxima parte edificatum*) by 1128. As the southern wall of the tower forms the northern wall of both the church and the narthex, the narthex ribs would have been in place by then, and those to the high vault planned if not completed.

However, when I examined the capitals in the gallery I recognised forms that were familiar to me from capitals in northern France that we would date to 1130 or later, but would not under any circumstances date a generation earlier [below left]. I would stick with that date, even taking possible restorations into account, as I examined them with that possibility in mind. For this reason, I became dubious of the usual date of 1100 for the San Ambrogio vaults, and spent part of a summer visiting all the early rib-vaulted churches in Italy.



One other building needs particular consideration: San Nazaro in Milan. The capitals are undecorated, and cannot be related to McKinne's dating system. The choir vault has the usual Anglo-Norman level crown and the segmental ribs, while the nave is domed with all the traditionally accepted characteristics of Lombard vaulting. Villar has argued that the choir was earlier than the nave,<sup>9</sup> while McKinne follows de Longhi in suggesting the choir vault was built later, in the 1160s, arguing that the torus profile of the ribs had to come from the Cistercians in France.<sup>10</sup> This is nonsense, as the Cistercians were not the originators of the torus rib. We find them in six French vaults a full generation earlier.<sup>11</sup>

Though the choir vault has been heavily restored, the ribs are original.<sup>12</sup> Two observations indicate that the choir is earlier than the nave. Firstly, the ribs are not straight in plan, but are bent between the capital and the boss. Secondly, as a consequence they are offset to one another at the boss [above right], characteristics that are found in the majority of pre-1125 rib vaults in northern Europe.

On the other hand, the form of the nave vaults is very precise: there are no bent ribs, the curvature is exactly calculated, the boss is structural and the cells quite thin. This indicates that the San Nazaro choir vaults were built in the 1120s, like the other buildings mentioned.

For this discussion I suggest:

1. that it was the earthquake of 1117 that stimulated the Italian builders to reinforce their big vaults with ribs, and
2. that the technique for these first ribs was introduced into Italy by an Anglo-Norman builder, possibly around 1120.

The first point became more logical the more I thought about it. Early Lombard ribs occur only over large spans and never in aisles, suggesting they had a utilitarian rather than an aesthetic purpose. If we could devise an experiment that would show whether earth tremors caused the stones in the groins of ribless vaults to fall out first, then we may have a good explanation for their decision to use ribs to relieve a post-earthquake anxiety. Ribs seem to have gone out of fashion by the middle of the century (until re-introduced in Gothic mode later on) suggesting that once the immediate memory of the earthquake had passed builders no longer

felt they had to use them. Lastly, even when restoration is taken into account, I saw few signs of the dislocation we should expect in ribs shaken by the earthquake as we would if they had been erected before 1117.

The second point needs a short introduction: The earliest rib vaults in England and Normandy were constructed in the manner of groin vaults in which the role of the rib was more decorative than structural. This can be seen in the shape of the boss. Where the junctions between the boss and the ribs are not at 90° to the ribs, Fig. 16-9 in the previous chapter, they are non-structural because these ribs could not have supported themselves if the cells had not been erected with them. By the 1120s some builders had realised that ribs could have a structural purpose. The structural domical vaults being built in the Oise,<sup>13</sup> and those used to strengthen the Gloucester crypt being examples. However, it took a further ten or fifteen years for most builders to understand that the rib could be constructed independently of the cells. It follows that until the masters realised this it is doubtful whether many would have perceived that the rib had more than a marginal effect on the structural integrity of the vault.

The three characteristics of early ribs are:<sup>14</sup> the shape of the boss, the ribs being offset at the crown and/or being twisted in plan, as in Durham. It follows that any ribs displaying these technical imperfections are likely to be earlier than ribs that could have been built to support themselves independently of the cells.

In Lombardy, bent and offset ribs and non-structural bosses are to be found in the easternmost bays of all these five churches, while most of the western bays are technically perfect. This suggests that the western bays are later than the eastern.

It is often said that the typical Italian rib vault is very domical, with pointed ribs and transverse arches. They are compared with the typical English and Norman vault with level crowns and round arches. To keep the crown level Anglo-Norman ribs were usually set out from the segment of a circle, in which the centre of the arc was located well below the capitals. It was for this reason that Bony thought that English and Italian rib vaults had been invented independently of one another.

However, in the earliest Lombard vaults the crowns of the vaults are not domical but level: in the eastern bays of San Nazaro, San Michele and San Savino. Further, the ribs are neither round nor pointed, but are segmental. Their spatial arrangement is therefore entirely Anglo-Norman.

Where nearly all Lombard vault profiles, and all those later vaults with true bosses, are rectangular, those in the eastern bays of San Nazaro, San Michele and Brebbia, are circular. This circular profile is also a French and English characteristic.

This combination of non-structural bosses, level spatial organisation and circular rib sections is so typical of northern vaults that it is hard to believe that the concept of the rib and the mode of construction was not imported into Italy from the north.

It has been argued that ribs with a circular profile are later than rectangular ribs as the latter, being simpler, must be earlier. We only have to compare the Durham ribs of 1100 with the ones at Gloucester from 1125± to raise doubts about this argument.

Some have wanted to date the vaults with circular profiles to the 1160s. As they all have non-structural bosses and bent ribs this is much too late. The non-structural boss does not exist in northern Europe after 1140, or 1145 at the latest. By then every builder understood how the rib could be best used to support the vault, and the formwork techniques had been refined so they aided the workmen in the accurate laying of the stones. Once the Italians had understood this, and demonstrated it in most of the western bays of these churches, it is hard to believe they would revert to the more primitive technique two generations later. Therefore, we should consider dating these earlier ribs to the 1120s.

If the earthquake was the trigger that brought the rib to Lombardy, I would postulate that they sought out some Anglo-Norman builder to advise them on how to reinforce the vaults over the larger spans. That man brought the techniques and methods he had learned to Italy. Once the Italians had absorbed what he had to offer they altered it to suit themselves, using heavier square sections for the ribs and making the vaults even safer with domical cells.

Some of the domical vaults in Lombardy with rectangular ribs have the same non-structural bosses and other technical imperfections as the Anglo-Norman vaults. Those that are structurally true tend, on the whole, to be those over the westernmost bays, which were, in most cases, the last to be erected. In the north the true structural boss over straight ribs was rarely found before the mid-1130s, so it may be reasonable to suggest that these last vaults should be dated to the 1130s or later. The others would, by this argument, have been constructed between 1117 and then.

It should be remembered that the rib was not the only concept the Italians learnt from the north at this time - consider also alternation, square bays, barrel vaulting and, later, the Gothic style itself.

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- 1 Porter, *Lombard architecture*; and Krautheimer, *Lombardische Hallenkirchen*, 162-94.  
2 McKinne, *Rivolta d'Adda*.  
3 McKinne, *Rivolta d'Adda*, 257. The bases are set square to the walls. It was a later master that placed the  
4 diagonal capitals.  
5 McKinne, *Rivolta d'Adda*, 259 n. 80.  
6 McKinne, *Rivolta d'Adda*, 269-76.  
7 Casavolone dedicated 1118/1119; Verzone, *Lombarda*, 53-64. Tarquinia was dated to 1115± by Porter,  
8 *Lombard architecture*, 348.  
9 McKinne, *Rivolta d'Adda*, 329 and 342-43.  
10 McKinne, *Rivolta d'Adda*, 317 and 333. Construction commenced around 1122.  
11 Villa, *San Nazaro*, 39-40.  
12 Longhi, *Cistercensi in Italia*, 118-20.  
13 Saint-Etienne in Beauvais, Saint-Leu-d'Esserent and Airaines, the liernes in Montivillers and Saint-Etienne at  
14 Caen in the 1120s, Breny around 1135 and Lucheux a few years later.  
McKinne, *Rivolta d'Adda*, 242.  
"Peaked arch" on this site.  
"Ribbed vaults of Durham" on this site.