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Provenance of Medieval atlantes in the Ribe Cathedral, Denmark, based on geological and palaeontological investigations

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An atlante is a corbel figure (or pillar support) sculpted in the form of a man carrying a heavy load. A group of well-preserved stone carved atlantes from c. 1250 carrying the vaults of the Ribe Cathedral in western Jylland, Denmark, represents the antique titan Atlas and are up to 150 cm high. Their obviously foreign origin has so far remained uncertain. The figures are made of a relatively soft, sandy limestone. A new nanofossil analysis of small chips of the chalky and sandy limestone narrows the age of the stone down to the late Campanian (Late Cretaceous). Upper Campanian sandy limestones of this type are exposed in the Münster Basin in North Rhine-Westphalia, western Germany. The Campanian Baumberger Sandstein in this region fits well with the atlantes in terms of lithology and age and is the only possible provenance of the stone. Around 1250 the Baumberger Sandstein was used for baptismal fonts as far north as Ostfriesland at the Dutch-German border, and it is a novel finding of this investigation that it even reached Denmark. The stone was most likely floated along the rivers Lippe and Rhine and shipped via the Wadden Sea to Ribe. It is a remarkably long transport distance for historic commercial stone transportation in continental northern European art in the High Middle Ages.

Keywords: Ribe Cathedral, Medieval sculpture, provenance, late Campanian, coccoliths, Baumberger Sandstein, Münster Basin.

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Medieval Denmark was particularly short in easily workable stone for the building of churches and castles. The Ribe Cathedral, situated on the North Sea coast of Jylland, was thus built mainly of volcanic tufa which was floated from quarries near Cologne (Köln) in the Rhineland down the river Rhine and shipped along the North Sea coast (Fig. 1). However, this rock type was too porous for making any monumental and artistic sculpture. Consequently, another imported stone was used for the decorative corbel figures to carry the weight of new vaults in the cathedral constructed by the middle of the 13th century. An atlante is a corbel figure (or pillar support) sculpted in the form of a man carrying a heavy load on his head, shoulders

or arms. The figures in the Ribe cathedral comprise a group of five up to life-sized atlantes, illustrating the classical myths of the titan Atlas who was doomed to hold up the celestial heavens eternally. The atlantes are shown in Figs 2–4; they are not easily accessible and only approximate sizes can be given. Most splendid is a flower-garlanded young man trampling an old bearded man underfoot – evidently a personification of Youth (Juventus) vanquishing Old Age (Fig. 4). Another figure is a stout giant standing on a dragon (Fig. 2), while a third is a crouching man who once sported a prominent male member which was amputated for propriety's sake during refurbishment in 1865 (Fig. 3).

Art history has long been aware that the sculptures

had a foreign origin (Helms 1870), but until now it has only been observed that similar but smaller sculptures carry the central vault in the castle chapel at Kobern south of Cologne (Nyborg in press). This paper presents an identification of the origin of the carving stone of the atlantes in the Ribe Cathedral.

Biostratigraphic analysis

In 1979 a geological identification of the sculpture stone was attempted by us, and we found that the material was a relatively soft chalky and sandy limestone belonging to the last part of the Cretaceous, the late Campanian – early Maastrichtian. Deposits of this age have been accessible in the Paris Basin, around Hannover in northern Germany, in Denmark, Belgium and at Maastricht in The Netherlands, but they mainly consist of pure chalk.

In 2017 a new sample was taken, this time from the giant behind its dragon, to be investigated in more detail. A calcareous nannofossil analysis was conducted on the new sample. A smear-slide was prepared following the procedure described in Thibault & Gardin (2006). As our results indicate a Late Cretaceous deposit, a recent standard Boreal nannofossil scheme focusing on the Campanian to lower Maastrichtian is presented along with other stratigraphic markers for that time interval (Fig. 5).

The atlantes in the Ribe Cathedral all have the same lithological composition and the new sample consists of a light-coloured chalky and sandy limestone of a type well known from the Münster Basin in North Rhine-Westphalia, western Germany (Fig. 1). A precise age for the Ribe sample was provided by the analysis of the calcareous nannofossil assemblage in the carbonate matrix. Calcareous nannofossils are the remains of calcifying phytoplanktonic organisms which are particularly abundant in Cretaceous

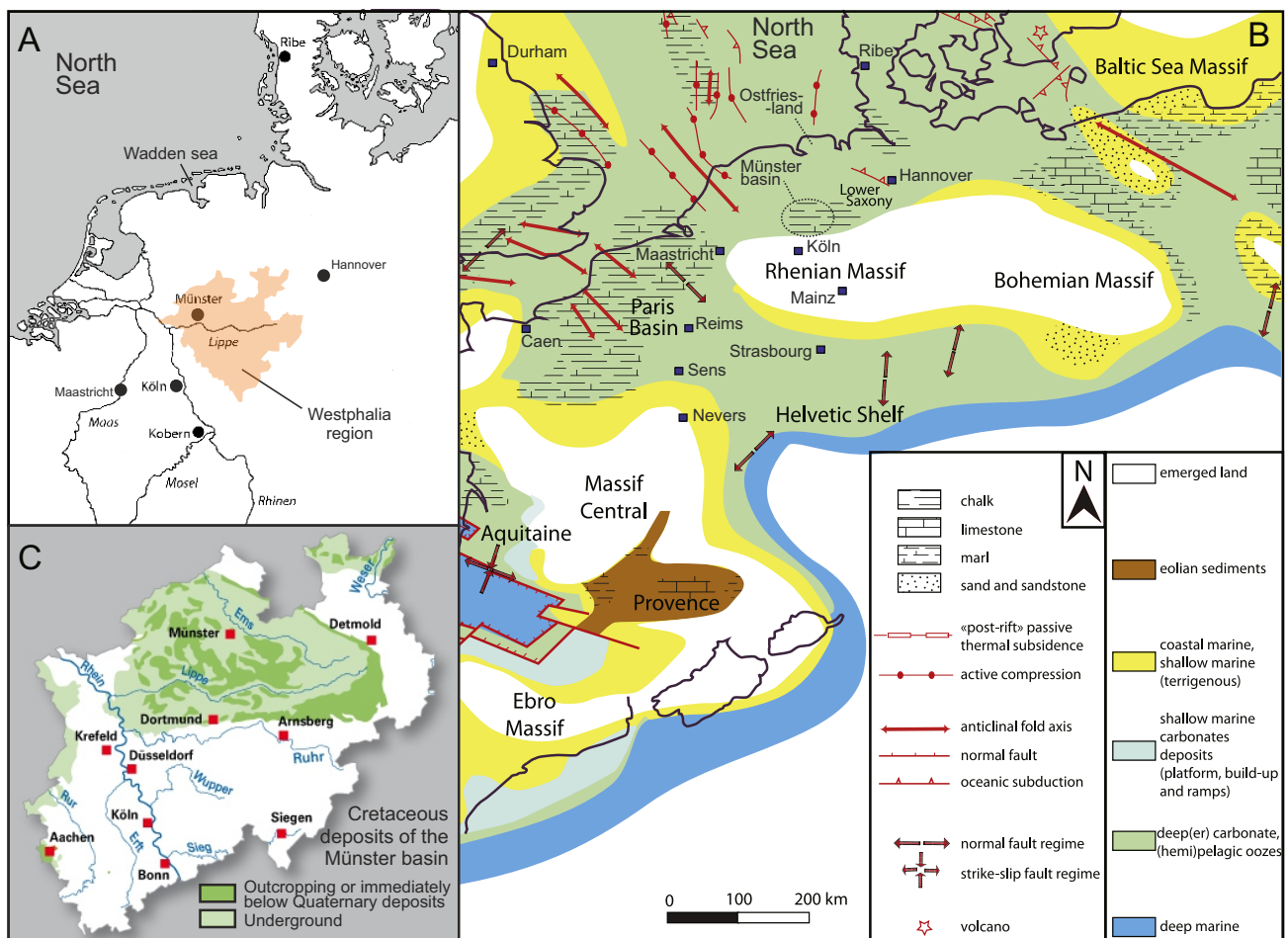


Fig. 1. A: Map showing the location of Ribe and relevant German locations cited in the text along the Rhine and Lippe rivers. B: Early Campanian palaeogeographic map of the western Peri-Tethys area with location of the Münster Basin and relevant French and German towns mentioned in the text. After Philip & Floquet (2000). C: Map showing the distribution of Cretaceous sediments in the Münster Basin, compiled by Geologische Dienst Nordrhein-Westfalen, https://www.gd.nrw.de/ge_ev_stratigraphie.htm

marine carbonates. Their rapid evolution makes them an excellent group for relative dating. The assemblage of the Ribe sample is well-preserved, with abundant nannofossils (Fig. 6). The presence of *Tranolithus orionatus*, *Zeugrhabdotus bicrescenticus*, *Broinsonia parca parca* and *B. parca constricta* together with the absence of *Eiffelithus eximius* and *Orastrum campanensis* may constrain the assemblage to nannofossil zone UC16 (Burnett 1998). *Zeugrhabdotus praesigmoides* (syn. *T. stemmerikii* Thibault 2010) is common, which further constrains our sample to the upper Campanian below the top of subzone UC16S2 where this taxon gets extinct (Fig. 5; Boussaha *et al.* 2016; Thibault 2016a). *Watznaueria barnesiae* and *W. cf. W. manivitae* are common forms of the assemblage, and this feature is typical of the late Campanian warm optimum that took place across subzones UC15e^{BP} to UC16S3, these species becoming much rarer in the early Maastrichtian. We also note abun-



Fig. 2. Atlante from the Ribe Cathedral. A giant standing on the back of a dragon. The sculpture is about 1.5 m high. The sample investigated for calcareous nannofossils was taken in 2017 from the hidden back side of the dragon. Photo: Folmer Iversen.



Fig. 3. Atlante from the Ribe Cathedral. Young man crouching. Originally he sported a prominent male member until it was removed in 1865. Atlante is about 1.5 m high. Photo: Folmer Iversen.

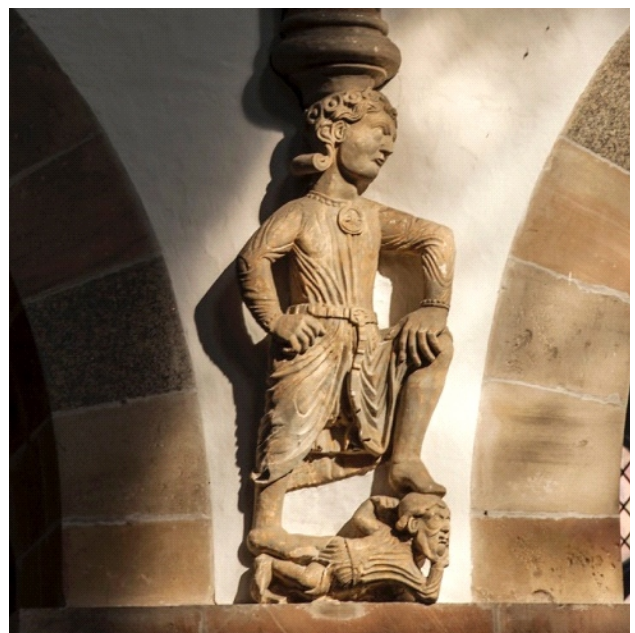


Fig. 4. Atlante from the Ribe Cathedral. Flower-garlanded young man trampling an old man underfoot. This atlante is 50–75 cm high. Photo: Folmer Iversen.

dant *Reinhardtites anthophorus*. Hence, our sediments cannot be younger than UC16S2, the last consistent occurrence of *R. anthophorus* being within this latter

subzone (Fig. 5). The presence of common *R. levis* and *Lucianorhabdus* spp., both of which compose a significant part of the assemblage, is another feature that

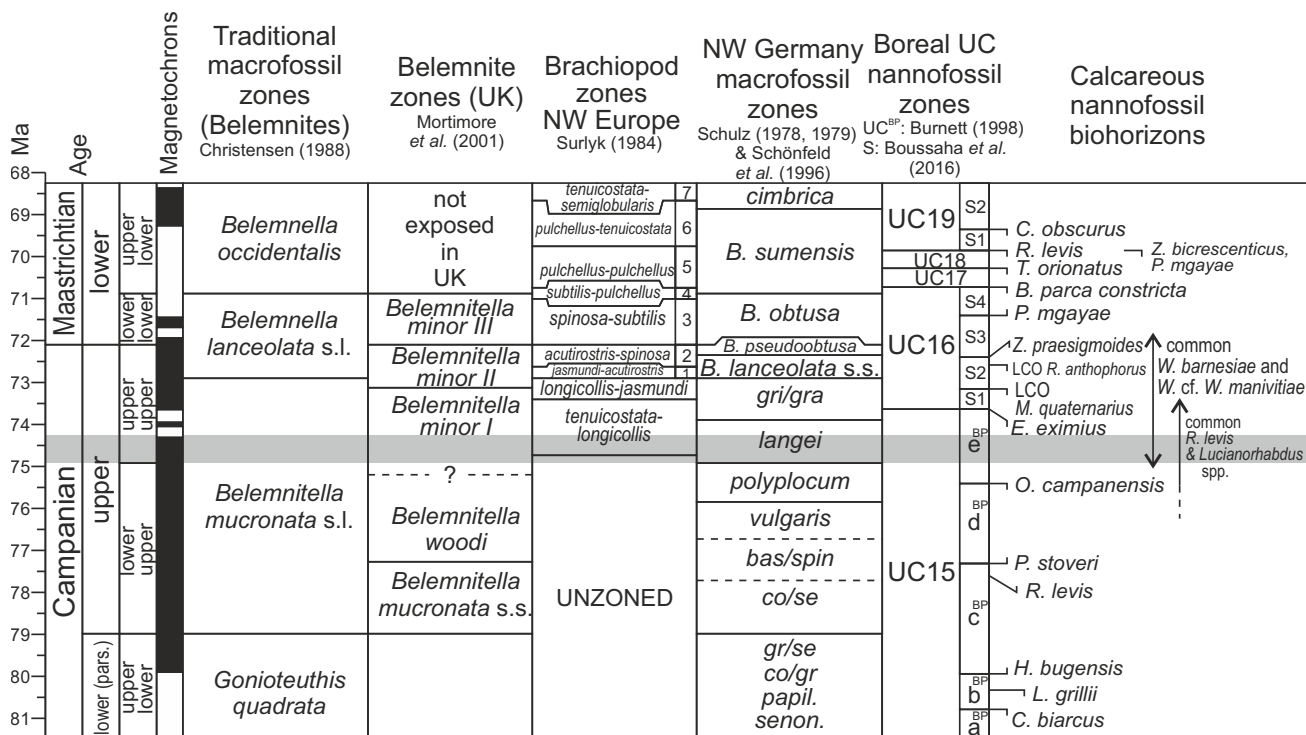


Fig. 5. Integrated stratigraphic scheme for the Boreal Realm with an up-to-date calcareous nannofossil scheme for the Campanian – lower Maastrichtian. The grey zone indicates the age of our sample.

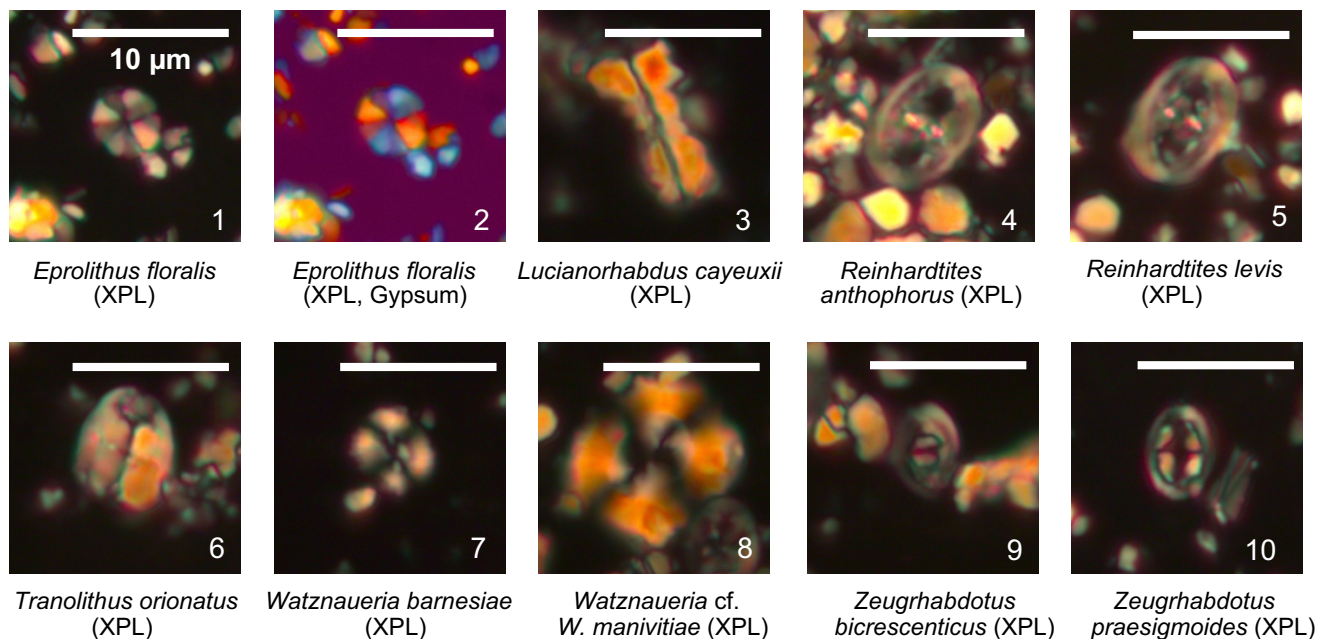


Fig. 6. Diagnostic calcareous nannofossils found in a sample taken in 2017 from one of the backsides of the dragon sculpture shown in Fig. 2. XPL: cross-polarized; Gypsum: view with cross-polarized light and gypsum plate. The white scale bars are 10 µm long in all images.

is generally restricted to an interval comprising the upper zone UC15 to the base of subzone UC16S1 in the Danish chalk (Thibault *et al.* 2012; Thibault 2016b). The coincidence of these features in the nannofossil assemblage tends to restrain the age of our sample to subzones UC15eBP–UC16S1 (Fig. 5). The absence of *E. eximius* is not necessarily a good diagnosis for the base of zone UC16 as this species becomes very rare toward the top of its range, making its extinction difficult to identify with confidence, and the range top is commonly diachronous. We also note the presence of *Eprolithus floralis*, which gets extinct in the middle part of UC14c^{BP} according to Burnett (1998) but has been regularly observed higher up within UC15 in the North Sea and in the chalk of the Danish Basin (N. Thibault unpublished observations). All taken together, these features point to an interval restricted to the upper Campanian subzone UC15e^{BP} despite the absence of *E. eximius*, which is diagnostic for the top of this subzone (Fig. 5).

Discussion

Upper lower – lower upper Campanian chalky, sandy limestones are not known in Denmark but crop out in western Germany. In the 12th and 13th centuries, a favoured building stone of the Rhineland area was the upper Campanian Baumberger Sandstein (e.g. Grimm 1990; Mutterlose & Wilmsen 2008). It consists of up to 70% CaCO₃, 16% quartz, 3% feldspar and small amounts of glauconite set in a mainly micritic matrix. Despite being a shallow marine deposit, the Baumberger Sandstein is known to contain a relatively well-preserved and diverse calcareous nannofossil association assigned to zone UC15 and to the lower *Belemnitella langei* belemnite zone (Fesl *et al.* 2005). The *B. langei* belemnite zone falls right within nannofossil subzone UC15e^{BP} (Fig. 5). Our sample from Ribe fits very well with this building stone in terms of both lithology and age (Fig. 6). The only possible provenance for the atlantes at Ribe is the Baumberger Sandstein, as there are no other rocks of this age and composition which could have been used (J. Eichler, personal communication 2019). A somewhat similar stone has been quarried near Prague in the Czech Republic, but in marked contrast to the Baumberger Sandstein it has not been used for sculptures.

Because of its quality, the Baumberger Sandstein has been quarried at least from the 12th century, and since then it was used extensively and exported mainly as raw blocks (Noehles 1953; Karrenbrock 1989; Plehwe-Leisen 2010; Bergmann & v. Plehwe-Leisen 2018). From the quarries, carts were run to

the Lippe river which flows into the Rhine. In the town of Wesel, the products were reloaded and sailed upstream to the Rhineland or downstream to The Netherlands (Fig. 1). It is undisputable that the Baumberger Sandstein was commonly exported to the north already by the middle of the 13th century when finely sculpted baptismal fonts are found in Ostfriesland at the Dutch-German border (Kroesen & Steensma 2011; Nyborg in press). The atlantes in the Ribe Cathedral are so integrated in the architecture, and the nature of the ornamentation is so delicate, that they were almost certainly carved at the building site in Ribe by German masons.

Close counterparts to the sculptures in Ribe are not known from northern Westphalia, but at Kobern in the Rhineland (Fig. 7), and it is thus assumed that the artists came from this area. It would be interesting to know if the sculptures in Kobern are also made of Baumberger Sandstein, but this is unknown to us.

It is a novel finding of this investigation that Rhinish-Westphalian stone and art of this age reached as far north as Denmark. Written evidence indicates that the vaults and their atlantes of the Ribe Cathedral were set up before 1266 and that the initiator of the ambitious works probably was the bishop Esger (1246–1273) (Nyborg in press). The monumental atlantes in the Ribe Cathedral are unique in northern Europe, forming a whole suite. Parallels may mostly be found in French cathedrals such as in Sens, Reims, Nevers and Strasbourg, and in Mainz in Germany.



Fig. 7. Atlantes in the Castle Chapel at Kobern in the Rhineland. The sculpture is 50–75 cm high. Photo: Marburg.

Conclusion

The atlantes from the Ribe Cathedral all consist of the same light-coloured chalky, sandy limestone. Calcareous nannofossil analysis indicates a Late Cretaceous, late Campanian age of a sample taken from one of the atlantes. The combined evidence from the lithology and the age of the sample indicates the Baumberger Sandstein exposed in the Münster Basin in Westphalia, northern Germany, as the only possible candidate for the provenance of the limestone blocks used for carving the atlantes in the Ribe Cathedral. The blocks were probably sailed down the Rhine and then farther on over the Wadden Sea to Ribe. The rather soft nature of the sediment indicates that the sculptures were exported as raw blocks and carved at the building site by German craftsmen.

We have used a combination of sedimentology, nannofossil analysis, art history and the history of transport to obtain new insight into northern European art and historic commercial stone transportation in the High Middle Ages. To our knowledge, this is the first reported occurrence of Rhinish-Westphalian stone and art of this age in Denmark.

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