CONCLUSION

Given the political context in which de Courcy was operating, it is fair to see Phase 1a and Phase 1b of his building programme at Carrickfergus as belonging to the period between 1177 and 1181 when he was under severe pressure from the indigenous Irish population. The details of the initial building programme prior to 1182 stand in contrast to the final flourishes afforded by de Courcy in his newly elevated position after that date. This can be best seen in the nature of the grandiose stairway that he erected as an integral part of his keep. There is no parallel for the survival of a stone stairway such as this at any other Anglo-Norman great tower in Ireland. At a few sites there is evidence for timber stairways; for example, at Dundrum, Co. Down, and Maynooth, Co. Kildare, the sockets to support a timber stairway are visible in the fabric of the great towers. At Trim, Co. Meath, however, there is an absence of any evidence (such as bonded stonework now torn away or timber-beam sockets) to indicate how entrance was gained to the tower's first-floor entrance. At Carrickfergus Castle it is clear that an open stone stairway led up to a doorway at the top of the steps. Behind this doorway lay a forework guarding the entrance into the great tower at first-floor level. In short, the entrance arrangement at Carrickfergus Castle relates more to a showpiece stairway, such as that at Hedingham Castle (Essex) built around 1140, than to any other entranceway in contemporary Ireland. This should not surprise us too much, however, since de Courcy's great tower was no mean construction in itself, and the cream-coloured stone steps and associated doorways would have made a fitting entrance into the great tower and private domain of the 'Princeps' of Ulster.

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RECENT PALAEOENVIRONMENTAL EVIDENCE FOR THE PROCESSING OF HEMP (*CANNABIS SATIVA* L.) IN EASTERN ENGLAND DURING THE MEDIEVAL PERIOD

Hemp (*Cannabis sativa* L.) — whose origins as a domesticated plant probably lie in C. Asia — has been cultivated in England since at least A.D. 800 (and before this perhaps in the Roman Period), mainly for its fibre, which was used to make sails, ropes, fishing nets and clothes, as well as for the oil from hempseed. Hemp cultivation may have reached a peak during the early 16th century, when Henry VIII decreed that increased hemp production was required to supply the expanding navy.[33] Evidence for the locations where the crop was cultivated and processed is available in several different forms, including written evidence in parish records and government reports, place-name evidence (e.g. *Hempholme* and some instances of *Hempstead*), and features on old maps, such as *Hempisfield* (hemp field).[34]

[33] H. Godwin, 'The ancient cultivation of hemp', *Antiquity* 41 (1967), 42–8 and 137–8; idem, 'Pollen-analytic evidence for the cultivation of *Cannabis* in England', *Rev. Pal. Pal.*, (1967), 71–80.
[34] M. Gelling, *Place-Names in the Landscape* (London, 1984); E. Ekwall, *The Concise Oxford Dictionary of English Place-names*, 4th ed. (Oxford, 1960); R. Payne, *Blo'Norton Tithe Map, 1838* (Norfolk, 1838).

Such documentary evidence can be supplemented by environmental archaeology. Fossil data are perhaps less readily accessible, but where samples are properly contextualised and given an adequate dating framework, they can contribute additional information regarding the spatial and temporal patterns of cultivation and processing of crop plants such as hemp within the landscape. Several different types of environmental evidence can be used in the search for hemp cultivation and processing. These include palynological data (i.e. from fossil pollen) — although the pollen of *Cannabis sativa* cannot easily be separated from that of *Humulus lupulus* (hops) — palaeoentomological data (from fossil insect remains) concerning water pollution[35] and plant macrofossil data (from seeds and other plant structures), which can provide more secure identification of particular plant species.

Traditional processing of the hemp crop to extract the long bast fibres without damaging them involves the process of 'retting'.[36] Hemp stalk bundles are submerged in water for about 7 to 10 days. During this time, the plant materials begin to decompose and the pectin that binds the fibrous and non-fibrous portion of the stalk is broken down, after which the fibre can be easily separated from the other tissues. The hemp fibres are removed from the water and dried, then stored prior to further processing. 'Water retting' is more labour intensive than other processes, but produces higher quality fibre. This process is normally carried out when the plant is mature and flowering, so that large amounts of pollen can be shed from the decaying flowers and are left behind in the sediments at the bottom of the pond when the fibres are removed. (In hemp, the sexes are on different plants, but both male and female plants yield fibre, so both pollen and seeds may be expected where retting occurs; even if seed is removed prior to retting, this is unlikely to be as efficient as to remove every one.) The retting process generates foul decay products, which can easily contaminate local water supplies and must therefore be carried out away from areas of settlement. To rehearse the lines from Tusser's instructions for proper husbandry in September:

> Now pluck up thy hemp, and go beat out the seed,
> And afterward water it, as ye see need;
> But not in the river, where cattle should drink,
> For poisoning them, and the people with stink.[37]

Pollen diagrams from eastern England show that the cultivation of hemp/hops increased in line with general agricultural expansion from the 11th century A.D. continuing into the post-medieval period.[38] Records from sites such as the peatlands of Thorne and Hatfield Moors in the Humberhead Levels reflect 'off-site' activity, showing only that hemp/hops were cultivated and processed somewhere in the pollen catchment around these sites: such catchments may cover tens of square kilometres. They cannot be used to establish precisely where in the landscape such activities were taking place. In order to

[35] Though Robinson was unable to find evidence for pollution associated with medieval flax-retting in the Thames at Oxford and the Nene in Northamptonshire: M. Robinson, 'Saxon flax retting in river channels and the apparent lack of water pollution', 141–2, in P. Murphy and P. E. Wiltshire (eds.), *The Environmental Archaeology of Industry* (Oxford, 2003).

[36] A. Young, *General View of the Agriculture of the County of Suffolk* (London, 1813).

[37] T. Tusser (1580) *Five Hundred Points of Good Husbandry* . . . (ed. W. Mavor, London, 1812), September, verse 24. Mavor's commentary also reflects the declining fortunes of hemp as a crop in the early 19th Century (pp. 20–1, fn 4: 'It is evident that hemp was formerly cultivated here to a great extent. The neglect of this valuable plant is one of the misfortunes arising from a dependence on foreign trade, which war and other casualties may interrupt. Our soil in many places is excellently adapted for the culture of hemp; and in fact, we possess the means within ourselves of raising or manufacturing almost everything necessary for our domestic wants, or public defence. The retting of hemp, as it is called, should be done with care. It should be taken out of the water as soon as it begins to swim. The smell left by hemp is extremely noisome'). In a further verse (25), Tusser reminds us that hemp (and flax) may be retted either in water or by dew — the latter method seems unlikely to leave any trace in the fossil record.

[38] B. M. Smith, *A Palaeoecological Study of Raised Mires in the Humberhead Levels* (BAR Brit. Ser. 336, Oxford, 2002).

obtain a more detailed understanding, smaller sites and 'on site' deposits need to be investigated. In this note, we summarise recent environmental archaeological evidence for the processing of hemp and other textile crops from the mid- to later medieval period from three contrasting sites in eastern England which provide more spatially precise information. These are (1) Ellerton Priory, (2) Morton Lane, Beverley, a recently excavated urban site, both in the historical East Riding of Yorkshire, and (3) Askham Bog, an area of peatland to the south of the City of York.

THE SITES

Ellerton Priory, North Humberside (SE 701398)

The site of Ellerton Priory survives as a series of crop marks clustered around Ellerton Church. The priory was founded before 1212 by William Fitz-Peter, and was a house of the Order of St Gilbert of Sempringham before its surrender in 1537.[39] Geophysical survey at the site led to the identification of a series of ditches with N.–S. and E.–W. alignments, as well as indications of buried structures and evidence of occupation near the present churchyard wall and a feature identified as a 'fish pond' on the edge of the floodplain of the River Ouse. A sediment core sample of the organic silts infilling the 'fish pond' feature was collected for palynological assessment as part of the Humber Wetlands Project.[40] A subsample from the top of this sediment sequence was characterized by exceptionally high percentages of *Cannabis*-type pollen, which accounted for 97% of total land pollen. This is the highest percentage of *Cannabis*-type recorded from any published pollen sequence in the United Kingdom to date and provides unequivocal evidence of a local source. This can almost certainly be attributed to the use of the 'fish pond' as a retting pit.

Askham Bog, City of York (SE 570480)

Askham Bog is located to the south-west of York and is currently a nature reserve covered by fen woodland.[41] Stratigraphic investigations at the site have demonstrated the presence of a substantial depth of sediment reflecting the infilling of a lake basin and the development of a *Sphagnum* raised mire system during the early Holocene.[42] A subsequent transition from mire to fen is probably the result of human activity in the form of peat cutting, perhaps starting during the Roman Period. Previous palynological investigation of the uppermost sediments from the north-eastern part of the site revealed a sequence with a pronounced rise in *Cannabis*-type pollen associated with other palynological evidence of human disturbance and agriculture dated to 470 ± 80 BP (cal. A.D. 1300–1370 and 1380–1640) (HAR-2259).[43] Radiocarbon dates on two samples of *Cannabis* achenes recovered from poorly humified peat at the site produced age estimates of 350 ± 35 BP (cal. A.D. 1450–1640) (OxA-6974) and 385 ± 30 BP (cal. A.D. 1440–1530 and 1560–1630) (OxA-6975),[44] supporting the interpretation of the *Cannabis*-type pollen as hemp-derived.

Recent palynological work on another core from the site found a similar rise in *Cannabis*-type pollen at a time of increasing agriculture in the wider landscape. The presence of *Sparganium emersum*-type (bur-reeds/cat-tail) and *Nymphaea* (water lily) pollen in

[39] W. Page, *Victoria County History of Yorkshire*, 3 (York, 1938) 251–2.
[40] R. Van de Noort and S. Ellis (eds.), *The Wetland Heritage of the Vale of York* (Hull, 1999).
[41] A. H. Fitter and C. J. Smith (eds.), *A Wood in Ascam* (York, 1979).
[42] B. R. Gearey and M. C. Lillie, 'Aspects of Holocene vegetational change', 79–109, in the Vale of York in R. van de Noort and S. Ellis, op. cit. note 40.
[43] R. H. W. Bradshaw, P. Coxon, J. R. A. Grieg and A. R. Hall, 'New fossil evidence for the past cultivation and processing of hemp (*Cannabis sativa* L.) in eastern England', *New Phytol.*, 89 (1981), 503–10; H. K. Kenward, D. Williams, P. J. Spencer, J. R. A. Greig, D. J. Rackham and D. Brinklow, 'The environment of Anglo-Scandinavian York', 58–73, in R. A. Hall (ed.), *Viking-Age York and the North* (London 1978).
[44] C. Bronk Ramsey, P. B. Pettitt, R. E. M. Hedges, G. W. L. Hodgins and D. C. Owen, 'Radiocarbon dates from the Oxford AMS system: Archaeometry Datelist 30', *Archaeometry*, 42 (2000), 459–79.

the same sequence, coupled with evidence from analysis of testate amoebae, implies that the environment at the coring point at this level was a shallow pool, surrounded by a mosaic of fen and mire communities. This sequence is further evidence of the use of pools within Askham Bog for hemp retting. There is comparable environmental evidence from Cumbria for the use of acid bog pools for retting during the medieval period.[45] The location of such mires with naturally acidic waters, some distance from areas of settlement, will have reduced the risk of polluting local water sources.

Morton Lane, Beverley, North Humberside (TA 034 397)

Archaeological excavations in advance of development at a site in Morton Lane, in the centre of Beverley, investigated a pit feature containing waterlogged organic sediments.[46] Bulk samples were taken for plant macrofossil and invertebrate assessment, with spot samples also collected for pollen analysis. Pottery sherds dated the sediments to the 14th or early 15th century. The samples contained a large residue of well-preserved coarse woody debris, including bark, wood fragments and wood chips from a wide range of trees. The abundant identifiable remains consisted primarily of buds and bud-scales of trees, especially oak (*Quercus*) and hazel (*Corylus*), but also of aspen/poplar (*Populus*), willow (*Salix*) and alder (*Alnus*), and also included leaf fragments of holly (*Ilex*), hazel nutshell fragments, and ash fruits (*Fraxinus*). Ash was also identified amongst the wood chips. Other coarser debris included stalk fragments and tracheid bundles (the water conducting vessels within the stalks) of bracken (*Pteridium aquilinum* (L.) Kuhn), while achenes of hemp were present in modest numbers. Amongst the other plant remains were seeds and capsule fragments of cultivated flax. Pollen analysis of the sediment was characterised by a high proportion (55% of total pollen counted) of *Cannabis*-type pollen. The presence of the *Cannabis* achenes indicates that the large amounts of *Cannabis*-type pollen can confidently be interpreted as deriving largely or completely from *C. sativa* rather than *Humulus lupulus*. Most of the flax seeds had lost their central portion, and many of the hemp seeds were fragmentary, pale in colour and rather soft, which may indicate that they were not mature; immature seeds might be expected if the crop had been harvested for fibre rather than seed. The sediments had clearly accumulated in a water-filled pit, which again is consistent with the use of the pit or pond for water retting of hemp and other plants.

Other bioarchaeological remains suggest that textile working was also being carried out near on the site, since rare seeds of weld or dyer's rocket (*Reseda luteola* L.) and at least two small fragments (<2 mm) of root of madder (*Rubia tinctorum* L.) were present in the sample. Both of these plants are recorded from other medieval sites in Beverley (e.g. Eastgate[47]) and weld seeds were especially abundant in a 12th-century drain fill at a site not far from Morton Lane in the appropriately named Dyer Lane.[48] Madder was used as a source for red dye and weld for yellow, although the latter plant is a common weed species today and must frequently have been so in the past. There is also some palaeoentomological evidence for textile working, in the form of at least one sheep ked (*Melophagus ovinus* (Linnaeus)) in this sample, almost certainly deposited during the cleaning of sheeps' wool.[49]

[45] D. Hodgkinson, E. Huckerby, R. Middleton and C. E. Wells, *The Lowland Wetlands of Cumbria* (Lancaster, 2001).
[46] B. R. Gearey, A. R. Hall, H. K. Kenward and J. Carrott, Palaeoenvironmental Assessment of Samples from Morton Lane, Beverley (unpubl. Rep. West Yorkshire Archaeol. Services, Hull, 2002).
[47] W. J. B. McKenna, 'The environmental evidence', 227–33, in D. H. Evans and D. G. Tomlinson, *Excavations at 33–5 Eastgate, Beverley, 1983–86* (Sheffield, 1979).
[48] A. R. Hall, unpublished data.
[49] H. K. Kenward and A. R. Hall, *Biological Evidence from Anglo-Scandinavian Deposits at 16–22 Coppergate* (The Archaeology of York, 14/7, 1995), 435–797.

CONCLUSIONS

The three sites discussed here demonstrate that medieval hemp processing was being carried out in urban, monastic and 'rural' contexts across the medieval period in eastern England. 'Water retting' of hemp appears to have been carried out at all three sites, but only in the deposits from Morton Lane, Beverley, located in what was presumably the edge of the town, is there evidence of processing of other fibres or of later stages in textile production. Retting is both foetid and potentially polluting, but reduces the amount of material needed to be transported by removing the undesirable, non-fibrous parts of the plant. Therefore, it is not surprising to find evidence for retting of the crop at many locations, probably chosen to be fairly near the fields where it was grown. The long bast fibres could then be transported elsewhere for further processing.

The pottery samples from Morton Lane indicate that hemp retting was being carried out in 14th and 15th centuries. Likewise, at Askham Bog, the rise in *Cannabis*-type pollen shows that hemp was certainly being grown locally from the earlier medieval period, with the dates on the hemp achenes themselves suggesting retting in pools on the mire surface continued into the 17th Ccentury. Dating of the Ellerton sequence is less secure, but presumably retting at this site was taking place at some time before the surrender of the Priory in the 16th century.

In terms of the wider framework of the medieval economy, whilst the importance of hemp as a crop might be known from other sources, without the application of environmental archaeology to the specific archaeological contexts of Morton Lane and Ellerton Priory, the function of the pool/pit features excavated at these locations would not have been established. Likewise, the use for retting of what otherwise have been regarded as an entirely 'natural' pool (or simply an infilled peat cutting) at Askham Bog, illustrates one of the many functions to which 'non-cultivated' or 'marginal' features in the medieval landscape were put, and for whose use little evidence, either archaeological or documentary, now exists.

In this note, we have shown the potential of the techniques of environmental archaeology to contribute to our understanding of the spatial and temporal patterns of cultivation and processing of fibre-producing crops such as hemp. As more records are collected, they may provide insights into spatial and temporal changes in patterns in hemp cultivation and processing, and their relationship with other economic and social activities. In particular, these methods are useful tools for assessing to what extent features identified as 'fish ponds' or livestock watering-holes might in fact have been employed as retting ponds for at least part of their life. Environmental archaeology has an important role to play in the investigation of these and other questions associated with the medieval economy, particularly when integrated with other lines of evidence.

We should end on a note of caution. The presence of a few hemp seeds in apparently waterlaid deposits should not be used alone as evidence that retting was carried out — complementary evidence, usually in the form of fibre or large concentrations of pollen — are needed for confirmation. Hemp seeds are very frequently recorded in small numbers from archaeological occupation deposits of Roman to post-medieval date,[50] doubtless having been used for food (perhaps mainly for animals) and perhaps representing part of the background scatter of biological remains which had been blown, trampled, washed in, or dumped with redeposited sediment. Secondly, every large shallow feature cannot be suspected of being a retting pit. A pond-like cut on the fringes of post-medieval Doncaster, South Yorkshire, for example, was — in view of its form and location in an industrial area — a prime candidate for identification as a retting pit, but bioarchaeological analysis

[50] P. Tomlinson and A. Hall, 'A review of the archaeological evidence for food plants from the British Isles: an example of the use of the Archaeobotanical Computer Database (ABCD)', *Internet Archaeol.*, 1 (1996), *http://intarch.ac.uk/journal/issue1/tomlinson_index.html*

produced no more evidence for hemp than is generally found in urban occupation deposits with good preservation by anoxic waterlogging.[51]

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[51] H. K. Kenward, A. R. Hall and J. M. McComish, 'Archaeological implications of plant and invertebrate remains from fills of a massive post-medieval cut at Low Fisher Gate, Doncaster, UK', *Environmental Archaeol.*, 9 (2004), 61–74.