

Chapter Title: Recent research on the White Tower: reconstructing and dating the Norman building

Chapter Author(s): Roland B. Harris

Book Title: Castles and the Anglo-Norman World

Book Editor(s): John A. Davies, Angela Riley, Jean-Marie Levesque, Charlotte Lapiche

Published by: Oxbow Books. (2016)

Stable URL: <http://www.jstor.org/stable/j.ctt1kw2b5s.19>

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PART III

RECENT ARCHAEOLOGICAL RESEARCH

RECENT RESEARCH ON THE WHITE TOWER: RECONSTRUCTING AND DATING THE NORMAN BUILDING

Roland B. Harris

Résumé

La Tour Blanche est le monument central de la Tour de Londres, à laquelle elle a donné son nom dès 1100: c'est le palais le plus complet conservé de l'Europe du XI^e siècle. Les travaux de conservation et la réorganisation interne en 1996–8 et 2008–11 ont permis de procéder à des recherches archéologiques. Cette analyse récente a donné trois résultats importants, qui ont trait à la construction primitive de la tour romane, examinés dans cet article. Tout d'abord, la forme actuelle de la Tour Blanche, comme le démontre sa maçonnerie, n'est pas seulement, dans une large mesure, celle de son état à sa date d'achèvement vers 1100, mais bien celle qui avait été conçue dès l'origine: cette remarque concerne les murs, les contreforts, quatre tourelles et l'abside en saillie. Ensuite, la principale modification durablement apportée au bâtiment comprend le relèvement des toitures des salles est et ouest par l'ajout d'un étage, créant ainsi des salles supplémentaires dont le plancher se situe au niveau des assises de la charpente et des gouttières de la toiture d'origine. Il n'existe aucune preuve de cette surélévation de la toiture avant environ 1490 et, auparavant, les charpentes des salles est et ouest étaient divisées par les murs du deuxième étage de la Tour Blanche. Troisième remarque: il y eut une pause assez longue dans la construction primitive, alors que seule la moitié du premier étage était construite (l'étage de la chapelle). Cette pause se reconnaît par les changements dans les matériaux et de technique et - d'une plus grande importance pour l'étude de l'architecture de la fin du XI^e siècle - dans le détail sculpté de la chapelle Saint-Jean. L'identification d'une pause majeure dans la construction est intimement liée à une réévaluation de la date de construction de la Tour Blanche, qui a pendant tant d'années été donnée, en toute certitude, aux environs de 1078: un ensemble de preuves scientifiques, documentaires et architecturales suggère que la construction primitive de la Tour Blanche commença autour de 1075–9 pour se terminer en 1100, la longue coupure dans la construction commençant aux alentours de 1079–83 (et plus probablement vers 1080) pour se terminer aux alentours de 1090–3.

Introduction

The White Tower (Figure 12.1 and 12.2) is the centrepiece of the Tower of London – one of the best-known castles in the world – to which it had given its name by 1100: it is the most complete 11th-century palace in Europe, and the best example of the great tower or *donjon* of this period. Opportunities for the first systematic investigation of much of the building were provided in 1996–8, when the building was emptied for installation of new displays and conservation works were carried out on the external south elevation. The archaeological recording and analysis was accompanied by a programme of dendrochronological sampling (which included additional work on the well in 2005), petrographic survey and documentary research. The results were published in a substantial multi-authored monograph (Impey 2008b). In 2008–11 cleaning and

conservation of the north, east and west elevations, and the turrets allowed continuation of the earlier research to the rest of the exterior, with the archaeological recording again integrated with a detailed petrographic survey. This second phase of analysis supported the findings of the 1996–8, with some minor modifications, and usefully expanded our understanding of the building, especially in relation to extent, form and dating of the post-medieval alterations and repairs. This paper presents a summary of the primary construction of the Romanesque tower, based on both the recent investigations.

Prior to these recent investigations, it had long been accepted that the White Tower was a building surviving largely intact from the late 11th century, albeit with post-medieval modifications that included the replacement of quoins and architraves with Portland stone, the insertion of brick vaults



Figure 12.1. View of the White Tower from the south-west, across the River Thames (Photo: Roland Harris).

in the basement, and the addition of a floor at the level of an original gallery (e.g. Allen Brown, Colvin and Taylor 1963, pp. 29–32). Other interpretations have been advanced over the years, with the theory that the basic form of the building evolved – rather than was conceived from the outset – reappearing in a more compelling manner: it has been proposed that the White Tower was initially built a storey lower, except for the chapel, and that, shortly after, this gabled structure was heightened by the addition of the mural passage (Parnell 1998).

The investigations of 1996–8 and 2008–11 show that the structural history of the White Tower is neither as simple as the traditional interpretation nor as complex as the evolutionists would have it. There were three important findings of the analysis, which are explored in this paper and, insofar as they are relevant to St John's chapel, in the paper elsewhere in this volume by John Crook. First, the present form of the White Tower as expressed by its masonry is not only largely that achieved by completion *c.* 1100, but as conceived from the outset: this includes the walls, buttresses, four turrets and the projecting apse. Second, the one lasting major alteration made to the building comprised the raising of the roofs of the east and west rooms by a storey, with a

new floor added where previously there were rafter feet and roof drains, creating additional rooms. There is no evidence of this higher roof before *c.* 1490 and, previously, the roofs of the east and west rooms were screened by the second-floor walls of the White Tower. Third, there was a substantial pause in the primary construction, midway through the building of the first floor (i.e. that with the chapel). This break is reflected by changes in material and technique and, most importantly for the study of late 11th-century architecture, in the sculptural detail of St John's chapel. The identification of a major building break is intimately bound up with a re-assessment of the date of the White Tower, for so long confidently cited as *c.* 1078: a combination of scientific, documentary, and architectural evidence suggests that the primary construction of the White Tower began around 1075–9 and was completed by 1100, with the long building break beginning *c.* 1079–83 and ending *c.* 1090–3.

Form of the 11th-century building

Introduction

As built by 1100, the White Tower comprised three floors, each with a larger and smaller pair of oblong rooms (those above basement level having fireplaces and garderobes), separated by a spine wall, with the south-east corner of the tower occupied by a room that had an apsidal projection. At first-floor level this apsidal room formed the barrel-vaulted chapel of St John. The chapel rose through two storeys and, thus, projected above the level of the adjacent rooms: the chapel gallery connected to mural passages that linked the embrasures of the false windows in the walls that screened the roofs of the east and west rooms. The western basement room contained a well. Access to the three floors was possible via the circular north-east turret, with the main entrance on the middle floor, on the south face (i.e. the main entrance used today).

Foundations, basement and plinth

As with all levels of the White Tower, the basement comprises three spaces: a room measuring 25.91m × 10.75m occupies the whole of the western half, while the eastern half is occupied by another room measuring 20.47m × 8.16m and, to the south, a smaller barrel-vaulted space with a projecting apse measuring 14.12m × 4.32m (Figures 12.3 and 12.4). The insertion of brick vaults in the larger two rooms in 1733 considerably altered the appearance of the basement floor. This resulted in the loss of most of the original fenestration, although the rear-arch of a primary loop remains intact in the south wall of the west room and, remarkably, the dolomitized Chalk window sill has now been identified on the external elevation. Similar windows are recorded in pre-1733 plans (TNA, Work 31/84 and

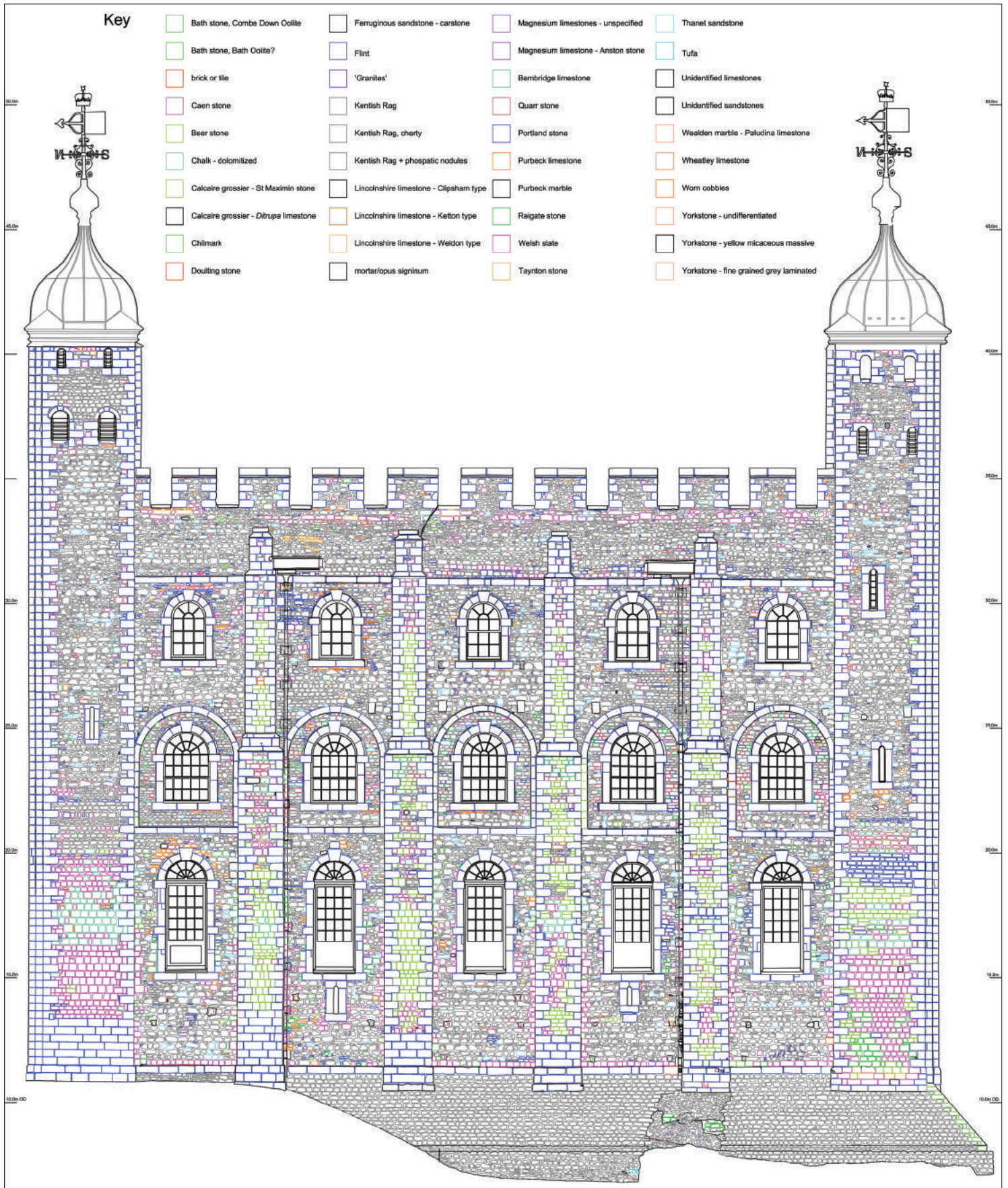


Figure 12.2. The west elevation, as recorded in 2010-11: the CAD format allows isolation of the many different stone types (Historic Royal Palaces. Drawing: Roland Harris).

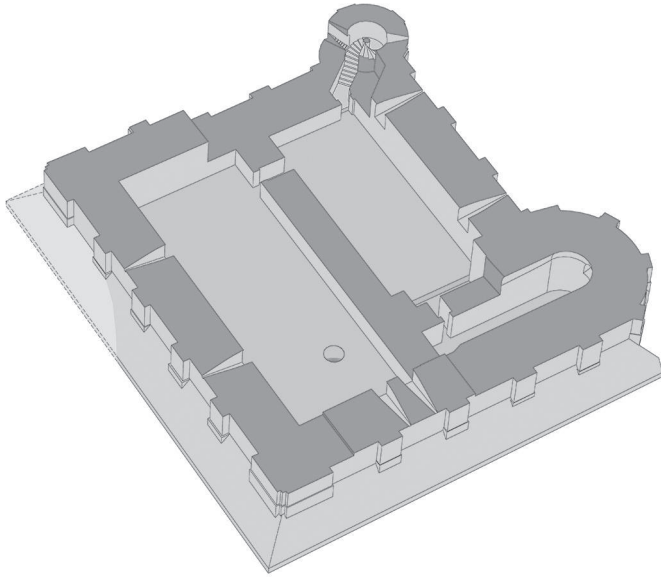


Figure 12.3. Basement: three-dimensional reconstruction of the primary form (*Historic Royal Palaces*. Drawing: Helen Jones).



Figure 12.4. View of the apse from the south-east (Photo: Roland Harris).

31/86). The three 11th-century internal doorways survive. That at the north end of the spine wall and that between the apsidal and east rooms were modified in the 14th century to allow replacement of flush-mounted doors by rebated doors at the other ends of the doorway passages. The north-east doorway is better preserved, and provided the only primary access to this storey, via the spiral stair turret in the north-east corner. All three doorways preserve evidence of drawbar sockets, with that of the spine wall doorway having a primary 25mm (1") thick lining plank intact: dendrochronological analysis has produced a felling date of after 1068. Another dendrochronological date was forthcoming – in this case of after 1082 – from the well in the west room. This came from the beech template located at the bottom of the ashlar-lined well, over 12m deep, during its draining for investigation in 2005.

The most misunderstood element of the basement level of the White Tower has been the apsidal projection at the south-eastern corner. Something of a tradition has emerged in which it is supposed that it was added to the White Tower after the construction of both the foundations and the lowest storey (e.g. Parnell 1993, p. 20). The origins of this idea lie in the fact that previous scholars were unaware of the existence of square great towers with apsidal projections other than at Colchester Castle and the Tower of London: it was accepted, on minimal and questionable evidence, that the former owed its existence to underlying Roman remains, yet the White Tower appeared to have been begun earlier and, thus, was easier to explain if its plan was achieved by subsequent modification inspired by Colchester. However, the great tower at Ivry-la-Bataille is now known to have established a similarly scaled double-pile plan with an east-facing apsidal projection much earlier in the 11th century, and, moreover, the evidence for the supposed fortuitous adoption of the plan at Colchester has not stood up to close scrutiny (Impey 2008a, pp. 239–41). Turning to the structural evidence of the White Tower itself, it is clear that to date the only indication that the apse could be secondary is a minor discontinuity at the junction of the foundations of the apse and east wall, recorded in a photograph of 1955–6 (Harris 2008, fig. 38). That this relates to the lowest levels of the east and apse walls that otherwise show remarkable consistency in their banding of rubble and in their lack of plinths suggests that this anomaly does not indicate two separate phases of construction. Indeed, the primary nature of the apse is positively supported by the facts that, first, the short length of plinth running north from the south-east corner of the White Tower terminates against the wall of the apse; second, the neatly mitred corner of this plinth lies a substantial 1.7m too far to the east to align with the east wall; and, third, archaeological excavation of the interior of the apsidal basement room in 1965 revealed no evidence of any discontinuity in the fabric, but, rather, a 390mm wide offset running around the entire room at the primary floor level.¹

Likewise, the identification of distinctive and unusual shelly mortar (unique to the pre-break construction) elsewhere in the basement as low as 8.40m OD and as low as 7.09m OD on the plinth of the south wall, means that there is a strong case for rapid and continuous construction from foundations to the first-floor building break. Finally, when the design implications of adding an apse are considered fully in terms of both the external bay divisions of the White Tower and the precise and related geometry of the first-floor chapel (Harris 2008, pp. 90–3), it is even more apparent that the idea of the apse being added to the White Tower has no basis in structural analysis.

Entrance floor

Other than the main entrance, the internal arrangement of the entrance storey replicates that of the basement, although the spine wall has a doorway at the southern end in addition to that at the north. Offsets at floor joist level mean that the east and west rooms are slightly larger than below, at 20.81m × 8.74m and 27.63m × 11.32m respectively. As at basement level, the east room is distinguished by a recess at its southern end, although on the entrance floor it is shallower (1.80m) and wider (6.12m) (Figure 12.5). The barrel-vaulted apsidal room is also larger than that below (15.34m × 4.23m), mainly due to a 1.42m-deep recess in the west wall. The increased sophistication of this room compared to its counterpart in the basement is also seen in the treatment of the apse, with its more extensive use of ashlar, in the fenestration that is extended to include three windows on the south side, and the small unlit room (3.37m × 2.56m) that opens off the north wall. Unlike their basement equivalents, the east and west rooms have preserved something of their primary internal arrangement in that they have timber arcades, with the posts supporting the wide span of the floors: the surviving posts, however, are post-medieval and it remains a matter of pure conjecture as to whether any primary supports took the form of single or, as now exists, double arcades. Although the barrel-vaulted window embrasures survive largely intact, the 11th-century windows themselves have been replaced, mostly in 1638–40, and then again in 1715 (the east and west rooms) and 1881–2 (the apsidal room). The steps in the floors of the embrasures in the apsidal room suggest that the windows here were smaller than in the other rooms, but there is no accurate record of the original fenestration. The spine wall on the entrance floor differs from the solid wall below in that it is penetrated by three wide plain openings and two doorways at the extremities. The soffits and reveals indicate that the plain openings were formerly blocked on the western side, and this is corroborated by the complete absence of Romanesque quoins and voussoirs on this side: confusingly, even recently published plans show the recesses on the wrong side (e.g. Parnell 1993, fig. 9, p. 21). Both east and west rooms have fireplaces. That in the east room has

been restored, while the other is in a less doctored but more ruinous state. The wall over the latter slightly projects, raising the possibility of a more subtle version of the conical hoods found at Loches (Mesqui 1998), but the evidence is far from conclusive and there may have been no more than an arch spanning the fireplace on the plane of the wall. The provision for garderobes on the entrance floor comprised two at the northern end of the west room only. The eastern of these was mostly obliterated during the construction of the splayed opening to the north doorway in the 16th century, but enough survives to show that it was a mirror-image of its dog-legged western counterpart, which is better preserved.

While no longer the only entrance to the White Tower, the doorway in the westernmost bay of the south elevation at this level provided the only known primary external entrance, raised roughly 6.4m above the external ground, as it is today. The location of the entrance on the south side probably reflected the greater importance attached to the elevation facing the river, and would have opened into the larger part of the bailey, which is known to have surrounded the building. The position of the doorway in the westernmost bay implies that the external stair ran eastward, parallel to the façade. Perhaps we can assume that this was still the case in the later 12th century, when the south forebuilding that protected the top of this stair was almost certainly in existence (Harris 2008, pp. 86–90). Significantly, similar arrangements are found in the square keeps at Canterbury, Corfe, Norwich, Rochester, and Castle Rising. Although not ornamented, the doorway passage is given special treatment in that it is of ashlar (here mostly comprising dolomitized Chalk), with the exception of the rubble vault. Moreover, in the side walls there are niches,

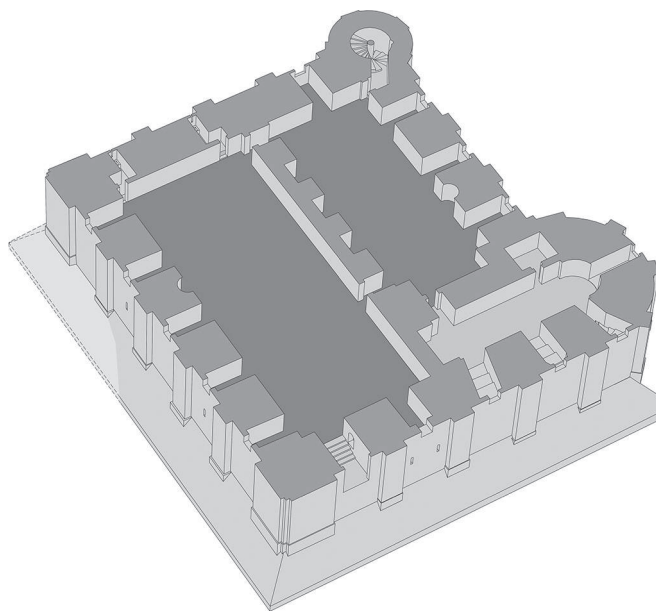


Figure 12.5. Entrance floor: three-dimensional reconstruction of the primary form (Historic Royal Palaces. Drawing: Helen Jones).

which although now rectangular in form, preserve evidence of their original roundheaded arches and bear comparison with the single example at Colchester Castle.

First floor

The first floor replicates the three volumes of the two floors below (Figure 12.6), although the progressive offsets mean that at this level the east and west rooms are larger, at 19.69m × 9.29m and 29.20m × 12.04m respectively. Lateral fireplaces in both east and west rooms (the latter is blocked) duplicate those below and intercommunication follows the pattern of the entrance floor. Minor differences are to be found in the absence of a recess at the southern end of the east room, an additional doorway linking the apsidal room to the western room, and in the distribution of the garderobes, with both rooms in this case provided with a pair. More significant differences are to be found in the greater number of windows, and in the provision of staircases in the north-west and south-west corners. Although the east and west rooms now have post-medieval timber arcades, in this case supporting the floors above, the absence of a second floor in the original building strongly suggests that these rooms contrasted from those below in that they were uncluttered by posts: it is possible, however, that the primary roofs utilized mid-span supports. The third, apsidal, room has the greatest difference to its entrance-floor equivalent, for at this level the aisled chapel of St John rises up through two storeys to include a gallery and a stone barrel-vault. Although, it went out of

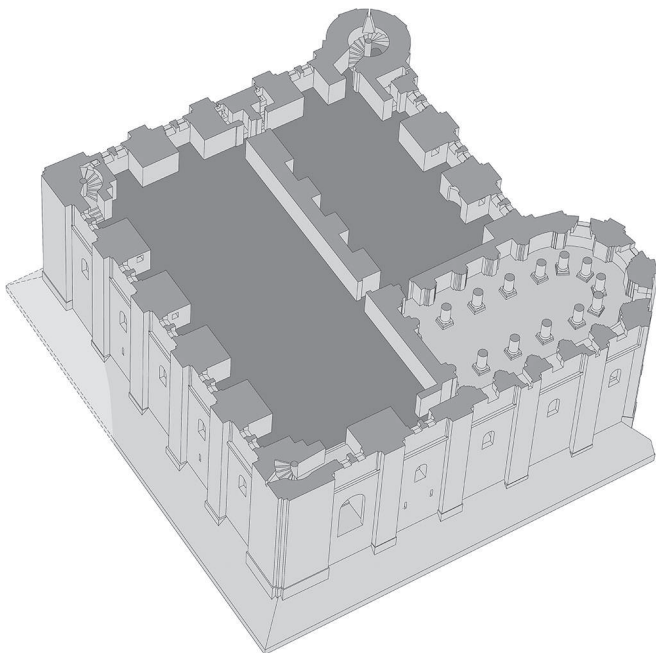


Figure 12.6. First-floor: three-dimensional reconstruction of the primary form (Historic Royal Palaces. Drawing: Helen Jones).

ecclesiastical use by the early 14th century and was thereafter adapted for a variety of other functions – notably a store for records – the chapel remained largely intact. As a result, the restoration by Salvin in 1864 involved little more than removal of a spiral stair from the ambulatory, replacement of aisle respond abaci lost to shelving, and replacement of 17th-century Portland stone windows with what he considered more appropriate designs (Keay and Harris 2008, pp. 209–12). The form of the chapel, its famous capitals, and its art historical context were studied anew in the course of the recent investigations (Crook 2008), and the findings are summarized elsewhere in this volume in John Crook’s paper.

The exterior of the first floor is more elaborate than that of the other levels, which, together with the location of the chapel here, strongly suggests pre-eminence of this storey. The main embellishment is the blind arcading, in which wide arches surround the windows and span the bay widths between the buttresses. Examination of the south elevation in 1996–8 confirmed that the blind arches were a primary feature, not on the basis of the arches themselves – which are entirely of 17th-century and later Portland stone – but on the basis that the rubble walling (which is essentially primary) is offset at the arch by up to 200mm. Portland stone (as well as other more recent) replacement of the voussoirs and the angle order from which the arches spring is evident in the apsidal, east, north and west elevations too, but the 2008–11 investigation showed that it is less complete and that primary ashlar (comprising Quarr stone, Bembridge limestone and Caen stone) survives, most of which is *in situ*, in the angle orders.

The large windows within these arches date from 1805, replacing smaller double-windows of 1638–9. As with most of William Mills’s 17th-century repairs at the White Tower, these double-windows exactly perpetuated the 11th-century arrangement and dimensions: this is evident from the intact Romanesque rear arches in the second bay from the west in the north wall at this level. Externally, the recent investigations have identified other survivals from the primary first-floor windows, comprising an *in situ* jamb in the south elevation, together with four *ex situ* primary voussoirs found at first-floor level in masonry in the north and west elevations, reset during the 1638–40 repairs. Two of the voussoirs were of Quarr stone (a stone that ceased to be used outside the immediate hinterland of the quarries on the Isle of Wight from c. 1120), with the others comprising Bembridge stone and Reigate stone (both key primary ashlar types at the White Tower). All four were from arches of c. 650–80mm diameter, which corresponds precisely with the narrow double-windows at this level as rebuilt in 1638–9 (c. 660mm). These four voussoirs suggest that the Romanesque double-windows were of simple form, lacking mouldings. This plainness is confirmed by the part-surviving jamb in the western bay of the south elevation, in which the quoins have no outer moulding and run back into the

wall (i.e. there is no return which would have allowed for a nook shaft). Internally, the Romanesque barrel-vaulted embrasures survive largely intact, again lacking any evidence for stepped floors. Uniquely, the embrasures on each side of the fireplaces in the two main rooms at this level have small square cupboards. They have plain timber lintels, two of which have produced dendrochronological dates (felling date ranges of 1055–87 and 1072–1104) linking them to the primary construction.

Second floor, roof and turrets

Today the second floor of the White Tower differs from the other storeys in matters of detail only. With the first-floor chapel rising through two storeys, there is, of course, no self-contained apsidal room at this level, but a barrel-vaulted gallery instead (Figure 12.7). The chapel gallery forms part of a mural passage that makes a complete circuit of the White Tower, cutting through window embrasures that are otherwise similar to those below. The east and west rooms are present again, and are also separated by a massive spine wall: offsets at floor level make these rooms a little larger than those below at $29.23\text{m} \times 12.36\text{m}$ and $19.74\text{m} \times 9.36\text{m}$.² Some elements of the floors below are missing, however, for the second floor has no garderobes or fireplaces. Moreover, the details are less sophisticated. For example, the voussoirs of the embrasures and spine wall openings (the latter were never only recesses here) are of rubble, not ashlar. The north-east, south-west, and north-west stairs reach this level and continue further up the corner turrets, which then break free of the building. In the chapel roof space a fourth turret rises from the top of the barrel vaults of the chapel, giving the White Tower a degree of symmetry it would otherwise lack. The irregular plan of this turret does not imply that it is secondary, but rather responds to its position above the ambulatory of the chapel: the east face of the turret is precisely angled so that it loads onto the piers of the gallery and main arcades of the chapel below. Despite this general consistency with the storeys below, the second floor of the White Tower has been viewed for many years as a substantial modification of the original design. The most consistently presented view of the primary form has been one in which the first-floor east and west rooms rose through two storeys in the manner of the chapel (e.g. Armitage 1912, p. 225, no. 2; Allen Brown 1984, pp. 30–2; Parnell 1993, pp. 20–2). The second-floor mural passage then becomes akin to a clerestory passage, overlooking the principal rooms. Such a model explains the absence of garderobes and fireplaces, and, indeed, the need for a mural passage. More recently, it has been suggested that the primary form of the White Tower was gabled, with the rest of the north and south walls and the east and west mural passages added later (Parnell 1998). The recent investigations have shown that the reality was rather different.

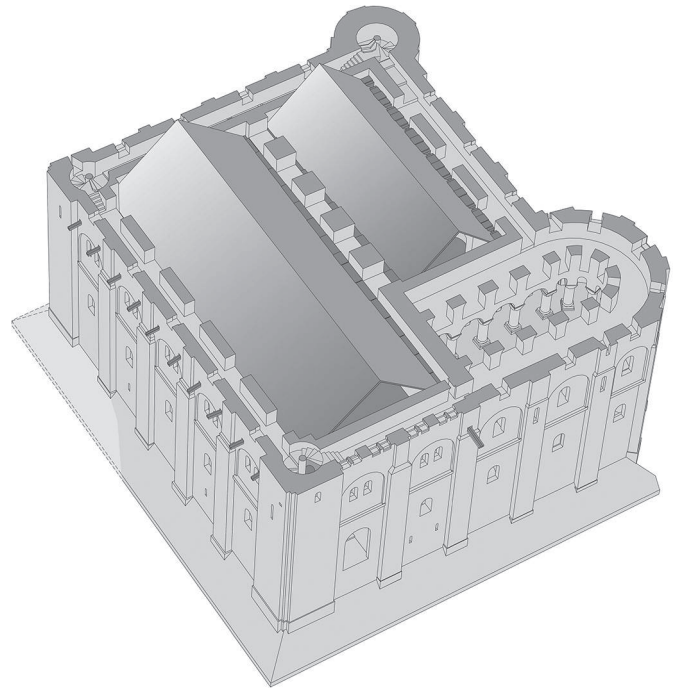


Figure 12.7. Second floor: three-dimensional reconstruction of the primary form (*Historic Royal Palaces*. Drawing: Helen Jones).



Figure 12.8. Primary roof scupper, or drain, unblocked in the northern bay of the east elevation in 2008, showing lead lining over disintegrating timber channel (Photo: Roland Harris).

The most important element of the primary roof was that it was a storey lower than that surviving today, which, on the basis of dendrochronology, has been dated to *c.* 1490. The evidence for the lower and more steeply-pitched roof comprises a soot imprint of the roof in the south wall of the east room (first recorded in 1966), scars of similar roof abutments in the north and south walls of the west room, and a series of scuppers, or roof drains, below the east and west mural passages (Figure 12.8). Many of the latter were excavated in 1996, with others investigated externally in 2008–11, showing survival of wooden drains with lead coverings: these presumably continued as spouts projecting clear of the building. Although now finished to look like the other scuppers, the squared hole in the west face of the south-west turret was examined in 2010 and found to be a putlog hole. That the lower roof was surrounded by the walls essentially as they survive today, rather than having gables, is clear from the homogeneity of the fabric of the closely studied south and north elevations, the stairs, the turrets, the mural passages, and, above all, the end walls of the two rooms. The spine wall is also tied into the primary fabric at both ends, and, uniquely at this level, exhibits a dramatic taper in plan. Given that it rose above the primary roofs and was necessarily flanked by gutters, or roof valleys, it is likely that the tapering was designed

to increase the width of the long drains of the enclosed roof at their narrowest points. The original boxed-in roof form of the White Tower was something of a norm and existed, for example, at Norwich, Montrichard, Portchester, Richmond, Rochester, and the south-west gatehouse at Sherborne Old Castle. That the walls rising above the eaves of an enclosed roof could be given false fenestration is also seen at Hedingham.

Dating the primary construction

Documentary evidence

The earliest unambiguous reference to the Tower of London makes it plain that the White Tower was in existence or well advanced: in the course of an explanation of how the cathedral church of Rochester came to possess several London properties from Eadmer the Cripple, the *Textus Roffensis*³ relates that ‘Gundulf, by command of King William the Great, was supervising the work of the great tower of London’ (*Textus Roffensis*, Hearne 1720, p. 212). As Gundulf was appointed to the see of Rochester on 19 March 1077, it has become something of a tradition to date the construction of the White Tower to 1078, or *c.* 1080. However, the *Textus Roffensis* does not imply that the bishop

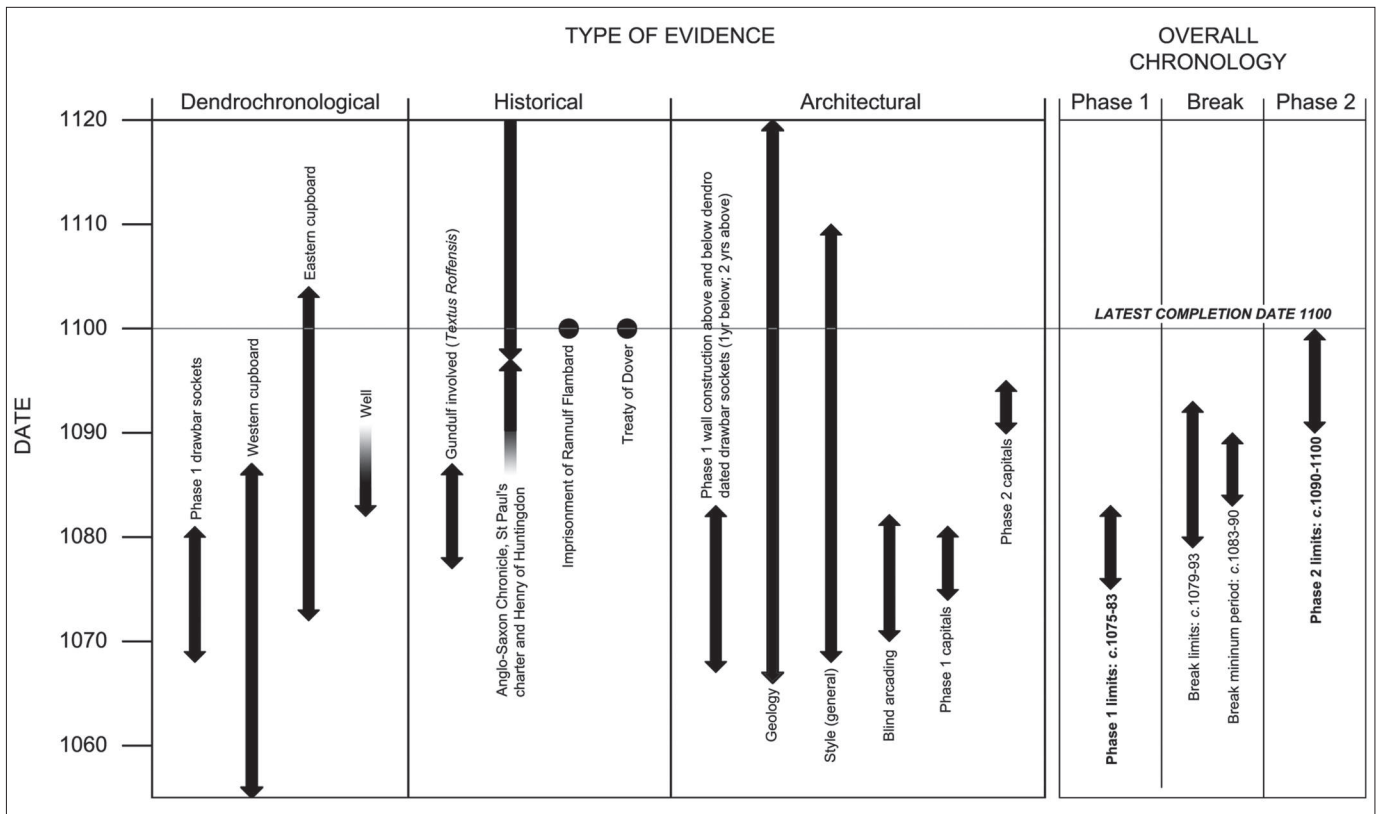


Figure 12.9. Summary of the diverse evidence for the chronology of the primary construction of the White Tower (Diagram: Roland Harris).

initiated the works, or that they were in progress immediately after his appointment, but simply that Gundulf was involved with the building of the White Tower sometime between becoming bishop in 1077 and the death of William I on 9 September 1087.

That the building was well under way by 1097 is clear from the *Anglo-Saxon Chronicle* entry which records that in that year many shires whose labour was due at London were hard pressed because of the wall that they built about the Tower [*tur*], and because of the bridge [i.e. London Bridge] that was nearly all carried away by a flood, and because of the work on the king's hall, that was being built at Westminster, and many a man was oppressed thereby (Whitelock 1961, p. 175).⁴ Together with a charter of 1093–7 by which William II confirmed exemption of St Paul's demesne from work on the 'castle of London, the wall, the bridge and the bailey, as the writ of my father ordered' (Gibbs 1939, Charter No. 13, p. 15), these sources confirm that the castle was still under construction in the 1090s, with the implication that the White Tower itself was complete, or well advanced, by 1097 and that work on an enclosing wall was in progress.

The completion of the White Tower is also implied by the accounts in the *Anglo-Saxon Chronicle* and by Orderic Vitalis of the famous escape from the castle by William Rufus's chief minister, Rannulf Flambard, in 1101 (Whitelock 1961, p. 177; Chibnall 1975, pp. 310–2). The *Anglo-Saxon Chronicle* records the prison as the *tur on Lunden* while Orderic uses the term *arce Lundeniensi*: both almost certainly refer to the White Tower. Additionally, Orderic recounts how Rannulf organized a great feast and then, while the guards slumbered drunkenly, escaped down a rope tied to a shaft in the middle of a window. Orderic's references to the building imply that the White Tower was complete and this concurs with the more general inference that can be drawn from Rannulf's imprisonment: that the building was fit for use as a prison and for feasting. It is unlikely that a half-completed building, let alone an active building site, would have provided secure or suitable accommodation. If it is to be accepted that Rannulf was imprisoned in a great tower that was near, if not wholly, complete, then the dating of his escape at Candlemas (2 February) 1101 means that the building was finished by or in 1100: an 1101 building season would not have begun as early in the year as Candlemas. Moreover, as Rannulf Flambard was sent to the Tower by Henry I in August or early September 1100, this would imply that works were completed by that date. The condition of Henry I's treaty with Robert Curthose of 1101 that, should he break it, hostages would be imprisoned in the Tower of London (*Turri London'*) supports this, in addition to being the earliest date by which the White Tower is known to have given its name to the whole castle (Chaplais 1964, no. 1).

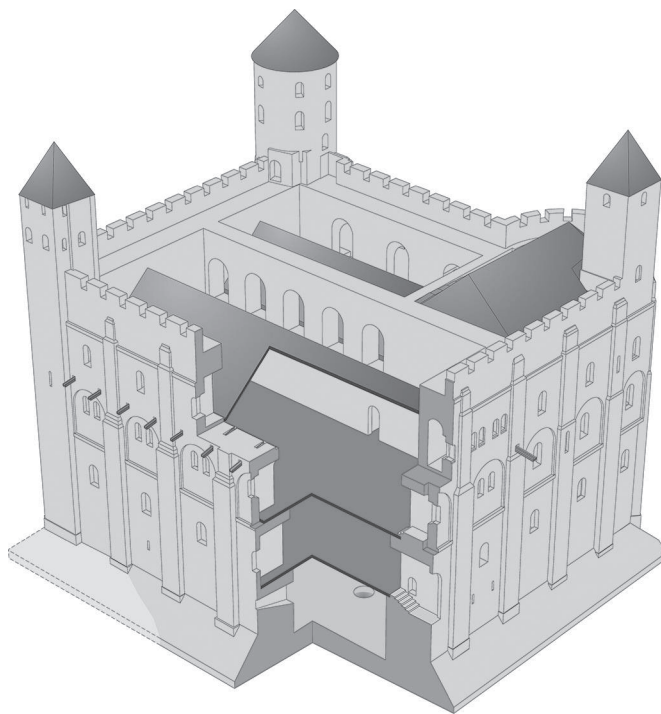


Figure 12.10. Three-dimensional cut-away reconstruction from the south-west (*Historic Royal Palaces*. Drawing: Helen Jones).

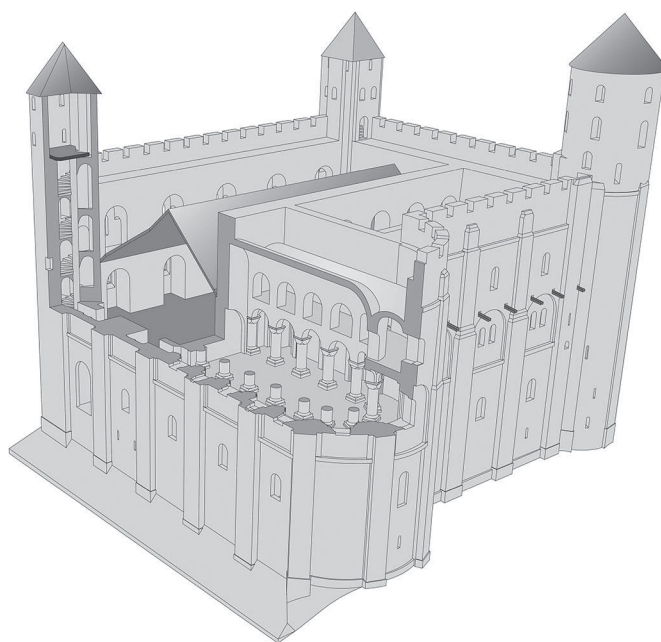


Figure 12.11. Three-dimensional cut-away reconstruction from the south-east (*Historic Royal Palaces*. Drawing: Helen Jones).

Architectural evidence

The chronology indicated by the architecture of the White Tower is typically broad, reflecting the long currency of aspects of the design, workmanship and materials, especially given the simple and robust nature of many of the details. For example the overall design – a combination of a tower of double-pile construction with multiple storeys and a projecting apsidal chapel – is known from Ivry-la-Bataille in Normandy in the early 11th century, as well as from at least two other examples from northern France in the 12th century (Impey 2002, 2008a). Specific features at the White Tower that can be identified simply as symptomatic of Norman construction prior to the early to mid-12th century include the vaulting in the two rooms below the chapel, the garderobes, and mural passages; the pilaster buttresses, of which we know only the general form; the fireplaces, which have lost their hoods; the plain non-rebated doorways; the plain windows; and the spiral stairs with rubble vaults rather than structural steps.

Several other features are unusual, but no more closely datable: into this category must go the recesses in the spine wall on the entrance and first floors, and the round-headed niches in the side walls of the entrance. There are also features for which dated parallels can be found but which,

it must be suspected, are insufficiently distinctive to be used as grounds for dating the White Tower: an example is the double-course of ashlar immediately above the junction of plinth and wall, which is found at the castles of Canterbury (c. 1100–20) and Colchester (probably 1080s), but which probably represents a more widely used feature in buildings mainly of rubble construction.

More distinctive is the use of blind arcading on the first floor of all four external elevations and the chapel apse, which finds its closest parallels in the blind arcading that encloses the gallery windows at St Etienne, Caen (begun in the early 1060s and well advanced by 1070; Figure 12.12), and at Lanfranc's Canterbury Cathedral (1071–7) where sufficient fragments survive to show that arches enclosed the clerestory and, very probably, the gallery windows. The more sophisticated architecture of the chapel of St John, however, provides the best scope for stylistic dating. Here, study of the bases, capitals, and responds of the arcade, and the side aisle abaci confirms that construction of the chapel was indeed interrupted by a significant building break (Figure 12.13). Inevitably, it is the capitals that have proved most datable, and they have been the subject of a thorough re-examination in the course of the recent investigations. A detailed analysis of the sculpture has been undertaken by



Figure 12.12. *St Etienne, Caen, south side of nave showing arcading surrounding the gallery-level windows (Photo: Roland Harris).*



Figure 12.13. *St John's chapel: view looking south-east (Photo: Roland Harris).*

John Crook (Crook 2008) and is summarized in his paper in this volume. The eight chamfered block capitals and the single free-standing volute capital are best paralleled by other examples from the mid to late 1070s. This is in contrast to the remaining capitals, for which the closest parallels date from the early 1090s.

Dendrochronology

The recent investigations included dendrochronology that, while inevitably concentrated on the predominant later medieval and, especially, post-medieval carpentry, included the few surviving primary timbers. Felling dates have been determined for boards lining drawbar sockets for doorways in the basement (after 1068), the main entrance (after 1050), and elsewhere on the entrance floor (two samples, one dating to after 1052 and the other, with a heartwood-sapwood boundary, giving the only precise range of the series, to 1049–81). The linings to the drawbar sockets were so constructed that they must have been placed in position as the wall around them was being built. The lintel of a first-floor cupboard in the west room produced a heartwood-sapwood boundary at 1046, giving a felling date range of 1055–87, while a counterpart from the east room produced a heartwood-sapwood boundary

at 1063, giving a felling date range of 1072–1104. A dendrochronological match was achieved for one of the wooden drains at the primary eaves level on the east side, but this had no heartwood-sapwood boundary and thus the timber simply dates from after 1101: given that it came from a simple board c.100mm (4") wide, in contrast with the carefully channelled drains surviving in the west wall and, as discovered in 2008, elsewhere in the east wall, it must be suspected that this relates to an early repair. More securely primary is the beech template at the bottom of the well, which dated its construction to after 1082.

The building break and a new chronology for the building of the White Tower

The combining of this diverse evidence for the dating of the construction of the White Tower needs to accommodate the evidence discovered during the recent investigations for a hitherto unsuspected building break. This break was first suspected during the analysis of St John's Chapel, where John Crook identified various anomalies in the construction, and where the two groups of capitals suggest quite different dates. The subsequent survey programme identified more widely distributed and clearer evidence that includes a fundamental change in the bedding mortar type from one with a very

high concentration of small bivalve shells to one with little or no such shell, but with large pieces of unburnt chalk: this change was observed on the interior and exterior around sill height on the first floor. The change in mortar type that marks the building break is echoed in the geological variation of the building stones. Although successive banding of different types of ashlar is no evidence of a break in itself, the overall difference in distribution is consistent with it and it is noteworthy that the top of the band of Quarr stone marks the level of the break as indicated by the change in mortar. More tangible evidence for a building break is seen in the abrupt reduction in the use of ashlar. This is especially clear in the three spiral stairs where the ashlar lining gives way to rubble: in the case of the north-west and south-west turrets this is particularly striking as they only begin to rise from first-floor level, so that the ashlar to rubble transition is almost immediate. The reduced use of ashlar is also visible externally in the bays between the buttresses where there are ashlar quoins to the internal, or re-entrant, angles at the lower two storeys only: the additional angle order of the blind arcading of the first floor means that the break is obscured, but the second floor has no ashlar quoins. More obvious still is the change from ashlar to rubble on the faces of the three full-height corner turrets and the wide north-west buttress of the chapel apse.

While no significant modifications to the design are apparent following the building break, the changes in technique, mortar type and stone supply, and the remarkably horizontal level of the break across the whole building, suggest that the pause in construction was more than a normal seasonal break. At near-contemporary Colchester Castle a pause in construction just above the level of the existing first floor was sufficiently substantial for the building to be battlemented at this lower level and justifies doubt as to whether the putative final three-storey height of Colchester was originally intended. There is no such evidence for use of the White Tower on the completion of Phase 1, and the level of the break midway through a storey, but too high for battlements, positively suggests this was not the case. Furthermore, the fact that the first floor, with its two-storey chapel and the north-west and south-west stairs, was begun before the break reveals that the Phase 2 fabric was not in any sense an afterthought, but fully part of the original design.

The early documentary references strongly suggest that work was completed by 1100, but do not provide such a convincing *terminus post quem*. If the connection between Gundulf and the Tower is accepted, it is still not immediately clear when he was involved, or indeed whether he inherited responsibility for an existing construction project. In this light, the date range for the building of the lower part of the White Tower (Phase 1) provided by dendrochronology has particular significance, since it gives a more precise outer limit for the start of construction: 1068 minus perhaps one year to allow for the foundations, giving *c.* 1067. The dendrochronological

dating of the lower part of the White Tower also provides us with the latest likely date for the building break: 1081 plus perhaps two years to allow for the 6.63m of Phase 1 walling above the highest dated drawbar socket, giving *c.* 1083. The dated lintel in the western room around the level of the break means that at the very latest Phase 1 was completed by 1087, although this would represent improbably slow construction of the walling above the entrance-floor drawbar sockets, or, even, the storage of timber prior to use. Stylistic dating provides some evidence for Phase 1 belonging to the 1070s, with the chamfered block capitals and the free-standing volute capital in the chapel having closest parallels in the mid to late 1070s. Such comparative dating of sculptural detail is more precise as a means of dating the Phase 2 capitals in St John's Chapel to the early 1090s. On reasonable structural grounds, the upper part of the White Tower must have been finished soon after, and this accords well with the latest completion date of 1100 suggested by the documentary sources. Thus ranges of *c.* 1067–83 and *c.* 1090–1100 almost certainly contained the two primary construction phases of the White Tower.

Needless to say, this does not imply that construction in Phase 1 lasted fully 17 years or that Phase 2 lasted fully 11 years. Studies agree that the rate of tower or keep construction during this period was typically 10–12ft (3.1–3.7m) per year (Renn 1960, pp. 1–2; Harvey 1950, p. 17) so it might be expected that Phase 1 lasted as little as five years. Phase 2 involved more complex architectural detail, inherently more laborious work at height, and more complex carpentry and roofing, and may be supposed to have taken a little longer. Evidence for the rapidity of progress in Phase 2 (especially the lack of ashlar) may mean that even this phase was also as short as five years. Possible corroboration of the rate of construction in Phase 2 is provided by what appear to be annual building breaks visible on the interior of the upper part of the north-east turret, which suggest 2.8m for one year. Placing an actual building campaign within the broad date limits of *c.* 1067–83 of Phase 1 is helped by the oft-quoted *Textus Roffensis*, which, thus, assumes a new significance. If Gundulf was involved in supervision of the construction of the White Tower after his appointment as bishop and before the death of William I, then Phase 1 must have been still underway at some point within the period 1077–87. As we have seen, dendrochronology provides the basis for a probable end date of *c.* 1083 for Phase 1 and thus permits the refinement of the chronological limits of Gundulf's work for the Conqueror at the White Tower to 1077–83. Furthermore, for Gundulf to be so firmly associated with the works in the time of William I, whilst Bishop of Rochester, it is fair to assume that Phase 1 extended into this period by a year or two at the very least, suggesting that Phase 1 could hardly have finished prior to, say, 1079. The shorter date limits of *c.* 1090–1100 mean that there is less uncertainty for Phase 2. On the basis of the dating of the later capitals

of St John's Chapel, which must have been amongst the first work when construction resumed, any shorter period of actual construction is most likely to have started in the early 1090s, but not before *c.*1090. This accords well with those documentary references that seem to imply that the White Tower itself was complete by 1097. Therefore, while lacking the robustness of our more general chronological framework – which dictates that construction of the White Tower began no earlier than *c.* 1067, had finished by 1100, and saw a major pause in construction in at least the years between *c.* 1083 and *c.* 1090 – there are good grounds to suppose that we can achieve something very near to the actual chronology of the construction programme. Such diverse evidence as we can draw upon suggests that the somewhat extended period of primary construction at the White Tower began around 1075–9, was completed by 1100, with a break probably beginning *c.* 1079–83 (and most probably *c.* 1080) and ending *c.* 1090–3. The break, then, is unlikely to have been less than 7 years in duration and may have been as much as 14 years.

Notes

- 1 A north–south wall or revetment was also exposed in the 1965 excavation, which appeared to be part of the primary construction: it is too far to the west to be identified as the surviving eastern wall prior to the addition of the apse.
- 2 The width measurements are minimums since the spine wall tapers (see below, p. 184).
- 3 The *Textus Roffensis* is a term used since the 16th century for a cartulary of Rochester Cathedral compiled in the 1120s that was bound together with another manuscript, possibly in the 13th century and certainly by the 14th century: Flight 1977, pp. 17–18.
- 4 The building of the wall surrounding the Tower (*turrim Londonie*) in 1097 is also mentioned by Henry of Huntingdon, writing in the 1120s (Henry of Huntingdon, ed., Greenway 1996, pp. 444–5).

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