architectural planning in the early medieval era

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Abstract
In the early middle ages the cathedral was the height of human achievement; it embodied the whole of Christian knowledge and attempted to mimic the divine. It was the ritual, spiritual, economic and physical centre of the city. These vast edifices welcomed pilgrims and strangers; they arose from the ground and seemed to reach the heavens. As the cathedrals grew larger and larger because of the demand of the pilgrims, there was a need for better building planning to cater for this demand. Yet little is known about the planning of these massive buildings. Vitruvius, who is considered the father of architecture, was discussed at the court of Charlemagne, and copies of his ten books on architecture survived throughout the libraries of Europe in the middle ages. However, although Vitruvius outlined a theory of planning and explained how the architect was to convey his plans to his masters and labourers, he was vague on the details regarding how this was to be carried out. This paper considers architectural planning of the early medieval era by looking at surviving plans and considering whether there was a consistent theory of planning, and, if so, whether it differed from Vitruvian theory.

When considering formal building and architecture through history, one name stands above all others: Vitruvius. His collected work, entitled *De Architectura*, was dedicated to the emperor Augustus early in that emperor’s reign; in modern times it has become known as *The Ten Books on Architecture*. Most works on the history of architectural theory begin at the renaissance with the ‘rediscovery’ of Vitruvius. The generally accepted story was that in 1416 Poggio Bracciolini and Cencio Rustici uncovered a Vitruvian text in the monastery library of St Gall.¹ The rediscovery of Vitruvius led to the translations and commentaries of renaissance theorists such as Leone Battista Alberti (1404-1472), Sebastiano Serlio (1475-1554), Daniel Barbaro (1514-1570), and Andrea Palladio (1508-1580). These works stimulated a classical revival and a style of architecture that became symbolic of the end of the renaissance. However, there are 78 Vitruvius manuscripts that survive from before this ‘rediscovery’, and 16 of these are from the early medieval period.² Thus it has been said that Vitruvius was a continuing architectural force throughout the early medieval era.³

² Krinsky, ‘Seventy-eight Vitruvius manuscripts’, 26-33.
The archaeology of villas and temples from the first century reveals significant differences from the principles laid down by Vitruvius and a broader range in the orders of architecture than the limited range he described.  

Vitruvius in fact appears to have had minimal influence in antiquity and the early imperial era. Pliny the Elder quoted him twice in *Naturalis Historia*, and the earliest compendium of Vitruvius’s *De Architectura* was from the third century, written by M Cetius Faventinus and entitled *De Diversis Fabricis Architectonicae*. It appears that Cassiodorus (sixth century) and Isidore of Seville (seventh century) were aware of Vitruvius’s work, but they do not quote or acknowledge him directly. Many abbreviations of the Vitruvian text were made in the early medieval period, making the text more practical and eliminating the text that was thought to be extraneous. Faventinus stated:

> On proficiency in the art of architecture Vitruvius Pollio has written eloquently and at length, and other authors with extraordinary knowledge. But for fear that their length and erudite copiousness may frighten less aspiring intellects of these studies, I have taken the resolution to clothe in everyday language a few items from their works, to be of use for private needs.

His purely practical adaptation is quite different to the spirit of the ‘rediscovery’ of Vitruvius, where the emphasis was on the theoretical side and works were written so that there would be ‘an understanding and knowledge of all the highest and most noble disciplines’, a work for the renaissance nobleman.

For Vitruvius, ‘Architecture depends on Order, Arrangement, Eurhythmy, Symmetry, Propriety, and Economy’. These five fundamental principles of architecture are the basis of his ten books on architecture. However, it is only Arrangement in the early medieval period that this paper will consider. Arrangement is the placement of things in

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4 P R Du Prey, *The Villas of Pliny from Antiquity to Posterity* (Chicago, 1994) 133.
8 Faventini, ‘De diversis fabricis architectonicae’, 41.
their correct position and the consideration of the elegance of this placement: the overall plan of the building. This form of expression Vitruvius called ‘ideas’; it consisted of ichnographia, orthographia and scenographia, where these terms are translated as ground-plan, elevation and perspective respectively. Vitruvius defined these three terms thus:

A ground-plan is made by the proper successive use of compasses and rule, through which we get outlines for the plane surfaces of building. An elevation is a picture of the front of a building, set up right and properly drawn in the proportions of the contemplated work. Perspective is the method of sketching a front with the sides withdrawing into the background, the lines all meeting in the centre of a circle. All three come of reflexion and invention.11

The modern translation of ‘scenographia’ is perspective, for the want of a better word, although this is not to say that Vitruvius understood the linear perspective or *perspectiva artificialis*, which was thought to be unknown in antiquity and an invention of the renaissance.12 However, the question of whether Vitruvius understood ‘scenographia’ as some sort of geometric space is greatly contested.13 His ‘ideas’ appear to be a more holistic approach similar to the Aristotelian concept of *phantasia* (image-representation); that is, ideas were not just a set of drawings, but rather these drawings were only fully understood through mental images.14 Vitruvius did understand the laws of optics, and he referred to optical corrections of columns based on the laws of optics as *perspectiva naturalis*.15 These optical corrections considered the visual width of columns as viewed from the ground, so that the columns would look as though they were tapering upwards regardless of whether they actually did taper upwards or not in their geometry. Vitruvius was aware of Euclid’s *Optics*,16 which is a work of geometry, but Vitruvius’s optics addressed visual, not geometric, corrections. Vitruvius was more concerned with the theory of numbers and modules than geometry. However, more revealing is his discussion of the fifth-century BCE painter Agatharcus, who painted a scene for a play and left a commentary about it:

This led Democritus and Anaxagoras to write on the same subject, showing how given a centre in a definite place, the lines should naturally correspond with regard to the point of sight and the divergence of the visual rays, so that by this deception a faithful representation of the appearance of buildings might be given in painted scenery, and so that, though all is drawn on a vertical flat façade, some parts may seem to be withdrawing into the background, and others to be standing out in front.17

This fascinating paragraph implies that paintings and drawings did use some sort of optical laws, but how far this translated into a form of geometric space is difficult to discern. It is more likely to have been a visual space, particularly considering that Vitruvius’s optical corrections of columns were visual and not geometric.18 Nevertheless, Vitruvius’s concept of ‘ideas’ was complex and the architectural arrangement of a building required all three forms of expression – ground-plan, elevation and perspective – to convey the architect’s intention.

Over three centuries later, Faventinus’s compendium paraphrased Vitruvius’s ideas as:

three sorts of figures called the plan, the elevation and the perspective. The elevation is the setting out of the proposed side walls and height. The perspective is the display of the façade and the whole building with the help of painting.19

In his commentary he just lists the three figures without any comment or any explanation. Faventinus gave little attention to plans and planning; his emphasis was more on the practical elements of architecture, such as the digging and lining of wells,20 on preparing brick walls for their final coat,21 how to make sun-dried bricks,22 and so on. In his paraphrase of Vitruvius, ground plans do not even warrant a definition and perspective appears to be an impossible view of the whole building. Given the style of paintings of the third century, it is difficult to comprehend how much accurate information could be conveyed by the architect to the builder through this means. Furthermore, Faventinus does not mention the painted scenery of Agatharcus. Yet it is mainly through the short adaptations of Faventinus’s compendium that Vitruvius was carried into the early

19 Faventini, ‘De diversis fabricis architectonicae’, 41.
20 Faventini, ‘De diversis fabricis architectonicae’, 49.
21 Faventini, ‘De diversis fabricis architectonicae’, 57.
22 Faventini, ‘De diversis fabricis architectonicae’, 57.
medieval period.23 Faventinus did not always adapt Vitruvius exactly, and he gave his own measurements of spaces between scantlings of deal poles,24 thickness of lime,25 a different order of the cornices as the lower border of the vaults26 and many other details which make it possible to distinguish between Faventinus’s text and Vitruvius’s original.

Paul, in 1 Corinthians 3.10-17, outlined an enduring master-builder metaphor; he turned away from the concept of a physical temple to the congregation and the spiritual temple within. The congregation, ‘as living stones, are built up a spiritual house’,27 and Christ was the ‘cornerstone’ of the spiritual house. This concept of the church as a spiritual house permeated medieval thinking and can be seen in the writings of Augustine,28 Gregory the Great,29 Bede30 and many others. However, while the concept of the building was raised to spiritual and divine heights, the knowledge of architecture and the tools of the architect were less understood or in decline.

According to Vitruvius, an architect was a man with ability and education; he must be:

both naturally gifted and amenable to instruction. Neither natural ability without instruction nor instruction without natural ability can make the perfect artist. Let him be educated, skilful with the pencil, instructed in geometry, know much history, have followed the philosophers with attention, understand music, have some knowledge of medicine, know the opinions of the jurists, and be acquainted with astronomy and the theory of the heavens.31

However, by the fifth century, architects were not esteemed as highly as a perfect artist. In Martianus Capella’s The Marriage of Philology and Mercury, seven bridesmaids represented the seven liberal arts and each gave a presentation in her discipline at the wedding of Philology and Mercury. The seven liberal arts were for the education of philosophers and theologians; they were not for the education of the ‘trades’. At the wedding of Philology and Mercury, Jupiter became restless after listening

26 Faventini, ‘De diversis fabricis architectonicae’, 73.
27 1 Peter 2.5.
29 The Homilies of Saint Gregory the Great ed T Gray (Etna CA, 1990).
30 Bede, De Templo trans S Connolly Bede: On the Temple (Liverpool, 1995);
Bede, De Tabernaculo trans A G Holder On the Tabernacle (Liverpool, 1994).
to the seven bridesmaids’ presentations and asked if there were any more bridesmaids to be heard. Apollo suggested that Medicine and Architecture wanted to give presentations, but he claimed that ‘since these ladies are concerned with mortal subjects and their skill lies in mundane matters, and they have nothing in common with the celestial deities, it will not be inappropriate to disdain and reject them’. The seven liberal arts were sufficient for the gods, who had no interest in mundane, earth-bound subjects. The concept of the ‘architect’ had changed: from Vitruvius’s architect as perfect, learned artist, to Capella’s architect who was a mere earth-bound technician.

Vitruvius was discussed at the court of Charlemagne. Alcuin, who is credited as being one of the engineers of the Carolingian renaissance, related two anecdotes from *De Architectura*. Charlemagne’s biographer Einhard, who had a reputation as poet, grammarian, mathematician, and architect, wrote to one of his students, Vussin, suggesting that Vussin might consult Virgil for the meaning of some of the difficult terms in Vitruvius, particularly the term ‘scenographia’. Thus it appears that by the ninth century, ‘scenographia’ was not understood by the architects of the day. However, Einhard appears to have been more interested in Vitruvius’s obscure words and names rather than applying his principles to actual architecture.

Few medieval architects were courtiers. Generally, the architects were master masons who functioned in four major areas: as the designer, as the administrator, as the building contractor and as the technical supervisor. The medieval master mason was a master of the mason’s craft, a man who had risen from the ranks. There has been no study on the literacy level of the master mason of the early medieval period; it can be surmised that his knowledge of building was handed on from generation to generation of craftsmen. The Vitruvian principle of Arrangement began to be described as an ‘architectural function’ by the medieval master builders who

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33 Rykwert, ‘On the oral transmission of architectural theory’, 43.
36 It has been noted that in the later medieval period there was a greater need for literacy because of the subtleties of contracts: see L C Lambdin and R T Lambdin, *Chaucer’s Pilgrims* (London, 1999) 161. However, the existence and complexity of building contracts for the early medieval period is not recorded.
37 L R Shelby, ‘The role of the master mason in mediaeval English building’, *Speculum* (1964) 387-403, at p 387.
‘ordained’ and ‘disposed’ the work.\(^\text{38}\) Vitruvius’s description of the form of expression of architectural Arrangement was scanty enough and lacked any real detail; the formalised concept of Arrangement as a means of architectural communication between designer, patron and builders does not appear to have had much relevance to the medieval builders.

Still, there must have been some form of overall plan. To transmit complex architectural ideas and to provide the technical details, the master mason could have used several techniques. He could copy an already existing building, construct a model of the proposed building, or supply drawings of the ground plan and elevations,\(^\text{39}\) which would be supported by oral communication. There is evidence of all of these techniques being used, but none appears to be completely sufficient on its own. For example, stylistically there are many medieval churches and castles that are loosely ‘copies’ of existing buildings. To copy the features of another building is quite possible. However, to copy the entire building without formalised instructions or plans would require the whole team of tradesmen, not just the master mason, to be familiar with the building that they were copying, as well as all of its details. There would need to be a more specific plan; but there is no surviving evidence of any ‘pattern book’ in the early medieval period allowing styles of windows, vaults and arches to be copied from one building to another. By itself, copying from an existing building would not be a very satisfactory way of communicating an overall plan of a building.\(^\text{40}\)

A range of images of small-scale models from the early medieval period have survived in depictions of individual designers and patrons. These models, which have much in common with the mosaic of Justinian at Hagia Sofia, are all associated with church architecture, and relate to the relationship between buildings and their representations.\(^\text{41}\) For example, in Gloucester cathedral, there is a Gothic recumbent effigy of the Saxon abbot Osric, who clasps a model of the abbey church to his chest. At Ravenna, a fresco depicts an archbishop offering a model of the church of San Vitale to the titular saint.\(^\text{42}\) In Rheims, the master mason of Saint Nicaise, Hugh Libergier, is depicted in the church grasping its scale model.\(^\text{43}\)

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\(^{39}\) Leaving out perspective plans, since the state of drafting and painting of three-dimensional buildings in the early medieval period could not convey any useful construction information or design detail.

\(^{40}\) Shelby, ‘The role of the master mason in mediaeval English building’, 391.


\(^{43}\) Morrison and Ostwald, ‘Shifting dimensions’, 143.
These models are signs of their bearers’ achievements as well as symbolic devotional offerings. These are not working models; they are early forms of the presentation model, a representation in the form of the building that has been constructed to convey a message. In these cases, the messages signify the role of the creative individual as well as the power, and supposed divinity, of the patron.\footnote{Morrison and Ostwald, ‘Shifting dimensions’, 144.} No models that have survived from the early medieval period were intended for demonstrating the design or conveying information to the builders. Even if they were, there would still have been the difficulty of translating the information provided by the model into the technical details necessary for the precise work of the stonemasons.\footnote{Shelby, ‘The role of the master mason’, 391.} The massive edifices of the cathedral or castle would have needed more specific instructions than a model could convey.

A few plans have survived from the early medieval period, including the ninth-century Plan of St Gall\footnote{MS 1092, Stiftsbibliothek, c820.} and two twelfth-century plans of Christ Church waterworks.\footnote{Tripartite Psalter, Cambridge, Trinity College MS R.17.1, folio 285, c1147.} Other plans of buildings exist, such as plans of Solomon’s Temple, the Tabernacle\footnote{For example, the floor plan of the Tabernacle from the Codex Amiatinus, Florence, Biblioteca Medicea Lautenziana MS Amiatinus I, folios 2v-3r.} and the plans of the buildings in the Holy Land sketched to illustrate Adomnán’s \textit{De Locis Sanctis}.\footnote{These plans were originally drawn by Bishop Arculf into wax tablets; however, the surviving illustrations are by Walahfrid Strabo, d849. These can be seen in Adomnán, \textit{De Locis Sanctis} ed D Meehan (Dublin, 1958).} However, these were sketches of existing buildings and were not executed as working drawings for a new building, or as conveyers of building instructions. Nonetheless, what they do demonstrate is the poor state of plan drafting in the early medieval period.

Both the Plan of St Gall and the plans of Christ Church waterworks also have problems as conveyers of building instructions, and could not be considered ‘working drawings’ without the assistance of other forms of information. The Plan of St Gall is a ground-plan for a complex of buildings, but each building is defined minimally in only a few lines. The plans of Christ Church waterworks are a mixture of ground-plan and elevations in one image, and in reality they define neither ground-plan nor elevation clearly because of the confusion of shapes and lines.

A strong oral tradition would have been needed to support these plans. This oral tradition ‘must have been a body of intellectual speculation, a body of theories about the nature of building, not merely a handful of rules-of-thumb’.\footnote{Rykwert, ‘On the oral transmission of architectural theory’, 32.} There is evidence for both this oral tradition and the master mason’s control of the building process and design. William
of Sens was the master mason of Canterbury cathedral, and from 1179, after falling from a scaffold above the high altar, he had to direct the construction of the building from the ground. Descriptions of William’s direction still exist: ‘He orders his men about but rarely or never lends his own hand. Pointing his walking stick, he directs, “Cut here,” or “Cut there” [and is promptly obeyed].’ Contemporary accounts reveal that one of William’s tasks was to prepare the mouldings for the shaping of windows, arches and vaults; these would be delivered to the stonemasons to shape the stone accordingly. There is also evidence of a special area or room called the ‘tracing house’, where the master mason would trace onto the floor the full size details of the arches, piers and windows.

The oral tradition was strong and, with the support of tracings and mouldings, constituted the main form of direction given to the builders. Architectural design of the early medieval period was strongly dependent upon the master mason. On the basis of existing buildings and tracery from the early medieval period, it appears that the master mason had an excellent understanding of Euclidian geometry. This can be seen particularly in romanesque and early Gothic cathedrals such as Salamanca, Saint Denis, Notre Dame and many more. Theories of proportion, visual space, numbers and modules were strongly represented in Vitruvian theory; however, many of the designs of the medieval tracery adhere to the geometric axioms and propositions of Euclid. In the early medieval period, this practical geometry dominated over the theoretical systems of proportion of Vitruvian theory, and the practice of this geometry is preserved in the details of the early medieval buildings.

The ultimate holistic plan of the building and its details may only have been known by the master mason, since there was no way of expressing the plan adequately, and his continued association with the project was therefore essential. Nevertheless, the master mason himself would have needed some form of overall plan or model to convince the city or the patron of the building to invest their money in his concept, or to employ him over others. Since there are no surviving models of the early

51 F Gies and J Gies, Cathedral, Forge and Waterwheel: Technology and Invention in the Middle Ages (New York, 1995) 192.
52 Shelby, ‘The role of the master mason’, 393.
53 Shelby, ‘The role of the master mason’, 394.
54 Gies and Gies, Cathedral, Forge and Waterwheel, 195.
55 See Euclid, The Elements of Euclid trans T L Heath (London and Toronto,1933). Many individual studies of the geometry and tracery of churches have been made: see, eg, A Behan and R Moss, ‘Metrology and proportion in the ecclesiastical architecture of medieval Ireland’, 171-184 in Kim Williams (ed), Nexus: Architecture and Mathematic (Turin, 2008).
57 Shelby, ‘The role of the master mason’, 395.
medieval period the two surviving plans may serve as examples of such an overall plan, or at least part thereof.

The Plan of St Gall was accidentally preserved when an unknown twelfth-century monk utilised the unused side of the parchment to write the text of the *Life of St Martin.* Because the monk folded the parchment and did not scrape the side with the plan, using only the reverse side of the parchment, the plan is in extremely good condition. The plan has been intensively studied and the most significant study was executed by Walter Horn and Ernest Born in *The Plan of St Gall: a Study of the Architecture & Economy of, & Life in, a Paradigmatic Carolingian Monastery,* published in 1979. This is a massive and elaborately illustrated three-volume examination of the plan, and its reconstruction was the result of 20 years’ labour.

The plan is of an entire monastery and is dated generally to c820. In their work, Horn executed a systematic study of the working and living conditions of monastic life in the Carolingian period, which was illustrated with detailed architectural drawings by Born. Horn considered the plan to be a paradigmatic document, an ideal model which would be a guide for monastic planning throughout the Frankish empire. He believed that the plan was copied from an already existing archetype and was developed by the Benedictine reformers following the synods of 816 and 817. In support of this assumption, a careful reconstruction of the monastery was carried out.

Although a complex ground plan, the Plan of St Gall itself is very scantily drawn, and each building has minimal lines. It is very large (112 x 77 cm: see Figure 1). The measurements of the buildings are given and the purpose of each building is specified. However, apart from the church, which dominates the plan, without the scribe’s titles on the buildings it would be difficult to know what the purpose of each of the buildings was. In their reconstruction, Horn and Born used a selection of architecture ranging from German wooden buildings to the church architecture of the romanesque period. Their choice of architecture to fit the outlines of the buildings on the plan is selective and seems quite cavalier. The reconstruction is repeatedly qualified with the words ‘author’s interpretation’ which suggests that it is highly speculative. Furthermore, details such as ovoid shapes in the plan are turned into fireplaces, without justification, and the reconstruction illustrates these buildings with anachronistic chimneys. There is a great deal of criticism of the

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59 Horn and Born, *The Plan of St Gall* vol 1, 20-25.
Figure 1: The Plan of St Gall

60 Copied from Horn and Born, The Plan of St Gall.
reconstruction, which is outside the scope of this paper. The question we consider here is: would a ninth-century master mason understand this plan as a ‘working drawing’? The Plan of St Gall from the building perspective only shows the layout of the building and the plan of the foundations.

It has in fact been questioned whether the plan is a working drawing for a building at all. There is an inscription in the top right hand corner of the plan which reads:

For thee, my dearest son, this design of the layout of a monastery, by which means you may exercise your ingenuity and recognise my devotion, whereby I trust you do not find me slow to satisfy your wishes. Do not imagine that I have undertaken this task because I considered you to need our instruction, but rather believe that it was drawn out of love of God for you alone to scrutinize. Farewell in Christ, always mindful of us, Amen.

Mary Carruthers suggests that the ‘the Plan of St Gall is the earliest surviving instance of an architectural pictura, a device of memory work found commonly … in the literature of the later Middle Ages.’ Unfortunately, she does not give any real evidence that such a device applies to the early medieval Plan of St Gall, except to say that buildings were used as a mnemonic and the inscription implies it was intended to be a mnemonic.

Much has been made of the fact that the scale and the scribe’s instructions regarding the measurements on the plan do not match, and this is also used to support the mnemonic argument. However, the notion of scale is a modern concept and was unknown in the medieval period. Furthermore, none of the late medieval examples of architectural pictura have measurements specified on the plans. This does not rule out the Plan of St Gall as being an early architectural pictura with measurements, but

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63 Quoted in Latin by Horn and Born, The Plan of St Gall vol 1, xx: my translation.
64 Carruthers, The Craft of Thought, 230.
67 Perez-Gomez and Pelletier, Architectural Representation and the Perspective Hinge, 8.
given the size of the plan and the layout of the building it does appear to be a ground-plan.

Clearly the Plan of St Gall could not act as a working drawing on its own but, given the support of oral tradition, ground tracing and mouldings, there is no reason to suggest that this is not a plan for a monastery. A significant number of buildings are included in it: a substantial church; a bathhouse; an infirmary; large kitchens and a refectory; dormitories and individual chambers for the abbot; and sleeping quarters for pilgrims. The construction of each of these features would have required additional instructions over and above a simple ground plan. However, the Plan of St Gall would be sufficient to demonstrate the practical layout of the monastery to the abbot or patron. I argue that it was not the paradigmatic document, the ideal model that would be a guide for monastic planning throughout the Frankish empire, which was proposed by Horn and Born, but a design for an individual monastery.

The plans of Christ Church waterworks are to be found in the Eadwine Psalter and they are an amazing record of the state of hydraulic and engineering practices in the twelfth century. They demonstrate that in the twelfth century the cathedral priory at Canterbury had running water, which was carried through a system of underground pipes to the prior’s chambers, the bathhouse, the infirmary, the kitchen and the refectory.68 The smaller drawing (see Figure 2) shows how the water was carried: from the source to a circular conduit house, it passes through a large reservoir or settling tank and thence through the pipes to the different destinations. This system of settling tanks is in accordance with the theory of Vitruvius.69 On this plan, the pipes appear to run through a vineyard and orchard, so it is possible that a type of irrigation system was involved as well.

The larger plan (figure 3) shows the passage of the water in a more detailed drawing. The buildings are in elevation and are depicted as a bird’s-eye view in the ground-plan of the monastery. The elevation of the buildings is not in scale or proportion and, as noted previously, this is not to be expected; however, all the buildings are shown as being parallel with the cathedral, which in reality is not the case.

The two drawings are not part of the original manuscript and they have been considerably trimmed to make them fit. They are at the very end of the manuscript and bear no relation to the rest of it.70 The drawings are thought to be the work of Prior Wibert, and were probably added to the manuscript as a means of preserving the plans. Prior Wibert is thought to

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68 Gies and Gies, Cathedral, Forge and Waterwheel,188-189.
have been the engineer, or at least the instigator, of the plan, primarily because the buildings depicted are characteristic in style for the date of his priorate (1153-1167). His responsibility for the waterworks has also been attested by several medieval references, and the land for the water tower was purchased during Wibert’s priorate.\(^{71}\)

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\(^{72}\) Copied from James (ed), *The Canterbury Psalter*, folio 286.
Figure 3: Detail of the larger drawing of Christ Church waterworks

The architecture in the large drawing is fairly crude and naïve; the orientation of the buildings is incorrect, so that while their placement is broadly comprehensible, they do not represent an architectural plan. However, as a plan for the hydraulic system it can be clearly followed. In the small drawing, the artist has made no attempt at realism in the architecture, but the workings of the hydraulic system are clear. While the Plan of St Gall is purely geometric and was constructed with simple and minimal shapes, the plans of the waterworks differ greatly; they are complex and detailed patterns. Nevertheless, as a working drawing for the hydraulic system they are practical. Like the Plan of St Gall, they would have needed further instructions in order for their construction to be completed, but both the Plan of St Gall and the plans of the waterworks of Christ Church would have functioned effectively as preliminary working drawings for architecture and engineering.

It is said that Vitruvius was a continuing force throughout the early medieval era. Was that force architectural? Did Vitruvius’s ‘ideas’, that

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73 Copied from James (ed), The Canterbury Psalter, folio 284, 285.
consisted of ichnographia, orthographia and scenographia, have any authority in early medieval building plans? If he had no authority in planning, was there a consistent theory or practice that was utilised instead?

At the court of Charlemagne, Alcuin’s interest in Vitruvius was in the origins of architecture and the architectural orders as described in the *Ten Books on Architecture*, in sections II, I and IV, 1. Both these sections are about the apocryphal accounts of the origins of architecture rather than a strict history of architectural development. Einhard was interested in the linguistic basis of particular words; this suggests a decline in the understanding of some architectural terms. There are 16 surviving Vitruvian texts from the early medieval period, dating from the ninth century. These manuscripts came from Belgium, France, the German Federal Republic, Great Britain, Italy, the Netherlands and Spain. Marginalia may be found on these manuscripts, but there is no clear focus for the marginalia; they reveal an interest in the geometry, the architectural orders and the apocryphal accounts of the origins of architecture. Some marginal notes are corrections of the text in a different hand to that of the scribe, which at least demonstrates a familiarity with the Vitruvian text. However, while there was continued interest in Vitruvius throughout the early medieval period, there is insufficient evidence to claim that this interest influenced architecture in any significant way.

Although Vitruvius’s works were carried into the early medieval era, in both *The Ten Books on Architecture* and, more frequently, through the paraphrased version of Faventinus’s compendium, the theory of planning lost consistency, and appears to have been replaced by a consistent practice of ground plans, oral tradition, tracings and mouldings. The plans, like the Plan of St Gall and the plans of the waterworks at Christ Church, could carry the main concepts of the overall plan in themselves, but they would have relied on the oral tradition, tracings, mouldings and the

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75 Brussels, Bibliotheque Royale, MS 5253.
76 Paris, Bibliotheque Nationale, MS Lat 7227; Paris, Bibliotheque Nationale, MS Lat 10277; Paris, Bibliotheque Nationale, Nov Acq Lat 1236; Selestat, Bibliotheque et Archives Municipales, MS 17.
77 Wolfenbüttel, Herzog-August Bibliothek, MS Guianus 69.
79 Florence, Biblioteca Medicea-Laurenziana, Plut XXX, 13; Vatican City, Biblioteca Apostolica Vaticana, Reg Lat 2079; Vatican City, Biblioteca Apostolica Vaticana, Urb Lat 293.
80 Leeuwarden, Provinciale Bibliotheek, B A Fr 51; Leiden, Rijksuniversiteit, Bibliotheek, Voss 88; Leiden, Rijksuniversiteit, Bibliotheek, Voss 107.
81 Escorial, Library, Folio III, 19.
82 For example London, British Museum, MS Cotton Cleopatra D I; Brussels, Bibliotheque Royale, MS 5253; London, British Museum, MS Harley 2767.
overarching control of the master mason for their execution. Some outlines of sections of the building were engraved onto the rafters of the buildings as they were being built; examples of these can still be seen at Canterbury in England and Bourges in France. Perhaps this indicates that, although there could have been an overall plan, the details of sections were approached individually at the crucial time. In early cathedrals and castles, every detail was supervised by the master mason.\textsuperscript{83} However, the role of the master mason was more than a supervisor; he had to control all aspects of the building and design.

In the fifth century, according to Martianus Capella, architects were mere earthly tradesmen; by the eleventh century, master masons built cathedrals which were the height of human achievement. These cathedrals embodied the whole of Christian knowledge and attempted to mimic the divine. The cathedral was the ritual, spiritual, economic and physical centre of the city. Evidence from the buildings themselves, particularly the tracings and mouldings, reveals that Euclidian geometry became a dominating force in this period. The master mason’s tools of trade were the compass and ruler, and the image of God as the divine architect wielding a compass and ruler began to appear in the eleventh century.\textsuperscript{84} Although the concept of God as the divine architect was established very early in Christian thought,\textsuperscript{85} the wielding of compass and ruler was a later development. This image continued to illustrate bibles well into the fifteenth century,\textsuperscript{86} by which time the role of the master mason had changed again with the ‘rediscovery’ of Vitruvian theory.

Although Vitruvius’s works continued to be copied in the early medieval period, they do not appear to have had much effect on planning and building practices. Vitruvius’s ideas, which consisted of ichnographia, orthographia and scenographia, were obscure and difficult to understand. In Faventinus’s practical third-century adaptation of Vitruvius’s theories, the description was minimal, making it more difficult to follow. By the ninth century, Vitruvius’s terms were no longer understood. Architectural planning moved from planning theory to planning practice, until, during the renaissance, practice once again gave way to Vitruvian theory.

\textsuperscript{83} Gies and Gies, \textit{Cathedral, Forge and Waterwheel}, 195.
\textsuperscript{84} Examples from the eleventh century are Eadwin Gospels, Kestner Museum, Hanover, folio 9v: 1025; Psalter, British Museum, MS Cotton Tiberius C vi 7v: c1050; Bible, British Museum, MS Royal 1 E vii, folio 1v: c1050: reproductions can be seen in J B Friedman, ‘The architect’s compass in creation miniatures of the later Middle Ages’, \textit{Traditio} XXX (1974) 419-429, at p 427-428.
\textsuperscript{85} Augustine, \textit{The City of God}; T Gray (ed), \textit{The Homilies of Saint Gregory the Great} (Etna CA, 1990); Bede \textit{On the Temple}; Bede, \textit{On the Tabernacle},.
\textsuperscript{86} Friedman, ‘The architect’s compass’, 419-422.