

The *Timaeus* and Durham Cathedral

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1 Introduction

This chapter considers the architecture of Durham Cathedral, begun at the end of the eleventh century, and of Lincoln Cathedral, designed in the thirteenth century, in relation to the geometrical cosmological substructure of Plato's *Timaeus* and in the light of its subsequent interpretations. In the twelfth century, classical philosophical concepts coalesced with Christian theology in the same way that in architecture classical concepts intermingled with Christian traditions. According to Rudolf Wittkower, architecture in the Middle Ages belonged to an “unbroken tradition coming down from antiquity according to which arithmetic, the study of numbers, geometry, the study of spatial relationships, astronomy, the study of motion of celestial bodies, and music formed the Quadrivium of the mathematical ‘arts’” in the scholastic system.¹ As we have seen earlier in this volume, the cohesion of this body of mathematical sciences emerged through the Middle Platonist exegesis of Plato's *Timaeus*.² For Wittkower, the “belief in the correspondence of microcosm and macrocosm, in the harmonic structure of the universe, in the comprehension of God through the mathematical symbols of centre, circle and sphere”, and the other mathematical symbols in the *Timaeus*, “had their roots in antiquity and belonged to the undisputed tenets of medieval philosophy and theology”.³ According to Anna Somfai, the diagrams preserved in manuscripts containing the first part of Calcidius' commentary relate to the four disciplines of the quadrivium, the study of which “serves, in a Platonic fashion, as a path for the mind to ascend from sense perception to abstract concepts”.⁴ This chapter argues that the architecture of Durham Cathedral can be understood in a similarly metaphorical sense as having the same purpose. It will illustrate how

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- 1 Rudolf Wittkower, *Architectural Principles in the Age of Humanism* [1949] (New York: W. W. Norton & Company, 1971; reprint of 3rd rev. edn., London: Alec Tiranti, 1962), 117.
 - 2 See Petrucci, above, Chapter 3.
 - 3 Wittkower, *Architectural Principles*, 29.
 - 4 Anna Somfai, “The Eleventh-Century Shift in the Reception of Plato's *Timaeus* and Calcidius's *Commentary*”, *Journal of the Warburg and Courtauld Institutes* 65 (2002), 1–21, at 5.

by pervading a general visual and spatial culture philosophical concepts can reach a broader audience. It will elucidate the purpose of the ribs on the vaults of these two cathedral churches, which was not explained in medieval treatises and has not been fully expounded in modern scholarship. The clarification of these connections between the geometries of the philosophical treatises and those in the architecture is based on both contemporary written sources and visual observations.

2 Calcidius at Durham

As Raymond Klibansky described, the first half of the *Timaeus* (17a–53c), in Calcidius' fourth-century Latin translation, "was studied and quoted throughout the Middle Ages, and there was hardly a mediaeval library of any standing which had not a copy of Calcidius' version".⁵ One of the earliest such copies, acquired in the sixteenth century by Daniel Heinsius of Ghent, survives in the Vatican Library (Fig. 9.1). By the mid-eleventh century, the increased circulation of this text was such that it was no longer read in only a few isolated centres. In addition to Calcidius' translation and his associated commentary, newer commentaries on Calcidius' text by Thierry of Chartres and William of Conches, from the first half of the twelfth century, and an anonymous set of glosses attributed to Bernard of Chartres also circulated widely.⁶ The Priory Library of Durham Cathedral was no exception to these intellectual developments, containing copies of both Calcidius' *Timaeus*, as a twelfth-century catalogue of its holdings attests, and probably the earliest surviving copy of these *Glosses*, dated to "late in the first quarter of the twelfth century".⁷ The author of

5 Raymond Klibansky, *The Continuity of the Platonic Tradition During the Middle Ages, Outlines of a Corpus Platonium Medii Aevi* (London: Warburg Institute, 1939), 28.

6 For Thierry and William, see Chapter 1, "Introduction", above. For the text of the *Glosses*, see *The Glosae super Platonem of Bernard of Chartres*, Studies and Texts 107, ed. Paul Edward Dutton (Toronto: Pontifical Institute of Mediaeval Studies, 1991), 137–234, and for its attribution to Bernard, see Paul Dutton, "The Uncovering of the *Glosae super Platonem* of Bernard of Chartres", *Mediaeval Studies* 46 (1984), 202–17.

7 Calcidius' translation, listed as "Timaeus Platonis": Durham Cathedral Library [DCL], MS B.IV.24, reprinted in *Catalogi Veteres librorum ecclesiae Cathedralis Dunelm. Catalogues of the Library of Durham Cathedral at Various Periods from the Conquest to the Dissolution*, ed. James Raine, Publications of the Surtees Society 7 (London, 1838), 4. Glosses: DCL, MS C.IV.7, fols. 41ra–49va, written in late Carolingian minuscule, probably in Northumbria in the early twelfth century, online at <https://www.durhampriory.ac.uk/>: see *Glosae*, ed. Dutton, 109–112 (D) for the manuscript, 14 for its date, and 110 for its apparent listing in the same twelfth-century catalogue, a few entries above "Plato's Timaeus", as "Rhetoricae iii". For



FIGURE 9.1 Early tenth-century manuscript of Calcidius' *Timaeus* translation and commentary. Rome, Vatican Library. Public domain. On the left, the sun, moon, and earth; on the upper right, a lunar eclipse with spherical bodies and a cylindrical shadow; on the lower right, the sun with the zodiacal circle, Venus as Hesperus (in the evening), and Venus as Lucifer (in the morning). See Calcidius, *Timaeus*, trans. Magee, 702 and 705

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the latter used a copy of Calcidius' *Timaeus* with some variants from the standard modern edition and from the copy used by William of Conches, but as the copy of Calcidius in Durham no longer survives, it is impossible to say what version of the text it presented.⁸ Added to the manuscript after the *Glosses* is a set of notes on the *Timaeus*, the *Platonic Notes* (*Notae Platonicae*), some of which are extracts from Calcidius' commentary, but others are independent and may be owed to Bernard or his school, since one of them is related to one

the library and its holdings, see S. L. Greenslade, "The Contents of the Library of Durham Cathedral Priory", *Transactions of the Architectural and Archaeological Society of Durham and Northumberland* 11.5–6 (1965), 347–369, and A. J. Piper, "The Libraries of the Monks of Durham", in M. B. Parkes and Andrew G. Watson (eds.), *Medieval Scribes, Manuscripts, and Libraries: Essays Presented to N. R. Ker* (London: 1978), 213–249.

⁸ *Glosae*, ed. Dutton, 131–134.

of Bernard's glosses.⁹ The author, or authors, of these texts clearly paid close attention to Calcidius' commentary, but also showed a high degree of independence in mining it for points of interest and ignoring the rest.¹⁰ All in all, it is evident that before 1150, when the vaulting of the Cathedral nave was being constructed, the monastic community at Durham was not only "in touch with contemporary scholarship as it was developing" at advanced centres such as Chartres, as Anne Lawrence-Mathers has shown, but also, as the *Notes* show, particularly aware of certain passages from the *Timaeus*.¹¹

As the illustration in the Vatican manuscript shows, Plato's treatise raised interest in the spatial arrangement of the universe and in understanding the creation of the world. Alongside Calcidius' exegetical commentary, the *Timaeus* myth served as both a supplement to and an interpretative framework for the biblical story of creation, which helped to visualize the primordial matter from which God created heaven and earth.¹² In Calcidius' *Timaeus* (30b), "after placing intellect in soul and soul in body, [the demiurge] constructed the entire sphere of the living world".¹³ The sensible world is thus a "living being endowed with intelligence" and, like the Cathedral, contains all things that are a reflection of it.¹⁴

In *Timaeus* 36, Plato describes the construction of the soul in mathematical and geometrical terms. The mathematical structure of the universe receives corporeal form as the geometrical structure of the universe, as polyhedral solids. The Demiurge marked off sections of the soul, physical and eternal, according to numerical proportions. Theon of Smyrna interpreted this as the Platonic

9 *Glosae*, ed. Dutton, 111, 235–238. The *Platonic Notes* also follows directly after the *Glosses* in a copy from the Monastery of St Vitus, near Regensburg in Germany, now in Munich (M), and a copy of Italian provenance now in Paris (T): *Glosae*, ed. Dutton, 113–114, 123–124.

10 For Bernard's use of Calcidius' commentary, see *Glosae*, ed. Dutton, 134–135 and Somfai, "The Eleventh-Century Shift", 1.

11 Anne Lawrence-Mathers, *Manuscripts in Northumbria in the Eleventh and Twelfth Centuries* (Woodbridge: D. S. Brewer, 2003), 160.

12 Ittai Weinryb, "Living Matter: Materiality, Maker, and Ornament in the Middle Ages", *Gesta* 52.2 (2013), 113–132, at 125 draws attention to Calcidius' translation of the Greek *hyle*, which encouraged the association of the primordial matter of Creation with the vast, unsettled European forests. For the use of the *Timaeus* to interpret the account of the Creation in *Genesis*, see Saccenti, above, Chapter 6.

13 Calcidius, *On Plato's Timaeus*, ed. and trans. John Magee (Cambridge, MA: Harvard University Press, Dumbarton Oaks Medieval Library, 2016), 47.

14 Calcidius, *Timaeus* 30c, trans. Magee, 47. Glossed by Bernard in *Glosae*, ed. Dutton, 165, as *intellectu dato animae, anima data mundo, per quam rationabiliter movetur* ("with intelligence given to the soul and soul given to the world, by means of which there is motion according to reason").

“Lambda”, corresponding to a spatial arrangement, from point to line to surface to body (point, duality, triangle, and cube).¹⁵ In the series 1, 2, 3, 4, 9, 8, 27, the number 1 represents the point, 2 and 3 the line, the squares 4 and 8 the surface, and the cubes 9 and 27 the solid. The number series 1, 2, 3, 4 corresponds to the Pythagorean tetractys of magnitudes, which also represents the geometrical sequence of point, line, surface, and solid.¹⁶ In his *Glosses*, Bernard discusses this passage after Calcidius, highlighting how this process helps to understand knowledge of the four mathematical disciplines of the quadrivium, “in which is the perfection of science through numbers: arithmetic through what lines, surfaces, and cubes are numbers; geometry through consonances noted in proportion; music and astronomy, which deals with the harmony of the spheres in music”.¹⁷

After making the numerical divisions of the soul, the Demiurge proceeded, in Calcidius’ version of the passage:

he cut the series itself lengthwise and from one series made two, and he forced them round, middle to middle, into the shape of the Greek letter chi [X] and bent them into circles so that their ends joined one another, and he set one circle within the other such that they rotated, one of them in a lateral orbit and the other in an oblique one, and the movement of the outer circle, since it was cognate with the nature of the Same, he called the Same, and that of the inner one he called the Other.¹⁸

The third of the *Platonic Notes* that follow the copy of Bernard’s *Glosses* in Durham Cathedral Library comments on this passage as follows:

Note that in every circle or in a wheel there can be considered an intelligible line, as if drawn through the diameter to every part, which is understood to be immovable, like the axis on which the wheel turns. Therefore, although the firmament revolves from east to west, yet, in as much as it is revolvable, it relates equally to every part, and thus to every part potentially it has that intelligible and immovable line, as if it were a diameter. This intelligible line is called a pole.¹⁹

15 Cornford, 70; Calcidius, *Timaeus* 36a–d, trans. Magee, 57–61. The passage is extensively glossed by Bernard in *Glosae*, ed. Dutton, 179–181.

16 See also Temple, below, Chapter 14.

17 *Glosae*, ed. Dutton, 178–179; Durham Cathedral Library C.IV.7, f. 44v.

18 Calcidius, *Timaeus* 36b–c, trans. Magee, 59; cf. Plato, *Timaeus* 36b6–c5.

19 *Glosae*, ed. Dutton, 236, no. 3: *Nota in omni rotundo vel in volubili posse considerari intelligibilem lineam, quasi per diametrum ductam in omnem partem, quae intelligitur*

The circles in the *Timaeus* are defined as the Same, the outer circle, and the Different (literally, “the Other”), the inner circle, and they revolve in opposite directions on an inclined axis from each other. According to Dmitri Nikulin, “Calcidius takes Plato to say that the two parts of the ‘chi’ are bound by the Demiurge into two mutually connected circles (*duos innexos sibi inuicem circulos faciat*) meeting each other in two points – the one resulting from their initial intersection, the other from the Demiurge’s operation.”²⁰ Joannes de Sacrobosco (1190–c.1256) interpreted these circles in an astronomical context in his *Sphaera* as representations of the ecliptic and the zodiac, or the equator and the zodiac. Illustrations in early modern commentaries on this work of the armillary sphere representing the sphere of the universe (Fig. 9.2) drew on an iconographical tradition established as early as the later thirteenth century and transmitted through manuscripts of Calcidius’ *Timaeus*.²¹

While the circle of the Same is left whole and undivided, the circle of the Different is divided six times to form seven circles, which correspond to the east to west orbits of the sun, moon, and five planets, or the motions of the material world, in turbulence and containing the irrational in the physical world. This, however, also constitutes the establishment of time, the primary measurement by the Demiurge. In *Timaeus* 38c, in Calcidius’ version:

In virtue, then, of this reasoning, this kind of plan, on the part of god, who desired that the generation of time should be brought into effect, the Sun, Moon, and five other so-called wandering stars were made so that the parts of time might be recorded according to a fixed method of measurement and the temporal cycles of return and procession might equally well come within the grasp of number.²²

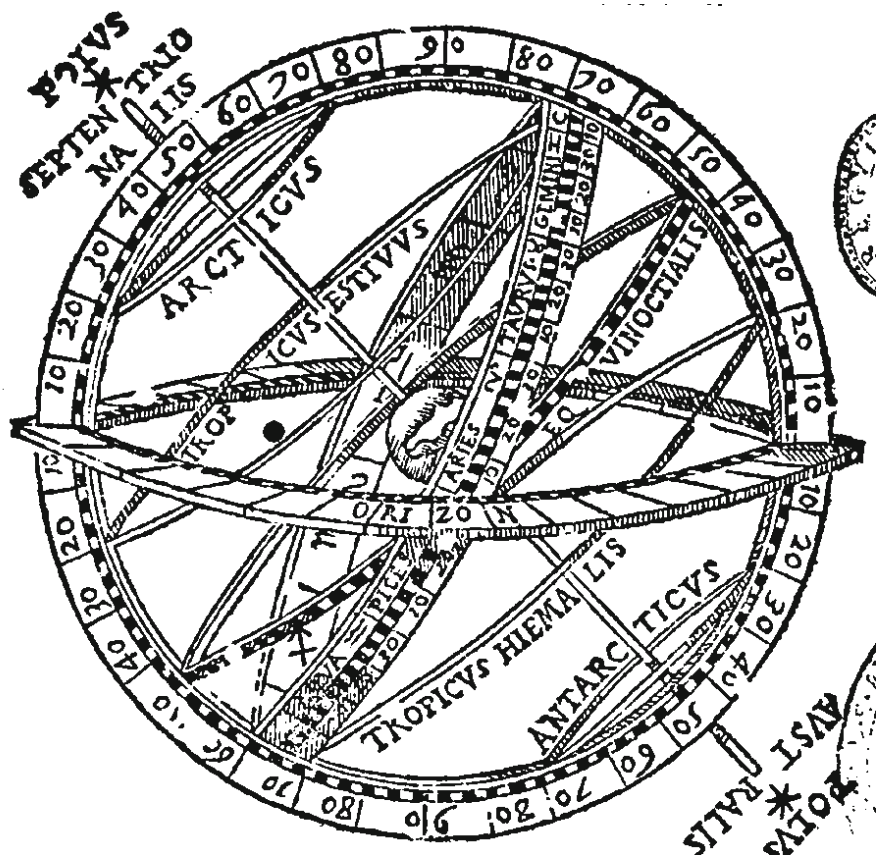
The circle of the Same, in its regular and constant motion, rational and harmonious, is the part of the soul which corresponds to the *archê*, or archetypal

immobilis, sicut axis in quo volvitur rota. Firmamentum ergo, quamvis ab oriente in occidentem volvatur, tamen secundum quod est volubile aequaliter se habet ad omnem partem, et ita in omnem partem potentialiter habet illam intelligibilem et immobilem lineam, quasi diametrum. Quae intelligibilis linea dicitur polus.

20 Dmitri Nikulin, “A new interpretation of Plato’s cosmology: *Timaeus* 36 B–D”, *Méthexis* 13 (2000), 113–118, at 114.

21 Isabelle Pantin, “Borrowers and Innovators in the History of Printing Sacrobosco: The Case of the In-Octavo Tradition”, in Matteo Valleriani (ed.), *De sphaera of Johannes de Sacrobosco in the Early Modern Period. The authors of the commentaries* (Cham: Springer, 2020), 265–312, at 268–269.

22 Calcidius, *Timaeus* 38c, trans. Magee, 65.



The geometries in the design of the universe, like the geometries in the design of the Cathedral, serve to reflect the geometries in the mind of the worshipper in the Cathedral, so that its architecture steadies and purifies their mind. In Calcidius' *Timaeus*, "god gave eyes to human beings so that by observing the circuits of mind and providence that occur in the heaven they might to the advantage of their own mind retrieve circuits which are like and akin to them".²⁵ The purpose of this is that the circuits in the soul, considerations and deliberations in thought, should be "as like as possible, despite their disturbances, to the provident, calm, and tranquil movements of the divine mind", and humans "may correct the erratic movements of the mind" and imitate the "nonwandering circumlation of the intelligible world".²⁶

In her recent book, *Calcidius on Plato's Timaeus*, Gretchen Reydam-Schils writes: "According to Calcidius, 'man is called a "miniature universe" (*hominem mundum breuem a ueteribus appellatum*) because the World body and the human body are made out of the same materials, and the World Soul and the human soul share the same nature'".²⁷ According to Calcidius, Plato divided the human soul into two levels, the rational soul located in the head, governing the soul and body, and the appetitive soul located in the heart, ruled by spirit (*uigor*). Higher soul is indivisible Being, purely noetic, *nous* or *intellectus*, while lower soul is inseparable from bodies (Calcidius, *Commentary*, Chapters 29–31). The thoughts of the Demiurge or craftsman are ideas, exemplars of natural reality, and intellect, the divine origin of the craftsman, adorns the corporeal structure of the universe with harmony, proportion, and reason (Chapter 304). The Demiurge is associated with the divine. As Calcidius wrote: "First, all things that are, including the world itself, are embraced and ruled principally by the Supreme God who is the Supreme Good 'beyond all being' and all nature, who is superior to thought and Intellect, whom all things seek because of His being of complete perfection".²⁸ In his commentary, Calcidius uses the Latin term *species* for the Platonic Form, and a version of the Greek

25 Calcidius, *Timaeus* 47b, trans. Magee, 99.

26 Calcidius, *Timaeus* 47b–c, trans. Magee, 101. Calcidius uses the term *circumactus*, "moving around in a circle."

27 Gretchen Reydam-Schils, *Calcidius on Plato's Timaeus: Greek Philosophy, Latin Reception, Christian Contexts* (Cambridge: Cambridge University Press, 2020), 71, referring to *Timaeus a Calcidio translatus commentarioque instructus*, ed. J. H. Waszink, *Corpus Platonicum Medii Aevi, Plato Latinus 4* (Leiden: Brill, 1962), 221–222, Ch. 202, where Calcidius discusses this as the "building (*aedificatio*) of the human body".

28 Calcidius, *Timaeus, Commentary* 176, trans. Magee, 401.

idea.²⁹ The model (*exemplum*) or archetype (*archetypus*) is seen in relation to its image (*imago*) or impression (*signaculum*).

3 The Language of Rib Vaulting at Durham and Its Cosmic Meanings

Throughout the Middle Ages, God was seen as a mathematician or architect who created all things in number, weight, and measure, as described in *Wisdom* 11:21, and established the *modus species et ordo* ("measure, beauty, and order") of the cosmos described by Augustine.³⁰ Many early medieval writers had connected the work of the Creator to the discipline of arithmetic, including Claudianus Mamertus (420–473), Cassiodorus (485–585), Isidore of Seville (560–636), Rhabanus Maurus (780–856), and William of Saint-Thierry (1085–1148).³¹ At Lincoln, there is direct evidence for such mathematical conceptions of the Creation at the time of the building of its cathedral. Around 1230, Bishop Robert Grosseteste described God as *mensurator primus et certissimus*, "the primary and most certain measurer", or, in the words of James McEvoy, "as a mathematician who established the basic indivisible units of space and time from which the whole extension of the material world is effected".³² As both architectural historians and theologians have recognised, the goal of the designers of the largest medieval churches was to create a microcosm of God's design of the universe, a model of the cosmos.³³ This interest in the construc-

29 Reydam-Schils, *Calcidius on Plato's Timaeus*, 133.

30 August. *De Civ. D.* 11:21; cf. Sheldrake, *The Spiritual City*, 59. Augustine made many references to *Wisdom* 11:21, and thus this scriptural text was influential in medieval Catholic philosophy and architecture. See, for example, Thomas Woods, *How the Catholic Church Built Western Civilization* (Washington, D.C.: Regnery, 2005), 76.

31 James M. McEvoy, "The Divine as the Measure of Being in Platonic and Scholastic Thought", in John F. Wippel (ed.), *Studies in Medieval Philosophy* (Washington, D.C.: Catholic University of America Press, 1987), 85–116, at 106. For the earlier history of the Demiurge/God as architect, see Thomas, above, Chapter 5.

32 Grosseteste, *Commentary on the Physics*, in Richard Dales (ed.), *Roberti Grosseteste Episcopi Lincolnensis Commentarius in VIII Libros Physicorum Aristotelis* (Boulder: University of Colorado Press, 1963), 90–93; James McEvoy, *The Philosophy of Robert Grosseteste* (Oxford: Clarendon Press, 1982), 175–176.

33 See, for example, Otto von Simson, *The Gothic Cathedral: Origins of Gothic Architecture and the Medieval Concept of Order* (Princeton: Princeton University Press, 1988), 37; Philip Sheldrake, *Spaces for the Sacred: Place, Memory, and Identity* (Baltimore: Johns Hopkins University Press, 2001), 51–61; idem, 'Reading cathedrals as spiritual texts', *Studies in Spirituality* 11 (Nijmegen: Titus Brandsma Institute, 2001), 187–204; and idem, *The Spiritual City: Theology, Spirituality and the Urban* (Malden, MA: Wiley Blackwell, 2014), 60: "The architecture of the cathedrals acted as a kind of symbolic landscape, a microcosm in

tion of the universe, filtered through readings of Calcidius' *Timaeus*, informed the building of Durham's great Cathedral, which was under way in the last decade of the eleventh century and became a visual and built model of knowledge for the purpose of instruction in theological and philosophical concepts.

Construction of the cathedral at Durham began around 1093 under the direction of Bishop William de Carilef (or Calais), shortly after the Norman invasion, and under the purview of William the Conqueror.³⁴ The rib vaulting was constructed in the choir probably around 1104, and possibly replaced in 1242, and in the nave around 1133 (Fig. 9.3).³⁵

According to Nikolaus Pevsner and Priscilla Metcalf, this was the first appearance of the rib vault (Fig. 9.4), the most basic element of the vocabulary of Gothic architecture, occurring thirty years before the so-called first elements of Gothic architecture at St Denis in France. For Paul Frankl, the combination of ribs and groin vaults in the choir aisles at Durham was "the constructional foundation of Gothic masons".³⁶ The constructional system of rib vaulting involved the elimination of thick masonry walls. The rib vaults stand on shafts, which rise in the elevation between arcades, and the cells between the ribs in the vault become less substantial than those in Romanesque barrel or groin vaults. Transverse arches and ribs in the Gothic vault are "lines of action", which continue the lines of the shafts, so that the architecture becomes a composition of points, such as the springing points of the rib vaults from the shafts, and of lines in relation to solids. This configuration offers an architectural elaboration of the conception in Plato's *Timaeus*, interpreted by Theon and Calcidius, of the composition of the material universe in a process from point to line to plane to solid.³⁷

The pointed ribs that appear at Durham seem to have been the product of experimentation intended to compensate for structural deficiencies and aesthetic inconsistencies in the vaulting, as illustrated by the earliest rib vaults in the choir aisles. Since the transverse arches and diagonal ribs in the vaulting were of different widths, the arcs of the ribs required adjustment above or

stone and artwork of the whole cosmos evoking a peaceable oneness between Creator and creation."

34 Paul Frankl, *Gothic Architecture*, revised edition (New Haven: Yale University Press, 2000), 41.

35 Frankl, *Gothic Architecture*, 42, 58.

36 Nikolaus Pevsner and Priscilla Metcalf, *The Cathedrals of England: Midland, Eastern and Northern England* (Middlesex: Penguin, 1985), 76; Frankl, *Gothic Architecture*, 42.

37 Pl. *Ti.* 35b.



FIGURE 9.3 Durham Cathedral, vaulting of the nave
AUTHOR'S PHOTO



FIGURE 9.4 Durham Cathedral, interior
AUTHOR'S PHOTO

below a semi-circular profile.³⁸ The weakness of the rib in a shallow profile probably led the architects to compensate with the invention of the pointed rib arch. Because the pointed arch has two radii instead of one, its width to height ratio can be varied from the fixed 2:1 ratio of the semi-circular arch, and the widths of the vaults could be varied in relation to their heights, without sacrificing structural integrity or aesthetic consistency.

This invention, however, was not determined only by structural considerations. Pointed ribs appeared in France soon after Durham, but without the same combination of transverse and diagonal ribs. The first innovation at Durham was to put the rib over the groin, or the intersection of surfaces, of the groin vault, which for Frankl is an even more defining element of Gothic architecture than the pointed arch.³⁹ The introduction of the rib in the vault entails an extra geometrical element, the arc of the circle, in addition to the surface of the half-cylinder or ellipse formed by the groin vault. Although the addition of the rib to the vault has no known effect on the structure of the vault, its introduction has the visual effect of creating distinct and separate areas within the vault, rather than a homogeneous geometrical construct in space.

The geometry is thus simplified and shifts the visible structural logic of the architecture from spatial geometrical construct to surface pattern, a re-emphasis which, it has been argued, would determine the course of English Gothic architecture. According to Frankl, however, while the ribs “created the effect of division in the spatial forms of the vaults and of diagonality in the optical form”, “[t]he principle of structure. ... was not disturbed”.⁴⁰ Jean Bony described how the “Romanesque in England had reached in its late stages a high degree of refinement in the treatment of surfaces: play of light, accents of modelling, interweaving of patterns” and identified Durham Cathedral as the “first definite indication of that trend”.⁴¹ Gothic, which grew out of the experiments at Durham, “stands out as an architecture of strong graphic accents, of sharply inscribed forms, in which space is caught and enclosed not so much by bounding surfaces as by networks of interwoven lines”.

With its emphasis on mass, its huge cylindrical piers, the round arches in the elevations, and the low pitch of the vaulting, Durham Cathedral is a

38 Christopher Wilson, *The Gothic Cathedral, The Architecture of the Great Church 1130–1530* (London: Thames and Hudson, 1990), 22.

39 Frankl, *Gothic Architecture*, 41: “The Gothic style evolved from within Romanesque church architecture when diagonal ribs were added to the groin vault.”

40 Frankl, *Gothic Architecture*, 49.

41 Jean Bony, *The English Decorated Style: Gothic Architecture Transformed 1250–1350* (Ithaca: Cornell University Press, 1979), 43.

Romanesque building, not a Gothic one.⁴² The rib vault and the pointed arch can be seen as outgrowths of the Romanesque, whereas the Gothic was the product of the central role that these would play in building construction, whether for technical or symbolic reasons. There are no precedents in England for the innovations at Durham. While the rib vault appears immediately thereafter in France and plays an important role there in the twelfth century, it would be another century before it played an important role again in England, above all at Lincoln. Whether the rib vault was developed for technical, symbolic, or aesthetic reasons is a much-debated issue, and there is no consensus. As often in architecture, these three considerations are generally combined.⁴³ Frankl, who provides the most in-depth discussion of this issue, explains the presence of the rib on the vault, in the absence of its structural function, as motivated by aesthetics. Such a conclusion is unsatisfyingly vague and simply pushes back the question to ask why such an aesthetic should have arisen. The evidence discussed here for contemporary thinking about the geometries of the *Timaeus* suggests that the potential metaphysical function of the rib is also worth considering. Accordingly, the architecture functions as a model of knowledge, which comprises the structure of the cosmos and the soul as understood in Platonic cosmology and their implications for Christian belief.

Frankl defined the rib as an arch added to the surface of the vault and argued that the Gothic style emerged when diagonal ribs augmented the Romanesque groin vault.⁴⁴ The definition of the Gothic therefore involves the articulation of structure beyond the structure itself. The rib works as a signifier for structure, a linguistic element in architecture, which removes the reading of the architecture from its immediate physical presence, in the same way that language functions as a system of signifiers separate from that which it purports to signify. The idea that elements of architectural vocabulary are comparable to signifiers in language goes back to Vitruvius' *De Architectura*:

Both in general and especially in architecture are these two things found; that which signifies and that which is signified. That which is signified is the thing proposed about which we speak; that which signifies is the demonstration unfolded in systems of precepts.⁴⁵

42 Frankl, *Gothic Architecture*, 49: "The cathedral of Durham is a Romanesque building because it represents the principles of addition, frontality, and structure."

43 This combination could be considered a variation of Vitruvius' famous triad of stability, utility, and beauty: Vitruvius, *De Arch.* 1.3.2, trans. Frank Granger (Cambridge, MA: Harvard University Press, 1931).

44 Frankl, *Gothic Architecture*, 41.

45 Vitruvius, *De Arch.* 1.1.3, trans. Granger, 7.

Vitruvius also considered the number ten to be the perfect number:

Now the ancients determined as perfect the number which is called ten. ... Plato considered that number perfect, for the reason that from the individual things which are called *monades* among the Greeks, the decad is perfected.⁴⁶

The decad refers to the Pythagorean tetractys, symbolising the constitution of the World Soul for Plato in the *Timaeus*. A copy of Vitruvius was available in the Durham Priory Library by the later twelfth century.⁴⁷ The significance of the decad, however, was already clear from Calcidius' commentary on the *Timaeus*, in the second part of which, "On the Origin of Soul", he explains that "the Pythagoreans refer to the number 10 as the primary square on the grounds that it is the composite of the first four numbers, 1, 2, 3, 4".⁴⁸

The emerging Gothic architecture was a system of signification, which resulted from the synthesis of theology and natural philosophy beginning in the early eleventh century.⁴⁹ The additional articulations of its structures correspond to the articulations of theological tenets in philosophical terms. As the material substrate is inaccessible for Aristotle in classical philosophy, so the existence of the divine is inaccessible in medieval mystical or apophatic theology.⁵⁰ The material substrate of the architecture is inaccessible in relation to its intelligible structure, but elucidated and made accessible by the added structural articulation of the rib. The rib is the first vocabulary element in what would become an extensive language of forms developed for the purpose of articulating the intelligible structure of the architecture, or, in other words, the structure of the architecture as understood but not immediately perceived. In Calcidius' *Timaeus*, the intelligible structure of the universe is described as "that which forever is and lacks a process of coming to be", unchangeable and inaccessible to perception, while the world given by sense perception

46 Vitr. *De Arch.* 3.1.5, trans Granger, 161–163.

47 British Library, Additional MSS 38818. The date attributed to this manuscript, produced in north-east England, ranges from c.1150 to the final quarter of the twelfth century. For the role of this text in the design of the Galilee Chapel under Bishop Hugh Le Puiset in the 1170s or early 1180s, see Edmund Thomas, 'The Vitruvian Tradition and the Galilee Chapel of Durham Cathedral', forthcoming.

48 Calcidius, *Timaeus* 35, trans. Magee, 175.

49 John Marenbon, *Early Medieval Philosophy (480–1150). An Introduction*, revised edition (London: Routledge, 1988), 84–89.

50 See John Hendrix, "Apophatic theology in baroque iconology", *Metabasis. Online International Journal of Philosophy* 14 no. 28 (2019), 147–165.

is “forever coming to be but is not”, in the Heraclitan flux.⁵¹ The intelligible structure of the cosmos or the cathedral is, therefore, “perceptible by intellect under rational guidance and investigation”, while the cosmos as perceived by the senses is “opinionable by opinion combined with irrational sense perception and as such is uncertain, subject to birth and death, and never enduring in a constant and fixed condition of existence”, but always changing.⁵² The same might be said of the cathedral, subject to material decay. The sense experience of the worshipper, in response to the building’s material, light, colours, sounds, and smells, corresponds, in Aristotle’s terms, to that sense-based reason (*nous pathetikos*) which would eventually lead to a contemplation of the cathedral’s intelligible forms, or intelligible-based thinking (*nous poietikos*).⁵³ Deriving from the Divided Line in Plato’s *Republic*, such contemplation would be a higher form of thinking connected to God in medieval scholasticism.⁵⁴

The structure of the cosmos or the cathedral, as crafted by a demiurge or master mason, is a “respectable imitation” or “effigy ... resembling and emulating an immortal model persisting in its natural state”.⁵⁵ In the Cathedral, the imitative form consists of a false structural system in the elevations and vault ribs. The apparent structure that is perceptible by the senses at Durham or Lincoln is not the real structure of the cathedral, but only an imitation. The real structure, the buttresses supporting the roof, are not visible behind the elevations. The vault is not the roof. The elevations and vault are, like the shadows on the wall in Plato’s Allegory of the Cave, imitations of intelligible forms available to sense perception.⁵⁶ If the sense model does not correctly imitate the intelligible structure, focusing instead on what is born or generated, then the result, in nature or in architecture, will be “unseemly”.⁵⁷ Birth and generation are necessary for the apprehension of opinion based on sense perception, but only in so far as the world was constructed “on a model of pure and immutable properties”; in order to establish a cosmic order of such pure and immutable properties, “the craftsman god followed a straight edge that served as his venerable model”.⁵⁸ That guild members in medieval architecture used underlying geometrical patterns to compose figural and organic forms in cathedral construction is evident from the sketchbooks of Villard de

51 Calcidius, *Timaeus* 27d–28a, trans. Magee, 41.

52 Calcidius, *Timaeus* 28a, trans. Magee, 41.

53 Arist. *An.* 3.4–5.

54 Pl. *Resp.* 509d–511e.

55 Calcidius, *Timaeus* 28a–b, trans. Magee, 41.

56 Pl. *Resp.* 514a–517c.

57 Calcidius, *Timaeus* 28b, trans. Magee, 41.

58 Calcidius, *Timaeus* 29a, trans. Magee, 43.

Honnecourt for the designs of Laon and Reims cathedrals in France and has been widely accepted.⁵⁹

According to Otto von Simson, Calcidius “insists that the Demiurge, by so dividing the world soul, establishes a cosmic order based on the harmony of musical consonance”.⁶⁰ It became easy to reconcile this notion with the Augustinian idea of a universe created “according to measure and number and weight”.⁶¹ Von Simson observed that for the School of Chartres, following the legacy of Augustine and Calcidius’ and Macrobius’ interpretations of the *Timaeus*, the cosmic harmony established by the Platonic World Soul “is represented ... not only as a musical composition but also as an artistic one, more specifically, as a work of architecture”. He continued:

But for the theologians of Chartres, the notion of the cosmos as a work of architecture and of God as its architect has a special significance, since they assume a twofold act of creation: the creation of chaotic matter, and the creation of cosmos out of chaos. The Greek word *cosmos* signifying ornament as well as order, it was plausible to view matter as the building material, the creation proper as the “adorning” of matter by the artful imposition of an architectural order [the ribs in the vault, for example].

In the *Timaeus*, as read at that time in Calcidius’ translation, the intelligible structure of the cosmos is “removed from the senses and situated within itself” and is “invisible, imperceptible, and evident only to the mind’s attention and awareness”.⁶² Similarly, the intelligible and actual structure of the cathedral is invisible, whereas its visible structure, like the structure of the cosmos that is available to sense perception, is perceptible and, in a process of generation and transformation, “knowable by the senses and opinion”.⁶³ There is a third realm between the intelligible and the sensible, or between being and becoming,

59 See Carl F. Barnes, Jr., *The Portfolio of Villard de Honnecourt: A New Critical Edition and Color Facsimile* (London: Routledge, 2009); Robert Odell Bork, *The Geometry of Creation: Architectural Drawing and the Dynamics of Gothic Design* (London: Routledge, 2018), 2.

60 See, for example, Calcidius, *Timaeus* 47d, trans. Magee, 101: “And harmony, i.e. modulation, being a regulated tension and having agitations that are cognate with and, as it were, akin to the circulations of our soul”; and Calcidius, *Timaeus Commentary* 40, trans. Magee, 185: “As when musicians in tuning instruments within the two extremes set by the outer strings ... insert other intermediate ones of varying tone and pitch ... so god is represented as attuning the world soul”. Otto von Simson, “The Gothic Cathedral: Design and Meaning”, *Journal of the Society of Architectural Historians* 11.3 (1952), 6–16, at 12.

61 Wisdom 11:20, quoted often by Augustine in *The Literal Meaning of Genesis*.

62 Calcidius, *Timaeus* 52a, trans. Magee, 115.

63 Calcidius, *Timaeus* 52a, trans. Magee, 117.

which provides a “seat for the things that are generated”: Place (*locus*).⁶⁴ The *chôra*, in Plato’s original words, is permanent and eternal, but also accessible to sense experience and opinion.⁶⁵

The master mason at Durham who began work in 1093 probably trained in Normandy; so he may have been familiar with examples of remains of ancient transverse crypto-ribs in the ruins of Roman baths in that region. However, the Thermes Saint-Laurent at Bayeux, the former Roman *civitas* capital of *Augustodurum*, which Frankl identified as a possible source, was discovered only in 1760.⁶⁶ The structure at Durham is also unlike anything in France. The arches in the choir aisles (Fig. 9.5) are connected to the groin vault as ribs and extend diagonally from the corner. Such articulation of structure, in Frankl’s view, initiated the Gothic.

The choir aisles were finished in 1095, and the choir vault, with the same diagonal ribs, was finished in 1104, although it needed to be replaced in 1242 (Fig. 9.6). Up to that point, the rib was an arc, rather than of pointed form. The placement of the rib on the groin of the vault eliminated the problem of the “double curve”, a groin vault with one curvature on one axis and another on the other axis, usually because it is set on a rectangular plan. The rib also eliminated the distortion of the curvature due to the position of the masonry walls.

If the rib at Durham was intended to provide extra support for the groin, the ribs in the choir aisles provide no such support. The groin, the intersection of the curved surfaces of the vault, is already the thickest and strongest point of the vault. The structure of the vault never fails along the groin, but rather in the cells tangent to it; thus cracks appear perpendicular to the groin, rather than along it. The use of the rib to strengthen the sturdiest part of the vault may eventually have allowed the masonry of the vault to be thinner, and to be placed on thinner supports, thus facilitating the “dematerialization” associated with the Gothic, but the earliest vaults with ribs are not thinner. The ribs did nothing to alleviate the downward pressure created by the vault on its supports, though they did make the vaults appear lighter. The rib was perhaps a logical continuation of the vertical articulation of the wall, columns, and shafts, in

64 Calcidius, *Timaeus* 52a–b, trans. Magee, 117.

65 Pl. *Ti.* 52a–b. For further discussion of the significance of *chôra* in architecture, see Lisa Landrum, ‘*Chôra* before Plato: architecture, drama, and receptivity’, in Alberto Pérez-Gómez and Stephen Parcel (eds.) *Chora 7: Intervals in the Philosophy of Architecture* (Montreal: McGill-Queen’s University Press, 2016), 323–358.

66 Frankl, *Gothic Architecture*, 41. A crypto-rib is a segment of an arch below the plaster facing of a vault. For the history of the discovery of the baths and a recent survey of both these and the Thermes rue Laitière excavated in 1882, see Grégory Schütz and Charles-Édouard Sauvin, ‘Les thermes gallo-romains de Bayeux-Augustodurum (Calvados, Normandie)’, *Aremorica. Etudes sur l’ouest de la Gaule romaine* 7 (2015), 37–74.



FIGURE 9.5 Durham Cathedral, arches and ribs in the choir aisles
AUTHOR'S PHOTO

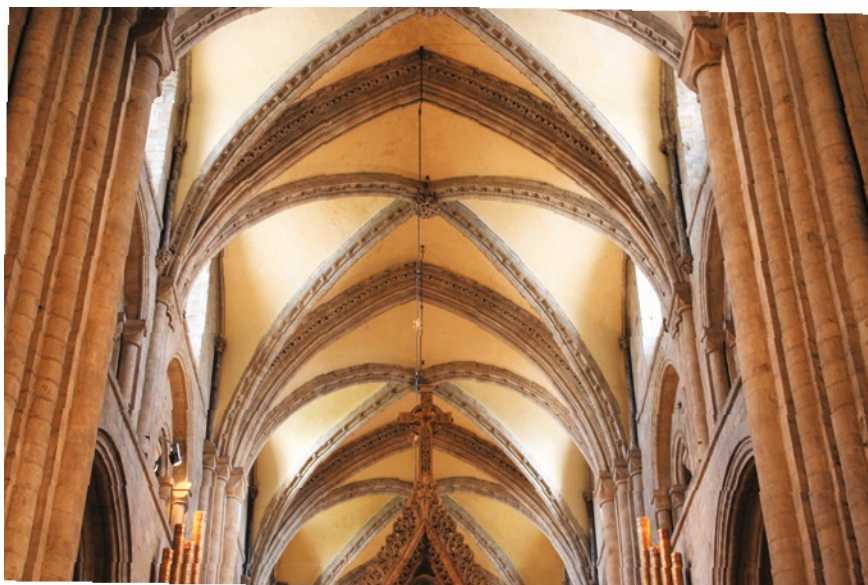


FIGURE 9.6 Durham Cathedral, detail of the choir vault
AUTHOR'S PHOTOGRAPH

a visual signifying structure, but the earliest Gothic ribs are continuations of Romanesque wall articulations, with a discernible visual differentiation. It is reasonable to assume that the introduction of the rib did not relate to the wall articulation nor serve to make the vaults thinner, provide extra support for the vault, or represent the structure of the architecture as a skeletal body.

The rib, then, developed for neither technical, aesthetic, nor symbolic reasons. Since there is no precedent for its development in England or anywhere else, it did not clearly relate to an agenda of national identity. Rather, I argue that the rib related to an agenda of signification, as the development of an architectural language that signified the complex relations developing between theology and natural philosophy in the eleventh and twelfth centuries. Such an agenda was not primarily aesthetic, symbolic, or technical. The ribs on the vaults at Durham visibly resemble the strips in *Timaeus* 36b–c, bending in a circle and forming a letter chi. This layout corresponds to the Demiurge's construction of the soul in *Timaeus* 36b–c and thus suggests the division of the soul between physical and intelligible or eternal.

It is common to label those geometrical elements in architecture that exceed the structural requirements of the building as “aesthetic” or “symbolic”. Yet, if the architecture of the Cathedral is seen as a language and a signifying structure in itself, capable of being a model of knowledge, the language of

architecture, its geometry, may in some instances be neither aesthetic nor symbolic. Of course, architectural geometry can often be aesthetic or symbolic, either within or beyond its structural function. It is, however, characteristic of English Gothic architecture, especially during the Early and Geometric periods from the late twelfth to the fourteenth century, that its geometry is generally neither aesthetic, in the sense of having no relation to structure, nor symbolic in referring to something other than itself. In these early phases of English Gothic, the introduction of compartmentalization and diagonal lines did not challenge the structural logic or integrity of the Romanesque, but extended the lines of statics and pressure in the building's structure. Ultimately, the principles of structure were contradicted in the visual forms, and the geometries of the architecture came to represent "texture" rather than structure, as in the net patterns of Decorated vaults.

As Bony described, the "first definite indication" of the refined treatment of surfaces in English Gothic architecture – "play of light, accents of modelling, interweaving of patterns" – was at Durham Cathedral. The Gothic, which grew out of these experiments, "stands out as an architecture of strong graphic accents, of sharply inscribed forms, in which space is caught and enclosed not so much by bounding surfaces as by networks of interwoven lines".⁶⁷ Yet he did not recognise that this movement towards intelligibility of space and structure in English Gothic became intelligible, communicated through geometry and mathematics, just as the natural world was coming to be understood through geometry and mathematics on the model of the *Timaeus*. The space and structure of these patterned surfaces became increasingly disconnected from the structure of the building as represented visually by horizontal and vertical lines of statics. Ultimately, surface patterns became ornament, which expressed ideas independent of, and even in contradiction to, the structure of the building.

By 1133, segmental pointed transverse arches had been incorporated into the vault of the nave (Fig. 9.7). As there was no original intention to build a vault, there were no shafts built into the elevations to provide support for the ribs; so corbels were inserted into the gallery wall to provide the support. The corbels supporting the segmental pointed transverse ribs stand on responds that extend to the floor, while the diagonal ribs of two quadripartite vaults between the transverse arches are supported by other corbels on either side of the transverse corbel, with smaller shafts below them and free-floating corbels in the spandrel of the gallery in the centre of the bay. All this appears to

⁶⁷ Bony, *English Decorated Style*, 43.



FIGURE 9.7 Durham Cathedral, vaulting of the nave, detail
AUTHOR'S PHOTO

be a structural system supporting the vault, but it is not. Thus already by this date major liberties are taken at Durham with the visual representation of the structural system, and vocabulary elements are introduced which exceed or contradict the actual system of forces in the building, apparently for the purpose of responding to evolving and changing individual, cultural, theological, and philosophical standards. The vocabulary elements introduced at Durham already constitute texture as opposed to structure, an intelligible structural super-system, which both elaborates and contradicts the structural system of the building, allowing the architecture to express an idea, a way of understanding the cosmos. A material imitation fills in for an intelligible structure, as in the *Timaeus*, where the geometries created by the Demiurge are a model for the material structure of the cosmos.

In *Gothic Architecture*, Frankl crudely differentiated a Platonism underlying the Romanesque from an Aristotelianism underlying the Gothic. The writings of Anselm of Canterbury express the Platonic metaphysical tenet in the *Timaeus* that archetypes have existence outside of human thought: "Anselm's proof of the existence of God is based on a Platonic method of thought."⁶⁸

⁶⁸ Frankl, *Gothic Architecture*, 295. For Anselm's "ontological" argument and its debt to Plato, see, e.g., Daniel A. Dombrowski, *A Platonic Philosophy of Religion. A process perspective*

The archetypal organization of a Romanesque building for Frankl, its underlying systems of mathematical and geometrical proportions, is inaccessible to the sensible experience of the spectator, and the architecture provides no access to the archetypes for the viewer. The architecture is composed of regular volumetric forms, like the Platonic solids (*Timaeus* 54d–55c), staged to represent the Platonic Idea, the design of the universe in the mind of the Demiurge, based in mathematics and geometry. The composition of the regular volumetric forms of Romanesque architecture is an additive process, in contrast to the Gothic process of division, and represents a totality as opposed to the divisibility of Gothic forms. The Romanesque building thus represents a *universale* corresponding to the Platonic Idea or archetype. All this changed with the introduction of the ribs onto the vaults at Durham, through which the archetypal substructure of the architecture as a model, possibly a cosmological one, became visible.

In Platonic philosophy, the abstract concept in the *universalia* is regarded as real, but in Aristotelian philosophy only the intelligibles in the mind, the individual manifestations of the Ideas, are real, and the archetype is only a representation, as Plato had also acknowledged. The ribs introduced to subdivide space provide a means to access and interpret the intelligible structure of the building through the viewer's sensible experience of it. These elements of architectural vocabulary function as a mechanism for the ascent of the Aristotelian intellect, from passive, material intellect, determined by sense experience, to creative intellect, determined by the intelligibles, as described by Plato's Divided Line.⁶⁹ Romanesque architecture does not accommodate the viewer's ascent in the cathedral from sense experience to intellectual or spiritual experience; but, in the experience of Gothic architecture, the intellect of the viewer participates in the intelligible understanding of the world. The added geometries of the Gothic, such as the ribbing in the vaults, beginning at Durham, provide material copies of the intelligible forms created by the Demiurge in the *Timaeus*, facilitating the intellectual ascent of the worshipper and appearing to bring together Plato and Aristotle.

Yet, while the *Timaeus* was the only Platonic dialogue known in Europe in the Romanesque period, Aristotle was unknown until the end of the twelfth century. Frankl considered it unlikely that any architect in the eleventh to thirteenth centuries took account of such philosophical questions when designing the architectural details and suggests that these issues were, rather, filtered

(Albany: State University of New York Press, 2005), 81–94, "Arguments for the existence of God".

69 Pl. *Resp.* 6, 510–511.

into the architectural process through the involvement of the clergy. Yet the presence at Durham by 1125 of copies of Calcidius' *Timaeus* and Bernard's *Glosses* makes it clear that some there at least were aware of these ideas. It is possible that the same ideas were in the minds of masons, including the *magister operis*, a master builder, or master of the works, hired by the bishop or king, or the *magister fabricate*, "Master of the Fabric", a member of the clergy acting as administrator of construction. Alternatively, they filtered through to the masons in their interactions with the clergy or with any other educated professional.

The masons' lodges, which were responsible for the design and construction of the building, collaborated with the clergy. The bishop or abbot discussed the program with the mason, and any other urban professional or member of the clergy involved in the building of the cathedral. The clergy and the artisans would have shared a knowledge of philosophy or theology, which provided a basis for aesthetic and even structural decisions.

4 A New Vocabulary of Architecture at Lincoln Cathedral and Aristotelian Readings of the *Timaeus*

The influence of the *Timaeus* on English Gothic architecture continued through the later Middle Ages. At Lincoln (Fig. 9.8) in particular, in the early thirteenth century, a new set of vocabulary elements appeared in the cathedral, which extended the vocabulary of the rib vaults: the ridge pole, a rib down the centre of the vault; the tierceron, an additional, non-structural rib crossing half the vault, used in St Hugh's Choir between 1192 and 1210, or perhaps in its reconstruction after 1239; the lierne, a shorter, non-structural, segmental rib, as on the vault of the nave (1235–1245); the conoid springer vault, a bundle of tierceron ribs springing from the corbel on top of the springer pole into the vault and shaped like a cone, which also appears in the nave (1235–1245); and, finally, the umbrella vault, a centralized conoid bundle of tiercerons springing from a column into the vault, adopted in the chapter house between 1185 and 1235 or after 1239. All these elements contributed to a visual language or system of representation, which would form the basic vocabulary for the entire later history of English Gothic architecture.⁷⁰ One explanation for these unprece-

⁷⁰ See John Shannon Hendrix, *Architecture as Cosmology: Lincoln Cathedral and English Gothic Architecture* (New York: Peter Lang, 2011), 85, 101, 114, 115. Frankl provides some background and development on the etymology of the terms in *Gothic Architecture*, 41, 101, 102.



FIGURE 9.8 Lincoln Cathedral, vaulting of the nave
AUTHOR'S PHOTO

dented geometrical vocabulary elements, widely copied over the next three hundred years, as in Westminster Abbey, is that they correspond closely to the geometries described by Robert Grosseteste.⁷¹

Robert Grosseteste served as Bishop of Lincoln from 1235 to 1253. He was a prolific writer and translator, who laid many foundations for the development of philosophy in the Middle Ages.⁷² Popularly known as the father of natural

⁷¹ See Hendrix, *Architecture as Cosmology*, 2, 3, 4, 7.

⁷² Older scholarship on Grosseteste as a philosopher includes: Alistair C. Crombie, *Robert Grosseteste and the Origins of Experimental Science, 1100–1700* (Oxford: Clarendon Press, 1953); James McEvoy, *Robert Grosseteste* (Oxford: Oxford University Press, 2000); idem, *The Philosophy of Robert Grosseteste* (Oxford: Clarendon Press, 1982); Richard W. Southern, *Robert Grosseteste, The Growth of an English Mind in Medieval Europe* (Oxford: Clarendon Press, 1986). Recently, the Ordered Universe project at Durham University, organised by Giles Gasper, has devoted particular attention to Grosseteste's scientific work. See *The Scientific Works of Robert Grosseteste. Vol. 1. Knowing and speaking: Robert Grosseteste's De artibus liberalibus, 'On the liberal arts' and De generatione sonorum, 'On the generation of sound'*, eds. Giles E. M. Gasper, Cecilia Panti, Tom C. B. McLeish, and Hannah E. Smithson (Oxford: Oxford University Press, 2019); and also Jack P. Cunningham, *Robert Grosseteste: his thought and its impact* (Toronto: Pontifical Institute of Medieval Studies, 2012); and Jack Cunningham and Mark Hocknull (eds.), *Robert Grosseteste and the Pursuit of Religious and Scientific Learning in the Middle Ages* (London: Springer, 2016).

philosophy, he laid the foundation for the Great Synthesis of Albertus Magnus and Thomas Aquinas by combining Platonic and Aristotelian philosophy with Catholic theology. He “introduced Aristotle to the west” with his *Commentary on the Posterior Analytics* (c.1230), the first commentary on Aristotle in Latin, and produced the first translation of the entire corpus of Pseudo-Dionysius. What concerns us here, however, are his cosmological works *De Luce* (*On Light*, c.1215), and *De lineis, angulis et figuris* (*On Lines, Angles and Figures*, c.1235), the first cosmologies since the *Timaeus*.⁷³

The *De Lineis* describes lines of light, which form matter, in geometrical terms. Rays of light emanate in cones, and are refracted (changed in direction) and rarefacted (changed in density) to form various geometries, which correspond to the substructure of matter, as in the *Timaeus*, and to the physical architecture of Lincoln Cathedral. The *species* (*eidos*, or visible form of matter) is projected by light in straight and bent lines, over convex surfaces (as in the piers in the cathedral), concave surfaces (the vaults), in acute or obtuse angles (formed by the tiercerons and liernes), and reflected off concave surfaces. The *species* is thus diffused and refracted, or multiplied, as in the arch tracery or Y-tracery, tri-radial vaulting, and double syncopated arcading in Lincoln Cathedral.

In his writings, Grosseteste distinguished between the sensible and the intelligible, following the *Timaeus* and the Divided Line of *The Republic*. He called the sensible form of an object perceived in vision the *species sensibilis*, and the intelligible form of the object in the mind prior to the perception of it the *species apprehensibilis*. As at Durham, the architecture of Lincoln Cathedral stages the distinction between the sensible and the intelligible, *species sensibilis* and *species apprehensibilis*. The intelligible structure of the building is hidden behind a false structure perceptible to the senses. The ribbed vault is not the actual roof; and the system of springer poles, corbels, and ribs in the elevations and vault appear to be structural, but do nothing structurally, hiding the buttresses that do the actual structural work. As in the *Timaeus*, we are presented with a sensible perceived world, subject to change and decay, namely a copy of the intelligible world, permanent, and unchangeable. The sense experience of the cathedral can lead us to the intelligible understanding of the cathedral, designed by the mason in imitation of the design of the cosmos by the Demiurge.

73 Robert Grosseteste, *On Light*, trans. Claire C. Riedl (Milwaukee: Marquette University Press, 1942). See also Amelia Carolina Sparavigna, *Light, heat and sound in Robert Grosseteste's Physics* (Turin: Lulu Press, 2016).

In the *De Lineis*, Grosseteste formulates a theory of universal motions as applied to particular actions, in order to understand particular occurrences in nature. It is necessary to establish a set of archetypal principles, following the *Timaeus*, but only through perception and sense experience, following Aristotle.⁷⁴ Grosseteste's theory combines Plato and Aristotle. The intelligible element of the cathedral, the archetypal principles, are only attainable through the sense experience of the cathedral. The power or virtue (*virtus*) of the natural object, which the natural agent extends from itself continuously into a passive object, is defined as the *species* (form), which is an imitation or likeness (*similitudo*) of the natural object similarly projected into both matter and the senses.

The *species*, or *eidos*, incorporeal *virtus* or *similitudo* of matter, is transmitted by light and reflected, doubled, and diversified according to lines and angles into the passive agent of perception. This corresponds to the passive intellect of Aristotle's *De anima*, which in itself is only potentiality and requires the entelechy or actualization to participate in the active or universal intellect as a creative force. In the *De Luce* of Grosseteste, light is the first corporeal form, but, "more than the form of corporeity, it is also a principle of activity".⁷⁵ Light is the *species* of bodies, and *species* is more spiritual and simple in higher bodies, and more corporeal and multiplied in lower bodies. Bodies differ in *species* depending on how far they are the product of multiplication. The simplest form is the most unified, represented by the point. Matter, by contrast, is a duality, because it is dense and at the same time susceptible to and receptive of the impressions of the *species*; matter is thus represented by a line, the instrument which connects the point, the simplest and most unified *species*, to corporeal mass in the form of surface and volume. The surface represents composition, while the fourth form, the composite, is a quaternary, the body or, in geometry, the volume. The composition of the material world progresses through these four forms, point, line, surface, and solid, the so-called tetractys of magnitudes by which Theon of Smyrna had interpreted "the numbers with which Plato constructs the soul in the *Timaeus*".⁷⁶

74 As for Frankl, *Gothic Architecture*, 296: "The Platonic theory that general concepts are real (realism) is contested by the Aristotelian theory that only individual manifestations are real and that general concepts are only names (nominalism)."

75 Sparavigna, *Light, heat and sound*, 51. See Jack Cunningham, "Lumen de Lumine: Light, God and Creation in the Thought of Robert Grosseteste", in Nicholas Temple, John S. Hendrix, and Christian Frost (eds.), *Bishop Robert Grosseteste and Lincoln Cathedral: Tracing Relationships between Medieval Concepts of Order and Built Form* (London and New York: Routledge, 2014), 81–98.

76 Cornford, 70, on Pl. *Ti.* 35b–36b. See above.

According to Grosseteste in *De Luce*, “bodies are composed of surfaces, surfaces of lines, and lines of points”.⁷⁷ A unified body is perceptible as a combination of numerical figures, just as numbers are perceptible as a solid composition. The cosmologies of Grosseteste and the architecture of Lincoln Cathedral both express a process of transference from numerical ratios to geometrical figures to material reality, which is, in essence, the basis for the harmony achieved by the process of creation in Plato’s *Timaeus*, as interpreted by Theon and Calcidius.⁷⁸ In the architecture, the mason begins by constructing lines from points, from which he constructs a geometrical surface, and from this is projected or telescoped a three-dimensional structure. In the nave vault, for example, the point of the corbel at the top of the springer pole in the elevation is the source of the lines of the ribs of the vault, which form a convex surface in combination with the severies of the vault, the surfaces between the ribs; the vault forms a cone or bundle of ribs in the direction of the ridge rib of the vault, which can be seen as defining the surface of the agent. The cone of lines is also perceptible in the umbrella vault in the Cathedral Chapter House, which converge at a central point at the top of the column and spread to the ribbed vault as the surface of the agent. These complex ribbed vaults at Lincoln are developments from the simple ribbed vaults introduced at Durham, involving more elaborate architectural geometries. Correspondingly, the *De Luce* and *De Lineis* constitute a more elaborate geometrical description of the substructure of matter than the *Timaeus* and its later interpretations.

In the *De Lineis*, the *virtus* from the natural agent is more active and more unified if it is along a shorter line, because it is closer to the recipient, the passive agent, and it is less active along a longer line, because of the greater distance from the recipient. A light is brighter if it is closer to the eye. Shorter lines contain a more condensed *virtus*; in architecture they are more structurally sound, and exert greater force on an adjoining member. The ribs in the vaulting at Lincoln display the same hierarchy of *virtus* and concentration of *species*. The *virtus* in *De Lineis* proceeds immediately from the natural agent along either a straight or a bent line. Such straight and bent lines, the latter formed by the lierne ribs, are also present in the vaulting of the cathedral. The *virtus* is greater in a reflection of light from a concave surface, because the rays

77 Robert Grosseteste, *On Light (De Luce)*, trans. Neil Lewis, in “Robert Grosseteste’s *On Light: An English Translation*”, in John Flood, James R. Ginther, and Joseph W. Goering (eds.), *Robert Grosseteste and His Intellectual Milieu* (Toronto: Pontifical Institute of Medieval Studies, 2013), 239–247, at 242.

78 Christina Hoenig, “Calcidius on Cosmic Harmony”, in Francesco Pelosi and Federico M. Petrucci (eds.), *Music and Philosophy in the Roman Empire* (Cambridge: Cambridge University Press, 2020), 262–285.

converge at a point, forming a cone of light. Similarly, lines emanating from a concave surface and converging at a point in the form of a cone are visible in the vaulting at Lincoln. The corbel at the top of the springer pole in the elevation, from which the ribs emerge, equivalent to rays of light, stands as a point of convergence, a nodal point, at which the *virtus* is greatest and the *species* most concentrated, as also intended in the architecture. Like the ribbed vaults at Durham, the developed architectural geometry at Lincoln relates to the cosmological substructure of matter. The corbel is the point at which the vault springs from its supporting structure, but clearly the corbel and springer pole below do not support the ribs forming the vault or the vault itself, as at Durham. What looks like a structural system is not the real structure of the cathedral, but is an admirable copy of the archetypal model in the sense world. The architecture is a visual model of the structure of the cosmos; the understanding of the intelligible structure of the architecture inspires the viewer to engage higher forms of intellect in the ascent to God.

In a letter to Master Adam Rufus, Grosseteste elucidates the influence of the *Timaeus* and archetypal form on architecture:

To make clear how God is the form of his creatures ... the meanings of this word "form" must be explained. It is said that the design is the model (*exemplar*) to which the craftsman looks to make (*formet*) his handiwork, in imitation of it and in its likeness. ... In such a manner then in which its design, in the mind of such an architect, is the design of the house, so is art (*ars*), or wisdom (*sapientia*), or the word of Almighty God the pattern of all creatures. For it is at the same time both the model (*exemplar*) and the producer (*efficiens*), and what forms, and what keeps in the form given, while creatures are applied to it and removed from it.⁷⁹

5 Conclusion

The *Timaeus* has arguably had more influence on architecture than any other work of western philosophy, even on architecture as dramatically different

79 Quoted in John Harvey, *The Mediaeval Architect* (New York: St. Martin's Press, 1972), 23–24. See Frank Mantello and Joseph Goering (eds.), *Letters of Robert Grosseteste* (Toronto: University of Toronto Press, 2010), 38–39, Letter 1; and H. R. Luard (ed.), *Roberti Grosseteste episcopi quondam Lincolnensis epistolae* (Cambridge: Cambridge University Press, 2012). Compare Pl. *Ti.* 28a–b and the discussion of the significance of this passage by Prins and Thomas, Chapter 1, above.

in style as Gothic and Renaissance.⁸⁰ In 1525, Francesco Giorgi, a Franciscan monk at the church of San Francesco della Vigna in Venice, wrote, in his treatise *De harmonica mundi*: “It is absolutely evident to all Pythagoreans and Academicians that the world and the soul were defined first by Timaeus of Locri and then by Plato by certain laws.”⁸¹ Ten years later, he clarified:

And this mysterious harmony is such that when Plato in the *Timaeus* wished to describe the wonderful consonance of the parts and fabric of the world, he took this as the first foundation of his description, multiplying as far as necessary these same proportions and figures according to the fitting rules and consonances until he had included the whole world and each of its members and parts.⁸²

Thus, Giorgi argued, when building the church, it is “most appropriate to follow that order of which God, the greatest architect, is the master and author”. The laws of cosmic order and the mathematical ratios that determine harmony in the cosmos, as revealed in the *Timaeus*, are the basis for the design of the building as microcosm and cosmological model.

Similarly, the architect Andrea Palladio declared in his *Quattro libri* of 1570: “We cannot doubt, that the little temples we make, ought to resemble this very great one, which, by His immense goodness, was perfectly completed with one word of His.”⁸³ The *Timaeus* described an architecture of the cosmos, an understanding of the structure of matter and the soul. Its continuing presence in scholastic literature contributed importantly to the development of architecture throughout the Middle Ages and Renaissance. The *Timaeus* recommended to architects a need to create buildings as models of the design of the cosmos. Its geometrical substructure of matter, its proportioning systems, and its distinction between the world as given to the senses and the intelligible world as understood by a higher form of intellect suggested equivalents in

80 On the Renaissance, see Temple, below, Chapter 14.

81 Wittkower, *Architectural Principles*, 104. Francesco Giorgi, *De harmonia mundi totius* (Venice: Bernardinus de Vitalibus, 1525), Book 5.

82 Francesco Giorgi, Memorandum for S. Francesco della Vigna, 1 April 1535, in Wittkower, *Architectural Principles*, 155. Translated from Giannantonio Moschini, *Guida per la Città di Venezia* (Venice: Alvisopoli, 1815), vol. 1.1, 56. See also Liane Lefaivre and Alexander Tzonis, *The Emergence of Modern Architecture: a documentary history, from 1000 to 1810* (London: Routledge, 2004), 102.

83 Wittkower, *Architectural Principles*, 23. Andrea Palladio, *I Quattro libri dell'architettura* (Venice: Dominico de'Franceschi, 1570), Book IV, Preface. For earlier instances of the analogy between temple and cosmos, see above, Introduction.

the structure and appearance of architectural forms. Architecture inspired by the *Timaeus* would seek to contribute to the intellectual development of the viewer or user. Still today, buildings have an ethical responsibility to contribute to the intellectual development of their viewers and users.

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