Seek Not to Know High Things
faith and reason in the middle ages

Philip Ball

Western religious art is an accurate reflection of mankind's changing attitude to the spiritual world.
—Hans Jantzen, *High Gothic* (1984)

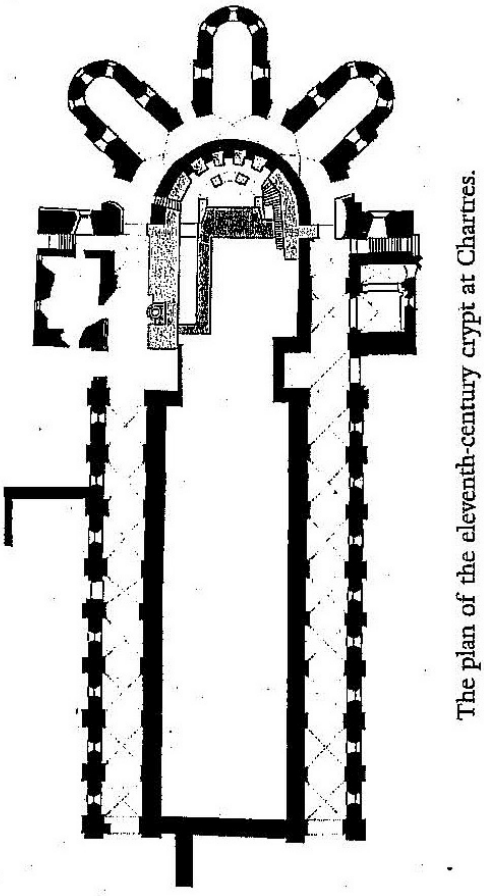
One of the most singular phenomena of the literary history of the Middle Ages is the vigour of the intellectual commerce, and the rapidity with which books were spread from one end of Europe to the other.
— Ernest Renan (c.1852)

From: Philip Ball, Universe of Stone: A Biography of the Chartres Cathedral *(HarperCollins, 2008).*

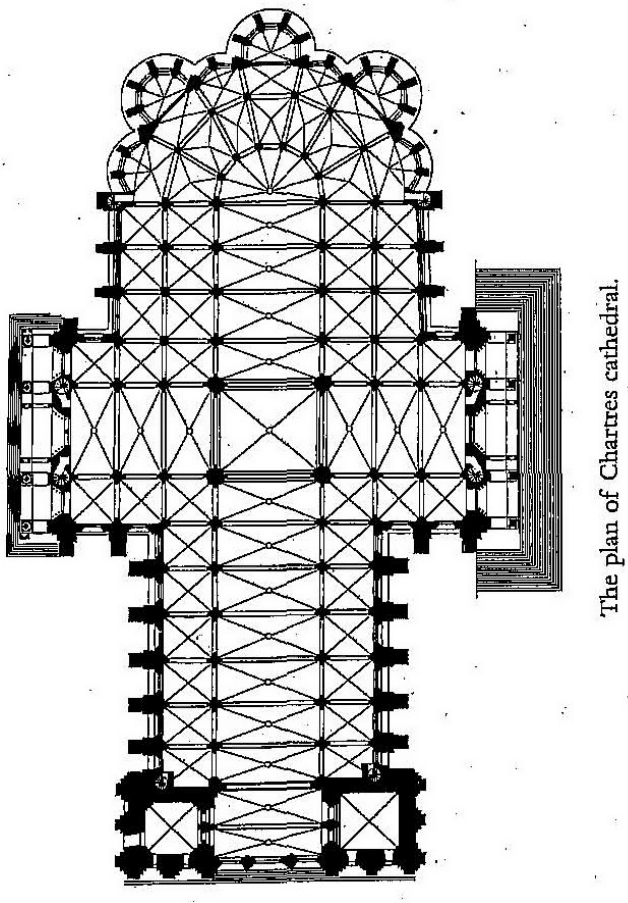
The Crypt and Plan

The eleventh-century crypt of Chartres, built by Bishop Fulbert's architect Beranger, was nothing less than a second church situated beneath the main edifice. Beranger constructed two long passageways that ran from the west end under the nave aisles, so that pilgrims could gain access to the relics without trailing through the church above. He built a semicircular passage around the central sanctuary — in essence an early ambulatory, a structure that eventually became a standard feature of Romanesque churches. The first ambulatory may have been constructed in the Carolingian abbey church of Saint-Denis around the mid-eighth century, with the aim of easing the flow of pilgrims wishing to see the shrine of St Denis. The visitors could enter on one side, walk around the sanctuary to view the reliquaries, and exit down the other passage.

The Chartres legend has it that this kind of arrangement was necessary to accommodate the hordes of pilgrims who came to the cathedral to see the relics, especially the *camisa*, and who would have disrupted church services if they had to pass through the main building to reach the crypt below the apse. But legend may be all it is. According to historian Nicola Coldstream, Chartres was not a major site of pilgrimage either in the twelfth or early thirteenth centuries,



The plan of the eleventh-century crypt at Chartres.



The plan of Chartres cathedral.

and there is no reason to believe things were any different in Fulbert's time. Rather, the design of the crypt may have been more an expression of intent — evidence of a concerted effort to swell the number of visitors, rather than a response to it. Thus it is possible that the attempts to manipulate the Marian cult of Chartres began with Fulbert. In any event, when Pope Alexander IV referred in 1260 to the 'innumerable multitudes of the faithful' that the town attracted, he may have been simply accepting what the Chartrains asserted about the situation.

Beranger constructed three deep chapels at the eastern end of the apse. Such chambers, emanating like incipient branches from the ambulatory, had previously been included in the apse of Rouen Cathedral in the 990s, and were built at Auxerre at much the same time as Chartres.

The lower church at Chartres was more than a walk-through display of relics. Pilgrims could lodge under the vaults — it has been suggested that the carelessness of those sleeping within the church on the eve of the Festival of the Nativity might have been responsible for the fire of 1020. There was even a hospital attached to the northern aisle of the crypt to treat the sick. The legendary sacred well was still maintained on the north side of the apse: it was known as Saints-Forts, since several martyred saints had been thrown into it by Viking raiders. That, at least, was what was alleged by monks in the early twelfth century, and no doubt the idea encouraged belief in the healing powers of the well waters — another attraction for pilgrims. Next to the well is an inner sanctuary, the *confessio*, probably dating from the ninth century and dedicated to St Lubin. The original wooden statue of the Virgin was placed here in the eleventh century, perhaps by Fulbert himself. In this way, the crypt contained the focal elements of the local folk cult of the Virgin, emphasizing that these belonged to and operated through the church alone.

The architect of the Gothic church was constrained by the fact that he was building on top of Fulbert's crypt. Furthermore, the mid-twelfth-century west end of the cathedral was still standing, though it needed modifying considerably to blend with the new construction and the Gothic style. So before we start to weave elaborate schemes that 'explain' the fundamental geometric concept of the cathedral, we need to recognize just what the architect could and could not do in the first place.

It is easy to forget this when we look at the plan of the existing church, which appears so coherent and orderly that it is hard to believe it was not imagined from scratch. The truth is that the architect wrought wonders under considerable constraints, integrating the old and the new so seamlessly that we barely notice the joins at first glance. Only on closer inspection do we see the compromises: for example, the uneven west bays of the nave (see page 274), the asymmetries of the remodeled west front (page 275), and the discrepancy between a single-aisled nave and the double ambulatory (both were double at the Bourges Cathedral, begun at much the same time). All the same, the plan is a good deal more regular and unified than several of its near-contemp–oraries, such as Soissons, and it is easy to see how it served as the prototype for Reims and Amiens.

Gothic churches are rightly celebrated for their use of proportion, geometry and symmetry. But it is all too easy to overstate the case. It seems likely that the careful plans of the architects may have sometimes been undermined by limitations in the accuracy of laying-out procedures on site, or by shifts in a building's fabric caused by irregular settling of (often inadequate) foundations — not to mention budgetary compromises or changes of heart by the church patrons. There is probably no intention in the fact that the nave width at Laon tapers by 3 per cent, or at Bourges by twice as much. Suger's proto-Gothic choir at Saint-Denis is rather irregular, while the ground plan of Notre-Dame de Paris is frankly something of a disaster from a geometric point of view. When faced with claims like those of Australian architect John James that an apparent twist in the key axes of the plan of Chartres is purposefully intended to 'inject asymmetry' into the design, we have to wonder whether the building practices of the Middle Ages really allowed for that kind of finesse. Isn't it more likely that this simply reveals their technical limitations?

In 1834 the twenty-year-old Eugene Viollet-Ie-Duc, a budding architect and artist without any social position to speak of, went travelling with his friend Leon Gaucherel to look at France's ancient buildings. They stopped at Chartres, where they passed their days inside the cathedral making sketches and water-colours. 'I have never seen anything as beautiful in my life', Viollet-le-Duc wrote to his wife. 'We live in the cathedral and we only leave when night has fallen ... I am continually torn between the joy of reproducing such beautiful things for myself and the sadness of never being able to produce anything associating such great beauty.'

He speaks for countless visitors who pass through the Royal Portal every day. But as should now be clear, we cannot assume that what the beauty of Chartres means to us, and what it meant to Viollet-le-Duc, is the same as what it meant for worshippers in the thirteenth century. If historians

are right to regard medieval art as an attempt to reveal the 'intelligible beauty' of creation, then we cannot hope to understand Gothic buildings unless we appreciate something about what this notion of beauty means and where it came from. In what sense was God's Creation beautiful? And what, in a world still emerging from centuries of turmoil and barbarism, could have given rise to the idea that God's work was pervaded by such magnificence?

Stirring Rome's Embers

For western intellectuals at the dawn of the past millennium, understanding the world meant looking to the past. They were acutely aware that the ancients had attained a philosophical sophistication of which only pitiful remnants had survived through the harrowing times that followed Rome's collapse. So the mission of the 'sciences', such as they were, was not to explore the universe but to scour the meager works of the philosophers of antiquity in the hope of recovering what they had known.

If this seems an oddly defeatist attitude today, it is because the Enlightenment idea of progress — technological, intellectual, spiritual, and moral — has become second nature to us. We may not believe that things always get better — the current fashion is to imagine quite the contrary — but we have come to accept that change is inevitable and that our store of knowledge (if not wisdom) is forever growing. But the Middle Ages shared none of our hubris. People then did not believe that the questions they faced were any different from those that confronted their dimly perceived forebears, who were considered to have been far better equipped to find answers. What remained of that learning in the tenth and eleventh centuries was to be trusted precisely because it had stood the test of time. Scholars lived in hope of scavenging more, and then recording it for posterity: truth was timeless. 'The twelfth century schools,' says the English historian Richard Southern, 'were engines designed for [the] single purpose of discovering a clear and unambiguous body of truth that could be handed on from generation to generation.'

This reverence for the classical heritage pervaded political and institutional structures. If Charlemagne's coronation as Holy Roman Emperor gave western Christendom fresh pretensions of grandeur, they were of a decidedly derivative nature — the emperor's very title said as much. Pope Leo III crowned him 'Augustus', and it was understood that he was successor to the Caesars. Nobles were starting to learn to read and write so that they could study not only the Bible but also the books of classical scholars. At the start of the eleventh century, the duke of Aquitaine was said to be devoted to learning: 'He keeps in his palace a great number of books, and if war chances to leave him some leisure time, he devotes it to reading them himself, and spends long nights among his books until sleep overcomes him.'

In the court of Charlemagne, workshops were established to translate and copy the classical Roman authors, a project that secured the precarious survival of many works. An educational programme in the liberal arts was advocated by the English scholar Alcuin of Northumbria, whom the Frankish king made master of the palace school at Aachen around 781. Alcuin helped to establish schools at the major cathedrals of the Holy Roman Empire: Paris, Orléans, Toledo, Chartres, and Cologne.

To Alcuin, the liberal arts were the columns that propped up the temple of Christian wisdom. Before joining Charlemagne's court, he commended the library of the monastery at York warmly for its stock of texts from the scholars of antiquity:

> There shalt thou find the volumes that contain All of the ancient fathers who remain; There all the Latin writers make their home With those that glorious Greece transferred to Rome, The Hebrews draw from their colossal stream, And Africa is bright with learning's beam.

This educational programme was supported by the Neo-Platonist John Scotus (c.810 — c.877), known as Eriugena because he was an Irishman (in those times, a 'Scot' was as likely to be Irish as Scottish). An important interpreter of St Augustine and Boethius, he has been called the only truly significant thinker in the western world between the seventh and the tenth centuries. He came to the Frankish court at the invitation of Charles the Bald around 847, only to find it devoid of scholars as learned as himself. In contemplating the spiritual realm, said Eriugena, one has a duty to employ the worldly faculties of sensation and reason.

The Carolingian Empire of the ninth century is often said to have hosted a modest renaissance, although this is rather generous to a culture that tended to regard books not so much as receptacles of wisdom but as expensive luxuries for princes to display ostentatiously. Yet if these books had few readers able to understand them, nonetheless their very existence helped to foster the belief that, just as questions about religion were answered by careful study of the Scriptures, so issues about philosophy and science were decided by appeal to ancient, pagan authorities — men who, unlike the fearful and bewildered Carolingian schoolmen, had been at home in their universe.

But when intelligent people devote themselves to learn-

ing, they can scarcely help but contribute to it. Despite the absence of any clearly defined sense of mission to elucidate the nature of the world, scholars in the early Middle Ages began to have new ideas. One of the curious things about this time, says Bertrand Russell, is that it was original and creative without knowing it. Originality was not necessarily seen as praiseworthy — it exposed one to accusations of obsessive pride — yet it happened all the same.

The Fathers of the Western World

In the twelfth century, learned clerics were guided in their studies of the Scriptures by the commentaries of the early Christian writers known as the Fathers: men like Clement of Alexandria (died c.215), Origen (died 254), Basil of Caesarea (died 379), St Augustine (354-430), Boethius (c.480-c.525), Cassiodorus (died c.580) and the Venerable Bede (died c.735). These 'Patristic' interpretations of the Bible, known as glosses, gave men hope of negotiating a path through some of the recondite aspects of Christian thought, such as the precise meaning of the doctrine of the Trinity.

But many medieval scholars found instruction and inspiration also in the pre-Christian writers of Rome and Greece. They learnt about the Greek myths from Ovid, and about the poetry and humanities of the ancient world from Virgil, Horace and Livy. And for understanding the fundamental basis of the natural world, there were no more eminent authorities than Plato and his pupil Aristotle. One can chart the course of natural philosophy in the West until the seventeenth century more or less in terms of the waxing and waning of the reputations of these two philosophers.

To characterize Plato and Aristotle by contrasting them is inevitably simplistic; but doing so highlights two seemingly universal responses to the world. Crudely put, Aristotle was concerned with things as they seem, and Plato with the truth that lies behind appearances. Aristotle discusses the world as we experience it through our senses. Plato distrusts sensory information, which is susceptible to irrationality, and he insists that genuine insight arises only when we can penetrate beyond appearance to the fundamental, universal properties of things. Aristotle's world is that of *physis*, or what we might call nature. For Plato, the cosmos comes into being as a kind of creative expression or interpretation of transcendental, archetypal forms, and thus it is more a matter of *techne*, of art.

Both men recognized that we struggle to make sense of the world, and that there is much in it that is confusing or seemingly inexplicable. For Aristotle this was because our sensory organs are imperfect: there is an objective world out there, but in interpreting it we are hampered by bad data. So we are forced to work hard at the task, reducing error by investigating and observing with great diligence. In the view of most intellectuals from the Middle Ages onwards, this required the scholar to specialize. Plato, on the other hand, felt that ignorance is inevitable, because it reflects the diminished reality of the material world in comparison to the transcendental.

The invitation, then, is to see Aristotle as the proto-scientist and Plato as the mystic. But that is to go too far. For one thing, Aristotle exhibits little interest in the careful experimentation that is the hallmark of today's science. He focuses on particulars, to be sure, but typically interprets them on the basis of rather arbitrary preconceptions that observation need confirm only schematically. And the most fundamental aspects of modern physical theory refer to entities, ideas and forces that are certainly inaccessible to our everyday sensory experience, drawing on forms of mathematical abstraction (especially symmetry) with which Plato would have felt comfortable. In the end it is somewhat futile to try to reconcile the philosophies of either man with modern science.

Many philosophers of the Middle Ages were more concerned with what some historians have described as an equally futile quest: to reconcile Plato and Aristotle with one another. Both were regarded as having privileged insight into the natural world, and so it flew in the face of all reason that they should not agree with one another. How, though, to make them consistent? There is, according to Southern, 'no scholarly ambition more ancient than this'.

In the twelfth century Aristotle's oeuvre was only just being rediscovered by Christian scholars translating his texts from Arabic transcriptions, The century that followed saw the triumph of Aristotelian 'naturalism', notwithstanding papal attempts to ban Aristotle's *Physics*. Albertus Magnus, a Dominican cleric from Swabia, and his Neapolitan pupil Thomas Aquinas presented the case for congruence of Aristotle's views with Christian belief, while the Aristotelian emphasis on sensory data was expounded in the experimental work of the Englishmen Robert Grosseteste and Roger Bacon at Oxford,

But during the springtime of the Gothic revolution, Plato was the dominant authority in natural philosophy. The mighty edifice of medieval Platonism rested on thin foundations, however, for many of his original writings were lost, and all that was really known in the early twelfth century were fragments of his *Timaeus*. Yet despite this paucity of

sources, Platonism was, in the view of the historian Raymond Klibansky, a force 'continuously stimulating scientific thought, aesthetic feeling and religious consciousness', from antiquity until the High Middle Ages. Because of the endorsement of Platonic philosophy in the Patristic texts, the *Timaeus* came to be seen as the most profound description of the physical universe. The book was widely available to scholars, the number of transcribed copies peaking around 1150.

For medieval Christian thinkers, the Fathers represented a link between this golden age of antiquity and their own tradition. These men, living through the waning of the Roman Empire, had enjoyed access to a wealth of classical thought that was now largely lost, while being able to contemplate it in a Christian context. The Platonism of early Christian thought tended to promote the view that nature is a projection of God, so that the aim of philosophy is not so much to discover how the world is constituted as to decode it. Yet that was in itself an important step forward, reflecting a new-found confidence in the intelligibility of the universe.

The Dilemmas of Augustine

The most authoritative and influential of these church patriarchs was Augustine. There are few more contradictory figures in early Christian thought than this North African bishop: he was progressive and reactionary, a liberal scholar and an austere zealot, a subtle philosopher who laid the basis of a sledgehammer morality. Augustine illustrates the problem that we face in understanding any philosopher of times past: he did not materialize with a doctrine that was fixed and polished, but spent his life struggling towards some kind of personal truth. As a result, he said conflicting things at different times, so that what later thinkers took away from Augustine was very much dependent on their own times and character.

Augustine was born in 354 in the town of Thagaste in the east of modern-day Algeria. Here he inherited the Latin Roman culture of Africa: his was a basically Christian society stimulated by the learning of classical Rome and Greece and by the influences of the Middle East. As a young man, Augustine was drawn into the Persian cult of Manichaeism, based on the beliefs of the third-century sage Manes or Mani — a strange blend of Babylonian folklore and cosmogony welded opportunistically to elements of Christianity. The Manichees maintained that our world is a battleground between the rival forces of good and evil; they considered that our dutiful attempts to direct thoughts and actions towards the good are constantly undermined by the snares that evil forces have set everywhere.

Augustine's initial enthusiasm for Manichaeism later cooled, and although it seems he did not reject it fully until around 383, he subsequently became a vociferous critic. During that period he earned a living as a teacher of rhetoric, first in Thagaste and then in the major city of Carthage in modern-day Tunisia. In 383 he went to Rome, and in the following year he took a prestigious teaching position at the court in Milan, where he came under the influence of Bishop Ambrose of Milan. His mother, a devout Christian, joined him there, and she and Ambrose between them persuaded Augustine to convert to Christianity. Ambrose baptized him in 387.

In Milan, Augustine discovered Platonic philosophy, which came to shape his thinking to such an extent that some have suggested his Christianity was simply a convenient peg on which to hang it. Like Manichaeism, Platonism is dualistic; but whereas the realms of good and evil are both material, Plato's later interpreters, such as the third century Hellenic Neo-Platonists Plotinus and Porphyry, asserted that the physical world accessible to sense perceptions is a mere shadow of an immaterial realm of true reality, where all things are intelligible and perfect. For Augustine this transcendental world of Plato seems to have been a pagan version of the kingdom of God, which was flawless and infinitely reasonable. Christian doctrine taught how God's love could render this world perceptible to us like a light shining in darkness.

In its insistence that all things are created by the emanation of God's goodness, Platonism sounded similar to Christianity. But Plato's transcendentalism was not moralistic; it was simply a description of how things are. This optimistic, pantheistic vision was modified in important ways by Augustine in order to bring it in line with a more explicitly Christian outlook. By fixing its gaze beyond the mundane world, Platonism renders this world an illusion of little interest. Augustine's Neo-Platonic Christianity did not merely remain aloof, however; it was apt instead to condemn and vilify the physical world, which is seen as inferior not just ontologically but morally. Knowledge of the transcendental realm of God is thus the only real knowledge worth having. 'I desire to have knowledge of God and the soul', he wrote in his *Soliloquies*. 'Of nothing else? No, of nothing else whatsoever.' If the world is just an illusion invoked by our unreliable senses, and if an understanding of true reality can be revealed only to the soul illuminated by God, there is no point in making too close a study of observable things, because they cannot 'in themselves bring us any closer to the

Deity. Their existence, moreover, is arbitrary: they are contingent things, the fruits of the seeds of causation that God sowed in the world.

The Role of Reason

Augustine concluded that one must seek God by withdrawing from the world and becoming an ascetic. It sounds like a prescription for ignorance, for weaving barren theological webs; and that is what it sometimes became in the monasteries of the Middle Ages. But total indifference to the world was not quite what Augustine had in mind. Allied to his trust in divine illumination was a faith in human rationality. God has placed in the human mind a capacity for reason that can and indeed should be used to deepen our understanding of him. Reason is a tool that may be honed, and wielded by means of the intellectual disciplines cultivated by the ancient scholars, which became enshrined in the tidy conceit of the liberal arts.

These disciplines were regarded by the classical writers as the essential components of a sound education. According to the sixth-century Roman monk Cassiodorus, 'liberal' has its roots not as we might expect in the Latin *liber*, 'free' — that is, being the topics suitable for the training of a free man in the ancient world — but in *liber*, book: they were subjects to be learnt by reading. Cicero listed them as geometry, literature, poetry; natural science, ethics and politics. The Roman scholar Marcus Terentius Varro (116-27 BC) included medicine and architecture in the roster. But by Augustine's time the syllabus of the liberal arts was generally deemed to be composed of seven topics: the *trivium* of grammar, dialectic and rhetoric, and the *quadrivium* of arithmetic, geometry, astronomy and music.

Augustine believed that, as God's reason has rendered the world intelligible, this order can be discovered by the use of mathematics, geometry and astronomy, as well as through literature, poetry and music. These subjects may be pursued, then, not for the sake of mere learning or art but as a route to divine truth — as a way of enabling men to appreciate the rational basis of their faith. Augustine's advocacy of the liberal arts can be seen as a call for a research programme that is no open-ended inquiry but whose aims and conclusions are preordained. Mathematics, for example, can be deployed to help us understand the significance of numbers that appear in biblical allegories. The purpose of studying nature was not to discover what it was like and how it was constituted but to uncover new demonstrations of the moral order and divine wisdom inherent in all creation.

Augustine thus initiated the discourse between faith and reason that continues even now to characterize the interactions of science and religion. On the one hand, he argued that it was essential to cultivate understanding of the world, because without that there could be no true belief. On the other hand, there was only one way this understanding was permitted to turn out: it had to be congruent with Christian doctrine, and so could hardly be a matter of genuine inquiry at all. Yet even in Augustine's time it was recognized that some of the descriptions of the world that appeared in the Scriptures did not match what was generally known to be true. Augustine accepted this as evidence that even the Bible's authors didn't know everything, showing that even his austere theology found no place for the credulous literalism of some of today's Christian fundamentalism:

> In points obscure and remote from our sight, if we come to read anything in Holy Scripture that is, in keeping with the faith in which we are steeped, capable of several meanings, we must not, by obstinately rushing in, so commit ourselves to any one of them that, when perhaps the truth is more thoroughly investigated, it rightly falls to the ground and we with it.

True, this passage artfully protects Christianity from being undermined by advances in our understanding of the world; but if dogmatists then and subsequently had heeded it, they would not have needed to deny the evidence of their senses. Galileo cited the remark in his defence against Rome.

Augustine's support of the liberal arts — the 'sciences' of antiquity — as tools for extracting religious knowledge informed a vigorous debate among early Christians. Some of the Greek Christians expressed a deep distrust of this ancient learning. The fifth-century Syrian theologian Theodoret, bishop of Cyprus, argued that because science could always be improved or disproved, it could not offer the kind of robust truths that religion provided — he likened it to writing on water. (Here perhaps is the patron saint of today's creationism.) Others shared Augustine's notion of pagan philosophy as a 'handmaiden to theology' — this was the position espoused in the second and third centuries by Clement of Alexandria and his disciple Origen. The idea was systematized in the fourth century by Basil of Caesarea, whose book *On How to Make Good Use of the Study of Greek Literature* was regarded by some as granting permission to read the classics. Basil noted that one could hardly understand the description of Creation in Genesis if one was wholly ignorant of the natural world. Moreover, studying nature brought to light fresh examples of God's providence, foresight and wisdom; for example, in the way that he has

provided creatures with the physical features they need to survive: an early example of what would later be regarded as the argument from design for the existence of God.

Sin and Recantation

But times change, and people are changed with them. In 410 the Visigoth leader, Alaric, conquered and sacked Rome; and if that event was not exactly perceived at the time as the end of western civilization that subsequent historians have made of it, nonetheless it was a stark reminder of the fragility of tradition for those living in the twilight of the Roman Empire. Refugees from Rome reached the seaport of Hippo on the North African coast (now Annaba in Algeria), where Augustine had become bishop fifteen years earlier. The news of Rome's demise may have hardened the conservatism of this increasingly reactionary man.

It is a likely, if not necessarily logical, consequence of Neo-Platonic philosophy that the world we live in should come to seem tawdry, flawed, and of little value. Augustine eventually went further by effectively pronouncing the world of humankind to be intririsically wicked, and all of humanity likewise. How was that possible, if God created, it? But God did not create evil itself, for that was unthinkable; he merely gave man free will, which Adam squandered. According to Augustine, this original sin tainted and damned us all. This was the argument he expounded in *The City of God*, written between 412 and 427, over which looms the gloomy spectre of the sack of Rome. It provides a prescription for the harshest and most disheartening aspects of subsequent Christian theology, burdening it beneath a crushing weight from which only the humanism of the twelfth and the fifteenth centuries offered some respite. Not only are we damned, and deservedly so (for Adam's transgression is ours too), but we can do nothing about it. Certainly, a man may lead a pious life in the hope of salvation — but that is conferred only by God's grace, bestowed on an elect for reasons of which we can know nothing. This grace, Augustine argues, is evidence of God's essential goodness.

Until they are baptized, then, infants belong to Satan. (There is a trace of residual Manichaeism in the way that Augustine, and others after him, began to elevate Satan from a fallen angel to the source of all evil who threatens and even dominates humankind.) The concept of original sin — a doctrine of despair, which is nowhere afforded clear support in the Bible — is surely Augustine's most insidious legacy, a reminder of where we are prone to end up once we avert our eyes from this world and seek perfection in a higher one. There was some meagre consolation in the eleventh-century idea that priests, rather than divine providence alone, could save men's souls from hell (albeit not before the discomforts of purgatory). Even this was of questionable benefit, however, for while it seemed to make redemption a little more attainable, it also strengthened the Church's power over the laity.

Pelagius, a Welsh cleric known by the Latinization of his native name of Morgan, objected to original sin on the grounds that if all we can do is hope that God selects us, for reasons unknown, to join the elect, there is no motivation even to seek salvation. Either it will come or it will not, regardless of our efforts. Pelagius considered that Augustine's theology undermined free will, and, as a consequence, any sense of moral responsibility. Surely, he argued, humankind may be virtuous only if we have the power to redeem ourselves?

But Augustine was not moved, and because of his opposition the Pelagian position was denounced as heretical. As his views became ever more fixated on the contrast between the worthlessness of this world and the perfection of the next (that is, if you were among God's elect), he even withdrew his support for the liberal arts, writing in his *Retractions* of 426 that the theoretical sciences and mechanical arts held no value for the devout Christian. He read Cicero and Aristotle, he confessed, but 'what did it profit me? … For I had my back to the light.' Among other complaints, Augustine said of the liberal arts that 'many holy people have not studied them at all, and many who have studied them are not holy'. (One might even then have said much the same of the Bible.)

It has been argued that Augustine might never have looked very favourably on the liberal arts in the first place — his *De doctrina Christiana*, for example, which has been interpreted as a manual for their use, arguably presents a rather sceptical assessment of their value. He warns there of the dangers of intellectual pride, of a passion for wrangling and a kind of childish parade of getting the better of one's opponents. The purpose of these skills, he says, is to help us sift through pagan philosophies for tools that might illuminate the Scriptures. Knowledge 'can give us swollen heads and stiff necks, unless we submit them to the Lord's yoke'. It is the Bible, after all, that warns how 'knowledge puffs up; love [of God] builds up'.

These attacks on secular learning were especially severe in Augustine's 'intellectual autobiography', the *Confessions*, in which he portrays himself and his scholarly peers as, 'selling talkative skills' like intellectual prostitutes.

Curiosity, he wrote, is a 'lust of the eyes'. What we dignify by the names of learning and science is merely 'empty longing and curiosity'. This inquisitiveness is a form of pride, and as such is deeply sinful: 'The proud cannot find you', said Augustine, addressing himself to God, 'however deep and curious their knowledge, not even if they could count the stars and the grains of sand, or measure the constellations in the sky and track down the paths of the stars.' The conflation of curiosity and pride was reflected in the Middle Ages in a common mistranslation of a passage from St Paul's letter to the Romans: where the Latin Vulgate Bible read *noli altum sapere*, the meaning was interpreted not as 'be not high-minded' — or as modern versions might have it, don't be arrogant — but rather, 'seek not to know high things': don't ask questions.

And there was, after all, no escaping the fact that the ancient exemplars of the liberal arts — Plato, Aristotle, Horace and the rest — were pagans. Not only were their words consequently incomplete but they could be misleading, because they contained no awareness of the Lord. The mission of humankind, churchmen insisted, was to cultivate one's reverence for God, and ancient philosophy and literature might be no more than a dangerous distraction from that. So in the early Middle Ages a man could know more than was good for him. Theologians gave warnings about the futility and the perils of knowledge. 'For with much wisdom comes much sorrow; the more knowledge, the more grief': in the end, the supposedly wise man faces the same fate as the fool, and not all the learning of Solomon (whom some have considered to be the author of those words) would save him from that. The love of God is his only redemption. We find Bernard of Clairvaux issuing a reminder of that to a young man whom he deems to be spending too long studying the liberal arts in the French schools:

> I grieve to think of that subtle intelligence of yours and your erudite accomplishments being worked out in vain and futile studies, of you with your great gifts not serving Christ, their author, but things that are transitory. O what if unexpected death should strike and snatch them from you? Alas, what would you take with you from all your toil? He will come, he will come and he will not delay, to demand what is his with interest. What will you answer at that dread tribunal for having received your soul in vain?

Having sown the seeds of Platonism in the Christian West, Augustine ended his days bolstering those who could condemn the enquiring spirit of its rationalistic supporters. This leads to the strange spectacle, in the twelfth century, of Platonic rationalists engaged in a war of words with Platonic mystics. Like Christianity itself, Plato's influence became so pervasive that it could be adapted to more or less any philosophical position (and by the same token you could usually invoke Augustine in your support too). We must bear this in mind before falling too deeply in thrall to the notion that Gothic churches are a kind of Platonism wrought in stone — for so, it seems, are Romanesque buildings to some extent, whether Cluniac, Cistercian, or otherwise. Gothic might never have happened without the Platonism of Augustine and the other Church Fathers; but that did not in itself make the style inevitable.

Consolation for the Arts

Although Plato was not strictly a monotheist, his concept of a supreme deity who created the world lent itself readily to a Christian interpretation. Aristotle's ideas, on the other hand, were widely deemed incompatible with the doctrines of the Creation, divine providence and the immortality of the soul, and they were often resisted and suppressed. This antipathy hardened in the fifth century when Aristotle's teachings were embraced by the heretical Christian sect of the Nestorians in Syria. Nestorius, a patriarch of Constantinople, was condemned by the Council of Ephesus in 431 for his suggestion that Christ was born of Mary as a human rather than as a divine being. The Nestorians, persecuted by the Church, fled east to Persia, where their enthusiasm for the rational, 'scientific' works of Aristotle, Euclid, Hippocrates, Galen and Archimedes enabled these texts to pass to the Muslim world. There they were preserved as Byzantium foundered.

But Aristotle had a Patristic champion in the person of the Roman statesman Boethius. Boethius was responsible for some of the earlier Latin translations of Aristotle's works, and this, along with his knowledge of Euclid and Ptolemy, made him something of an authority on the liberal arts, particularly mathematics and logic. He declared his bold intention to 'translate into Latin every book of Aristotle that comes into my hands'. Even more boldly, he strove to bring rational analysis to bear on the theology of the Christian schools, and entreated Pope John I 'as far as you are able, [to] join faith to reason'.

But as one would expect from a pupil of the Platonic Academy in Athens, there is much Platonism in Boethius's vision too, particularly in his concept of God — 'Plato's One' — as pure form. Indeed, if Boethius is seen as a champion of Aristotle, that is a product of historical circumstance, for he meant also to provide exhaustive Latin translations of Plato's works, many of which might never have been lost if only Boethius had managed to do so before be-

ing put to death. His untimely execution for alleged treason against the Ostrogoth king Theodoric, says Raymand Klibansky, 'deprived the medieval world of an opportunity of access to the whole heritage of Plato'. Boethius was one of those who hoped to unite the two great philosophers of Greece, and his most famous work, the *Consolation of Philosophy*, written while Boethius languished in Theodric's jail, is profoundly Platonic. Both here and in his book *On Arithmetic*, Boethius proposes the Pythagorean idea that the universe is based on numbers:

> God the Creator of the massive structure of the world considered this first discipline as the exemplar of his own thought and established all things in accord with it; through numbers of an assigned order all things exhibiting the logic of their maker found concord.

At the twelfth-century cathedral school of Chartres there was no mathematical authority who surpassed Boethius, and his writings on number and proportion were at the core of the canon. Some have ranked Boethius's influence on medieval thought alongside that of Plato himself.

Augustine and Boethius stand at the border between the ancient and medieval worlds, and by bridging the two they played a vital role for the philosophers of the Middle Ages. Theirs was, however, a world that seemed to be collapsing and shutting down: Rome was eclipsed during their lifetimes, and the Athenian Platonic Academy was closed four years after Boethius's death. It is not surprising, then, that these two men found solace in Plato, whose philosophy emphasizes the abstract over the material and thus seemed to promise unassailable certainties in an increasingly precarious age. On the one hand, this led both men to develop an aesthetic philosophy based on geometry and order that found its greatest expression at Chartres. On the other hand, it prompted Augustine to devalue the physical world of human experience in preference to an imagined 'higher' reality: the prescription for a corrosive, anti-humanistic theology that condemned worthless humanity to shudder in the dark as it prayed blindly for salvation. These two outlooks — the rational and the anti-rational — were destined to clash furiously in the century during which the building of Chartres Cathedral began.

Exchange of Words

Traders are pragmatic types, rarely deterred by war, religion or politics. Even as Arab armies harried the borders of the Christian West and the knights of Christendom rode in a muddle of piety, bellicosity and plunder-lust to the Holy Land, the twelfth-century merchants of Venice, Naples and Genoa were happy to conduct brisk business with the infidels around the fringes of the Mediterranean. Inevitably it wasn't only goods that got exchanged, but ideas too.

Some of this intellectual trade — which flowed almost entirely from east to west — came about as a direct consequence of commerce. It was on a business trip to North Africa that the Italian Leonardo of Pisa (later known as Fibonacci) learnt Arabic mathematics at the beginning o the thirteenth century, in particular the system of Arabic numerals whose virtues Leonardo expounded in his *Liber abaci* (1202). Other Europeans had advertised the benefits of this system during the previous century; the Arabs, who themselves acquired the numeral scheme through trade with India, already recognized how well suited it was to the everyday needs of merchants and engineers. For them, mathematics was a practical science. The great Arabic mathematician Al-Khwarizmi, whose writings on algebra were translated into Latin by Adelard of Bath in the twelfth century, explained that he had focused his attention on 'what is easiest and most useful in arithmetic, such as men constantly require in cases of inheritance, legacies, partition, lawsuits, and trade, and in all their dealings with one another, or where the measuring of lands, the digging of canals, geometrical computation, and other objects of various sorts and kinds are concerned.'

Much of the knowledge that came to the West from the Arabs was of a similarly applied character — medicine, craft recipes, mechanics, chemistry. But the Islamic scholars also wrote extensively on more abstract and philosophical matters, and it was abundantly clear to Christian scholars that the heathens knew plenty that they did not. A great deal of that information was second-hand, derived in particular from the works of the ancient Greeks; but some, like Al-Khwarizmi's algebra, was original. The Nestorians, fleeing from Byzantium to Persia in the sixth and seventh centuries, helped to export Greek scholarship to the Islamic world, but the Muslims also had a great deal of direct contact with the remnants of Hellenic culture in Byzantium itself. By the ninth century, Baghdad had become a major centre for the translation of Greek texts into Arabic. From these books — mostly scientific texts by writers such as Euclid, Aristotle, Archimedes and Ptolemy — sprang much of the subsequent learning of the western world. A handful of scholars, versed in Arabic, travelled from all over Europe to the volatile yet fertile boundary between the Christian and Islamic worlds, seeking the wisdom of the ancients. After the Europeans seized Constantinople in 1204, an increasing number of manuscripts became available in the original Greek, and scholars were able to make direct translations into Latin

rather than working from intermediate Arabic sources.

It is tempting to regard these translators as little more than diligent scribes, fluent in languages but mechanical in transcribing them. That is by no means so; many were original thinkers. Constantine of Africa was an influential teacher at the great Italian medical school of Salerno, while Adelard of Bath studied at Chartres and provided perhaps the most elegant and dignified defence of science ever uttered: 'If we turned our backs on the amazing rational beauty of the universe we live in, we should indeed deserve to be driven therefrom, like a guest unappreciative of the house into which he has been received.' He makes it clear that, contrary to what Bertrand Russell claims, some medieval thinkers were fully aware of their capacity for original thought. But they found it expedient to disguise their creativity, to hide their new wine in old flasks, so that others would take them seriously. 'Our generation,' Adelard wrote ruefully,

> has this deep-rooted defect: it refuses to accept anything that seems to come from the moderns. Thus when I have a new idea, if I wish to publish it I attribute it to someone else and I declare: 'It is so-and-so who said it, not I.' And so that I will be completely believed, I say of all my opinions: 'It is so-and-so who invented it, not I.' To avoid the disadvantage of people perhaps thinking that I myself, a poor, ignorant man, derived my ideas from out of my own depths, I make sure they are believed to have come from my Arab studies . . . I know what the fate of original thinkers is among the vulgar; thus it is not my case I am presenting, but that of the Arabs.

This explains why so many of the supposed works of philosophers and savants from antiquity to the Renaissance are apocryphal: attributing a book to Pliny or Avicenna greatly increased its chances of being read.

Adelard's complaint was no doubt justified, but the appearance in western Europe of classical texts and the interpretations and additions of the Islamic authors was surely a major impetus behind the emergence, in the eleventh and twelfth centuries, of thoughtful, probing men like him. This period was marked by a revival of learning and enquiry that was more profound than the institutional bibliomania of the 'Carolingian renaissance.' Now there was an alternative to the rote-learning of texts at the ecclesiastical schools or the blind faith of the abbeys: the path of reason, skepticism, and questioning opened up before men such as Adelard more clearly than ever it did for Augustine. Out of the subsequent clash of ideologies came the age of the cathedrals.

Against Reason

There is no better illustration of this struggle, and of what was at stake, than the dispute which took place in the early part of the twelfth century at the same time as a new way of looking at the world was being formulated at the Chartres cathedral school. Its protagonists were, in their different ways, two of the most influential men of their age — both of them difficult, contradictory, and extreme personalities, who might well stand as the two prototypes of the French intellectual during the twelfth-century renaissance.

Ever since Augustine, there was opposition to the notion of trying to understand the world. Leading that attack in the early twelfth century was one of the most powerful men in Europe: Abbot Bernard of Clairvaux. Bernard was, as we have seen, responsible almost single-handedly for the flourishing of the Cistercian Order, but there are few historians today (if they do not wear a white robe) who will offer unqualified praise for his achievements. A generous assessment is that St Bernard was simply a man of his time — revered and admired (not to mention feared) all over Europe in the twelfth century, he seems to us now to have been possessed of an ascetic severity that borders on misanthropy. Certainly, it is hard to warm to this 'violent, emaciated man' who crushed his enemies mercilessly and campaigned vigorously for the fruitless Second Crusade of 1146.

In Bernard, the austerity of the Benedictine ideals became almost pathological. There seems to be no space for joy in his world; rather, he believed that life must be lived in fear, for our fate in the afterlife depends on the ineffable grace of God. 'Be fearful when grace smiles on you,' he wrote, 'be fearful when it departs; be fearful when it returns.' Like Augustine, Bernard believed that no man may be certain of his salvation. And from Augustine too he inherited a bitter view of the contemptible nature of humankind, brimming with self-loathing:

> Born of sin, of sinners, we give birth to sinners; born of debtors, we give birth to debtors; born corrupt, we give birth to the corrupt; born slaves, we give birth to slaves. We are wounded as soon as we come into this world, while we live in it, and when we leave it; from the soles of our feet to the top of our heads, nothing is healthy in us.

His disgust at the decorative excesses of the Cluniac churches seems to stem not just from a belief that piety demands simplicity but also from an almost philistine attitude to the arts: he called representational art 'monstrous', and banned it from all Cistercian churches and works. (This proscriptive injunction was not always observed.) His tirade against gargoyles speaks of his impatience with anything frivolous or exuberant in humankind:

What purpose is there in these ridiculous monsters, in

> this deformed comeliness, and comely deformity … in these unclean apes … monstrous centaurs … this creature with many heads united to a single body … this four-footed beast with a serpent's tail? … For God's sake, if men are not ashamed of these follies, why at least do they not shrink from the expense?

Yes, it is hard to feel much sympathy for this cold, sometimes vicious and vindictive man. But we should hesitate before making him into a cartoon villain. He did much to stem the persecution of the French Jews, arguing one should rather convert than condemn them. There seems nothing Machiavellian in his political manoeuvres: his convictions may seem harsh and barren, but they were genuine. And it appears that even he was baffled by the intensity of his own censorial urges: 'All my works frighten me, and what I do is incomprehensible to me,' he confessed.

Erwin Panofsky accuses Bernard of being 'blind to the visible world and its beauty,' pointing out that he is said to have ridden for a whole day on the shores of Lake Geneva without casting a single glance at the scenery. He complained how fine sculptures in the cloisters would distract monks, leading them 'to spend the whole day in admiring these things, piece by piece, rather than meditating on the Law Divine.' But this denial of beauty does not necessarily imply indifference towards it; in fact, Bernard writes almost with yearning, and certainly with perspicacity: 'his analysis of what he rejects is extraordinarily fine,' says Umberto Eco. 'Don't allow yourself to be ignorant of beauty if you do not want to be confounded by the ugly,' Bernard said, making clear that he was neither blind to beauty nor unconcerned by ugliness. It is possible that his assault on the allures of artistry and beauty was all the more severe because he felt them so strongly himself, just as Augustine declared bodily pleasures sinful because he had yielded to them so wholeheartedly in his youth. Thus, Bernard's renunciation of art may have come at considerable personal cost.

Where he appears at his most conservative, however, is in his views on what we might call the science of his age. He believed that God is ineffable and cannot be understood through reason — in which case it was presumptuous to try to do so. Had not the Church Fathers, St Augustine in particular, inveighed against curiousity? The African writer Lactantius in the early fourth century claimed that it was God's intention that humankind should not know about the secrets of creation, wherefore he made Adam only at the end of his labours. It was Adam's pride and curiousity, said Bernard, that led him to seek 'forbidden knowledge by forbidden means,' and thus to 'the beginning of all sin.'

Such a forceful critique of reason was bound to come into conflict with the rise of science stimulated in the twelfth century by the influx of ancient treatises on natural philosophy. Nowhere was this battle waged more fiercely than in the heart of France, where a man every bit as argumentative and contrary as Bernard of Clairvaux achieved fame and notoriety from his defence of the merits of rationality. His name was Peter Abelard.

The Calamities of Abelard

Peter Abelard (c.1079-1142) was the son of a minor lord of Le Pallet, near Nantes in Brittany, then a duchy more or less independent from the French king. He was the kind of person who, delighting in his own brilliance, could not imagine how it might be improved by listening to others. Rather, the young Abelard was determined to make of himself an intellectual warrior who would ride forth and challenge all the great knights of the French schools to a duel.

Abelard argued that truth must be discovered not by poring over old books or contemplating God in a monastic cell, but by asking questions and looking for answers — as fair a description of the future programme of science as you could wish for. He quoted Virgil approvingly: 'Happy the man who has been able to discern the cause of things.' It was not primarily in natural philosophy that Abelard exerted his undoubtedly prodigious talents, however, but in logc and dialectics. He agreed with the great dialectician of the late eleventh century, Berengar of Tours (who studied under Fulbert of Chartres), that reason itself 'is worth more than any man' and does not need to be backed up by the words of dead authorities.

To prove himself in battle Abelard was naturally drawn to Paris, the intellectual centre of France since the early eleventh century. That fact alone made the city a treacherous Babylon of false learning in the eyes of Bernard: 'You will find much more in forests than in books,' he admonished those who flocked to the Parisian schools, 'the woods and rocks will teach you much more than any master.' But to a scholar such as the Englishman John of Salisbury, an alumnus of the Chartres school in the 1130s, it was paradise. As he said in 1164 in a letter to Thomas Becket,

> I … turned my face towards Paris … the thrill of this happy pilgrimage compelled me to confess: 'Truly the Lord is in this place, and I knew it not.' It came to my mind how the poet said: 'A happy thing is exile in such a place as this.'

In Paris, Abelard's first great bout was fought against William of Champeaux, a philosopher and theologian who became a close friend of Bernard of Clairvaux. William taught at the cathedral school of Notre-Dame, and although

Abelard arrived as a pupil, he confesses that 'I became most burdensome, for I sought to refute his teachings, frequently attacked him by reasoning against him, and sometimes seemed to be superior to him in disputation.' Their argument was over the vexed issue of universals: the question of whether general classes or categories of objects, such as 'man' or 'horse', have a real metaphysical existence. For the so-called Realists, to whom William of Champeaux was sympathetic, these categories are concrete entities. This was an attractive notion to a Platonist like Bernard. But the Nominalists, whose position was essentially defined by Abelard's one-time tutor Roscelin of Compiègne in the late eleventh century, maintained that such classes are merely conventions and mental constructs, and that only the particular tangible examples of them are real things. This seems an abstract, even an obtuse, issue today, yet to these men the whole philosophy rested on the rights or wrongs of Nominalism. Indeed, the debate was in a sense a restatement of the conflict between Platonic transcendentalism and Aristotelian concreteness. 'In the Paris of the twelfth century,' says Abelard's biographer Roger Lloyd, 'all academic discussions led sooner or later to the problem of problems, the question of Nominalism and Realism.'

Abelard adopted a Nominalist position, but he did not merely echo Roscelin. Whereas the debate had been conducted previously in isolation from other philosophical issues, Abelard was searching for an entire system of logic, an integrated framework within which a Nominalist standpoint could be seen as consistent with the other elements. This need for consistency in a philosophical scheme may seem obvious today, but it was not strongly felt in the early Middle Ages. Yet to Abelard there was no value in winning a debate by clever rhetoric or scriptural evidence unless one's argument dovetailed with the rest of one's ideas. In this sense it was not the materials he had at his disposal that made Abelard an intellectual innovator, but the way in which he constructed philosophical propositions with them.

But Abelard was not merely argumentative — he was a polemical point-scorer who could see no motive other than jealousy in his opponents and who used every opportunity to ridicule them. With some justification he has been accused of being 'possessed with an inordinate impulsion to undo his rivals.' It is not hard, in reading Abelard's account of his youth, to understand Bernard's fear that dialectic would lead to vanity and empty posturing: that's not all there was to Peter Abelard, but there was plenty of it in the mix.

Abelard pursued his battle against William with martial rigour and determination, even comparing it to the struggle between Ajax and Hector. His attitude precipitated his expulsion from the Paris school, but he took a band of followers with him and set up his own school at Melun on the Seine. His attacks were eventually so damaging to William of Champeaux's reputation that William left the Paris school himself and set up a new theological academy at a Parisian hermitage called Saint-Victor.

Realizing that skill in dialectic alone would not advance his career in the Church, Abelard went to study theology at Laon with William's own teacher, Anselm, who was by then an old man. Characteristically, Abelard was unimpressed. 'He had a miraculous command of words,' he wrote, 'but was contemptible in sense and empty of reason.' Abelard decided that there was nothing to be gained by sitting at the feet of such teachers, and that in any case the Scriptures were easy enough to comprehend without devoting long hours to studying the Patristic glosses. So he began, without any prior training, to teach them himself. Anselm was outraged and forbade it, and so Abelard returned to Paris, where he thrived as a teacher at the cathedral school.

It was there that he seduced Heloise. That, according to Abelard himself, is entirely the right word to use. Devotees of the romantic fable will be disappointed by his account of how, at almost forty years of age, he calculatedly selected the young niece of a canon named Fulbert as the target of amorous conquest. The many sentimental retellings of this tale have more to say about the times in which they were written than about Abelard and Heloise. After all, we know virtually nothing about Abelard's lover that does not come from Abelard himself, and he is not a reliable source. What he wrote about his personal life was, like so much medieval 'documentary' literature, intended not as history but as moral rhetoric that we would be foolish to take at face value. He recounts his story in the *History of My Calamities*, the first of the famous *Letters of Abelard and Heloise*; but the *History* is no more an autobiography than the *Letters* are genuine messages between the former lovers. The *Letters* seem to have been written as an instruction manual for the nunnery that Heloise later led. They were intended to be bound and kept in the library; to read them as one might the correspondence of nineteenth-century lovers is an anachronistic exercise that destroys their real meaning. For a while it seems likely that Abelard was indeed as arrogant in his youth as he portrays himself to be, the person in the *History* is merely a symbol of vanity. And the 'continuing passion' that Heloise at first confesses for Abelard simply establishes her need for spiritual succor, which she eventually finds

(and which the nuns would be expected to find) by binding herself to the nunnery.

At any rate, Heloise fell pregnant from their affair and gave birth to a son named Astrolabe. But she resisted the role of wife for fear that such domestic banality would impair Abelard's reputation and abilities, it being a common belief at the time that sexual continence and chastity were good for a man's powers of reason. Fulbert, infuriated by the refusal of the 'lovers' to adopt a conventional husband-and-wife relationship, incited his friends to an act of terrible violence. One night they burst in on Abelard and castrated him. Shamed as much by the loss of his reputation as of his manhood, Abelard fled to the abbey of Saint-Denis.

But his experiences had not instilled much contrition in Peter Abelard. His controversial ideas about the Trinity, whom he seemed to portray as three separate deities, led to a summons before a church council at Soissons in 1121, at which his work was condemned. He then had the temerity to suggest that the patron saint of Saint-Denis (and of the entire kingdom of France) was not the man they thought he was: he had become historically confused with a Greek named Dionysius who was converted by St Paul in Athens. One could not make such accusations with impunity, and Abbot Adam of Saint-Denis decided that the troublemaker should be handed over to the king for judgment. He fled; but after Adam died in 1122, his conciliatory successor Suger persuaded the Royal Council to let Abelard be. He set up a hermitage near Troyes, which he named the Paraclete. Soon students were drawn there to hear this reputedly brilliant master, and the place grew into a school.

Abelard's unorthodoxy and his passion for cross-examining the Scriptures under the spotlight of reason were bound to draw condemnation from Bernard of Clairvaux. To escape his powerful persecutors, he took on the abbacy at Saint-Gildas-de-Rhuis in Brittany, and for ten years from 1125 he wrestled with the 'wicked and unmanageable habits' of the Breton monks, who refused to be reformed and even tried to rid themselves of his meddling by poisoning his food. During this time, Abelard proposed that the Paraclete, which had become a moribund institution, should be made a nunnery, with Heloise at his head.

Abelard left Saint-Gildas (in little better condition than he found it) in 1135 and returned to Paris, where John of Salisbury saw him teach at the school of Mont-Sainte-Geneviève. Like many churchmen, he was aware that the writings of the Church Fathers were not always consistent with one another, and in his book *Sic et non* he suggested that these inconsistencies should be reconciled not by pedantic scholasticism but by using the criteria of reason. *Sic et non* is something of a sceptic's manual (the historian Constant Mews calls it an 'invitation to thought,' which is perhaps the same thing). It collates extracts from authoritative texts that offer opposed views on many propositions of the Christian faith, implying how difficult it is to really know the truth.

Naturally, there was much that was provocative in this position. Abelard was persistently criticized by William of St Thierry, abbot of the Cistercian monastery of Signy-l'Abbaye in the Ardennes, who, apparently lacking the intellectual confidence to engage in dispute himself, wrote to his former master Bernard of Clairvaux imploring him to expose what this wretch was up to. Bernard had little appetite for academic theological debate; for him, study was about devotion, not learning. 'My masters are not Plato and Aristotle, but Christ and the Apostles,' he said. But bookishness was worse than useless when it produced ideas as unorthodox as those he discovered in Abelard's work. Take, for instance, Abelard's views on sin, which could hardly be further from his own harsh position. 'Sin has no reality,' said Abelard, pointing rightly to the way that men like Bernard turned it into a denial of humanity: 'It exists rather in *not being* than in *being*. Similarly, we could define shadows by saying: The absence of light where light usually is.' Abelard did not deny that people could be sinful, but he did not consider this to be the fundamental human condition, and he felt it should be remedied not with punishment but with sincere contrition: 'Sin does not persist along with this heartfelt contrition which we call true penitence.'

This was vexing enough to Bernard; but Abelard truly overstepped the mark when he suggested that those who do evil without intending it do not sin. Even the men who crucified Christ, he said, were blameless in so far as they were just doing their duty. 'The crime lies in the intending,' Abelard claimed, 'not in the doing.'

Castigated by William and Bernard, Abelard requested an opportunity to defend himself against his detractors, and he was summoned to a debate at Sens in 1140. Here Bernard presented his prosecution in a work unambiguously titled *Treatise Concerning the Errors of Peter Abelard*, in which he did not hesitate to exaggerate his opponent's views so as to present him in the worst possible light. He called Abelard a heretic who 'is trying to make void the merit of Christian faith, when he deems himself able by human reason to comprehend God altogether.' It was gross impiety, Bernard charged, to shine the spotlight of reason into every corner of God's creation: 'he goes farther than is meet for

him … Of all that exists in heaven and earth, he maintains, nothing is unknown to him unless it be himself … This man is content to see nothing in a glass darkly, but must behold all face to face.'

At Sens, Abelard's nimble rhetoric and logic proved no match for Bernard's political acumen. His works were denounced, and Bernard pressed the matter with Pope Innocent II, who duly issued a condemnation in 1141. Humiliated for a second time, Abelard decided to take his appeal directly to Rome. But by now he was a sick man, wearied by his tribulations. He got only as far as the abbey of Cluny before his health prevented him from continuing. The abbot was Peter the Venerable, a tolerant and sensitive man who did much to re-establish the good reputation of the Cluniacs in the mid-twelfth century. Not only did Peter welcome Abelard warmly but he even brokered a reconciliation of sorts with Bernard. In 1142 Peter sent the ailing Abelard to the monastery of Saint-Marcellus near Chalon-sur-Saône, where he died. Peter's final act of kindness was to send a letter to Heloise at the Paraclete that was a model of delicacy, informing her that her former lover had passed away.

We should resist the idea that Peter Abelard was a lone martyr to logic and reason in an anti-rational age. Aptly called a 'prince of egoists' by the historian Christopher Brooke, much of what he said seems to have been motivated by ambition and by a desire to impress with dazzling intellectual displays. It was at the cathedral school of Chartres, as we shall see in the next chapter, that reason and science found more sober and systematic champions. But Abelard undoubtedly contributed to a climate in which an inquiry into nature could take root. His staunch defence of Nominalism, which earned him the vividly apt nickname of *Rhinocerus indomitus*, helped to encourage people to study the particular and thus to anchor the abstract tendencies of Platonism. And he refused to be cowed into capitulating all knowledge to an unknowable God. It was Abelard who (controversially as ever) coined the very word 'theology' for the study of the Scriptures, calling one of his works *Christian Theology* — before that, the term was used only for the study of pagan beliefs. Here as elsewhere he argued for debate and for a healthy scepticism rather than for the stock answers of the theologians: 'We seek through doubt, and by seeking we perceive the truth.'

Building by Numbers
Science and Geometry at the school of Chartres

We are amazed at certain things because they fit together in a clever and harmonious way, so that the very planning of this work seems to a certain extent to indicate the particular attention and care of the founder.
— Hugh of St Victor (twelfth century)

A considered arrangement of symmetries and repetitions, a law of numbers, a kind of music of symbols silently coordinate these vast encyclopedias of stone.
— Henri Focillon, *Art of the West* (1963)

The West Front and the Royal Portal

One of the joys of Chartres is that the square or *parvis* in front of the west end of the church has been kept free and uncluttered, so that you can appreciate this main entrance from a distance. As we have seen, this western mass escaped the great fire of 1194: it dates from the 1140s, when the Gothic style was still barely imagined, its earliest experiments being conducted at that moment at Saint-Denis. The west porch is flanked by two towers, built at more or less the same time but rather different in design. They are square in cross-section, but the uppermost tier of the south tower modulates cunningly into an octagonal form in preparation for its spire. Two great bells, weighing 13 and 10 tonnes, once hung up here; but they were melted down in 1793 to make cannons for the Revolutionaries. The north tower, which was begun immediately after the fire of 1134, was given a wooden steeple that was set ablaze by lightning in the fifteenth century. The stone spire that crowns the tower today was built at the end of the Gothic period, between 1507 and 1513, by Jean Texier, known as Jehan de Beauce, and in consequence it is encrusted with elaborate flourishes, crockets and curlicues that are quite out of keeping with the simplicity of the twelfth-century church. Jehan also added the little clock pavilion at the foot of the north tower around 1520.

The north tower has windows on all sides, even that facing east into the church, indicating that it was initially free-standing to the west of the entrance to Fulbert's church. It seems the plan was to link the western mass to the main

church via a covered courtyard or portico. The fine sculptural work that now adorns the western entrance (The Royal Portal) was originally intended for a new entrance into Fulbert's church from the east side of this portico. But Geoffrey of Lèves seems to have altered this plan while the south-west tower was still being built, deciding instead to extend Fulbert's nave to meet the new towers. Work was in progress on both towers by 1145. Just the lower section of the wall that bridges them, with its three lancet windows, dates from this mid-twelfth century rebuilding; the west rose window was added when the Gothic church was constructed. In fact this west front was initially set back between the two towers — only in 1150 was it advanced to become flush with the western faces of the towers.

While in most cathedrals with a triple west portal the flanking doors open *through* the towers onto the aisles of the nave (they do so at Notre-Dame de Paris, for instance), the initial lack of connection between the west towers and the old church of Chartres means that its three portals are squeezed *between* the towers so that they all open onto the nave. This curious history is also revealed by the fact that the builders did not quite get the towers aligned properly with the centre-line of the nave — when they were joined up, it was found that this line passed slightly to the south of the midpoint between the towers. As a result, the southernmost portal, which was designated to take some of the sculptures already prepared for the more easterly entrance that was originally planned, had to be made slightly narrower than intended. On the lintel above this door, the lying figure of the Virgin was clearly intended to be central, but is displaced slightly to the right, while one of the three shepherds has suffered the indignity of being sawn in half. It is worth noting too, lest we be inclined to enter into raptures about the perfect proportions of Chartres, that the difference in size between the two towers has created a difference in the proportions of the first bay of each aisle. Even with the best of intentions, sometimes the builder's job had to be a little makeshift.

A visitor to Chartres could easily stand arrested on this threshold for an hour or more, browsing through the library of warm, tawny stone that is the Royal Portal. This grand entrance represents many points of transition: from the sunlight of Beauce to the mysterious gloom of the great church, of course, and thus from the secular to the divine world; but also from the Romanesque to the Gothic, and from the age when God was feared to a time when it was believed that his works could be understood.

Although the three portals have pointed arches, their form is rooted in the Romanesque tradition, as are the statues that grace them in such profusion. But the wild vitality of the sculpture at Vézelay and Autun is replaced here by something calmer, less fantastic and more ordered and majestic.

There is almost too much to take in. Figures crowd across the frieze below the capitals of the jambs, and they fill the archivolts arrayed three deep over the central portal. But let's focus our attention on the southernmost door, and in particular on the figures around its two archivolts. Nearly all of the images shown on the portals are biblical, but the characters depicted here do not appear in any books of the Scriptures. These men are, for the most part, pagans: philosophers and writers from ancient Greece and Rome, and here they represent the seven liberal arts that constituted the intellectual syllabus of the Middle Ages. Each of these scholars is accompanied by a female figure personifying the respective academic discipline.

Geometry is denoted by Euclid, rhetoric by the Roman writer Cicero, while Aristotle stands for dialectics. Boethius represents arithmetic, and Ptolemy astronomy. Bent over a writing desk on his knees, Pythagoras is accompanied by a woman playing an array of bells, depicting music, while grammar is embodied by a figure who is either Donatus or Priscian, both renowned Roman grammarians.

These savants were, where necessary, welcomed as honorary Christians because of the light that their learning had shed on the world. Erected while the cathedral school was led by the progressive humanist Thierry of Chartres, the Royal Portal reveals how the Chartrain scholars were intent on mining the ancient world for new, rational understanding of the physical world. Their blend of Platonic philosophy and logical inquiry created an intellectual tradition that led to the growth of early science in the following century, and to the notion of a universe governed by order.

There are around 1,800 images and scenes carved into the stones of Chartres. But most of them are out of view — or would have been to a worshiper of the twelfth century, lacking powerful binoculars to spy out high nooks and remote, shadowy galleries. They were chiseled with great care and sensitivity by a skilled mason, and then carried to some location where the artist could not expect them to be seen again by human eyes.

This apparent perversity tells us everything about the philosophy with which Chartres was constructed, and it could hardly be more different from 'modern' ideas about the uses and functions of art. When Titian painted an altarpiece three hundred years later, he would have thought as much about his wish to impress the onlooker as about the

picture's function as an offering to God. But for many of the sculptors of Chartres, God was the only audience they thought they would ever have, and he was the only one they needed. It really did not matter to these men whether any mere mortals saw, appreciated, or understood what they had done. The building was a sacred symbol, and every part had the primary function of expressing piety and encoding a belief in divine order.

We no longer know how to read this code. It unites the physical with the metaphysical: according to Abbot Suger, building a church involved the transportation of the material into the spiritual. Artists of later ages, even until the present, have tried to achieve something analogous, but they have had no rules to guide them. Their attempts to forge materials into an expression of the ineffable therefore become highly personal visions, reflections of one individual's spiritual world.

The theoretical principles governing the construction of the Gothic cathedrals were geometry and clarity. The structure of these buildings is dictated by proportion, by simple numerical relationships between the key dimensions. These mathematical relations were deemed to be expressions of perfection, a belief that stemmed from ancient Greek thought and for which some found endorsement in the Bible. So when we experience unity and order in Chartres Cathedral, it is the result of careful and rational planning, motivated not by aesthetics but by morality. The building expresses a conviction that the glory of God's universe is expressed as a system of eternal order. This was a belief fostered in the early twelfth century at the cathedral school of Chartres itself.

The School of Thought

The cathedral schools were not merely centres of religious education but academies where students acquired a general education in the arts, literature, sciences and philosophies, both Christian and pagan. As at the monasteries, one learnt of course to be devout, to study the Scriptures, and to love God; but the schools were also places where one could learn about the world.

This isn't to say that their academic programmes were necessarily either rigorous or liberal: they could be patchy, dogmatic, and highly dependent on the quality of the masters. In the tenth century Gerbert of Aurillat had to travel to Reims to get decent tuition in dialectics, while Abbo of Fleury could find satisfactory instruction in music only at Orleans, and in astronomy only at Reims. But in principle at least, students at the cathedral schools were given a rounded education in the academic disciplines that comprised the *trivium* and *quadrivium.* The conservative scholastic tradition, which flourished at the schools of Paris, Orleans and Laon, favoured the *trivium* of rhetoric, logic and dialectics, often applied in pedantic detail to fine points of scriptural analysis. At the Chartres school, on the other hand, the emphasis was on the *quadrivium* of arithmetic, music, geometry, and astronomy, considered at that time to represent the four mathematical 'sciences'.

Students went where the best masters were, while masters might rove with skills for hire or, like Abelard, set up their own academies. Thus both teachers and pupils could find themselves in a city far from the one where they were born. In an age in which cities tended to function as self-contained mini-states, this meant that their rights as 'foreigners' were curtailed considerably, and they recognized the benefits of cementing their academic community into something akin to a trade guild. These trade organizations were sometimes called *universitas,* meaning totality, and this term became transferred during the twelfth century onto associations of masters and students. At first, a 'university' might comprise just a particular faculty, such as that of medicine or theology; but by the thirteenth century it had come to denote the *studium generale*, the collective organization of a school. By 1200 there was a 'university' in Bologna, in Paris and in Oxford.

The cathedral school at Chartres never became a university in this sense. But it was unquestionably one of the major centres of learning in France — aside from the school of Paris, it had no peer. This was due to a succession of extraordinary chancellors during the twelfth century, all of them fundamentally like-minded men who seem to have combined administrative ability and dynamism with prodigious intellect and that most controversial of endowments, curiosity. It is no exaggeration to say that the impulse to understand the world, which found a voice in thirteenth-century Oxford had flourished in the great universities of Renaissance Italy, found its first medieval expression in the chilly chambers that clustered around the imposing Romanesque church of Chartres. When that church had to be rebuilt at the end of the twelfth century, it was inevitable that the progressive spirit of the cathedral school's golden age should have infused and literally shaped the stones themselves.

The eminence of the Chartres school was kindled by the man whose effigy now stands in front of the cathedral's twin spires. The Italian Fulbert of Chartres (born c.960-70) was a pupil of the great tenth-century scholar Gerbert of Aurillac, a man so learned in mathematics and the sciences

that, despite becoming the first French pope (Sylvester II) in 999, he was rumored to be a magician in league with the devil. Gerbert was not content to take his learning from the simplistic glosses and summaries of ancient works in common currency at the cathedral schools; he studied at first hand the logic of Porphyry and Aristotle. It is said, apocryphally, that he invented the pendulum clock (an innovation more plausibly associated with Christiaan Huygens in the seventeenth century) and that he helped to spread the use of Arabic numerals and the abacus. Fulbert studied under Gerbert at Reims, where the cathedral school was at that time just about the only intellectual centre in France that could rival the German schools. Around 990 he arrived in Chartres, where he became chancellor of the chapter and head of the school. He was made bishop of Chartres in 1006, a position that he occupied until his death in 1028.

Characterized as the 'Venerable Socrates of the Chartres Academy', Fulbert established the cathedral school as a haven for rational and progressive debate. He seems to have been one of those people who, although not startlingly original, leaves his mark through an ability to inspire others. 'Without himself writing anything great, or starting any new line of thought,' says Richard Southern, 'he was able, by his sensitivity to what was going on around him, by his encouragement, and his genius for drawing men to him, to make the school of Chartres the most vigorous in Europe.' He combined a great breadth of interests with administrative skill and a moderation of temperament that won other men's confidence. Thanks to Fulbert, Chartres became for at least a hundred years one of the principal conduits of Arabic science and mathematics, and it was here that these discoveries became integrated into Christian thought. The Chartrain Socrates knew about the latest developments in astronomy and arithmetic; his pupils learnt the Arabic names for the stars, and he is credited with introducing the astrolabe (a device for predicting the positions of the stars) into Europe.

But Fulbert's principal interests were in logic and grammar rather than science. It would not do, he said, to rely on abuse, dogma and assertion in arguing one's case, as was the schoolmen's habit. If someone disagreed with your point of view, you did not call him a dunderhead and hunt down a text from the church patriarchs showing him he was wrong. You listened to his position and cross-examined it systematically. Fulbert instilled that attitude in his most celebrated student, Berengar of Tours, who sharpened the analytical and dialectic tools needed to conduct debates in this manner. Berengar acknowledged that the holy texts and Scriptures were indeed ambiguous, and he felt that their true meaning could be extracted only by careful examination of the words, based on the principles of logic. Nothing was too sacred to be exempt from this method. By applying dialectic thinking to the Eucharist, for example, Berengar felt compelled to deny the doctrine of transubstantiation (for which he was duly condemned by the Church). Anselm of Bec, author of the ontological proof of God's existence, was another product of this school of rationalistic grammarians.

Until the early eleventh century the main centres of learning were the monasteries; the monks tended to view cathedral schools as undisciplined and degenerate. But Fulbert's school was one of the institutions that reversed this conception. The library of Chartres accumulated new translations of the works of ancient writers and philosophers. Here pupils could hone their rhetorical and literary skills by studying Livy, Virgil, Ovid, and Horace; for logic and science they read Porphyry, Boethius and Aristotle's *De interpretation*. Tragically, nearly all of this collection was destroyed in the Second World War.

On Giants' Shoulders

After Fulbert's death, the school did not see his equal until the early twelfth century. It was then the cathedral's good fortune to acquire several able chancellors who did for the school's reputation what the politically astute bishop, Geoffrey of Lèves, did for the standing of the Chartrain episcopate. A friend of Bishop Stephan of Paris, Geoffrey was intimate with the most powerful churchmen of the age: his integrity was praised even by Bernard of Clairvaux. Geoffrey was bishop of Chartres from 1116 to 1149 — throughout the school's golden age — and his appointment as papal legate in 1132 raised the status of the city. A man of honour, he showed by his defence of Peter Abelard before the Council of Soissons that he could stand up for rationalism without alienating its opponents.

Geoffrey's first appointment as head of the school was a Breton, Bernard of Chartres, who became chancellor around 1119. What little we know of Bernard is derived from the writings of John of Salisbury about half a century after his death; but if John is to be believed, Bernard was a deeply learned and venerated man, 'the most perfect Platonist of his time'. John says that Bernard introduced his students to a range of philosophies, while taking care to adapt his teachings and his methods to the abilities of his audience:

> Such is the method that Bernard of Chartres followed, this well of learning, a man more well read than they are today. When he read and commentated on great writers, he showed what was simple and conformed to the rules

> … He highlighted the relationship of the passage studied to the other disciplines. He took care, however, not to teach everything about everything, but considered the capacity of his audience, giving them at the right time the amount that he knew they could manage.

Bernard's most abiding contribution to the intellectual world was to provide us with a vivid image of how knowledge progresses by building on its antecedents. 'We are dwarfs on the shoulders of giants,' he said, 'so we perceive more things than they do.' Isaac Newton claimed the phrase for science in the seventeenth century (while allegedly also using it as a barb to injure his short-statured enemy Robert Hooke). Bernard may have been merely paraphrasing a remark by Priscian; but if so, how memorably!

The grammarian Gilbert de la Porrée (c.1075-1154) became chancellor of the school after Bernard's death, and was succeeded in 1142 by the greatest of the 'scientific' chancellors, Thierry of Chartres, who was most probably Bernard's younger brother. For Thierry, the sciences of antiquity not only were consistent with Christian theology but were the essential tools for understanding God's creation. In *On the Seven Days and the Distinction of the Six Works*, he explained how the story of Genesis can be understood in terms of the classical elements. Indeed, he said, one cannot truly comprehend God's creation without being familiar with mathematics and with the account of matter and its transformations expounded in Plato's *Timaeus*. Here the Greek philosopher explains that the four elements, earth, air, fire, and water, are composed of fundamental particles — atoms, as Democritus called them in the fifth century BC — with geometric shapes that account for the way they can be interconverted. 'Let us begin with what we now call water', says Plato.

> We see it, as we suppose, solidifying into stones and earth, and again dissolving and evaporating into wind and air; air by combustion becomes fire, and fire in turn when extinguished and condenses takes the form of air again; air contracts and condenses into cloud and mist, and these when still more closely compacted become running water, which again turns into earth and stones. There is in fact a process of cyclical transformation.

Thus, Plato says, 'The names fire, air, water, earth really indicate differences of quality, not of substance.' He goes on to explain that, since the atoms of these elements are composed of polyhedral bodies with geometric faces — triangles and squares — these bodies may fall apart when 'surrounded by [particles of] fire and cut up by the sharpness of its angles and edges', after which they may be reconstituted into atoms with different shapes.

This Platonic cosmology provided Thierry with a physical description of the material world that he forged into an explanation of the biblical Creation. The medieval Platonists found in the *Timaeus* a universe that was consistent with their own sense of a natural hierarchy, consisting of concentric spheres with earth (the mundane world) in the centre, surrounded by water, then air, and finally fire, which extends from the orbit of the moon to the firmament of the stars. Plato himself talks of how this universe was created by a supreme deity; as he says, 'God placed water and air between fire and earth, and made them so far as possible proportional to one another, so that air is to water as water is to earth; and in this way he bound the world into a visible, tangible whole'.

Thierry and his contemporaries at Chartres considered that this account must equate with that in Genesis. Fire, said Thierry, vaporized some of the water surrounding the earth and let it ascend to the firmament, dividing the waters so that dry land might appear. From the moisture in the mundane sphere, plants were formed. The water in the firmament condensed to form the stars, which then gave warmth that allowed birds and fishes to appear in the rivers and seas, and animals on the earth.

As we've seen, Platonism had profoundly influenced Christian thought at least since Augustine's time. But it was not until the flourishing of the Chartres cathedral school in the twelfth century that the 'scientific' passages of the *Timaeus* were given due consideration. These were virtually unique in ancient literature in discussing how the universe was built up from the elements and in presenting thereby a fundamental theory of the physical universe and its cosmogony. Moreover, the *Timaeus* supplied extraordinarily fertile soil in which a primitive physics could germinate. For instance, it implied that each element tends to collect together on its own, which explained the action of gravity; stones fall to earth because they are drawn to the primal earthy sphere at the centre of the universe. Likewise, fire tends to rise towards to fire of the firmament. These notions sometimes spawned surprisingly 'modern' ideas about gravity. John Scotus Eriugena, an avid Platonist himself, suggested that in effect the strength of gravity (that is, the heaviness of a body) varied according to its distance from the centre of the earth; Adelard of Bath asserted that stone dropped into a hole passing through the earth would stop at the centre. The *Timaeus* also furnished the medieval Platonists with physical theories of sensations, colour, physiology, disease, and mental health.

When Thierry's student, the philosopher Clarembaud of Arras, called him the most important philosopher in all of

Europe, it was not simply the habitual genuflection of a medieval pupil towards his mentor. The renowned translator Hermann of Carinthia suggested that the heart of Plato was reincarnated in the famous master of Chartres, and in 1134 he dedicated his translation of Ptolemy's *Planisphere* to Thierry. Under Thierry Chartres drew students from all over Europe, who came to learn the liberal arts and to read what the ancient and Islamic writers had to say about them. Thierry admits that some of these pupils were of decidedly indifferent quality, so that in the end he became compelled to shut out of his classes 'the ignorant mob and the mish-mash of the schools … those who counterfeit genius, hating study, and those who claim to study at home, pretending to be teachers, and the clowns of scholastic disputation, armed with fistfuls of inane words'.

For Thierry, the world was systematic: what was true here must also hold there. It is this belief in pervasive principles that vindicates the words of historian Thomas Goldstein, who asserts that someday Thierry will probably be recognized as one of the true founders of western science.

The Possibility of Science

The programme that Thierry began was consolidated by an unruly Norman, William of Conches (c.1085 - c.1154), and his sometime pupil, the sober Englishman John of Salisbury. William was just the sort of provocateur that an intellectual transformation needs; John was the kind of conscientious scholar required to sustain it.

William of Conches studied under Bernard of Chartres, and began teaching (most probably there at the cathedral school) around 1120. But it seems that this irascible philosopher fell out with the bishop, and was soon blaming bishops everywhere for a decline in teaching standards. He said that they engage men 'without learning, without distinction, mere shadows of clerics', who will never challenge or contradict them. In his dialogue *Dragmaticon*, he charged that

> Most of these prelates seek in the whole world of pork butchers and skillful meat carvers to make poivrades and other delicacies. As soon as they find them, they cling to them at all costs. As for we philosophers, they flee from us as if from lepers. But to disguise their true villainy, they accuse us of pride, scandal, and all other crimes.

He went to the court of Geoffrey le Bel, Plantagenet count of Anjou, where he became tutor to the count's heir Henry, later Henry II of England. He was more interested in the sciences than in theology, and his *Philosophia mundi* provided twelfth-century Europe with its first comprehensive treatise on the physical world. It was a thoroughly rationalistic tract that made ample use of the new translations of Greek and Roman natural philosophy. Like his colleague Thierry, he used the elemental theory of the *Timaeus* to concoct a picture of how the stars were formed and how life began. He argued that natural phenomena arise from forces that, while of course created by God, may now act under their own agency. This system of nature, William insisted, is coherent and consistent, and therefore accessible to human reason: if we ask questions of nature, we can expect to get answers and to be able to understand them.

That is a necessary belief for one even to imagine conducting science. If everything is governed by the whims of God, there is no guarantee that a phenomenon will unfold tomorrow in the same way as it does today, and there is then no point in seeking any lawlike consistency in nature. William of Conches had no time for a Creator who was constantly intervening in the world. Rather, he envisaged the universe as a divinely wrought mechanism: once God set the wheels in motion, they would run of their own accord. It was in the twelfth century that one can find the first references to the universe as *machina*.

Just as essential to the scientific model is the notion that these natural laws are sufficiently simple for the human mind to comprehend. Like modern scientists (although perhaps for different reasons), William trusted that God's natural laws are well ordered and harmonious — for that was, as Plato attested, the very hallmark of the divine. Why, after all, would God have given us reason if the universe were not fashioned on the same principle?

Some regarded this attempt to develop a Christian Platonic natural philosophy as misguided. For all that he shared Augustine's Neo-Platonic convictions, Bernard of Clairvaux denounced Peter Abelard's use of the pagan Greek philosopher, saying that 'By making Plato into a Christian you are only showing that you yourself are a heathen.' To such attacks, William of Conches responded, 'If anyone considers not only Plato's words, but his meaning, he will find not heresy, but the most profound truth hidden under the coveting of words. It is this that we, who love Plato, will make clear'.

Yet, as we have seen already, to take too strong an interest in nature as a physical rather than a moral entity was to invite accusations of blasphemy. What wicked hubris this was, according to Absalom of St Victor, this study of 'the composition of the globe, the nature of the elements, the location of the stars, the nature of animals, the violence of the wind, the life-processes of plants and of roots'. Since everything was surely determined moment by moment by

the will of God; it was not only futile but impious to seek anything akin to what we would now regard as physical law, since that would be like trying to second-guess God at his own business.

The quest for laws of nature was also deemed improper because it seemed to constrain the omnipotence of God. That was what led the eleventh-century Italian cleric Peter Damian to cast doubt on all knowledge, saying that since God could act however he willed, no one could be certain about anything. William of Conches had an answer to that. 'One will say that it conflicts with divine power to say that man is made thus. To this I respond: on the contrary, it magnifies it, since we attribute it to Him to have given things such a nature, and thanks to this nature, to have created thus the human body.' He was not so unwise as to suggest that God was indeed bound by the laws he created; but, displaying a pragmatism that philosophers have frequently forgotten, he cannily indicated that this was not the issue: 'Certainly God can do everything, but what is important is that he did such and such a thing. Certainly God could make a calf out of the trunk of a tree, as country bumpkins might say, but did he ever do so?'

Thus the rationalists did not deny that God was the first cause of everything; but if that was where everything began, they did not believe this was where it ended. In his *Quaestiones naturales*, Adelard of Bath recounts a discussion he supposedly had with his nephew, who serves as a foil through which the traditionalist's position can be challenged. Yes, says Adelard, it is God who decides that plants should grow in the ground — but the process is 'not without a natural reason too'. Shouldn't one attribute all natural processes to God alone, his nephew asks? To which Adelard replies:

> I do not detract from God. Everything that is, is from him, and because of him. But [nature] is not confused and without system, and so far as human knowledge has progressed it should be given a hearing. Only when it fails utterly should there be recourse to God.

It would be hard to improve this as a description of the scientific attitude, or for that matter as a rebuttal to modern fundamentalism; and it serves as an epitome of the programme at Chartres.

But William of Conches was not a man to stand on scholarly argument alone. He was not above giving more salty responses to his accusers:

> Ignorant themselves of the forces of nature and wanting to have company in their ignorance, they don't want people to look into anything; they want us to believe like peasants and not to ask the reason behind things … But we say that the reason behind everything should be sought out … If they learn that anyone is so inquiring, they shout out that he is a heretic, placing more reliance on their monkish garb than on their wisdom.

He mocked the way these narrow-minded clerics would invoke God's mysterious powers to explain everything. Perceiving that attack is sometimes the best defence, William threw charges of impiety back at his assailants. Only by understanding the world can we appreciate how skillfully God has wrought it, and thus delight in his wisdom. Studying natural philosophy is thus not just a noble and worthy cause but an obligation, he said.

But there were powerful men among his enemies. That inveterate agitator William of St Thierry wrote to Bernard at Clairvaux, warning that the heretical Peter Abelard had a successor:

> [From] the stock of serpents has emerged a viper, an individual of obscure name and without authority, but who infects the air with a pestilential poison. After the *Theology* of Peter Abelard, William of Conches offers us his new *Philosophy*, confirming and amplifying all that the former has said, and adding still more impudence into the mix that the former hadn't said.

These natural philosophers, William of St Thierry complained, were trying to explain the creation 'not through God, but by nature, spirits, and stars'. That was, of course, a condemnation of the whole Chartrain enterprise. Bernard never challenged the Chartres school itself — perhaps he was too wily a politician for that, or perhaps his friendship with the bishop held him back — but William of Conches was ultimately denounced as a heretic and sorcerer, and was forced to return to Normandy.

William's Platonic cosmology was supported by his colleague at Chartres, the Spanish-born Bernard Silvestris. And his rationalism (if not so much his science) was echoed by John of Salisbury (c.1115-80), who, in contrast to William's bullishness, wrote in a calm, urbane and moderate fashion, spiced with wit in the manner of Erasmus. His erudition was put to good effect in the Church: returning to his native country after his years of study as a young man in Paris and Chartres, in 1147 he became secretary to Archbishop Theobald of Canterbury (to whom he was recommended by none other than Bernard of Clairvaux), and he was serving in the same capacity to Thomas Becket when the English archbishop was murdered in 1170. Six years later John went back to Chartres as the new bishop, where he remained until his death.

John's ideas were shaped by Peter Abelard, William of Conches and Gilbert de la Porrée. He was primarily a humanist, a literary rather than a scientific man. But as a natural philosopher he brought a measured, Aristotelian empiri-

cism to temper any excesses of Platonic abstraction. Men need to confine their studies to practical and concrete matters, he said, since the human intellect is limited and *a priori* logic will not alone suffice to decipher the world.

In one sense the spirit of rationalistic, proto-scientific inquiry that was developed at Chartres by Thierry and pursued by his successors can be seen as a natural outcome of the emerging humanism of the times, a consequence of the fresh influx of classical texts in Latin translation. But this was more than a question of the western assimilation of 'new' knowledge. The whole idea of studying nature for its own sake, and of looking for rational causes for natural phenomena, was new to medieval Europe, and signaled a profound shift in thinking. Previously, the only reason to study the mundane world was to uncover symbols for moral instruction. Things were the way they were because God willed it so, and if there was logic or reason to be found, that was simply an illustration of the wisdom and foresight of the Creator.

The Platonism of Chartres was not the same as the Neo-Platonism of Renaissance philosophers such as Marsilio Ficino and Pico della Mirandola, which emphasized the Gnostic mysticism of Plato's interpreter Plotinus rather than the rationalism of his elemental physics. For the Chartrains, nature was a network of laws that reason could penetrate, and they believed in what we might now call the Baconian accumulation of knowledge through experience, rather than the Neo-Platonic 'Light of Nature' as a source of revelation. They praised the way that Alexander the Great, Aristotle's pupil, was said to have been lowered to the seabed in a glass barrel to study the fish and the flora of the deep. To that extent, it was genuine proto-science and not pseudo-science that was incubated at Chartres.

But one could hardly study Plato without embracing some of his mysticism. We shall see that the Neo-Platonic notion of divine light may have played a role in shaping the new cathedral. And it seems that the Chartrain scholars regarded the natural universe not so much as a machine but as a creative entity: a central belief of later Neo-platonism, in which the universe is seen, in the words of the twelfth-century theologian Gerhoch of Reichersberg, as 'this great factory; this great workshop'. William of Conches drew a parallel between the artisan and God: 'All work is the work of the Creator, the work of nature, or of man the artisan imitating nature'. The Chartrains exalted Solomon as an ancient sage of the 'occult' hermetic arts, and it seems likely that as a result they treated the manual crafts with an esteem that was lacking at the universities. Some contemporaries of Thierry and William of Conches, such as Hugh of St Victor in Paris and the German monk Honorius of Autun, even admitted mechanics as a liberal art — in Honorius's words, a discipline 'where the pilgrims learn the working of metals, wood, marble, painting, sculpture, and all the manual arts'.

It must be said that the whole notion of a 'school of Chartres' has been challenged. Richard Southern in particular has argued that it was far less of a coherent movement than has often been suggested, some of its leading members having spent only brief periods at Chartres itself. And Southern asserts that the programme at Chartres was concerned not with disentangling science from theology but with weaving them more tightly together — which, he says, was no different from what other schools throughout Europe were doing at the time. Historians 'have been dazzled by the great name of Chartres', says Southern, 'which required that the works associated with it should be more than just remarkable examples of a common tradition; they were required to have a special kind of distinction different from all others'. The 'school of Chartres', he concludes, is 'a door that must be left behind, forgotten even'. As with most extreme positions that historians have a tendency to adopt, this one is not to be taken literally but should rather be seen as a warning not to overstate the case. 'It remains clear', says the historian Winthrop Wetherbee, 'that there are important and widely influential common elements in the thought of those masters whose names have been most frequently associated with Chartres.' It is hard to argue with that.

All Things in Proportion

A reverence for light and a belief in the creativity of the universe were not the only mystical aspects of Platonic philosophy that the Chartres school embraced. More significant perhaps than both of these was the sacredness of number, a notion promoted not only by Plato but also by Pythagoras. The Pythagoreans, according to Aristotle, 'reduce all things to numbers ... they construct the whole universe out of numbers'. Plato was profoundly influenced by this idea, since he was taught mathematics by the Pythagorean Archytas of Tarentum.

The ancient philosophers knew that musical harmony is governed by principles of proportion. A plucked string clamped at its midway point produces a tone a perfect octave above the 'fundamental' that is sounded by the open string. Clamp it two-thirds of the way along (giving a length ratio of 2:3), and you get a note separated from the fundamental by an interval of one-fifth: a harmony most pleasing on the ear. Other harmonious tones come from other simple ratios of length: a fourth from a

ratio of 3:4, a whole tone from 9:8. It was clear that harmony was linked to mathematics.

In the *Timaeus,* Plato explained that this same principle of construction from ratios extended to the structure of the universe. He said that the 'world soul' can be regarded as a strip, which God subdivided to produce the orbits of the planets:

> He began the division as follows. He first marked off a section of the whole, and then another twice the size of the first; next a third, half as much again as the second and three times the first, a fourth twice the size of the second, a fifth three times the first, a sixth eight times the first, a seventh twenty-seven times the first. Next he filled in the double and treble intervals by cutting off further sections and inserting them in the gaps, so that there were two mean terms in each interval, one exceeding one extreme and being exceeded by the other by the same fraction of the extremes, the other exceeding and being exceeded by the same numerical amount. These links produced intervals of 3/2 and 4/3 and 9/8 within the previous intervals, and he went on to fill all the intervals of 4/3 with the interval 9/8; this left, as a remainder in each, an interval whose terms bore the numerical ratio of 256 to 243.

Plato goes on to describe the construction of the heavens from these strips in a process of truly baffling complexity; sounding somewhat like the fabrication of an extremely complicated paper chain. The point, however, was not that one might follow exactly how this process unfolded, or how strips of the world soul should be mapped onto the observable universe. Rather, Plato's account showed that God was a builder, and that he built using the strict geometric, harmonious principles that can be discerned also in music. This was embodied explicitly in Plato's famous formulation, in his *Republic,* of the harmony of the spheres.

The geometric nature of the universe was also reflected in Plato's theory of the elements. As we have seen, he maintained that each of these is composed of atoms with geometric shapes, now known as the regular or Platonic solids, which are polyhedra for which every face is a regular polygon with all sides and angles equal. The properties of the elements derive from these shapes: tetrahedral fire is sharp and penetrating, cubic earth may be stacked into stable arrays. The fifth regular solid, the pseudo-spherical dodecahedron, represents the eternal cosmos. Thus, in Plato's cosmology the world is made from components and materials that are fashioned by the Master Builder into perfect geometric shapes and proportions, particularly those based on squares, cubes, triangles, and musical ratios.

Augustine and Boethius both wrote about the mathematical aspects of Platonism, and they were considered the greatest mathematical authorities at Chartres. 'Reason', said Augustine, 'is nothing else than number'. And since reason is a divine attribute, Augustine agreed with Plato that the geometry of nature reveals its intrinsic 'goodness' and thus provides an objective basis for aesthetic judgment. True beauty, in other words, came not from the hands and minds of artists but from order and proportion. These qualities, said Augustine in his book *On Order,* are to be found in the two supreme 'arts', music and architecture. Just as music can be derived only from harmonious proportions, the architect makes a 'good' building by observing simple mathematical relationships between its dimensions and by dividing space using geometric figures. This, then, is how one may build a temple or church that reflects the true, divinely beautiful structure of the universe.

This underlying order of the universe was considered to be a moral reality that transcended the purely sensual realm. While Augustine does seem to have been sensitive to the delights of music, he would surely have balked at the suggestion that its purpose was to give pleasure. In *De institutione musica,* Boethius approvingly quotes Pythagoras's injunction to regard music as an idealized thing that should be studied by 'setting aside the judgment of the ears'. Likewise, Augustine harmonious intervals were 'good' not because they sounded pleasing; rather, their pleasing effect was an inevitable side-product of the metaphysical dignity that stemmed from their mathematical origin. Music made by people untutored in its mathematical foundations was merely 'art'; but music based on those laws was 'science'.

Thus, Platonists held that beauty was not at all in the eye of the beholder but was an objective and quantifiable property: it was present a body to the extent that the body exhibited order. In other words, regularity did not supply beauty but actually defined it. 'In the body, certain symmetrical shape of the limbs ... is described as beauty', said Cicero. The Greek sculptor Polyclitus went further in the fifth century BC, explaining that beauty derived from *symmetria* and that beautiful comes about, line by line, through many numbers'. But it was Plato himself who made the most explicit statement of geometrical aesthetics. He distrusted the visual arts as deceitful, since they merely imitated superficial nature and did not attempt to reveal the underlying simplicity and order that lay beneath. 'I would not describe as beauty of form that which most would probably believe, namely the beauty of living bodies or certain paintings', he said in *Philebus.* 'What I would describe as beautiful is rather something straight or circular, and from these then the surfaces and volumes which are turned or defined through

spirit levels or squares ... for these are always in themselves beautiful and have a unique attraction'. By the twelfth century this Platonic view of beauty was the conventional one. So profoundly did the Platonic reverence for numbers influence Thierry and his followers at Chartres that it has been said they attempted to turn theology into geometry. Thierry even tried to reduce the doctrine of the Holy Trinity to a mathematical formula, something that would strike us today as cold to the point of impiety. It was a puzzle to many Christian theologians how God could be 'three in one': was he truly threefold, and, if so, how did he nonetheless retain his unity? Thierry proposed that these were precisely the properties of the number one, or unity: it could be multiplied by itself without changing its essential nature. Thus the trinity could be represented as the equation 1 x 1 = 1, in which the first '1' represents God the Father, the second '1' is the Son (equal to God but distinct), and the multiplication sign is the Holy Spirit that connects them and restores them again to unity.

From School to Stone?

There can be no doubt that geometry and proportion provide the central organizing principles of Gothic architecture in general and of that at Chartres in particular. But was that a consequence of the geometrical theory devised by the school of Chartres? This question has divided historians of art and architecture ever since Erwin Panofsky proposed in the 1950s that Gothic building was an embodiment of the abstract principles explored in the progressive medieval schools. This idea, itself a kind of riposte to the popular nineteenth-century view that Gothic was foremost a manifestation of technical and engineering advances, reflects the art-historical enthusiasm for uniting art with its intellectual climate. It was a tremendously fertile suggestion, which has helped to sharpen discussions about the state of twelfth-century philosophy and the extent and mode of its dissemination. It forces us to examine the character and training of the patrons and architects of the Gothic churches, and the nature of the discourse between them.

Panofsky claimed that

> During the 'concentrated' phase of this astonishingly synchronous development, viz., in the period between about 1130-40 and about 1270, we can observe, it seems to me, a connection between Gothic art and Scholasticism which is more concrete than a mere 'parallelism' and yes more general than those individual (and very important) 'influences' which are inevitably exerted on painters, sculptors, or architects by erudite advisers. In contrast to mere parallelism, the connection which I have in mind is a genuine cause-and-effect relation; but in contrast to an individual influence, this cause-and-effect relation comes about by diffusion rather than by direct impact. It comes about by the spreading of what may be called, for want of a better term, a mental habit.

What Panofsky had in mind was that all educated people in the 'tight little sphere' of the '100-mile zone around Paris' — the Île-de-France, which was the cradle of both Gothic architecture and French intellectual culture — acquired the habit of thinking in the way that the scholastic movement fostered. While admitting that 'it is not very probable that the builders of Gothic structures read Gilbert de la Porrée or Thomas Aquinas in the original' (the latter in any event would have prayed under Gothic arches already in place during his student years in Paris), Panofsky reasonably argued that they were exposed to the scholastic tradition in many other ways. By the latter half of the thirteenth century, he says, 'the architect himself had come to be looked upon as a kind of Scholastic'.

And what, then, did the cathedral builders learn from the scholastic movement? First and foremost, says Panofsky, 'the unity of the truth', coupled to the 'elucidation of faith by reason' — the principle, in other words, that was nurtured at the school of Chartres. And beyond this, a technical method of organization through a scheme of division and subdivision, which the scholastics employed 'to make the orderliness and logic of their thought palpably explicit'. And this, Panofsky says, is precisely the scheme that is evident in the Gothic style, in which the principles of organization are transparent and the total effect is one that conveys comprehensible order: 'Pre-Scholasticism', he says, 'had insulated faith from reason by an impervious barrier much as the Romanesque structure conveys the impression of a space determinate and impenetrable.' The Gothic church is constructed from units and motifs that recur identically and consistently, as opposed, for example, to the profusion of different vaulting forms that can be found in some Romanesque buildings. The Gothic wall has a hierarchical structure in which there is clear differentiation of elements and yet also consistency of forms.

This mode of organization by subdivision, says Panofsky, is evident in the west portals of the great Gothic churches, such as those of Chartres, Amiens, and Notre-Dame de Paris. With their nested archivolts and their layered tympana, they speak of an orderly and systematic partitioning of space. This was a habit taught in all spheres of the liberal arts, from rhetoric (indeed, Thomas Aquinas was led ultimately to complain of the penchant for 'multiplication of useless questions, articles, and arguments') geometry and music, where time itself was segmented into hierar-

chical sequences of notes.

At first glance, it might seem far-fetched to suppose that practical men, faced with the almost unimaginably daunting task of erecting a soaring temple of stone while coping with the grumbles and caprices of an itinerant workforce, the vicissitudes of funding and weather, and the demands and entreaties of clergymen, would have thought to import ideas half-assimilated from the traditions of bookish theologians. But we should never forget what it was they were building: a representation of heaven on earth. They knew that, and they believed it too. And they accepted the medieval notion that the physical world is no more than a symbol of an ultimate, immaterial reality — of which architecture was intended and experienced as a representation. Recall Jean Bony's remark that the physical form of the cathedrals expresses what was believed by the architects to be the theoretical framework of the building. Scholasticism supplied that framework, the guide to that ultimate reality.

Otto von Simson expanded on Panofsky's argument in the 1950s, making even stronger claims in the same direction: 'Gothic art', he said, 'would not have come into existence without the Platonic cosmology cultivated at Chartres.' While Panofsky wished to point out the general analogies between twelfth-century scholasticism and the Gothic style, von Simson looked more closely at the role that geometry and order had to play in this relationship. 'The Gothic builders', he says, '… are unanimous in paying tribute to *geometry* as the basis of their art.' He asserts that it was at the school of Chartres that this long-standing tradition became linked to beliefs about the way God had constructed the universe. Alain of Lille, one of the great humanists of the school, spoke of God as the *elegans architectus* who created the world using the harmonious rules evident in music. 'The first Gothic,' von Simson argues,

> In the aesthetic, technical and symbolic aspects of its design, is intimately connected with the metaphysics of 'measure and number and weight.' It seeks to embody the vision that the Platonists of Chartres had first unfolded, no longer content with the mere image of truth but insisting upon the realization of its laws. Seen in this light, the creation of Gothic marks and reflects an epoch in the history of Christian thought, the change from the mystical to the rational approach to truth, the dawn of Christian metaphysics.

For and against Panofsky

Erwin Panofsky was not the first to make the connection between scholasticism and architecture. In 1860 the German architect Gottfried Semper called Gothic 'the lapidary translation of scholastic philosophy', while seven years later the historian Ferdinand Piper saw a 'wonderful consummation in the parallel phenomena of scholastic systems and the Gothic cathedrals'. And Raymond Klibansky was developing the idea of a 'parallelism' between the scholarship of the Chartres school and the 'artistic symbolism of the building' in the 1930s.

But Panofsky's short treatise *Gothic Architecture and Scholasticism* argued for this connection with more force and clarity than anyone had done previously. As a result, says the British historian Peter Kidson, 'Gothic at last took its place as a major manifestation of the spiritual ferment which transformed twelfth-century Europe, and it could be seen to bear the imprint of much contemporary intellectual activity.'

That's the position I want to advance in this book. But I do not wish to advocate uncritical acceptance of Panofsky's idea. His analysis of the links between the schools and the builders of the Gothic era is too narrow and too assertive — as Kidson says, he succumbed somewhat to 'the temptation to rewrite history rather more emphatically than the evidence warranted'. It has rightly been pointed out, for example, that the great age of cathedral-building had to be supported on the solid bedrock of economic prosperity; theology alone wouldn't have sent those spires heavenward and filled those walls with light. But that pertains to the scale of the enterprise, not its style. It is also true that, as we have seen, the emergence of Gothic does not constitute an abrupt break with the Romanesque tradition. Let alone anything else, the 'architects' of the twelfth and thirteenth centuries did not have a sound enough theoretical knowledge of mechanics to introduce all the innovations at once.

In the absence of definitive evidence, however, historical debates of this sort are unfortunately apt to be advanced with ungenerous and dogmatic certainties. As a result, Panofsky's thesis has sometimes been not so much critiqued as trashed. The acerbic art historian Jan van der Meulen dismissed his book as a 'facile little tract,' and claimed that 'the theological origins of every individual form of the High Gothic cathedral of Chartres and of their overriding relationships lie … long before that synthesis of reason and faith during the advancing thirteenth century stressed by Panofsky'. He has a point, although it rather leaves one wondering why it was nevertheless precisely during the period of that 'synthesis' (rather earlier than van der Meulen states) that the Gothic style appeared. Van der Meulen also objects, with some justification, that Panofsky displays the bad habit common among art historians of relying on an analysis of styles rather than the scientific and archaeologi-

cal evidence of the methods and patterns of construction.

But Panofsky himself admitted that hard evidence for his thesis is 'very slight' — he could adduce little more than the (disputed) journal of a thirteenth-century architect (see chapter 6) which makes glancing reference to the rhetorical practices of scholasticism. 'The gentle reader', Panofsky says, 'may feel about all of this as Dr Watson felt about the phylogenetic theories of Sherlock Holmes: "It is surely rather fanciful."'

Temples to Proportion

Was von Simson correct to equate the geometry of Chartrain (and other Gothic) architecture with the Platonism of Chartrain thought? It would be rather surprising if the two were not somehow connected. But while some critics insist on the lack of hard evidence, others question the significance of this link for the opposite reason that geometry and architecture, and particularly sacred architecture, seem already to have been firmly wedded centuries before the golden age of Chartres.

'Thou hast ordered all things in measure and number and weight': this thoroughly Platonic idea is voiced in the First Book of Kings by Solomon himself, and Christian theologians had no doubt that it was embodied in the king of Israel's legendary temple. It was not out of sheer pedantry that the Bible specifies the proportions of this building in such detail, but because these dimensions had holy significance:

> The temple that King Solomon built for the Lord was sixty cubits long, twenty wide and thirty high. The portico at the front of the main hall of the temple extended the width of the temple, that is, twenty cubits, and projected ten cubits from the front of the temple … The lowest floor was five cubits wide, the middle floor six cubits and the third floor seven … And he built the side rooms along all the temple. The height of each was five cubits … He partitioned off twenty cubits at the rear of the temple with cedar boards from floor to ceiling to form within the temple an inner sanctuary, the Most Holy Place. The main hall in front of this room was forty cubits long.

And so the description goes on, with sufficient detail that one can make an architectural drawing. All of the building's key proportions correspond to simple integer ratios: 1:2, 1:3 and so forth. 'Let no one be so foolish or so absurd', Augustine warned in *On the Trinity*, 'as to contend that [these numbers] have been put in the Scriptures for no purpose at all, and that there are no mystical reasons why these numbers have been mentioned.' Clement of Alexandria, one of the first Christian Platonists, expresses this same belief with his injunction that a church should be 'constructed in the most regular proportions'.

This idea that a sacred building should embody numerological symbolism seems to have been manifested in western Christianity from at least the time of Charlemagne. His chapel at Aachen, which was planned around 790 when Alcuin was at the imperial court, bears the following inscription: 'As the living stones are bonded in a fabric of peace, and all come together in matching numbers, the work of the lord who has built the entire hall shines forth brightly.' This symbolism is even more explicit in the description given by a monk called Arnold, from the abbey of St Emmeram in Regensburg, sixty years after it was begun in 976:

> [Abbot] Ramwold … commanded the erection of a crypt at St Emmeram. This building — very artfully ordered by the man of God — exhibited in threefold and even fourfold notion what was intended. And because the originator of this work [the abbot] loved the holy Trinity and held fast in the faith of the four Gospels, he produced thus a kind of credible evidence. The columns, indeed, which hold up this underground church compose wonderfully the duality of his twofold love, namely of God and the neighbor. Also the five altars — in which … relics are arranged … keep in mind foremost respect for the five Books of Moses, and they urge strongly ever to have fivefold circumspection regarding the five bodily senses. The sixth altar, however … announces the perfection of the 'sextuple', comprising everything.

There was arguably a more direct avenue for Pythagorean symbolism and Platonic geometry to find their way into architecture in the tenth century — the early Romanesque period — than the twelfth, since clerics were much more involved in the building programme of their churches before the professionalization of architecture in the early Gothic era. In any event, there is nothing uniquely Gothic, let alone Chartrain, about Platonic church geometry. Bernard of Clairvaux shared Augustine's Platonic mysticism, so it is no surprise that many of the key proportions at Chartres — simple ratios such as 1:2, 1:3, 2:3 — can be found also in Cistercian churches.

But there is another reason, aside from Christian Platonism and biblical symbolism, why number, proportion and geometry may have taken root in medieval architecture, for these principles are also evident in the secular traditions of building practice. The architects of the cathedrals did not use geometry purely or even primarily for theological or philosophical reasons, neither was this an aesthetic choice of what 'looks right' (at Reims, for example, the ribs under the vaulting are circumscribed by equilateral triangles, which is not a feature any observer would have noticed). It has been

asserted instead that these practices merely provided the architect with convenient rules of thumb, or even that they constitute nothing more than an unquestioned tradition, being notions learnt by rote during a mason's apprenticeship without any real understanding of where they came from.

In so far as this architectural tradition drew on the authority of classical authors, its equivalent of Euclid's *Elements* or Ptolemy's *Almagest* was *De architectura* by the Roman Marcus Vitruvius Pollio (born c.80-70 BC), who was more or less the only pre-Christian writer known to have discussed the topic. (Hero of Alexandria, born c.AD 10, whose followers built the vaults of the Hagia Sophia, was apparently a greater authority than Vitruvius, but his works were lost.) Vitruvius advised the architect to build according to rational, mathematical principles and argued that architecture should be considered a liberal art. He stressed that the architect needs a broad education, encompassing geometry, arithmetic and music, so that he might 'demonstrate and explain the proportions of completed works skillfully and systematically'.

For Vitruvius, a sound and beautiful building is one that observes the tenets of symmetry and proportion: 'The composition of a temple is based on symmetry, whose principles architects should take the greatest care to master. Symmetry derives from proportion, which is called *analogia* in Greek.' Proportion itself, he says, is 'the appropriate harmony arising out of the details of the work itself; the correspondence of each given detail among the separate details to the form of the design as a whole'. It is the key to shapeliness, defined as 'an attractive appearance and a coherent aspect in the composition of the elements', which is achieved when 'the elements of the project are proportionate in height to width, length to breadth, and every element corresponds in its dimensions to the total measure of the whole'. In these prescriptions, Vitruvius can be seen to provide a blueprint for the 'modular', hierarchical coherence of Gothic to which Panofsky alludes: 'Proportion', Vitruvius wrote, 'consists in taking a fixed nodule, in each case, both for the parts of a building and for the whole.' Victor Hugo captures this spirit in his description of the medieval churches of Christendom: 'Everything is of a piece in this logical, well-proportioned art, which originated in itself. To measure the toe is to measure the giant.'

Vitruvius is not obviously a profound thinker — some have presented him as a rather naïve dilettante, others as a boring engineer. In any event, he seems to have been rather conservative in his methods and views. Yet his geometric approach does contain a clear strand of Pythagoreanism. He notes that the height of a man is more or less equal to the span of his outstretched arms, so that the human figure can be inscribed in a square: the *homo quadrates*, as it became known in the twelfth century. The square is a fundamental building block for Vitruvius, reflecting the Platonic idea that it is a particularly stable shape.

In the writings of Vitruvius, the medieval builder may have found a vitally important conceptual tool: geometry was shown to be a means by which the proper shape of a building might be deduced from simple, basic figures. Beginning with such figures, commonly the square or the equilateral triangle, the Gothic architect was able to calculate all the dimensions of both the ground plan and the elevation by strictly geometrical means. This practical utility of geometry played an especially important role in a time when there were several different systems of measurement in use (see Chapter 7). The question of whether such figures were merely a matter of practical convenience, or whether they reflected a desire to 'encode' geometry into the building, is obviously bound up with the matter of what the builders knew, and of how much say they had in matters of design. I shall explore these issues in the next chapter.

The use of geometry in the structure of Chartres Cathedral therefore permits of several interwoven interpretations, and how much significance one attributes to each of them must remain for the time being a matter of personal preference. The builder appreciated geometrical means of construction as a practical tool, but he also inherited Vitruvius's notion that it was a way to achieve harmony of proportion. That in turn connects geometric ratios and angles to a more metaphysical perspective, in which geometry confers a kind of 'rightness' — in Platonic philosophy it has intrinsic virtue, and one can find biblical support for this idea.

To go any further than this — to understand how and why the master builders might have used geometric principles in practice — we need to take a closer look at the roles of these men in that construction of a cathedral. But we should not lose sight of the fact that, according to the natural philosophy that developed in twelfth-century Chartres, a church modeled on geometrical form would have in some sense reflected the structure of the universe. That, as we have seen, was one of the key functions of the ecclesiastical architecture. The stones themselves encoded a belief in an ordered and thus a comprehensible cosmos; according to Georges Duby, in the twelfth century 'the universe ceased to be a code that the imagination strove to decipher. It became a matter of logic, and the cathedrals were to restore the pattern of it … Henceforth it was up to the geometers, using the

deductive science of mathematics, to embody in stone the fantastic airiness of the celestial Jerusalem.'

Sacred Geometry or Numerology?

A great deal has been written about the 'sacred geometry' of Chartres and the mystical secrets it is supposed to encode, most of it wildly speculative, if not outright fantasy: we are told that one can read here the 'lost secrets' of the Druids, the Knights Templar or some such semi-legendary institution. Some have claimed that geometric construction was applied in the church to a degree that seems almost obsessive, such that there is not the smallest feature — the angle of a bevel in a window frame, say — that was not calculated using a geometrical scheme.

The problem in assessing these claims is that which dogs all numerology: if you look hard enough, you will almost always find a 'meaningful' ratio more or less close to your measurements. Thus, for example, one might look for simple integer ratios found in musical scales, such as 1:2 and 1:3, but also 2:3 (that is, proportions related by a factor of 1.5), 3:4 (1.333), 4:5 (1.25) or even 8:9 (1.125). Then one could also search for the ratios of 1:√2 (1.414) and 1:√3 (1.732). Allowing for only a small margin of error in measuring these figures, it is not hard to encompass most of the numerical space between 1 and 2 with 'significant' ratios.

We should bear in mind that it is not clear whether medieval masons had any concept of what a square root actually was; these ratios are simply those that appear in simple geometric figures, such as the diagonal of a square or the hypotenuse of a right-angled triangle with other sides in the ratio 1:√2. √2 and √3 are, and were even then, recognized by mathematicians as so-called irrational numbers, which cannot be represented by any ratio of integers. This was, to men trained to think in terms of simple proportions, an uncomfortable notion; but it seems that they were often content to use rational approximations in their measurements. √2, for instance, can be reasonably well represented by the fraction 17/12 (equal to 1.417), or even 7/5 (1.4). It wasn't only masons who made such simplifications; two scholarly pupils of Bishop Fulbert of Chartres, himself a masterly mathematician, can be found discussing the relative merits of these two rational approximations.

A ratio that has aroused particularly enthusiastic commentary is 1:1.618, which corresponds to the *sectio aurea* or Golden Mean (1 : (1+√5)/2), one of the most profound proportions in classical antiquity. It has been asserted (and the notion is still popular today, though apparently unfounded) that a rectangle whose sides are related by this proportion is uniquely pleasing to the eye. Whole books have been written how this number may be found in the forms of nature and in the human anatomy. The ratio is also distinguished as that to which the successive numbers of the Fibonnaci sequence converge. This sequence of integers, in which each is found by adding together the two previous numbers in the series, was popularized in the West by Leonardo of Pisa (Fibonacci), who discovered it in Arabic mathematics; it begins 1, 1, 2, 3, 5, 8, 13, 21 … As the numbers get larger, the ratio of two consecutive members of the series gets ever closer to 1:1.618. The Golden Mean was revered at the Chartres cathedral school, where it was known from Euclid's *Elements*. Ptolemy describes how to construct it geometrically in his *Almagest*, a translation of which, apparently made by Abelard of Bath around 1150, was dedicated to the chancellor of Chartres.

Vitruvius recommended the use of the 'early Fibonacci' ratios 2:3 and 3:5, which may have led to their adoption by architects even though Vitruvius did not justify the choices. It has been claimed that the ratio 5:8 is particularly prominent at Chartres, where it is said to represent an approximation of the Golden Mean. Otto von Simson asserts that the proportions in the cathedral's columns seem to be based on the Golden Mean. From the top of the plinths to the springing of the nave is a distance of 8.61 m (28 ft 3 in); the height of the shafts above this is 13.85 m (45 ft 5 in); and the distance between the base of the shafts and the lowest string course (the narrow, horizontal raised ribs that punctuate the elevation) is 5.35 m (about 17 ft 6 in). The ratios 5.35:8.61 and 8.61:13.85 are both equal to 1.609 — which is indeed rather close to 1.618. And the lower string course of the walls, level with the floor of the triforium, divides the shafts into lengths of 8.78 m (about 28 ft 10 in) and 14.19 m (about 46 ft 6 in) with a ratio of 1.616.

Moreover, the Golden Mean is related to the dimensions of the pentagon, a shape that von Simson claims was widely used by the designer of Chartres. For instance, the ratio of the width to the length of the crossing — 16.44:13.99, as measured in metres from the centres of the piers — is equal to the length of side of a pentagon to the radius of the circle in which it may be inscribed.

These numerical matches look impressive, and perhaps von Simson is justified in regarding them as intentional. Yet as we have seen, there are in fact rather few numbers between 1 and 2 for which a close correspondence with some 'meaningful' ratio cannot be found. How close do the numbers have to be to make a convincing match? And how do we measure dimensions in any case? If we are fitting a

ratio or a geometrical figure to the ground plan, do we use the midpoints of walls or their internal or external faces? The same pertains to the positions of columns. The differences can be significant, yet the choice is arbitrary. That is why, the moment one hears an appeal to 'sacred geometry' in church architecture, it is wise to heed what one contemporary historian has said:

> The presence of proportions in a building can be asserted with confidence, but they are notoriously difficult to demonstrate, at least on the evidence of the building alone. Monuments of great age hardly ever survive intact or unchanged, and, even if they are well-enough preserved for their mathematical proportions to be detected, few were built to standards of exactitude high enough to resolve the problem beyond doubt.

Art historian Eric Fernie is more outspoken, calling the notion of sacred geometry 'pyramidiocy' that relies on coincidence. 'So much of what has been written on the subject is nonsense,' he says, 'consisting of webs of literally unbelievable complexity and corresponding intellectual nullity which are clearly not worth the effort required to unravel them.'

One of the most controversial conjectures of this kind in regard to Chartres has been made by John James. He claims, for instance, that the ground plan is based on the figures of three adjacent squares and that the lengths of the building in feet can be construed astronomically: 365 ¼ (from the Royal Portal to the tip of the apse) is of course the number of days in a year, and 354 (from the Royal Portal to the centre of the easternmost apsidal chapel) corresponds to the number of days in a lunar year, which was important for determining the date of Easter. James identifies several proportions that are apparently related according to the squares and cubes of a basic dimension ($x:x^2:x^3$), and others that reflect the Golden Mean. He argues that even minor adaptations to the design to make features fit would be done using geometric construction rather than arbitrary shaping. 'There was not one decision that was not made through geometry', James claims. In some other dimensions of the cathedral, meanwhile, he identifies numbers allegedly encoded in sacred phrases, such as *Maria mater dei*, according to the cabbalistic system of gematria, which assigns numerical values to alphabetical letters. Again, it is hard to know how impressed one should be by such suggestions.

Mindful of that danger, the British historian Nigel Hiscock has proposed schemes for the geometrical basis of medieval churches with some circumspection, admitting that his evidence comes from plausibility arguments rather than documentation. Hiscock argues that Platonic tendencies are equally if not more characteristic of Romanesque building than of Gothic, so he believes that we should search for geometric principles not in the current cathedral at Chartres but in Fulbert's earlier design.

Fulbert's plan can be reconstructed with a fair degree of reliability, not least because his crypt still survives. Hiscock shows that the positions of all the principal elements, such as the aisle and bay widths, narthex and radiating chapels, can be derived from a series of geometric constructions based in particular on the right-angled triangle with an internal angle of 60º. The resulting scheme looks highly complex — a web of lines that, one might imagine, can be tuned to fit anything. But the series of 'moves' that leads to this construction involves only a few steps. To the obvious charge that one could find such schemes that fit any building with a little ingenuity, Hiscock responds by demonstrating that geometric designs built up this way can be found for many medieval buildings but not for the later ones that have no reason to be informed by Platonic thinking.

Is it convincing? You must decide for yourself. But Hiscock's suggestion that the Gothic plan at Chartres can be accounted for by elaborating on the same scheme he evolves for Fulbert's church seems to demand either that a record of these design principles was preserved for more than a century and a half, or that the Gothic architects were remarkably attuned to the logic of their predecessors. And for this way of building to have been standard among Romanesque and Gothic architects but to have left no record demands either an impressive adherence to secrecy among these professionals, a remarkable loss of documents (which by no means is impossible), or such a casual familiarity with the approach that there was thought to be no need to write it down. Yet at the very least, Hiscock says reasonably, this theory 'shows there are alternative geometric proportions present in medieval architecture to those commonly advanced in the literature'. His proposal will surely not be the last.

In the end, there is one very serious objection to any notion of 'sacred geometry' that goes beyond the widespread use of simple ratios and geometric figures by the master builders: the buildings themselves contradict any suggestion of some universal geometrical key that unlocks their secrets, for the proportions of Gothic churches vary immensely and no two are identical in this regard.