

CHAPTER TWO



THE MATHEMATICAL POPE

In the year 999, on Palm Sunday, Gerbert of Aurillac (c. 940–1003), the most learned man in Europe, was crowned Pope.¹ As the papal tiara was placed on his head, Gerbert's elevation to such a height from his humble beginnings in rural poverty must have seemed miraculous. During the Middle Ages, the princes of the Church tended to be related to the princes of the state, and there would not be another lower-class pope until the thirteenth century.² Gerbert's coronation took place in the Basilica of St. John Lateran, the cathedral of Rome, which lies on the other side of the city from the Vatican. The building that stands on the site today is largely a seventeenth century creation, but we can gain a good idea of what the old basilica looked like from studying ancient churches that have survived.³ At the end of the first millennium, the interior would have been a long box-like space called the nave, with stone walls and a wooden ceiling. The walls would have been supported by a row of pillars which allowed access to the aisles that ran down each

side. At the far end of the nave was the apse, a semi-circular alcove before which stood the altar. The roof of the apse was a half dome, providing an artistic space that could dominate the whole length of the basilica. Typically, a golden mosaic of Christ triumphant stared out making it clear who the true master of the building was. Along the walls of the nave, frescos of the saints would make the building a riot of color. Just below the roof, a line of windows would have let in light and ensured that the building was not too gloomy, despite the clouds of incense.

Packed into this richly decorated hall on that coronation day would have been a crowd of people as finely arrayed as the church itself. The clergy would be distinguished by their tonsured heads—the ceremonial shaving that marked them out as men of God. Any monks present would be plainly attired, but most priests would wear their most splendid vestments. Foremost among them were the cardinals who represented the parish churches of Rome. They did not yet have the power to elect the pope. That was the preserve of the noble families of the city who fought among themselves for control of the papacy. At the coronation, the members of each family would have sought to surpass their rivals with the splendor of their jewels and robes. On that day, however, they would have had to stand aside for a still greater power, because the Holy Roman Emperor was in town. In truth, Gerbert owed his elevation to his patron and pupil Emperor Otto III, who was still only in his teens. Otto had seized control of Rome and, when the previous pope died, ensured the appointment of Gerbert in his stead. The new pope knew where he stood. He took the pontifical name Sylvester II because the first Pope Sylvester had been a councilor to the Emperor Constantine.⁴ Thus, Gerbert's ascent to the throne of St. Peter in St. John Lateran was supposed to signal a new partnership between Church and state. It never happened. Within four years, both emperor and pope were dead.

THE CAREER OF GERBERT OF AURILLAC

We know a good deal about Gerbert's life because one of his contemporaries, a monk called Richer of Saint Remi (who died around 998), wrote a history of France giving plenty of attention to Gerbert's career.⁵ We also have a collection of letters that Gerbert wrote, although most of these relate to Church business and not to his personal life.⁶ He was born near Aurillac in south central France and entered the local monastery at an early age. Initially, he would not have been one of the monks—his origins were too humble for that. Monasteries had two ranks of membership; the monks who spent their time praying came from well-to-do or even noble families. Below them were the lay brothers who carried out the day-to-day housework, farming, and manual labor. However, Gerbert had great ability, which his superiors must have decided to nurture. The abbot allowed him to profess as a monk and devote himself to scholarship. Gerbert was always grateful for the opportunity that his monastic teacher afforded him and in later life wrote that to him "I owe everything."⁷

In around 967, a Spanish nobleman visited the monastery and was struck by Gerbert's talent. He persuaded the abbot to let him take the young monk back home with him to Barcelona, probably to act as his secretary. At this time, Barcelona was on the border between Christian and Muslim Spain. Living there presented Gerbert with an excellent opportunity to learn the latest mathematics and philosophy from the Arabs. He may even have travelled to Islamic Seville and been taught by Muslim scholars.

After two years in Spain, Gerbert and his noble patron travelled to Rome on a pilgrimage where the young scholar was introduced to the two most powerful men in western Europe, Pope John XIII (d. 972) and Emperor Otto I. Otto had asked the pope to keep an eye out for anyone skilled in mathematics because he was keen to encourage its study in his court.

Gerbert must have made a very favorable impression on the emperor because, from then on, the imperial family promoted him incessantly. First, he became tutor to the emperor's son. Then he was sent to complete his education at the cathedral school of Reims in northern France. This was one of the schools set up at the behest of Charlemagne to improve literacy. While there, Gerbert introduced some of the knowledge of the Arabs to a Christian audience. His surviving letters show that he considered arithmetic to be a useful skill; in a series of letters to a monk called Constantine of Fleury, he patiently explained the rudiments. Richer mentions how Gerbert used a musical instrument called a monochord to teach harmonics to his students. He also gave instructions on how to make astronomical apparatus, and frequently mentioned his excitement at finding lost manuscripts. His greatest claim to fame is that he helped to introduce Arabic numerals into the West. He incorporated them into the abacus, which was used for almost all calculations in his day, to produce a more efficient instrument. His modified abacus used beads with numbers inscribed on them, rather than having each of the beads represent a single unit.⁸

We know that Gerbert was extremely knowledgeable about astronomy because he spent much of his time building models of the universe. Richer gives us details of several spheres that his master constructed, showing the locations of the stars and different sectors of the sky. These were assembled from horsehide stretched over a wooden frame that was then painted according to the requirements of the customer. Gerbert didn't take money for his work, but rather manuscripts. In 988, he wrote to one Remi of Trier offering him a celestial sphere in exchange for a copy of an epic poem by the Roman author Statius. Remi was clearly intrigued at the prospect of owning such an unusual object and duly wrote out the manuscript himself. Unfortunately, the version he copied from was incomplete, much to Gerbert's annoyance.⁹

Being interested in math at this time could be a frustrating experience. Even those who knew enough to ask the important questions rarely had

access to the right answers. Two near contemporaries of Gerbert, Ragimbold of Cologne and Radolf of Liège, liked to set each other geometrical problems and then circulate their discussion to anyone else they thought might be interested. What can be gathered from their correspondence is not only how little information these two had, but how passionate they were about what they did know. They were completely confused about the angles that make up a triangle, which as the ancient Greeks knew must always add up to 180° . Then, they could not make sense of the square root of two, which is a number that cannot be expressed as a fraction. Radolf got hold of a new astronomical instrument called an astrolabe,



1. A later Islamic astrolabe of similar design to those which Gerbert would have seen in Spain

probably introduced to Europe from Arab Spain by Gerbert. An astrolabe should allow its user to tell the time from the positions of the stars or planets as well as carry out astronomical observations. Radolf was beside himself with excitement. He desperately wanted to show the instrument to Ragimbold but refused to part with it, so insisted that his friend visit him.

Judging by the rest of their correspondence, neither of them could have understood how an astrolabe works, but that failed to detract from their boyish enthusiasm for the new toy.¹⁰ Thankfully, it did not take long for knowledge of the instrument to spread, at least in part due to an astrolabe instruction manual attributed to Gerbert himself. In 1092 a monk named Walcher, from Great Malvern in England, used his astrolabe to carry out an observation of a lunar eclipse that enabled him to reconstruct the entire lunar calendar.¹¹

Meanwhile, as Gerbert's fame spread, so did speculation about where he had gained his great learning. He acquired an undeserved but unshakeable reputation as a sorcerer. Some held that Arabian alchemists had taught him forbidden arts while he lived in Spain. The English chronicler William of Malmesbury (who died around 1143) claimed that his knowledge came from a magical head made of brass. This powerful artifact supposedly spoke to Gerbert and revealed the secrets of nature to him.¹² His ability as a teacher and closeness to the imperial family also attracted jealousy from his colleagues. Richer wrote that the headmaster of the palace school in Magdeburg in Germany accused Gerbert of promoting mathematics at the expense of philosophy. Gerbert was not impressed. "Do not let some half-educated sophist let you think that arithmetic is contrary to the liberal arts or philosophy," he wrote to a student.¹³ However, the impudent headmaster would not relent and Otto II, who had by then succeeded to his father's throne, summoned both protagonists to Ravenna in Italy to debate the point. Gerbert, of course, obliterated the arguments of his opponent, and the emperor awarded him with the abbacy of the famous and venerable monastery of Bobbio

in the Apennine Mountains. He also raised his former tutor to the rank of count.

Sadly, Gerbert's appointment was not a success. Bobbio had fallen on hard times under its previous abbots. The treasury was empty and the monks dissolute. He tried to turn things around by improving discipline, but the monks defeated his every move. They were not going to take orders from a lowborn abbot imposed on them by the emperor. Eventually, things got so bad that he fled back to Reims and a position as secretary to the archbishop there.

As the right arm of his master, Gerbert effectively ran much of the Reims diocese's business himself. Many of his letters were written on behalf of the archbishop. Such was Gerbert's reputation for both scholarship and piety that plenty of people wanted to see him become the archbishop when the incumbent died. Unfortunately, politics got in the way, and in 995 Gerbert gave up the fight. Instead, he travelled back to Italy to join Otto III who, at age thirteen, had ascended the throne. Gerbert travelled with the imperial court to take up the position of adviser and teacher to the young monarch. In return, Otto appointed him archbishop of Ravenna and then pope.

He was not, it has to be said, one of the great popes. He was probably too intelligent and unworldly to be much of a politician, and he owed his position so plainly to the emperor that he never had much of a power base in his own right. When the people of Rome rebelled, as they frequently did, he was forced to flee the city and only made it back shortly before his death in 1003. The young Emperor Otto III had died the previous year at the age of twenty-two, his dreams of rebuilding the Roman Empire unfulfilled. Nonetheless, despite Gerbert's shortcomings, several of the popes who had reigned shortly before him had been so awful, sunken into pits of corruption and sexual depravity, that the entire period was later dubbed the "pornocracy"—literally the "rule of the prostitutes."¹⁴ Compared to such popes a scholar, whatever his imperial connections, was a vast improvement.

GERBERT'S KNOWLEDGE OF ANCIENT PHILOSOPHY

Although Gerbert knew more about science than any other Catholic in his day, he was still well behind the achievements of the ancient world. The split between the barbarian kingdoms of the West and Greek-speaking Byzantium in the East did not help either. However, before the final collapse of the western Roman Empire, a few Christian scholars had written important books that they passed on to their Latin-reading successors. Foremost among them was Saint Augustine (354–430 AD), the bishop of Hippo in North Africa whose magisterial *City of God* and autobiographical *Confessions* remain classics to this day. The philosophy of Plato (427–347 BC) was the dominant school of thought when Augustine was writing, and it did much to inform his own ideas. Although the most important neo-Platonists were pagans, it was easy for Augustine to adapt Platonism's mystical and supernatural tenets into something compatible with Christianity. The resulting synthesis became one of the major sources of Christian theology throughout the Middle Ages, while the original pagan sources remained unknown.

As well as the works of early Christians, Gerbert also had access to a few scraps of Greek philosophy that had been translated into Latin before all knowledge of the former language was lost. These included half of *Timaeus*, a dialogue by Plato about the creation of the world. The largest surviving fragments, however, were the intricate treatises on logic by Plato's greatest pupil, Aristotle (384–322 BC).

The man who had carried out the task of putting Aristotle's complicated Greek philosophy into Latin was Anicius Manlius Severinus Boethius (480–525 AD), a Christian and Roman aristocrat (hence the long name) who lived through the final collapse of classical civilization in the West. He was orphaned before he was ten but raised by another upper-class family who ensured that he achieved an exceptional level of education. He could read Greek fluently at a time when such knowledge was already rare in the West, and he was familiar with all the major works of

ancient philosophy. Like a true Roman, Boethius combined his private scholarship with a career in public service. He served as consul in 510 and steered his sons in the same direction so that they too became consuls. In fact, both offspring achieved that honor in the same year, 522.

By this time, of course, Rome no longer ruled itself. It was under the sway of a barbarian king called Theodoric (454–526) whose warriors had conquered much of Italy in the 490s. Boethius saw it as his duty to serve this ruler in order to keep the old ways alive. For a while, the plan worked and Theodoric handed much of the administration of his kingdom over to the old Roman aristocracy. Boethius was the master of offices, effectively prime minister. Such accommodation with the new order was not universally popular, and many Romans looked to Constantinople, where an Emperor still ruled, as their true capital city. Unfortunately for Boethius, one of his friends became embroiled in a plot to overthrow Theodoric and restore Roman rule. Being an honorable man, Boethius came to his friend's defense, but this only meant that he fell under suspicion himself. He was imprisoned in Pavia and sentenced to a brutal death.¹⁵

While in prison awaiting his fate, he wrote his famous treatise *The Consolation of Philosophy*. It is impossible to overstate the popularity and influence of this book. Originally written in Latin, even kings and queens translated it into their own languages—both Alfred the Great (849–899) and Elizabeth I (1533–1603) tried their hand at rendering it into English. The *Consolation* takes the form of a dialogue between Boethius, sulking in his cell after the bottom has fallen out of his world, and Lady Philosophy who tries to cheer him up. There is nothing explicitly Christian in the *Consolation*, but plenty of stoicism of the sort popular with Roman aristocrats. Neither does it say anything incompatible with Christianity. Boethius asks the same big questions that have troubled thinkers throughout the ages: “Why do bad things happen to good people?”, “Why bother being virtuous?”, and “How can I have free will if God knows what I am going to do?” Lady Philosophy assures Boethius that goodness is its own reward and that the evildoer is really only hurting himself. Once he accepts that

wealth, power and status are meaningless, evil men can do him no harm. As for free will, although God knows the future, he does not make it happen. If God does not cause us to act, then his mere knowledge cannot impinge upon our freedom. These answers do not satisfy everyone, but they have provided succor and comfort to readers for 1,500 years.

Even before his fall from grace, Boethius recognized that the classical world was ending and that few of his descendants would have direct access to Greek scholarship. To remedy this, he set out to provide textbooks and translations into Latin that would form a core syllabus for future students. Initially he wrote short treatises based on Greek originals, covering arithmetic and music. These textbooks became the centerpiece of elementary education in their respective subjects until the sixteenth century.

For more advanced students, he set himself the task of translating the entire *oeuvre* of Aristotle, but managed to complete only some of the logical treatises before his arrest. At first these were not especially popular, largely due to their being excruciatingly difficult to understand. But they came into their own in the eleventh century when, as we shall see, there was a flowering of rational thought.

THE CHRISTIAN VISION OF THE NATURAL WORLD AND THE MUSIC OF THE SPHERES

On the paltry rations of Boethius, Aristotle, and a few other authors, Gerbert and his contemporaries fed their appetite for science. It is hardly surprising that when early medieval people looked out onto their world, they perceived it in a way that is quite alien to us. The concept of "worldview" is important because it underlies other ideas, such as science, which would simply not make sense without it. The way we imagine our universe and ourselves is often deep-seated, almost unconscious, and we rarely think about it. We find it hard to imagine that the world could function in any other way and feel that the ideas we have learned to believe are, in some sense, self-evident. The modern secular western "worldview" is

naturalistic. We believe that nature blindly follows laws that we can describe using mathematics; and that we live in an impersonal universe that is unimaginably old and vast, on a planet orbiting an ordinary star. We also assume the laws of physics that apply to us also apply to the rest of the universe. Almost nobody asks why gravity actually works, and we regard it as inconceivable that it should cease to do so. The only way that we can enjoy reliable knowledge is through science, which works because the laws of nature never change.

Medieval people also believed that the world worked in a completely reasonable way; it just wasn't the same way that we think it works. The central idea of the medieval worldview was that everything and everybody had a purpose. Nothing just happened. Nothing existed purely for its own sake. The ultimate governor of the universe was God, and he had endowed everything with a reason for its existence.

For modern people who hold a naturalistic worldview, nothing ultimately has a purpose. The universe just is, and has no guiding hand. We do not need to look for a conscious reason for anything to know how it works. In fact, any such explanation involving a purpose is scientifically invalid. To medieval men, such a view would be completely irrational. They would say that rationality itself required a reason for everything. Take an example from the animal kingdom: today, when we want to know why a lion has sharp teeth and claws, we will look to the theory of evolution to explain it. To the medieval mind, the correct question to ask was what purpose the lion served. The answer would be that God designed it to catch its prey, and therefore it had the attributes that enabled it to do that. Furthermore, God gave the world the lion to act as a symbolic reminder of his son, Jesus Christ, who is king of men just as the lion is king of the beasts.¹⁶ This seems a million miles away from a mentality that could lead to a modern scientific outlook, but as we shall see, that is what happened.

In some ways, the medieval worldview was closer to ours than we sometimes imagine. For example, Gerbert and all his fellow men and

women of any education in 1000 AD were perfectly well aware that the earth was a sphere. They also knew that the universe was very large compared to earth. As Boethius wrote in his *Consolation of Philosophy*:

It is well known and you have seen it demonstrated by astronomers, that beside the extent of the heavens, the circumference of the earth has the size of a point; that is to say, compared to the magnitude of the celestial sphere, it may be thought of as having no extent at all.¹⁷

The myth that a flat earth was part of Christian doctrine in the Middle Ages appears to have originated with Sir Francis Bacon (1561–1626), who wrongly claimed that geographers had been put on trial for impiety after asserting the contrary.¹⁸ There were a few authentic flatearthers in late antiquity, but none among the scholars of the Middle Ages proper. One of the main reasons that some historians previously fell for the flat earth idea is because of the existence of *mappae mundi* (Latin for “maps of the world”) like the famous example at Hereford Cathedral. These follow the so-called T-O pattern. The O represents the encircling ocean which surrounds the entire inhabitable earth. The T comprises the Mediterranean Sea, the River Nile, and either the River Volga or Don, which split the O-shaped landmass into the three continents of Europe, Africa, and Asia.¹⁹ In this simplified plan of the world, east is towards the top and Jerusalem usually occupies a point very close to or at the center. The Latin for east is *oriens*, which is why we now say we “orientate” our maps, although with north pointing upwards. It is understandable that, faced with such a map, modern scholars mistakenly believed that the people who drew it thought the earth was flat. What modern scholars did not realize was that it was only intended to map the quarter of the earth’s surface that medieval people believed to be inhabited.

Gerbert and his contemporaries evidently also knew the approximate size of the earth, as a figure for its circumference of 29,000 miles appeared



2. A T-O map from a 1472 printed edition of *Eymologies* by Isidore of Seville (d. 636)

in Latin sources.²⁰ Like the ancient Greeks, Gerbert believed that the only inhabitable part of the planet was the segment of the northern hemisphere that was sandwiched between the frozen poles and the burning equator. They were aware that it was a very long way from the far eastern tip of Asia over the ocean to the western coast of Europe. Thus, the inhabited region filled much less than one quarter of the earth’s surface and could easily be mapped onto a flat projection. The *mappae mundi* may not be very accurate, but there is no reason to believe that their drafters did not intend them to give a reasonably literal view of their corner of a spherical world.

As for the southern hemisphere, medieval people believed the extreme temperatures at the equator to be so great that no one could cross it. This meant that the deadly heat of the “Torrid Zone” would completely cut off the antipodes, if indeed any land existed in the south. In the eighth century, Virgil of Salzburg (c. 700–784), an Irish monk who had travelled

to mainland Europe, was accused of teaching that the antipodes were inhabited and, furthermore, that the inhabitants were not descended from Adam. The pope condemned this doctrine, but Virgil himself was cleared of any unorthodoxy. In the thirteenth century, he was even canonized.²¹

Gerbert's picture of the universe differed from ours in other ways too. He did believe that the earth was both stationary and the center of the universe. According to him, while the earth stood still, the whole of the heavens revolved counter-clockwise once a day. Each planet was believed to be embedded in the rim of a great sphere which rotated clockwise, with periods ranging from one month for the moon to thirty years for Saturn. This meant that all the planets were orbiting the earth at a speed determined by the rotation of their respective celestial spheres. Of course, we now know that Gerbert was wrong, but his belief was perfectly rational. For a start, it is self-evident to us all that the earth is not moving. When you are on a merry-go-round, turning at high speed, you have to hang on tight. Gerbert knew how large the earth was, and he knew that if it were rotating every twenty-four hours then he would be travelling on its surface at close to 1,000 miles an hour. He would hardly be able to hang on! Or at the very least, he would feel the winds rushing past him as the atmosphere struggled to keep up with the spinning earth. Likewise, if he threw something into the air, he would note that it fell well behind where it started, as the earth would have moved on by the time it landed.²² Anyway, this is what he learned at school. His textbooks and his teachers agreed that the earth neither moved nor revolved. True enough, the Bible said this too, but it was in agreement with all the pagan Greek sages. Besides, it was not always to be taken completely literally. The Bible also strongly implied that the earth was flat, for instance with reference to it having "edges" in Job 38:13. Yet medieval people sided with the astronomers on this matter. Where the Bible seemed to conflict with good sense or reason, medieval thinkers were happy to interpret it figuratively rather than literally.

Before we criticize Gerbert and his compatriots for their foolish adherence to ancient Greek and Hebrew authority, consider this: if someone asked you today to demonstrate that the earth orbits the sun, you almost certainly could not do it. You could show them every book and ask every expert, but you could not provide them with direct evidence without a telescope, a lot of time, and a lot of mathematics. Gerbert lacked the telescope and the math, so we cannot blame him for believing his books when they so clearly echoed common sense. The idea that the earth moves was absurd, and it would take a great deal of careful thought before people realized that it was even possible.

Another modern misconception about the medieval Christian worldview is that people thought the central position of the earth meant that it was somehow exalted. In fact, to the medieval mind, the reverse was the case. The universe was a hierarchy and the further from the earth you travelled, the closer to Heaven you came. At the center, underneath our feet, the Christian tradition placed Hell. Then, surpassed in wickedness only by the infernal pit, was our earth of change and decay. Above us, acting as a boundary between the earthly and the heavenly, was the sphere of the moon. This marked the dividing line between the perfect unchanging heavens and the transient sub-lunar region containing humanity, which was doomed to die. Next, there were the crystalline spheres of the seven planets—the moon, the sun, Mercury, Venus, Mars, Jupiter, and Saturn—eternally orbiting with uniform, circular motion. The spheres were thought to consist of a transparent and imperishable fifth element called ether or quintessence. Above them were the fixed stars whose positions relative to each other never appeared to change. Beyond even them was the firmament, and outside that was the realm of God. This hierarchical system gave people absolute directions of up and down, one towards the heavens and one down to earth at the bottom of the celestial ladder. To move the earth away from the centre of the universe was not to downgrade its importance but to raise it up toward the stars.



3. A diagram of the medieval universe from *Cosmographia* (1539) by Peter Apian (1495–1552)

The attraction of this model of the universe was its harmonious order. Everything had its correct place in the celestial hierarchy and it provided an exemplar for good governance on earth. Harmony was especially important to the theory. At this point we should recall that Gerbert had taught harmonics to his students at Reims. The relevance of this topic was that the crystalline spheres were believed to move in harmony, emitting as they did so the “music of the spheres.”²³ This wonderful sound, the very resonance of the universe itself, was unfortunately inaudible to human ears. Instead, through proper training, students could learn to experience it second-hand through the mathematics of harmony. These ideas were not specifically Christian, but came from the pagan classical world with adjustments made to fit Christianity as necessary. The most important of

these pagan philosophers in Gerbert’s time was Plato because he had so strongly influenced Saint Augustine.

Alfred North Whitehead (1861–1947), the Cambridge and Harvard philosopher, once wrote, “The safest general characterization of the European philosophical tradition is that it consists of a series of footnotes to Plato.”²⁴ Even if this is an overstatement, few men’s ideas have had such great influence as his. He was born in Athens to an upper-class family and was a pupil of Socrates (469–399 BC), a controversial philosopher who had a habit of exposing the hypocrisy of his compatriots by asking penetrating and leading questions. When a time of war and plague arrived, the authorities could no longer tolerate Socrates, and they convicted him of blasphemy and corrupting the young. While these were undoubtedly trumped-up charges, Socrates did his level best to ensure that he suffered the highest penalty by refusing to compromise with his accusers or accept exile. In consequence, shortly after his trial, he was executed in prison by being forced to drink hemlock.

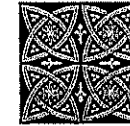
After his master’s death, Plato founded a philosophical school in Athens called the Academy which paid its way by educating the aristocracy in rhetoric and culture. Exactly what he taught from day to day is hard to know because his surviving works are all highly polished literary dialogues between his dead teacher, Socrates, and various interlocutors. Apart from *Timaeus*, Gerbert could not have known any of Plato’s dialogues at first hand because they remained in Greek until the fifteenth century when, newly rendered into Latin, they became extremely influential. What made Plato so conducive to Christianity was that he emphasized the intellectual and spiritual aspects of life over the material. For Plato, the ultimate reality was not the everyday physical world, but a transcendent realm of ideas. He called these ideas “Forms” and claimed that they were the templates from which our world had been constructed by a divine creator from pre-existing matter. Thus, the material world was simply a shadow of the perfect reality of the Forms. A philosopher could gain access to this true reality through the act of contemplation. Plato believed that this ability to

approach perfection gave the thinking man the advantage over the man of action.

Clearly, some of this would sound acceptable to a Christian. He would agree with the Platonist that God created the world, as the book of Genesis affirms at the start of the Bible. However, the Christian would deny that the material from which God made the world had already existed. Rather, God had created the world out of nothing, *ex nihilo*, which gave it an intrinsic value as the result of the direct will of God. Both pagan and Christian would agree that the world is not perfect, but the Platonist would blame the material the creator had to use, while the Christian would believe that it was created perfect and only fell later due to human actions. Plato's support for a life spent in contemplation could easily be interpreted as praise for a life dedicated to Christian prayer and meditation rather than to secular deeds.

There is little doubt that Plato was the most influential of the ancient Greeks in Gerbert's time. This, however, would shortly change, and Plato's pupil Aristotle would become known as "the master of those who know."²⁵

CHAPTER THREE



THE RISE OF REASON

Cold and hungry, a young man staggered through the snow of the Mount Celis pass in the western Alps. At its highest point, his journey towards the Rhône valley in France had taken him almost 7,000 feet above sea level. He had always loved the beauty of the mountains and in later years spoke about his dreams of God feeding him on white bread as he wandered in the peaks. Now, though, neither God nor anyone else was around to give him food, and he was close to starvation. Leaving home without money or supplies no longer seemed a wise idea, but he was not about to return to his hostile father. Thankfully, his biographer Eadmer (who died around 1124) tells us, rummaging around in his pack, his servant found some more white bread that had miraculously appeared.¹

Chapter Two

1. Horace K. Mann, *The Lives of the Popes in the Early Middle Ages*, vol. 5 (London: Kegan Paul, 1910), p. 63. I have taken much of the story of Gerbert from Mann's volume and Anna Marie Flusche, *The Life and Legend of Gerbert of Aurillac: The Organbuilder who became Pope Sylvester II* (Lewiston, NY: The Edwin Mellen Press, 2005).
2. Alexander Murray, *Reason and Society in the Middle Ages* (Oxford: Clarendon Press, 1985), p. 290.
3. An outstanding example is the Basilica of Santa Maria Maggiore in Rome.
4. Maurice Hugh Keen, *The Penguin History of Medieval Europe* (Harmondsworth: Penguin, 1969), p. 42.
5. Richer of Saint Remi, *Historia*, MGH Scriptores, vol. 38 (Hanover, 2000).

6. Gerbert of Aurillac, *The Letters of Gerbert: with his Papal Privileges as Sylvester II*, trans. Harriet Pratt Lattin (New York: Columbia University Press, 1961).
7. Gerbert, *The Letters of Gerbert*, p. 140.
8. D. J. Struik, "Gerbert," in *Dictionary of Scientific Biography*, ed. Charles Coulston Gillispie, vol. 5 (New York: Scribner, 1970), p. 365.
9. Gerbert, *The Letters of Gerbert*, p. 184.
10. Stephen C. McCluskey, *Astronomies and Cultures in Early Medieval Europe* (Cambridge: Cambridge University Press, 1998), p. 177.
11. *Ibid.*, p. 180.
12. William of Malmesbury, *Gesta Regum Anglorum: The History of the English Kings*, vol. 1, trans. R. A. B. Mynors (Oxford: Clarendon Press, 1998), p. 295 [II:173].
13. Gerbert, *The Letters of Gerbert*, p. 45.
14. For a critical discussion of the term see Paolo Squatriti, "Pornocracy," in Christopher Kleinhenz et al., eds., *Medieval Italy: An Encyclopaedia* (London: Routledge, 2004), vol. 2, p. 928.
15. Lorenzo Minio-Paluello, "Boethius, Anicius Manlius Severinus," in *Dictionary of Scientific Biography*, ed. Charles Coulston Gillispie, vol. 2 (New York: Scribner, 1970), p. 228.
16. Werner Telesko, *The Wisdom of Nature: The Healing Powers and Symbolism of Plants and Animals in the Middle Ages* (Munich: Prestel, 2001), p. 90. Among other things, lions were believed to sleep with their eyes open and to be stillborn, only waking from the dead three days after birth—the parallel with Jesus' resurrection on the third day is obvious.
17. Anicius Boethius, *The Consolation of Philosophy*, revised ed. (Harmondsworth: Penguin, 1999), p. 41.
18. Quoted in John Henry, *Knowledge Is Power: How Magic, the Government and an Apocalyptic Vision Inspired Francis Bacon to Create Modern Science* (Cambridge: Icon Books, 2003), p. 85.
19. Naomi Reed Kline, *Maps of Medieval Thought: The Hereford Paradigm* (Woodbridge, Suffolk: Boydell Press, 2001), p. 13.
20. Pliny the Elder, *Natural History: A Selection*, trans. John F. Healy (London: Penguin, 1991), p. 41. The precise figure depends on the exact interpretation of the size of a *stade* (an ancient Greek measure of distance derived from the length of a stadium). See chapter 13 of the present book.
21. John Carey, "Ireland and the Antipodes: The Heterodoxy of Virgil of Salzburg," *Speculum* 64, no. 1 (January 1989): p. 1. Sir Francis Bacon's remarks, referred to above, may be based on a garbled recollection of this case.

22. These arguments were rehearsed in many ancient sources. See, for example, Ptolemy, *Ptolemy's Almagest*, trans. G.J. Toomer (London: Duckworth, 1984), p. 45 [I:7].
23. Boethius referred to the "music of the world," which we call the "music of the spheres." Anicius Boethius, *De institutione arithmetica, libri duo: di institutione musica, libri quinque*, ed. G. Friedlein (Leipzig: Teubner, 1867), p. 187. The concept of the "music of the spheres" is Pythagorean, and many ancient commentators, including Aristotle, denied its existence. See *On the Heavens* in Aristotle, *The Complete Works of Aristotle: The Revised Oxford Translation*, vol. 1, ed. Jonathan Barnes (Princeton: Princeton University Press, 1984), p. 479 [290b14].
24. Alfred North Whitehead, *Process and Reality* (New York: Free Press, 1979), p. 39.
25. The phrase is Dante's from Dante Alighieri, *Inferno*, trans. Robert M. Durling (New York: Oxford University Press, 1996), p. 77 [IV: 131].