CHARLEMAGNE'S BLACK MARBLE: THE ORIGIN OF THE EPITAPH OF POPE HADRIAN I

INTRODUCTION: CONTEXT

The black marble inscription commemorating the life of Pope Hadrian I, who died on 26 December 795, is preserved today in the portico of Saint Peter's in the Vatican (Fig. 1). It was placed there in 1619 on the orders of Paul V, after the nave and portico of the new church had been completed.¹ The location of the Epitaph in new Saint Peter's mirrored its secondary position in the Constantinian basilica; in 1574 Gregory XIII had ordered it to be put up in the portico of the old church, since the south transept, where Hadrian's burial chapel had been located, had been demolished during the early phases of the construction of the new building.² The side walls of Hadrian's oratory projecting into the transept had in fact been razed to the ground during the pontificate of Nicholas V (1447–55), as part of his project to clean out and enlarge the old basilica; but the Epitaph had been left in place on the back western wall of the south transept, where it had been seen by pilgrims since the ninth century.³ The Epitaph is one of remarkably few monuments to have been translated directly from the late Roman and medieval basilica into the new building, and its relocation to the entrance of both the old and the new church of Saint Peter reflects its value to the rulers of sixteenth-century Rome, 'so that it might be read by all the faithful for the strengthening of the Catholic faith'.⁴ Gregory XIII realized the devotional importance of the Epitaph as a statement of faith and imperial loyalty to the papacy in an earlier age, and he recognized its antiquity, correctly associating it with Charlemagne. But Gregory was not the first to appreciate the aesthetic, spiritual and political importance of the Epitaph; throughout the Middle Ages, commentators on the church of Saint Peter in Rome had noted the location of Hadrian's oratory, the black Epitaph commemorating his life and death, and the name of the man who had commissioned it.

¹ As recorded by Giacomo Grimaldi, *Descrizione della basilica antica di S. Pietro in Vaticano. Codice Barberini Latino 2733* (ed. R. Niggli) (*Codices e Vaticanis Selecti* 32) (Vatican City, 1972), 396. R. Krautheimer, S. Corbett and A.K. Fraser (eds), *Corpus Basilicarum Christianarum Romae. The Early Christian Basilicas of Rome (IV–IX Cent.)* V (Vatican City, 1977), 165–279, at p. 185.

² Hadrian's oratory is no. 15 on Alfarano's plan of c. 1571, whilst the new location of the Epitaph is no. 132; Tiberio Alfarano, *De Basilicae Vaticanae Antiquissima et Nova Structura* (ed. M. Cerrati) (*Studi e testi* 26) (Rome, 1914), 41–2, 116, 153, 184, 195.

³ Maffaeo Vegio, c. 1455, 'De rebus antiquis memorabilibus basilicae Sancti Petri Romae', in *Acta Sanctorum Iunii VII* (Antwerp, 1717), col. 0081D; 'But the third oratory of Saint Hadrian was close by [to this], is now totally vanished, of which nothing is visible except only the remarkable hewn marble with inscription and verses fixed to the wall of the basilica, which show that he himself [Hadrian] had been buried there by the care of Charles the Great'; Grimaldi, *Descrizione* (above, n. 1), 396.

⁴ Alfarano, *De Basilicae Vaticanae* (above, n. 2), 42.

FIG. 1. The Epitaph of Pope Hadrian. (Reproduced by permission of the Istituto Suore Benedettine di Priscilla.)

Pope Hadrian's monumental Epitaph is a masterpiece of the Carolingian Renaissance, and its superb quality is displayed in every aspect of its production.⁵ The form of the poem and the form of the script owe much to classical examples, and it is evident that both the poet and the epigrapher of Hadrian's memorial were learned in the epigraphic legacy of late antiquity, as transmitted through the pages of books as well as extant inscriptions cut or painted onto walls.⁶ Its classical aspect, combined with a distinctive Carolingian aesthetic, signified a renewal of epigraphic standards not seen, in Rome at least, for several centuries.⁷ Hadrian's Epitaph proved to be a turning-point for epigraphy in Rome in the ninth century; subsequent papal inscriptions up to about 850 are noticeably more regular and precise in letterform and layout than their eighth-century predecessors.⁸ The form of 'square' capitals (*capitalis quadrata*) used by the Hadrian Epigrapher was also influential in the development of display scripts in de luxe Carolingian books, especially those produced at Charlemagne's court.⁹ It has been argued convincingly that the author of the Epitaph was the Anglo-Saxon scholar, Alcuin of York, who was one of the most influential thinkers at Charlemagne's court in the 790s.¹⁰ His epigrammatic style was heavily influenced by syllogae of late antique inscriptions, especially those

⁵ G.B. De Rossi, 'L'inscription du tombeau d'Hadrien I', *Mélanges d'Archéologie et d'Histoire de l'École Française de Rome* 8 (Rome, 1888), 478–501; H. LeClercq, 'Hadrien I (épitaph de)', in *Dictionnaire d'Archéologie Chrétienne et de Liturgie*, 15 vols (Paris, 1924–53), VI.ii, cols 1964–7; N. Gray, 'The paleography of Latin inscriptions in the eighth, ninth and tenth centuries in Italy', *Papers of the British School at Rome* 16 (1948), 38–162, at pp. 97–100, no. 76; W. Braunsfels (ed.), *Karl der Grosse. Werke und Wirkung* (Aachen, 1965), no. 8, pl. 7. The text was edited by E. Dümmler (ed.), *Poetae Latini Aevi Carolini I* (*Monumenta Germaniae Historica, Poetae*) (Berlin, 1881), 113–14, and is translated in P.E. Dutton (ed.), *Carolingian Civilization: a Reader* (Peterborough (Ontario), 1993), 46–7.

⁶ S. Morison, *Politics and Script. Aspects of Authority and Freedom in the Development of Graeco-Latin Script from the Sixth Century BC to the Twentieth Century AD* (Oxford, 1972); D.A. Bullough, 'Roman books and Carolingian renovatio', in his *Carolingian Renewal* (Manchester, 1991), 1–33, at pp. 13–15; A. Petrucci, 'Aspetti simbolici delle testimonianze scritte', in *Simboli e simbologie nell'alto medioevo* (*Settimane di Studio di Spoleto* 23) (Spoleto, 1976), 813–44, pl. I–VIII.

⁷ G.B. De Rossi (ed.), *Inscriptiones Christianae Urbis Romae*, 2 vols (Rome, 1861–88), II, no. 7; A. Silvagni (ed.), *Monumenta Epigraphica Christiana Saeculo XIII Antiquiora quae in Italiae Finibus adhuc Extant*, I: *Roma* (Vatican City, 1943), II.6; F. Schneider and W. Holtzmann, *Die Epitaphien der Päpste und anderer Stadtrömische Inschriften des Mittelalters* (*Texte zur Kulturgeschichte des Mittelalters* 6) (Rome, 1932), no. 30; Gray, 'Paleography' (above, n. 5), no. 76; A. Petrucci, *Le scritture ultime* (Turin, 1995), 56–7; R. Krautheimer, *Rome: Profile of a City, 312–1308* (Princeton, 1980), 140–1, fig. 115.

⁸ Gray, 'Paleography' (above, n. 5), 97.

⁹ D. Ganz, 'Roman books' reconsidered: the theology of Carolingian display script', in J.M.H. Smith (ed.), *Early Medieval Rome and the Christian West. Essays in Honour of Donald Bullough* (*The Medieval Mediterranean* 28) (Leiden/Boston/Cologne, 2000), 297–315; J.A. Harmon, *Codicology of the Court School of Charlemagne: Gospel Book Production, Illumination and Emphasized Script* (Bern, 1984), 68–9.

¹⁰ L. Wallach, *Alcuin and Charlemagne: Studies in Carolingian History and Literature* (Ithaca (NY), 1959), 178–97.

from the catacombs and basilicas of Rome, which had been circulating in England and Francia since the later seventh century.¹¹

In contrast, the quality and significance of the materials used to manufacture Hadrian's Epitaph have been discussed much less. Contemporary chronicles claim that the inscription had been made *in Francia*, so this aspect of the Epitaph may have something to reveal about Carolingian resources and cultural ambitions.¹² Particularly unusual was the choice of a dark, almost black, stone for the inscription. Given what we know of the high quality of the lettering and the poetry of the inscription, it is reasonable to suppose that the stone was carefully selected and that, like the epigraphy and poetry, it carried significant messages of cultural authority and legacy. We now recognize that coloured stones were often used in antiquity, not just for their aesthetic qualities but also for their symbolic significance, often with quite specific ideological connotations.¹³ This paper offers new evidence to identify the origin of the black stone used to make Hadrian's Epitaph. The results of the investigation described here have significant implications for our understanding of Charlemagne's relationship with Rome and the Carolingian notion of *renovatio imperii*.

Despite its unusual character, the black marble of Hadrian's Epitaph has been subject to much less analysis than other aspects of its manufacture. Two arguments have been proposed hitherto for the origin of the stone, and thus the location of the workshop where the Epitaph was made. In 1888 De Rossi argued, on the basis of contemporary accounts of the commissioning of the Epitaph and from his belief in Alcuin's authorship of the poem, that the stone for the inscription was quarried in western Francia, in the vicinity of Alcuin's own monastery at Tours, which had a famous scriptorium and maintained a late antique tradition for metrical inscriptions.¹⁴ De Rossi acquired a sample of a black marble from a quarry on the river Sarthe, about 100 km northwest of Tours, and, noticing that it was of the same character as the stone of the Hadrian inscription, concluded that the same quarry had

¹¹ Wallach, *Alcuin and Charlemagne* (above, n. 10), 193–4; P. Sims-Williams, *Religion and Literature in Western England, 600–800* (Cambridge Studies in Anglo-Saxon England 3) (Cambridge, 1990), 328–59; A. Orchard, *The Poetic Art of Aldhelm* (Cambridge Studies in Anglo-Saxon England 8) (Cambridge, 1994), 203–9.

¹² *Annales Laureshamenses* (Annals of Lorsch); G.H. Pertz (ed.), *Monumenta Germaniae Historica Scriptores I* (Hanover, 1826), 22–39; P.D. King (trans.), *Charlemagne Translated Sources* (Kendal, 1987), 141–2. *Historia Regum* (History of the Kings); T. Arnold (ed.), *Symeonis Monachis Opera Omnia* (Rolls Series 75), 2 vols (London, 1885), II, 2–283, at pp. 56–7; D. Whitelock (trans.), *English Historical Documents I* (London, 1979), no. 3, at p. 273.

¹³ M. De Nuccio and L. Ungaro (eds), *I marmi colorati della Roma imperiale* (Venice, 2002), 136–8, no. 51; R.M. Schneider, *Bunte Barbaren. Orientalenstatuen aus Farbigem Marmor in der Römischen Repräsentationskunst von Augustus bis Trajan* (Worms, 1986).

¹⁴ De Rossi, 'L'inscription' (above, n. 5); E.K. Rand, *A Survey of the Manuscripts of Tours* (Studies in the Script of Tours 1) (Cambridge (Mass.), 1929), 41–2; Wallach, *Alcuin and Charlemagne* (above, n. 10), 178–9; F. De Rubeis, 'Epigrafi a Roma dall'età classica all'alto medioevo', in M.S. Arena, P. Delogu, L. Paroli, M. Ricci, L. Sagui and L. Venditelli (eds), *Roma dall'antichità al medioevo. Archeologia e storia nel Museo Nazionale Romano, Crypta Balbi* (Rome, 2001), 104–21, at pp. 112–13, fig. 83.

been the source for the stone of the Epitaph over a thousand years before.¹⁵ Köhler, however, argued for an East Frankish origin for the stone. His opinion was later discussed by Ramackers, who argued that the stone had been sourced much closer to Aachen, in the region around Dinant in modern Belgium.¹⁶ Köhler's and Ramacker's conclusions were based in part on their knowledge of the exploitation of fine black marble from that region in modern times, but more specifically on comparisons of the epigraphy of the inscription with display scripts used in contemporary manuscripts made in the vicinity of Charlemagne's court.

The conclusions of all these arguments were reached primarily through a comparison of the epigraphy of the monument with the palaeography of de luxe Carolingian manuscripts from the Tours scriptorium and from the court school focused on Aachen. Geological considerations were of secondary significance to the arguments, and were made on the basis of broad probabilities rather than direct comparative petrological analysis of the inscription with possible quarry sources. The lack of precision on the petrology of the inscription is largely a result of its inaccessible location. Its site, more than 30 feet above the ground in the portico of Saint Peter's, does not lend itself easily to close palaeontological or petrological inspection.

An opportunity to investigate the monument arose in September 2002, when the *Fabbrica di San Pietro* gave permission to examine the Epitaph and agreed to the use of a scaffolding tower to allow close-up petrological and palaeontological observation, and geochemical analysis of the black marble (Fig. 2). These results were then compared with samples taken from eight modern quarry sites across northern Francia. The precise methodology and detailed observations are described below. The broader historical analysis of the results will be dealt with elsewhere, but at the outset it is clear that the use of such a fine black stone for the Epitaph of Pope Hadrian was a deliberate and careful choice. The identification of the likely origin of the quarry permits not just a broader interpretation of the monument than has been possible hitherto, but also encourages a new interpretation of it as a key piece of evidence surrounding the coronation of Charlemagne as emperor before the shrine of Saint Peter on Christmas Day, 800.¹⁷

BLACK MARBLE IN ROME

The marble from which the Epitaph is made is fine-grained and a monochrome dark grey, almost black, colour, which to modern eyes appears entirely appropriate

¹⁵ De Rossi, 'L'inscription' (above, n. 5), 485.

¹⁶ W. Köhler, *Die Karolingischen Miniaturen*, I: *die Schule von Tours. Band 1, die Ornamentik* (Berlin, 1930), 87; J. Ramackers, 'Die Werstattheimat der Grabplatte Papst Hadrians I', *Römische Quartalschrift* 59 (1964), 36–78.

¹⁷ The broader political and cultural context of Hadrian's Epitaph will be explored in more detail in a forthcoming study by J. Story.

FIG. 2. The location of the Epitaph in the portico of Saint Peter's, with the scaffolding and EDXRF equipment in place.

for a funerary inscription. However, in this respect, the colour selected for the inscription was an innovation; prior to 800 the norm for monumental stone inscriptions in the western Roman provinces was a light-coloured or white marble ground. In his study of the monuments of Rome, De Rossi knew of none other,

pagan or Christian, carved on black stone.¹⁸ It is hard to find large-scale inscriptions with a coloured background, and where these do occur the material is usually not stone — such as the *Lex Vespasiani* (c. AD 70), incised in rustic capitals onto a large bronze tablet, or mosaic inscriptions such as that of Pope Celestinus at Santa Sabina, Rome (AD 422–32), or painted *tituli* (for example at Santa Maria Antiqua, AD 705–7).¹⁹ It may be that Hadrian's Epitaph was intended to recall these other, non-lapidary, types of inscriptions — certainly it is of a similar scale and visual impact to the bronze *leges*, which may still have been displayed in Rome at this time — but it is possible also that the black stone was chosen because it had other connotations for the patron who commissioned it and the audience that viewed it.

It is clear from studies of marble use in the Roman period that the geographical sources of marbles were remembered in their names, and so in pragmatic as well as symbolic ways the selection of particular marbles resonated with the power of empire to control scarce resources in distant lands. Thus red porphyry was so called because it came from *Mons Porphyrites* in Egypt; yellow *Lapis Numidicum* came from the land of the Numidians in North Africa; purple-streaked *Phrygium* came from the province of Phrygia in western central Turkey; a white marble dramatically veined with black and known as *Aquitanicum* came from the Pyrenees.²⁰ Coloured marbles were valued not simply for their aesthetic impact but because they provided a 'material map' of the Roman Empire and, when used in Rome and its provincial capitals, a physical statement of the conquest of distant lands and peoples. The ability to extract and transport monolithic blocks of coloured marbles great distances across sea and land thus symbolized the power of that Empire over the resources of the natural world in lands far from Rome itself.²¹

Black marble was scarce in classical Rome. Most significant was the marble known to fifteenth- and sixteenth-century commentators as *nero antico*. The ancient name of this fine-grained black marble is unknown, but it was valued as a source for small columns and veneer in the first to third centuries AD, and was sourced in

¹⁸ De Rossi, 'L'inscription' (above, n. 5), 484. Our thanks to one of the anonymous referees who noted that the eighth-century epitaph of Otto of Brescia, at Monte Cassino, is cut into a polished slab of purple, black and cloudy white *africano* (from Teos); A. Pantoni, *Le iscrizioni medievali di Montecassino* (Monte Cassino, forthcoming), no. 25.

¹⁹ On the medieval history of the *Lex Vespasiani*, see Krautheimer, *Rome: Profile* (above, n. 7), 192–3; for the mosaic inscription at Santa Sabina, see E. Diehl (ed.), *Inscriptiones Latinae (Tabula in Usum Scholarum IV)* (Bonn, 1912), 36b; for the painted inscription at Santa Maria Antiqua, see De Rubeis, 'Epigrafi a Roma' (above, n. 14), 109, fig. 76, and P.J. Nordhagen, 'Constantinople on the Tiber: the Byzantines in Rome and the iconography of their images', in Smith (ed.), *Early Medieval Rome* (above, n. 9), 113–34, esp. fig. 19.

²⁰ H. Dodge, 'Main quarries and decorative stones of the Roman world', in H. Dodge and B. Ward-Perkins (eds), *Marble in Antiquity: the Collected Papers of J.B. Ward-Perkins (Archaeological Monographs of the British School at Rome 6)* (London, 1992), 153–9; M. Greenhalgh, *The Survival of Roman Antiquities in the Middle Ages* (London, 1989), 126–34; D.P.S. Peacock, *Rome in the Desert: a Symbol of Power* (Southampton, 1993).

²¹ For an introduction to the growing literature on this subject, see R.M. Schneider, 'Coloured marble: the splendour and power of imperial Rome', *Apollo* 154 (July 2001), 3–10.

Tunisia.²² Pliny had known of another 'generally black' marble that was unusual not just for its colour, but also because it had been named after the consul, Lucullus, who had particularly favoured it, rather than the place where it was quarried.²³ Pliny's discussion of this 'generally black' marble followed his account of the importation and use of *Lapis Numidicum*. This seems to have led to confusion among fifteenth- and sixteenth-century commentators on Old Saint Peter's, who turned to Pliny to discover the source of the black stone of Hadrian's Epitaph; they conflated his description of the (bright yellow) *Lapis Numidicum* with the black marble of Lucullus, and assumed that this too had an exotic, African origin. For Vegio (c. 1450), Alfarano (c. 1570), and Grimaldi (1619), this reinforced the importance of the stone used for Hadrian's Epitaph; 'it is rare and precious indeed' and was 'without doubt black and Numidian'.²⁴ Peter Sabinus, writing for Charles VIII of France in 1494, concurred with Vegio's assessment of the rarity and prestige of the stone, referring to the Epitaph as having been *incisum in tabula porphyretica litteris elegantissimis*.²⁵

Prominent also, for scholars of classical Rome, is the so-called *Lapis Niger*, which is an area of paving in the Forum within the *Comitium* opposite the *Curia*, made from black limestone streaked with white veins, that is thought to have come from the Tolfa district north of Rome.²⁶ The *Lapis Niger* was linked in early imperial texts with the place of the death of Romulus, the legendary founder of Rome; the place (and thus the coloured stone) acquired inauspicious connotations as a *locus funestus*, a place associated with death. However, it is unlikely that the *Lapis Niger* was known by the late eighth century; the area of paving would not have been visible by that date, and it could only have been known indirectly through literary sources, namely Pompeius Festus's epitome of the late first-century BC work of Verrius Flaccus.²⁷ The Lombard scholar Paul the Deacon abridged Festus's work in

²² Pliny, *HN* 36.29. R. Gnoli, *Marmora romana* (Rome, 1988), 193–5; Dodge and Ward-Perkins (eds), *Marble in Antiquity* (above, n. 20), 158; G. Borghini (ed.), *Marmi antichi* (Rome, 1998), 254–5.

²³ Pliny, *HN* 36.8, the reading of the name of the island is uncertain. This marble is now thought probably to be the dark breccia from Teos in western Turkey (known later as *africano* in ignorance of its origin); M.H. Ballance, 'The origin of *africano*', *Papers of the British School at Rome* 34 (1966), 79–81; Gnoli, *Marmora romana* (above, n. 22), 174–8, pl. 132–4, 197; Dodge, 'Main quarries' (above, n. 20), 157; De Nuccio and Ungaro (eds), *I marmi colorati* (above, n. 13), 244, 250–1, 262–5 (for the black marble of Chios, long thought to be that of Lucullus).

²⁴ Vegio discussed Pliny's attribution of black marble to Lucullus, and invented an alternative association with Pescennius Niger, the late second-century challenger to Severus; Vegio, 'De rebus antiquis' (above, n. 3), col. 0081D–0082B. Also Alfarano, *De Basilicae Vaticanae* (above, n. 2), 42–3; Grimaldi, *Descrizione* (above, n. 1), 396.

²⁵ De Rossi (ed.), *Inscriptiones Christianae Urbis Romae* (above, n. 7), II, p. 411, no. 6.

²⁶ M. Fornaseri, L. Lazzarini, P. Pensabene, M.P. Martinez and B. Turi, 'Lapis Niger' and other black limestones used in antiquity', in Y. Maniatis, N. Herz and Y. Basiakos (eds), *The Study of Marble and Other Stones Used in Antiquity. ASMOSIA III Athens* (London, 1995), 235–40.

²⁷ Festus, *De Verborum Significatu*; W.M. Lindsay (ed.), *Glossaria Latina* 4 (Paris, 1930), 184.19; F. Coarelli, 'Sepulchrum Romuli', in E.M. Steinby (ed.), *Lexicon Topographicum Urbis Romae* IV (Rome, 1999), 295–6; T.N. Ganz, 'Lapis Niger: the tomb of Romulus', *La Parola del Passato* (Rivista di Studi Antichi 29) (1974), 350–61.

the later eighth century, but did not select this entry for his epitome. It thus seems unlikely that the *Lapis Niger* was known even as a literary *topos* in Carolingian court circles, in spite of the fact that Pope Hadrian carried out extensive restoration works in that part of the Forum, restoring the *Curia*, which was by then a church dedicated to his patronymic saint, the martyr Adrianus.²⁸

IN FRANCIA: THE PETROLOGY, PALAEOLOGY AND GEOCHEMISTRY OF THE EPITAPH

A contemporary Frankish chronicle known as the *Annales Laureshamenses* (*Lorsch Annals*) states that the Epitaph was made in *Francia* and that it was sent to Rome as a finished object to grace the tomb of the pope.²⁹ The section of the *Lorsch Annals* describing the death of Pope Hadrian survives in a manuscript copied by four scribes that is very close to the date of the events it describes (794–803); it is probably not the authorial copy but it is very close to it, and in that respect is unique among Frankish annalistic texts. The contemporaneity of the manuscript, as well as the fact that for these years the *Lorsch Annals* provide a rather different view of events to the major Frankish chronicles, has encouraged historians to consider the *Lorsch Annals* a particularly valuable source for events around the year 800.³⁰

The *Lorsch Annals* imply that the stone for Hadrian's Carolingian memorial was sourced in *Francia*. Some basic observations of the stone of the Epitaph help quickly to narrow down possible sources. Firstly, it is not a true marble in the technical geological sense of a recrystallized metamorphosed limestone; the word 'marble' is commonly used today, just as it was in antiquity (*marmor*), to describe any hard stone that can take a polish and that is suitable for sculpture or high-quality architecture.³¹ Secondly, the stone contains several identifiable fossils (described below), some visible by eye and others with a hand-held magnifying glass. The presence of these fossils within a black-coloured matrix confirms that it is a carboniferous limestone. The size, structure and colour of the Epitaph are also

²⁸ *Vita Honori*, ch. 72.6 — R. Davis (trans.), *The Book of Pontiffs (Liber Pontificalis). The Ancient Biographies of the First Ninety Roman Bishops to AD 715 (Translated Texts for Historians 6)* (Liverpool, 1989), 64–5; *Vita Hadriani*, ch. 97.51, 97.73, 97.81 — R. Davis (trans.), *The Lives of the Eighth-Century Popes (Liber Pontificalis) (Translated Texts for Historians 13)* (Liverpool, 1992), 145–6 n. 83, 160, 165.

²⁹ *Lorsch Annals* 795: '... ebitaffium aureis litteris in marmore conscriptum iussit in Francia fieri, ut eum partibus Romae transmitteret ad sepultura summi pontificis Adriani ornamam'; see above, n. 12.

³⁰ F. Unterkircher (ed.), *Das Wiener Fragment der Lorscher Annalen, Christus und die Samariterin, Katechese des Niceta von Remesiana. Codex Vindobonensis 515 der Österreichischen Nationalbibliothek Facsimile Ausgabe (Codices Selecti 15)* (Graz, 1967). See also J. Story, *Carolingian Connections: Anglo-Saxon England and Carolingian Francia, c. 750–c. 870 (Studies in the Early History of Britain 2)* (Aldershot, 2003), 104–10; R. McKitterick, *History and Memory in the Carolingian World* (Cambridge, 2004), 104–11; R. Collins, 'Charlemagne's imperial coronation and the Annals of Lorsch', in J. Story (ed.), *Charlemagne: Empire and Society* (Manchester, 2005), 52–70.

³¹ J.B. Ward-Perkins, 'Materials, quarries and transportation', in Dodge and Ward-Perkins (eds), *Marble in Antiquity* (above, n. 20), 13–22, at pp. 13–14.

important indicators of its petrological qualities; it is a substantial slab measuring 2.23×1.16 m. The depth of the inscription is unknown, since it is set tightly in a seventeenth-century frame, but is likely to be 10–20 cm in depth. The colour is uniform across the surface of the slab and is very dark greenish grey rather than jet black; the matrix is fine-grained, showing no lighter-coloured inclusions and no mineral veins, and the fossils are a similar colour to the rest of the stone. These observations of fossil content, size of the slab, and consistency of colour and texture help to characterize the petrology of the stone and to narrow down possible geological sources. A comparative analysis can then be made of the petrological, palaeontological and geochemical characteristics of the stone of the Epitaph and carboniferous limestones sourced within Charlemagne's kingdom. In combination with an historical and archaeological analysis of the exploitation of such stones in antiquity and the Middle Ages, this enables us to determine the source of the marble used for Hadrian's Epitaph within a high degree of probability.

THE PALAEOLOGY AND PETROLOGY OF THE EPITAPH

The palaeontological characteristics of the stone of the Epitaph were gauged by assessing the range of fossil species and the density of their occurrence across its surface. A thin section was also made from a small sample, permitting further analysis of the components and matrix of the stone at microscopic level.

Close inspection of the Epitaph by eye and hand-held magnifying glass revealed the presence of a number of types of fossil, including corals, crinoids, brachiopods and bivalve shells (see Fig. 3 and, below, Fig. 5). Irregular lines are also visible in places on the surface of the inscription. These are the same colour as the rest of the matrix and are thought to be pressure-solution bands, known as stylolites. These do not affect the structural integrity of the stone, but in some places they have created sufficient weakness in the surface of the inscription to cause superficial cracking when conditions of preservation have been unfavourable. In some places this has caused damage to the lettering, which was probably precipitated by the removal of the inscription from its original location in the south transept (by 1543 at the latest), and its subsequent storage and display until finally set in the wall of the new portico in 1619.³²

The density of fossils visible across the surface of the Epitaph is also an important diagnostic feature. Fossils do not occur in great numbers or in dense concentrations, and where they are found they are a similar colour to the matrix. Thus the marble was not selected for the visual impact of its fossils, which under favourable depositional conditions can produce striking, bi-coloured patterns. Rather, it is the monochrome consistency of the slab that is striking, since no white or other coloured inclusions are visible. The most prominent geological feature

³² The two parallel areas of damage on lines 19–21 could have been caused by clamps used when the inscription was moved from its original location; these have been filled.

FIG. 3. Close-up of coral fossils (*caninia cornucopiae*). Scale: letter E (line 37, *SPLENDES*) height: 34 mm; width 20 mm. Note also the small pockmarks on the surface, indicating the erosion of ooids. The whiteness around the edge of the letter is white lead, squeezed into each letter to enhance the clarity of the inscription.

of the surface of the Epitaph is pitting, a result of the erosion of ooids from the stone in an acid atmosphere, which post-dates the carving of the inscription (Fig. 3). Close-up inspection of the stone also shows that the marble is not true jet black in colour; rather it is a very dark greenish grey. Again, in combination with other physical observations, this is an important diagnostic characteristic of the stone of the Epitaph.

Thin sections of a sample taken from the stone permit microscopic examination of its petrological structure (Fig. 6, below). It is a grain-supported shelly oolite with around 95% grains and 5% dark, fine-grained carbonate mud matrix. The well-rounded and well-sorted grains include fragments of crinoid, brachiopod shell, bivalve shell and some foraminifera. Terrestrial sand grains (for example, quartz and feldspar) were not present in the sample. These observations suggest that the stone was deposited in a shallow, high-energy marine environment, since the production of ooids (small, ~0.5 mm diameter, spherical calcareous grains) depends upon vigorous wave action.

THE GEOCHEMISTRY OF THE EPITAPH

The geochemical analysis of the Epitaph was carried out using a portable energy dispersive X-ray fluorescence (EDXRF) spectrometer, developed in the Laboratory of Archaeometry and Non-Destructive Analysis (LANDA), University of Rome 'La Sapienza'. The technical details of the equipment are given elsewhere.³³ The primary X-ray and the fluorescence beams sample an analytical surface of around 2 mm diameter; several points for each sample have been measured and the results averaged to obtain a 'fingerprint' of the constituent chemical elements of the stone. Each X-ray photon reaching the detector generates a group of electrons, the number of which (that is the total charge) is proportional to the energy of the detected photon. These electrons produce a pulse of electric current, which is amplified and shaped before being sent to the multi-channel analyser. The multi-channel analyser separates the pulses of different amplitudes into 1024 channels, where they are counted for a selected time interval. The multi-channel analyser is connected to a personal computer for data acquisition control and for storing the spectra. The EDXRF spectra were processed later with the AXIL software package released by IAEA. This program allows the assignment of the fluorescence peaks to the chemical elements and yields the area subtended by each peak (counts).

For our purposes it is not necessary to calculate absolute mass concentrations of the elements, but, for each spectrum, it is sufficient to obtain relative percentages, P_i , that is, the ratios between the counts N_i of the peak corresponding to the atomic species i and the total number of counts for all elements: $P_i = N_i / \sum_i N_i$. In our experiments we used two values for the amplifier gain, one to expand the low-energy region of the spectrum (approximately from 1 keV to 9 keV) and the other one for the high-energy region of the spectrum (approximately from 4 keV to 25 keV).

MEASUREMENTS AND ANALYSIS

Initially, measurements were made *in situ* on the Epitaph itself, measuring EDXRF spectra on several points chosen on the flat regions of the stone as well as inside the carvings of the letters (Figs 1–2). The Epitaph is covered by a layer of polishing wax, which has been rubbed over the surface to clean it and to enhance the patina at infrequent intervals since at least the early seventeenth century, when the inscription was placed in its current position. Because wax is an organic compound composed of light elements only, it should be almost transparent to the X-rays detected in our measurements, and thus should have had little effect on our results. However, the wax contained also a fairly large amount of lead (Pb) that affects significantly

³³ A.C. Felici, G. Fronterotta, M. Piacentini, C. Nicolais, S. Sciuti, M. Vendittelli and C. Vazio, 'The wall paintings in the former Refectory of Trinità dei Monti convent in Rome: relating observations from restoration and archaeometric analyses to Andrea Pozzo's own treatise on the art of mural painting', *Journal of Cultural Heritage* 5 (2004), 17–25.

the relative intensities of the measured X-ray fluorescence lines, and was thus very likely to distort the results. The lead may have derived from air pollution (some sulphur is also present), but is likely also to have come from the white lead paste that, at some point in the past, was squeezed into the letters of the inscription to enhance their clarity against the dark background (Fig. 3). The white lead in the letters also obscures any possible evidence of gold that contemporary sources suggest may have originally enhanced the inscription.³⁴ Because of the omnipresence of this distorting layer of lead across the surface of the inscription, permission was given by the Fabbrica di San Pietro to obtain a small sample of the Epitaph stone. This sample was used for two purposes: firstly to measure the EDXRF spectra on the clean, recently broken surfaces on these flakes, and, secondly, to prepare thin samples for the petrographic analysis discussed above.

The results of the EDXRF analysis of the Epitaph stone are discussed below alongside the comparative data gleaned from the samples taken from quarries of known provenance (below, Table 2 and Fig. 7). For each sample we measured at least nine EDXRF spectra on different points in order to check the reproducibility of the measurements and the homogeneity of the samples. Significantly, the results demonstrate that this technique can distinguish between stone from different quarries, some no more than a few kilometres apart. The results reflect geochemical differences between the discrete layers of carboniferous limestone that were laid down under variable depositional conditions. Subsequent folding and faulting of these horizontal beds caused them to break the surface at different places, so that a bed of carboniferous limestone laid down early in the geological sequence may be quarried near the surface not far from strata laid down much later in time, each with different geochemical signatures. These experiments have shown that EDXRF analysis can distinguish between carboniferous limestone beds of different ages, even when the stone produced outwardly appears to be similar.

THE GEOLOGY OF CARBONIFEROUS LIMESTONES IN FRANCIA

Carboniferous limestones are relatively scarce in Europe; where they occur they are found stratigraphically below coal measures. Carboniferous limestones range primarily, northwest-southeast, in a band from Ireland, Wales and northern England, to southern Belgium. Of these, the Belgian sequences are the most substantial and, historically, the most significant.

The European carboniferous limestones were laid down in a rapidly changing shallow sea. The periodic exposure and erosion of land masses in the sea led to the addition of silicate sediment to some of the limestones. This combination of sea-level change and changing sediment source means that the limestones are palaeontologically and chemically variable and distinct from each other. There were three episodes of relatively high sea level, during each of which black limestones

³⁴ See above, nn. 12 and 29.

were deposited; these are the Frasnian (F2), Tournaisian (Tn2c–Tn3a) and Viséan (V1–V3b). Although the co-joined seas in which the limestones were deposited contained a sequence of microfossils that can be correlated across the region, there are local variations in the macrofossil communities that have made it possible to identify the source of the limestone used for Hadrian's Epitaph. A summary of the main phases of black limestone deposition is given in Table 1.

The fluctuations in the marine environment that produced the black limestones in our area are described briefly since, over geological time, these changes account for the different characteristics of the black marbles sampled. From the early Devonian period, progressive marine transgressions covered the lower reaches of the mountains formed during the Caledonian orogeny, in a process that culminated during the Siegenian stage. In the late Emsian stage, the process was reversed, and by the Frasnian stage marine regression had created an archipelago in the area with numerous coastlines and many well-developed reefs that, in the area of Dinant, constituted a barrier reef. Tectonic changes meant that at some times the waters of the lagoons behind the barrier reef were isolated from the open sea, while at other times they were connected to it. These changes mean that both the composition of the water and the sediment being deposited in the basin were constantly changing; it is these variables that were responsible for the geochemical variations evident in the EDXRF analysis.

Marine transgression and deep-water deposition at the end of the Frasnian stage were reversed again during the Famennian stage and, again, rhythmic sequences of varied sediments were deposited during this period of marine regression, the

TABLE 1. Sequence of deposition of black limestone in northern Europe.

Period	Stage	Environment	Black limestones	Samples
Carboniferous ↑	Viséan V3b	deep sea	–	–
	Viséan V2b	sea	Sclayn ('Mosan')	BE001
			Anhée, Dinant	BE004
			Sablé, Port Etroit	BE005
	Viséan (V1–2a)	algal lagoon	St Anne, Dinant	BE002b
Devonian ↑			Salet, Dinant	BE003
			Theux	Theux
	Tournaisian (Tn2c–Tn3a)	shallow water	Tournai / Maredsous	Tournai
	Famennian	exposed limestones	None	
	Frasnian (F2)	narrow anoxic muddy sea	Golzinne	Golzinne

character of which depended upon the varying terrigenous inputs and carbonate production of the time. Another period of marine transgression during the lower Carboniferous period (often called the 'Dinantian' stage) led to the production of rhythmic carbonates. This long phase of marine transgression was temporarily interrupted by a minor regression at the end of the Tournaisian that reached its maximum during the lower Viséan stage. At this time there were three interconnected basins of 'Dinant', 'Namur' and 'Campine', separated from each other by islands (Fig. 4). After the sea-level high point of the lower Viséan stage, the sea again began to retreat until, at the end of the Viséan, the carbonate sequence was overwhelmed by siliciclastics flooding in from the south.

The sites from which samples of the black marbles laid down during these various geological phases have been analysed are shown in Figure 4 and Table 1. The famous black stone of Tournai in western Belgium is representative of the lower

FIG. 4. Palaeogeographic reconstruction of northwest Europe during the Dinantian (lower Carboniferous), showing the ancient coastline and the areas of land. As the sea level rose and fell these landmasses were swamped or exposed. The locations of black marble quarries are shown: 1. Sclayn (BE001); 2. St Anne, Dinant (BE002b); 3. Salet, Dinant (BE003); 4. Anhée, Dinant (BE004); 5. Sablé, Port-Etrot (BE005); 6. Tournai; 7. Golzinne; 8. Theux.

Carboniferous series. It is well known to scholars of medieval sculpture, especially through the fonts and low-relief tomb monuments that were exported up the river Scheldt into southern and eastern England in the twelfth and thirteenth centuries.³⁵ Because it is geologically older, Tournaisian marble has lithological and palaeontological characteristics that are different from the younger carboniferous rocks of the Viséan stage. It also ages differently from the Viséan rocks, since the surface often develops a yellowish tinge as the surface layers oxidize.³⁶

The geological stages of the lower Carboniferous series, known as the Tournaisian and Viséan, are often collectively termed 'Dinantian' because rocks of both stages crop out around the southern Belgian town of Dinant.³⁷ The Viséan is itself stratified; the lower layers produce the *marbre noir de Dinant* (V1a) that was widely quarried in the modern period. It is compact, very fine-grained and thinly bedded, and is found (as its name suggests) in outcrops in northeast-southwest bands in the vicinity of Dinant. Further up the Viséan sequence, and further north, are the carboniferous limestones of the Namur syncline. These are found below and around the substantial coalfield of the valley of the rivers Sambre and Meuse between Charleroi and Liège. These middle Viséan beds tend to produce black limestone that is more massive and has a different range of fossils to that found around Dinant. The *marbre noir de Namur* is part of this middle Viséan sequence, and is found particularly within the so-called *Calcaire de Lives* (V2b) along the banks of the river Meuse, between Namur and Liège. The black limestone of the *Calcaire de Lives* is also commonly known as 'Mosan marble', and it is this stone that provides the closest analogue to the stone of Hadrian's Epitaph.³⁸ Windows of carboniferous limestone also crop out further east of Namur, particularly around Theux, southwest of Verviers; this stone is from the lower phases of the Viséan (V1).³⁹

Black limestones are also found on the eastern edge of the Amoric Massif in western Francia, to the northwest of Tours in the 'Laval syncline' around Sablé. These are mainly of the Tournaisian sequence (with thick coal measures interleaved), and to a lesser extent of the lower and middle Viséan period. The marble known as *noir de Sablé* was that which De Rossi thought had been used for the Hadrian Epitaph. De Rossi was right to recognize that the sample of *noir de*

³⁵ G.C. Dunning, 'The distribution of black Tournai fonts', *Antiquaries Journal* 24 (1944), 66–8; J.-C. Ghislain, 'La production funéraire en pierre de Tournai à l'époque romane. Des dalles funéraires sans décor aux œuvres magistrales du 12e siècle', in *Les Grands-Siècles de Tournai (Art et Histoire 7)* (Tournai (Louvain-la-Neuve), 1993), 115–208.

³⁶ F. Anderson and E. Groessens, 'The black altars of Nehalennia', *Oudheidkundige Mededelingen uit het Rijksmuseum van Oudheden te Leiden (Nieuwe Reeks 76)* (1996), 129–38, at p. 133.

³⁷ C. Pomerol (ed.), *Guides géologiques régionaux. Ardenne Luxembourg* (Paris, 1973), 23–8; E. Groessens, 'L'industrie du marbre en Belgique', *Mémoires de l'Institut Géologique de l'Université de Louvain* 31 (1981), 219–53.

³⁸ Groessens, 'L'industrie' (above, n. 37), 228–9; Anderson and Groessens, 'Black altars' (above, n. 36), 134.

³⁹ Groessens, 'L'industrie' (above, n. 37), 221–8.

Sablé he saw had the same general petrological character as the stone of the Epitaph. The bed outcrops along the banks of the Sarthe between Port Etroit and Juigné for no more than 2 km, and was extracted primarily at the quarry at Port Etroit (the source of De Rossi's sample), where the stone is found in regular, thick beds that are steeply angled. The overgrown remains of smaller quarries are identifiable further along the river-bank; in the nineteenth century the Benedictine abbey at Solesmes on the south side of the river operated a marble factory that worked different marbles from across the region. However, the main commercial feature of *noir de Sablé* is the extensive and prominent white veining running through the black ground; these are entirely absent from the stone of Hadrian's Epitaph. The white veins are very likely to be found throughout the sequence of black limestones at Sablé since, geologically, the beds lie in the nose of a fold that would cause extensive veining through pressure and cracking. It is possible that De Rossi saw a small sample in which the white veins were absent, but it would be most improbable that a slab the size of the Epitaph could be produced from these beds without showing any sign of the white veins so characteristic of the *noir de Sablé*. Additionally, the *noir de Sablé* tends to contain prominent fossils that appear bright white against the dark background and are found in a much greater density and variety than in Hadrian's Epitaph.⁴⁰

GEOLOGICAL COMPARISONS

Samples were taken from seven Belgian quarries: Golzinne (middle Frasnian); Tournai (upper Tournaisian); Salet, Dinant (BE003) (lower Viséan); Anhée, Dinant (BE004) (middle Viséan); St Anne, Dinant (BE002) (middle Viséan); Sclayn (BE001) (middle Viséan); Theux (upper Viséan); and an eighth sample from the French quarry at Port Etroit (Sablé, BE005) (middle Viséan). It is necessary to draw attention to the variables that affect this sampling strategy. The samples provide a keyhole-view of the geology of the region; the palaeontology is sufficiently similar within rocks of the same geological age to render a comparison meaningful, but the local circumstances of deposition mean that geochemical readings from a small sample may differ from a bed not far above or below it, even within the same geological sub-phase. This variability can be minimized by taking a number of readings from each sample; here, at least nine readings were taken from each. It is exacerbated, however, by the very nature of quarrying; over time and use, a quarry destroys the evidence of its own production, as beds are extracted sequentially. Thus, even if a sample were to have come from exactly the same quarry as the Epitaph, the geochemistry and palaeontology of strata at the front and back of the

⁴⁰ *La Flèche (Carte géologique de la France à 1/50000, XVI-20)* (Orléans, 1989), 12-13; C. Lorenz (ed.), *Géologie des pays européens. France, Belgique, Luxembourg* (Paris, 1980), 176-80; Watson collection, no. 205, Department of Earth Sciences, University of Cambridge.

quarry may differ sufficiently to make a match impossible to achieve with 100% certainty; we must thus work within a range of probabilities and use a combination of scientific techniques and historical observations to reduce the variables.

PETROLOGICAL AND PALAEONTOLOGICAL COMPARISONS

The combination of analytical techniques comparing the palaeontology and the petrological and geochemical qualities of Hadrian's Epitaph with samples from quarries producing black marble of varying geological ages in Belgium and France strongly suggests that Mosan marble of the middle Viséan period is the best match. The modern quarry at Sclayn, 14 km downstream from the confluence of the Sambre and the Meuse at Namur, produces Mosan marble of the middle Viséan stage that displays a similar range of fossil species, in similar density, to the stone of Hadrian's Epitaph. These are compared in Figure 5.

The Sclayn marble is also very dark greenish grey, like the Epitaph. In these two respects, colour and palaeontology, the samples from Sclayn are quite unlike the marble of different geological ages produced in other quarries. Mosan marble is also more massive than that of other period quarries and would be more likely to produce a slab of the size of the Epitaph. The quarries around Dinant produce marble of the lower Viséan sequence that is much blacker, shows fewer fossils of a more restricted fossil assemblage, and tends to be thin-bedded and compact. In addition to this, the most distinctive fossil of the Epitaph, the coral *zaphrentis*, is absent from the French middle Viséan limestone at Sablé. The petrological differences between the samples are best illustrated by the thin sections taken from each sample and from the Epitaph (Fig. 6a-b).

The thin sections show that the limestones form two contrasting groups. The first includes the rocks of Sclayn (BE001) and the Epitaph, which have a large number of well-rounded and well-sorted carbonate grains (including shells and ooids) with a small amount of matrix (5-15%). The other quarries form a group that is matrix dominated (70-97%), containing varying amounts of shells, sand and ooids. While the components of each of these rocks will change from bed to bed within a quarry, the features of the Mosan marble (*Calcaire de Lives*, sampled at Sclayn) and the Epitaph suggest that the rocks were laid down in high-energy, shallow water, while the preponderance of matrix in samples from the other quarries suggests deposition in deeper quiet water.

GEOCHEMICAL COMPARISONS

The geochemical data from each sample are given in Table 2. The composition of the samples coming from Theux, BE005 (Sablé) and BE003 (Salet, Dinant) are rather different from the Epitaph sample, and may thus be disregarded as a possible source for the Epitaph. Theux and BE005 (Sablé) are much richer in strontium (Sr)

FIG. 5. A visual comparison of the features of the Epitaph and the Mosan marble (*Calcaire de Lives*) at Sclayn, showing the fossil assemblage including a coral, probably *caninia cornucopiae* (*zaphrentis* -); a coral, *syringopora*; a crinoid; and a brachiopod (*productus*). The drawings shown at a similar scale for comparison are *zaphrentis enniskilleni*; *syringopora geniculata*; *woodocrinus macrodactylus* and *productus corrugatus*, from *British Palaeozoic Fossils* (London, 1996), © Natural History Museum (reproduced courtesy of the Natural History Museum). Also shown are a stylonite (irregular pressure-solution lines) and some shelly fragments. The letters of the Epitaph are around 35 mm tall.

SAMPLE	THIN SECTION	COMPONENTS
EPITAPH 1		95 % ooids, shells 5 % lime mud matrix
EPITAPH 2		95 % shelly ooids 5 % lime mud matrix
BE001		85 % ooids, shells 15 % calcite cement
BE002		5% ooids, shells, sand 95 % lime mud

FIG. 6a and b. Comparison of thin sections showing a photomicrograph of each sample with an estimate of the bulk composition of the rock from thin section. The images are shown at the same scale, with the width of each image equivalent to 6 mm at actual scale.

SAMPLE	THIN SECTION	COMPONENTS
BE003		15 % shells, sand 85 % lime mud
BE004		30 % shells 70 % lime mud
GOLZINNE		3 % shells (shown) 97 % lime mud
THEUX		5 % shell, white veins 95 % lime mud

FIG. 6b.

TABLE 2. Mean values of the relative percentages of the black marble samples and the Epitaph.

Key: K – potassium; Ca – calcium; Ti – titanium; Mn – manganese; Fe – iron; Co – cobalt;
Cu – copper; Zn – zinc; Rb – rubidium; Sr – strontium; Y – yttrium.

	K	Ca	Ti	Mn	Fe	Co	Cu	Zn	Rb	Sr	Y
BE001	0.00	96.36	0.00	0.13	0.72	0.14	0.42	0.39	0.00	1.76	0.08
BE002b	0.29	92.06	0.03	0.00	2.32	0.12	0.68	0.39	0.00	3.94	0.17
BE003	0.87	88.63	0.11	0.00	5.16	0.11	0.42	0.53	0.00	4.05	0.12
BE004	0.00	93.71	0.04	0.03	1.56	0.16	0.45	0.42	0.00	3.54	0.10
BE005	0.00	88.65	0.06	0.00	2.04	0.10	0.43	0.53	0.00	8.06	0.14
Golzinne	0.46	92.99	0.06	0.02	2.87	0.12	0.43	0.40	0.00	2.50	0.14
Tournai	0.59	86.30	0.15	0.07	8.46	0.17	0.40	0.42	0.14	3.12	0.18
Theux	0.00	84.74	0.00	0.00	0.92	0.14	0.60	0.49	0.00	12.94	0.16
Epitaph	0.00	95.23	0.00	0.00	0.97	0.14	0.38	0.42	0.00	2.69	0.17

than the Epitaph, and the BE003 (Salet, Dinant) sample is richer in iron (Fe). The other samples have percentage values closer to those of the Epitaph and so it becomes difficult to give any a unique assignment or to discard other samples. For example, the value of calcium (Ca) for the Epitaph is between those of BE001 (Sclayn) and Golzinne; the strontium concentration in the Epitaph is closer to that of Golzinne, but the iron content is closer to that of BE001 (Sclayn). A statistical study, which considered the entire set of measurements instead of their mean values, was used to refine the comparison between the populations of measurements for the quarries and the Epitaph.

Statistical analysis

Principal Component analysis is used as a means of demonstrating the differences between groups of data where each group represents the results from a single sample; it also enables comparisons to be made of the variations within each dataset. The Principal Components (PCs) were calculated from the covariance matrix. The first two PCs provide a good summary of the data, since they account for 99% of the total variance. The two-dimensional scatterplot of the first two PCs (Fig. 7) confirms that there is a significant separation of the Theux and BE005 (Sablé) groups from the other classes, and that the two groups are different from each other. Inspection of the Principal Component plot (Fig. 7) shows that the two closest populations to that of the Epitaph are those of BE001 (Sclayn) and BE004 (Anhée, Dinant), both of which are from the middle Viséan stage and are parts of the *Calcaire de Lives*.

Together with PCs analysis, a classification algorithm was employed in this study, the so-called Support Vector Machines (SVMs) method, a new generation

FIG. 7. Principal Components analysis of marble samples.

learning system based on recent advances in statistical learning theory.⁴¹ The learning machine was trained on a training set consisting of eight classes: Golzinne, BE002b, Theux, BE004, BE003, BE005, BE001, Tournai with respectively seventeen, ten, twelve, thirteen, fifteen, thirteen, fifteen and fourteen observations. After the training the machine was asked to classify the twenty observations of the Epitaph sample and it assigned 75% of them to the BE004 class and the remaining 25% to the BE001 one.

While the linear trends for the rocks of Golzinne, BE002b (St Anne, Dinant), BE003 (Salet, Dinant) and Tournai are similar to those of the Epitaph, their chemistry is much more variable than that of the Epitaph, BE001 (Sclayn) and BE004 (Anhée, Dinant). This increased variability is illustrated on the chart; each group of data points for the Epitaph, BE001 and BE004 is compact, whereas the groups of data points for the other samples are more stretched. The differences in chemistry between the two groups are probably a reflection of different dates of deposition. The Golzinne marbles were created during the Frasnian stage of the late Devonian series (Table 1). The other two samples are limestones from the lower Viséan stage; BE002b (St Anne, Dinant) and BE003 (Salet, Dinant) were deposited at a time of low sea level and increased exposure of the land. This is reflected in the presence of small amounts of sand found in these rocks, as observed in thin section (Fig. 6). These sand grains are probably the cause of the greater variation in geochemistry of these two samples. The distribution of the Tournai samples is compact but has a composition distinct from that of the Epitaph and the other related rocks. This difference probably reflects the difference in chemistry of the sea in which it was deposited, a result of the rock being deposited at a much earlier time.

Chemical analyses of the samples from carboniferous limestone quarries and from the Epitaph do not give a unique result. However, they restrict the provenance to rocks laid down during the Viséan stage in the region of the Meuse valley around Dinant and Namur. Note that rocks of this age deposited away from the Namur/Dinant region (that is Sablé) can also be excluded on geochemical grounds. Within the Namur/Dinant region, the closest match to the Epitaph is given by samples BE001 (Sclayn) and BE004 (Anhée, Dinant), which are both outcrops of the middle Viséan (V2b) Mosan marble (*Calcaire de Lives*) and hence have similar chemistry to each other. To further discriminate between these two sources, petrological evidence is required.

The palaeontological analysis supports the geochemical result that the *Calcaire de Lives* (BE001 (Sclayn) and BE004 (Anhée, Dinant)) is indeed the best match for the stone of the Epitaph as it contains an assemblage of fossils characteristic of the Viséan in this area. Furthermore, the thin-section petrography of the stone shows that the environment in which the BE001 (Sclayn) sample was deposited was

⁴¹ N. Cristianini and J. Shawe-Taylor, *An Introduction to Support Vector Machines and other Kernel-Based Learning Methods* (Cambridge, 2000).

characterized by high-energy conditions and hence abundant ooids, while the environment of deposition of BE004 (Anhée, Dinant) was generally lower-energy with occasional influxes of shelly material, perhaps storm deposits. Thus, of the two, the sample from Sclayn, BE001, is more like the stone used for the Epitaph.

HISTORICAL EVIDENCE FOR THE USE OF MOSAN MARBLE

This preference for the marble of the middle Viséan stage is also supported by the historical and archaeological evidence, which indicates that these rocks were exploited in the Roman period whereas the black marbles from Dinant were exploited only later. There is a considerable history of exploitation of the black limestones in Belgium. Marble known as 'Belgian black' was very highly valued during the seventeenth and eighteenth centuries because of its homogeneous, intense black colour and its very fine grain, which enabled the creation of complex three-dimensional sculptures.⁴² The best source of this 'Belgian black' comes from Golzinne (Mazy) to the north of Namur, where it is quarried underground. Geologically, however, the black marble from Golzinne pre-dates the Dinantian stage, belonging to the last stage of the Devonian (middle Frasnian). This is significant since, although the quarry is close to Namur, to the river Meuse and to the younger marbles of the middle Viséan stage found along the banks of that river, the geological and geochemical properties of marble from Golzinne are quite different, as we have seen.⁴³ The first quarry exploiting marble from the Golzinne area was opened in 1645, and there is no evidence that it was used before that time.

The modern term 'Belgian black' was also applied to the lower Viséan marbles from Dinant. The stone from this region was also highly prized in the seventeenth and eighteenth centuries, but could only be quarried in blocks of relatively small size; it was used particularly therefore for floor tiles and tomb slabs (and is now quarried at Salet). There is some textual evidence for the use of the stone in the later Middle Ages, and surviving tomb monuments, such as the tomb of John the Fearless (1371–1419) in Dijon, indicate that it was used for high-status commissions.⁴⁴ Marble from thicker middle Viséan layers was preferred for Romanesque sculpture, especially fonts, in the twelfth and thirteenth centuries.⁴⁵ Many survive within the diocese of Liège, some very finely carved, others with less sophistication.

⁴² Gnoli, *Marmora romana* (above, n. 22), 194, n. 3; Borghini (ed.), *Marmi antichi* (above, n. 22), 256.

⁴³ Groessens, 'L'industrie' (above, n. 37), 222.

⁴⁴ E. Groessens, 'L'exploitation et l'emploi du marbre noir de Dinant sous 'Ancien Régime'', in J. Lorenz (ed.), *Carrières et constructions en France et dans les pays limitrophes III (119^e congrès national des sociétés historiques et scientifiques, 1994 Amiens)* (Paris, 1996), 73–87.

⁴⁵ L. Tollenaere, *La sculpture sur pierre de l'ancien diocèse de Liège à l'époque romane* (Gembloux, 1957), 157–65.

The colour of the stone is often quite grey, but where features and figures have been polished, a smooth, shiny black patina is created.

The black stones of Belgium were exploited in the Roman period also. It has been argued that the stone of the eastern Belgian site at Theux was used in the Roman period, but the argument has been confused by a misplaced nineteenth-century attempt to associate this source with Pliny's Lucullan marble.⁴⁶ Tournai was an active quarrying centre in the Roman period and stones from that region were transported along the river Scheldt/Escault for use in the construction of the third-century coastal fort at Aardenburg. Black Tournai stone was used in the construction of its walls, the *principia* and two towers, and it has been suggested that an internal temple at the site may have been made of polished black marble. Black stone was used also at the nearby Saxon Shore fort at Oudenburg, from where it was quarried for reuse in the walls of Bruges in the late eleventh century.⁴⁷

Roman quarries were also worked along the banks of the river Meuse, between Namur and Liège, producing middle Viséan 'Mosan marble'. Fragments of black marble from this phase are known from the Roman villa at Echternach, Luxembourg, and from six funerary slabs of third-century date from the citadel at Namur. A third-century altar and the octagonal itinerary column from Tongres, now in the Royal Museum in Brussels, are also made from Mosan marble.⁴⁸ A fragmentary late fifth- or early sixth-century funerary inscription from the abbey of Saint Servatius in Maastricht was made from a piece of Mosan marble, possibly *spolia*.⁴⁹ Mosan marble is also the material of several of the remarkable group of altars dedicated to the goddess Nehalennia; seventeen whole or fragmentary black altars were recovered from the temple site off the Dutch coast at Colijnsplaat, transported there via the Meuse to the mouth of the Rhine.⁵⁰

⁴⁶ P. den Dooven, 'Histoire de la marbrière antique de Theux et des tombeaux de la famille de La Marck dans l'Eifel', *Bulletin Société Vervétoise d'Archéologie et d'Histoire* 53 (1966), 115–55; E.M. Wightman, *Gallia Belgica* (London, 1985), 136. A small building with wall mosaics of glass *tesserae* of Merovingian date has been excavated there recently; F. Theuvs, 'Maastricht as a centre of power', in M. de Jong, F. Theuvs and C. van Rhijn (eds), *Topographies of Power in the Early Middle Ages* (Leiden, 2001), 155–216, at p. 208, n. 172.

⁴⁷ Anderson and Groessens, 'Black altars' (above, n. 36), 132.

⁴⁸ Groessens, 'L'industrie' (above, n. 37), 228; Anderson and Groessens, 'Black altars' (above, n. 36), 133. For the Mosan marble itinerary column, see F. Cumont, *Catalogues des sculptures et inscriptions antiques (monuments lapidaires) des Musées Royaux du Cinquantenaire* (Brussels, 1913), 235–8, no. 196.

⁴⁹ T. Panhuysen, 'Maastricht, centre de production de sculptures gallo-romaines et d'inscriptions paléo-chrétiennes', in *Studien zur Sachsenforschung* 8 (Hildesheim, 1993), 83–96, no. 4; W. Boppert, 'Die frühchristlichen Grabinschriften aus der Servatiuskirche in Maastricht', in C.G. De Dijn (ed.), *Sint-Servatius, Bisschop van Tongeren-Maastricht (Actes du colloque à Alden biesen (Bilzen), Tongres et Maastricht 1984)* (Borgloon-Rijkel, 1986), 64–96, at pp. 80–3. Thanks to Wim Dijkman for these references.

⁵⁰ About 300 altars (or fragments of altars) were recovered from the site (most made of 'white' limestone); P. Stuart and J.E. Bogaers, *Nehalennia. Römische Steindenkmäler aus der Oosterschelde bei Colijnsplaat (Corpus Signorum Imperii Romani, Nederland 2, Collections of the National Museum of Antiquities at Leiden IX)*, 2 vols (Leiden, 2001), I, 18, 132–7, 147–8, 156–7, 184, tav. 91–2, 101.

BLACK STONES AND THE MEUSE VALLEY IN THE AGE OF CHARLEMAGNE

Our analysis suggests that Hadrian's Epitaph was made from a Mosan marble of the middle Viséan stage, cut in the vicinity of Namur. We have good evidence that this material was exploited in the Roman period and again in the Romanesque. Our observations concerning its use for Hadrian's Epitaph provide hard evidence for its use in the intervening centuries, though whether it was freshly cut or reused *spolia* remains to be seen.

The Meuse is one of the major rivers of Francia, central to the eastern kingdom of Austrasia, providing a communication link northwards and, through its proximity in its upper reaches to the Rhône-Saône axis, to the southern provinces and the Mediterranean.⁵¹ It rises in the plateau of Langres and flows north through the forested lands of the Ardennes, cutting and exposing the carboniferous limestone geology between Dinant and Namur. At Namur it joins the course of the Sambre and turns eastwards, following the line of the geology (exposing the coal and dolomite), before turning north again at Liège, through Maastricht, to Frisia, the Rhine delta and the North Sea.

From the mid-seventh to earlier eighth centuries this region formed a discrete political unit — the kingdom of Austrasia — that was one of the three major units of Merovingian Francia and often in political opposition to Neustria and Burgundy. It was here that the Carolingian (Pippinid) dynasty rose to prominence from the ranks of the Austrasian aristocracy, acquiring political influence and control of the region through marriage into families that had well-established claims to lands and monastic foundations around the central Meuse valley.⁵² The charter evidence suggests that the core of the family lands lay to the west of Namur, focused around the monastery of Nivelles, which was founded c. 640 on lands owned by Itta, the wife of Pippin I and Charlemagne's great-great-great-grandmother. Pippin II (d. 714) extended the family's influence further south by marrying Plectrude, whose family had founded the monastery at Echternach and controlled great tracts of land in the Ardennes and the middle Moselle region. He consolidated his influence further east by marrying again into another family based in Maastricht, which possessed lands around Liège. The lower Meuse came under his control through the conquest of Frisia in the 690s and through the consequent division of land, churches and monasteries among men loyal to him and to Plectrude and her sons. This policy was

⁵¹ F. Rousseau, *La Meuse et le pays Mosan. Leur importance historique avant le XIII^e siècle* (Namur, 1930); J. Plumier-Torfs, S. Plumier-Torfs, M. Regnard and W. Dijkman (eds), *Mosa Nostra. La Meuse mérovingienne de Verdun à Maastricht V^e-VIII^e siècles* (Namur, 1999).

⁵² The most important studies of the aristocratic families of the early medieval Meuse region are: M. Werner, *Der Lütticher Raum in Frühkarolingischer Zeit: Untersuchungen zur Geschichte einer Karolingischen Stammlandschaft* (Veröffentlichungen des Max-Planck-Instituts für Geschichte 62) (Göttingen, 1980); R.A. Gerberding, *The Rise of the Carolingians and the 'Liber Historiae Francorum'* (Oxford, 1987), 116–45 and map 2; Theuws, 'Maastricht' (above, n. 46), 186–93 and fig. 8.

disliked by the aristocracy of Liège–Maastricht, who resented the intrusion of Plectrude's southerners into a region that they felt should have come within the diocese of Tongres/Maastricht/Liège.⁵³ Charles Martel, Pippin's son by his second wife, was eventually able to overturn the influence of Plectrude and to succeed his father as mayor of the palace in Austrasia by marshalling this unrest among the local aristocracy of Liège–Maastricht, where his own maternal family was based, against the considerable forces of his step-mother, culminating in his victory at Amblève in April 716. It was from here that Charles was able to gather sufficient strength to take on the Neustrian forces and to become *de facto* ruler of all Francia, as his father had been before him.⁵⁴

The central Meuse valley was thus a crucial power base for the Carolingian dynasty in the late seventh and early eighth centuries, articulated by a network of aristocratic centres that either belonged to the immediate family of Charles Martel or identified with his cause. The creation in the early eighth century of a new cult centre at Liège, focused on the remains of the martyred bishop Lambert, was a demonstration of Pippinid power within the extensive diocese of Tongres/Maastricht/Liège, and served to marginalize the claims of other regional aristocratic families to control of the bishopric and its dispersed estates, and to act as an alternative focus to the royal demesne focused on Maastricht.⁵⁵ Namur had been a stronghold of the Pippinid family since the time of Pippin I in the earlier seventh century, and his wife Itta also seems to have owned lands through her family further downstream around Andenne.⁵⁶ Their daughter Begga founded a monastery at Andenne, which may have lain within a bigger estate that straddled the river and included Seilles, Landenne and Vezin on the north bank, and Andenne, Sclayn, Bonneville and Coutisse to the south.⁵⁷

Begga's monastery at Andenne never rivalled that of her sister Geretrude at Nivelles, which became one of the most influential royal nunneries in Francia, but its location on the banks of the Meuse was an important marker of Pippinid presence that complemented the family's other centres of power along the central Meuse, such as Namur, Huy, Chèvremont/Liège, and the *palatia publica* at Jupille and Herstal.⁵⁸ Werner and Theuws have shown how the social landscape of the central Meuse became Carolingianized during the eighth century, as the properties

⁵³ Gerberding, *Rise of the Carolingians* (above, n. 52), 125–8.

⁵⁴ P. Fouracre, *The Age of Charles Martel* (Harlow, 2000), 61–4; Gerberding, *Rise of the Carolingians* (above, n. 52), 180; Theuws, 'Maastricht' (above, n. 46), 180.

⁵⁵ Theuws, 'Maastricht' (above, n. 46), 174–91.

⁵⁶ Gerberding, *Rise of the Carolingians* (above, n. 52), 99, 125; Theuws, 'Maastricht' (above, n. 46), 188–90 and n. 100.

⁵⁷ For the possible boundaries of the estate, see G. Despy, 'Henri IV et la fondation du chapitre de Sclayn', in *Mélanges Félix Rousseau: études sur l'histoire du pays mosan au moyen âge* (Brussels, 1958), 221–36, at pp. 233–6. Seilles is later mentioned as Carolingian property; the *Annales Regni Francorum* s.a. 806 say that Charlemagne met his eldest son and the army there; F. Kurze (ed.), *Monumenta Germaniae Historica Scriptores Rerum Germanicarum* (Berlin, 1895), 122; Theuws, 'Maastricht' (above, n. 46), 209.

⁵⁸ Theuws, 'Maastricht' (above, n. 46), 192–3, 209.

FIG. 8. Merovingian and Carolingian property in the middle Meuse valley. (After Despy, 'Henri IV' (above, n. 57); Werner, *Der Lütticher Raum* (above, n. 52); Theuws, 'Maastricht' (above, n. 46).)

possessed by Pippin's family along the Meuse and its hinterland were amplified by additional estates to the east of the river, including that which became Charlemagne's favoured residence at Aachen, 17 km to the west (Fig. 8).⁵⁹

These family Carolingian estates included the areas that produce the black Mosan marbles. The modern quarry at Sclayn lies within the suggested boundaries of the estate on which the monastery of Andenne was founded, and an earlier quarry

⁵⁹ Werner, *Der Lütticher Raum* (above, n. 52), map 14; Theuws, 'Maastricht' (above, n. 46), 208–13; M. Untermann, 'Opere mirabile constructa: die Aachener 'Residenz' Karl des Grossen', in C. Stiegemann and M. Wemhoff (eds), 799, *Kunst und Kultur der Karolingerzeit: Karl der Große und Papst Leo III in Paderborn. Beiträge zum Katalog der Ausstellung* (Mainz, 1999), 152–64; J.L. Nelson, 'Aachen as a place of power', in De Jong, Theuws and van Rhijn (eds), *Topographies of Power* (above, n. 46), 217–41.

(possibly Roman in origin) lies between it and Namur. Evidence for the use of these black stones during the Carolingian period is otherwise hard to come by, although local white limestone was certainly used in the early Middle Ages, especially for sarcophagi and monumental sculpture.⁶⁰

Perhaps the most intriguing piece of evidence for the use and desirability of black stones at this time comes from the letter written by Charlemagne to King Offa of Mercia in early 796.⁶¹ This letter, which is well known to historians of Anglo-Saxon England, covers a variety of topics of serious concern to the two kings, including Charlemagne's gift of alms to the episcopal sees of Mercia and Northumbria for the intercessions for the soul of Pope Hadrian. Among other topics, his letter discusses 'black stones' that Offa had asked to be sent to him:

As for the black stones which your Reverence pressed earnestly to be sent to you, let a messenger come, who may consider what kind you have in mind, and wherever they are to be found we will willingly order them to be given and to help with their transport. But just as you have intimated your wishes concerning the length of the stones, so our people make a demand about the size of the cloaks, that you may order them to be such as used to come to us in olden times.

The form and function of these 'black stones' is obscure, but they were evidently a topic worthy of negotiation between the two kings. Hincmar of Rheims, writing to his diocesan priests c. 856, told them to make altars *de marmore vel nigra petra*, which suggests that the material was to be reserved for special use.⁶² Levison thought that the reference in Charlemagne's letter was for building stones, but others have favoured a more mundane interpretation, arguing that the *petrae nigrae* were quern-stones made of dark Mayen lava, commonly imported into Britain in earlier centuries.⁶³ However, Charlemagne's letter specifies that it is the length of the stones that is important to Offa.⁶⁴ Peacock has argued that Offa's 'black stones'

⁶⁰ See especially the sarcophagus of Saint Chrodoara at Amay; F. Tourneur, 'Le travail de la pierre', in Plumier-Torfs *et al.*, *Mosa Nostra* (above, n. 51), 40, 56–7.

⁶¹ Alcuin, *Epistolae* no. 100; E. Dümmler (ed.), *Monumenta Germaniae Historica Epistolae Karolini Aevi IV* (Berlin, 1895), 144–6; Whitelock (trans.), *English Historical Documents I* (above, n. 12), no. 197; S. Allott, *Alcuin of York: his Life and Letters* (York, 1974), no. 40.

⁶² *Capitula Synodica* III.3, *Patrologia Latina* 125, col. 794C; M. McCormick, *Origins of the European Economy: Community and Commerce, AD 300–900* (Cambridge, 2001), 700.

⁶³ W. Levison, *England and the Continent in the Eighth Century* (Oxford, 1946), 111; P. Rahtz, 'Medieval milling', in D.W. Crossley (ed.), *Medieval Industry (Council for British Archaeology Research Reports 40)* (London, 1981), 1–15, at p. 4; R. Hodges, *Dark Age Economics: the Origin of Towns and Trade, AD 600–1000* (London, 1982), 124; R. Hodges, *The Anglo-Saxon Achievement* (London, 1989), 136; examples of these quern-stones are in C. Stiegemann and M. Wemhoff (eds), *799, Kunst und Kultur der Karolingerzeit: Karl der Große und Papst Leo III in Paderborn. Katalog der Ausstellung*, 2 vols (Mainz, 1999), I, no. VI.80a–d.

⁶⁴ D.P.S. Peacock, 'Charlemagne's black stones: the re-use of Roman columns in early medieval Europe', *Antiquity* 71 (1997), 709–15, at p. 709.

were columns rather than querns, the length of which would be a crucial feature. Furthermore, he suggested that such columns must have been *spolia* from Roman sites rather than ones quarried *de novo* in Francia in the later eighth century.

Peacock's conclusion was prompted by a study of the columns used in Charlemagne's chapel within the new palace complex at Aachen, begun in 792. Nineteen antique columns survive in the building and, of these, two are made of very rare black porphyry.⁶⁵ Of the rest, there is a marked preference for grey marbles and granites, which had come originally from the imperial quarries in eastern Turkey and Egypt.⁶⁶ The black porphyry columns in Charlemagne's chapel are very significant; the stone is exceedingly scarce and, Peacock has argued, would have been of immense value and prestige in the Roman world. Porphyry was the stone of Imperial Rome *par excellence*. It comes only from the quarries at *Mons Porphyrites* in Egypt and was normally purple in colour. Its exotic origin, the difficulty of extraction and transport, as well as its intense purple colour, meant that it more than any other stone came to symbolize imperial power, and efforts were made to limit its use to imperial projects. Black porphyry came from only a few places on the mountain, and was thus even more rare than the purple variety; it 'may have had a value almost beyond comprehension'.⁶⁷ Objects made from black porphyry are few and far between, which makes it difficult to generalize about their significance and primary use; Gnoli knew only of two other columns that are said to have come from an altar commemorating the decapitation of Saint Paul in the church of San Paolo alle Tre Fontane, south of Rome on the *Via Laurentina*, where the saint was said to have been martyred.⁶⁸ Another black porphyry column is to be found — with four red porphyry columns — in the apse of the thirteenth-century cathedral in Magdeburg, perhaps reused from the tenth-century palace of Otto I nearby.⁶⁹

The reuse of marble from existing Roman structures was discussed by both Charlemagne and Hadrian; a letter survives in the *Codex Carolinus* in which Hadrian granted permission to Charlemagne's agents to collect 'mosaic and marbles

⁶⁵ Stiegemann and Wernhoff (eds), 799, *Kunst und Kultur* (above, n. 63), I, no. II.69.

⁶⁶ Dodge, 'Main quarries' (above, n. 20); J.C. Fant, 'Ideology, gift, and trade: a distribution model for the Roman imperial marbles', in W.V. Harris (ed.), *The Inscribed Economy: Production and Distribution in the Roman Empire in the Light of 'Instrumentum Domesticum'* (*Journal of Roman Archaeology Supplementary Series* 6) (Ann Arbor, 1993), 145–70, at pp. 164–5.

⁶⁷ Peacock, 'Charlemagne's black stones' (above, n. 64), 712.

⁶⁸ The church was reconstructed by Sergius I in 689; R. Coates-Stephens, 'Dark age architecture in Rome', *Papers of the British School at Rome* 65 (1997), 177–232, at p. 180. The columns were moved to the stairs of the Vatican Museums in the eighteenth century. Fragments of black porphyry are known from the pavement of the Domus Flavia in Rome and other pieces were reused in twelfth-century panels in San Saba, Rome, and the cathedral at Salerno; Gnoli, *Marmora romana* (above, n. 22), 77, 138; Borghini (ed.), *Marmi antichi* (above, n. 22), 272–3.

⁶⁹ Peacock, 'Charlemagne's black stones' (above, n. 64), 713.

and other specimens' from the floors and walls of a palace in Ravenna.⁷⁰ This could refer to objects of varying size and function, such as small coloured tiles, large pieces of marble veneer or squared blocks, as well as columns, capitals or other architectural elements. The letter is undated, but may have been written after Charlemagne's visit to Ravenna on his way home after spending Easter in Rome in 787. The reference to *musiva* in Hadrian's letter may be to *opus tessellatum* or to the larger, coloured pieces of *opus sectile*, the fashion for which had been revived in Rome during Hadrian's pontificate.⁷¹ *Opus sectile* tiles, as well as column shafts that had been taken from Roman buildings, have been found at Aachen and in Charlemagne's palace at Ingelheim, as well as in several contemporary Carolingian churches; much of this material might have come from Roman buildings closer to home than Ravenna, but its reuse in Francia mirrored the latest fashion in Rome, which was itself derived from late antique interior design.⁷² We should note that some of the *opus sectile* pieces from Aachen, Corvey and Münster are mottled dark grey/black marble (some with fossils), reminiscent of the stone of Hadrian's Epitaph, and are assumed by the excavators to be of Roman manufacture.⁷³

Hadrian's letter reveals that Carolingian agents were actively collecting stonework from afar for Charlemagne's building projects in Francia, with considerable logistical implications. Peacock's work on the petrology of the Aachen columns implies that these agents were preferentially selecting particular types of worked stone from particular Roman buildings, especially stones that were black or grey in colour. Charlemagne's letter to Offa implies that 'black stones' were widely appreciated, and that they were sufficiently scarce for access to them to be controlled by the king. Hincmar's comment that altars were to be made of marble or black stone suggests that the material retained its value and scarcity into the middle of the ninth century at least. All this has implications for our study of the marble selected for Hadrian's Epitaph. Firstly, it raises the question of whether the Epitaph was also

⁷⁰ Perhaps the building known as the 'Palace of Theoderic'; *Codex Carolinus* (ed. F.W. Gundlach), *Monumenta Germaniae Historica Epistolae Karolini Aevi* I (Berlin, 1892), no. 81; C. Ricci, 'Marmi ravennati erratici', *Ausonia* 4 (1909), 247–89, at pp. 247–8; W. Jacobsen, 'Spolien in der karolingischen Architektur', in J. Poeschke (ed.), *Antike Spolien in der Architektur des Mittelalters und der Renaissance* (Munich, 1996), 155–77.

⁷¹ C.B. McClendon, 'The revival of *opus sectile* pavements in Rome and the vicinity in the Carolingian period', *Papers of the British School at Rome* 48 (1980), 157–65; L. Paroli, 'La scultura a Roma tra il VI e il IX secolo', in Arena et al. (eds), *Roma dall'antichità al medioevo* (above, n. 14), 132–43, at p. 132.

⁷² McClendon, 'The revival of *opus sectile* pavements' (above, n. 71), 162–5, with reference to *opus sectile* floors at Centula (Cologne), St Germain (Auxerre), Lorsch and Germigny-des-Près. For *spolia* at the palace sites, see Stiegemann and Wemhoff (eds), 799, *Kunst und Kultur* (above, n. 63), I, no. II.59–63, 65 (Ingelheim), no. II.67–70 (Aachen), but note the doubts over the dates of some of the capitals and column bases.

⁷³ Stiegemann and Wemhoff (eds), 799, *Kunst und Kultur* (above, n. 63), I, no. II.67–8 (Aachen); II, no. VIII.49d–g (Corvey), no. VIII.50g–j (Münster).

made from a piece of *spolia*, taken from an imperial building or a stockpile of stone cut during the Roman period and, secondly, whether the choice of a black-coloured stone for the Epitaph reflected Carolingian aesthetics that can be traced in other contemporary settings and media, and whether the colour (as well as the nature of the material) carried with it particular cultural connotations that added to the significance of the gift when it was received in Rome by the successors of Hadrian.

In Francia, Einhard's account of the building of the chapel at Aachen is often cited to show the reliance of the builders on *spolia* from Italy. In fact, Einhard says that Charlemagne turned to Rome and Ravenna for columns and marble only when such material 'could not be found from somewhere else', implying that other sources existed closer to home.⁷⁴ Charlemagne's comment in his letter to Offa that he would arrange collection of the black stones from 'wherever they are to be found' could also refer to local supplies perhaps from quarries within his own family estates, and need not refer to *spolia* collected in Italy, as Peacock suggested. Peacock rejected on chronological grounds the notion that the black marbles of Belgium were the topic of Charlemagne's deliberations with Offa, arguing that Tournai marble was not imported into Britain before the twelfth century, and that the other zones of black marble around the Meuse valley were not exploited before the nineteenth century.⁷⁵ But, as we have seen, the evidence of the Nehalennia altars and other objects proves that Mosan marble was exploited in the Roman period and was transported away from its source, downstream to the Rhine delta. The same is true of black stones from Tournai. That none has been found in excavated contexts in Anglo-Saxon England is an argument from absence, reflecting the paucity of relevant excavations rather than a large corpus of comparanda.

In short, there is good reason for thinking that black stone was locally available to Charlemagne in the later eighth century and that these resources were used for Hadrian's Epitaph; what remains ambiguous is whether such stones were necessarily *spolia* (from a building or stockpile), because the Carolingians lacked the ability to extract the marble from a quarry, or whether they were indeed freshly quarried, 'wherever they are to be found'. In either case, the use of a scarce coloured stone for the Epitaph that came from the heartlands of Charlemagne's own lands was surely a deliberate and careful choice that complemented the echoes of empire embedded in the poetry and epigraphy of the monument.

⁷⁴ Einhard, *Vita Karoli*, ch. 26; G. Waitz, *Einhardi Vita Karoli Magni (Monumenta Germaniae Historica Scriptores Rerum Germanicarum)* (Hanover/Leipzig, 1911), 30–1; P.E. Dutton (ed. and trans.), *Charlemagne's Courtier: the Complete Einhard. Readings in Medieval Civilizations and Cultures 2* (Peterborough (Ontario), 1998), 32.

⁷⁵ Peacock, 'Charlemagne's black stones' (above, n. 64), 709–10.

CONCLUSION

The palimpsest of evidence presented here encourages us to look afresh at Pope Hadrian's Epitaph. Understanding the origin of the stone used to make it casts new light on the embedded cultural messages of the object; Hadrian's Epitaph is much more than a poem by Alcuin, and much more than an exceptional survival of the art of Carolingian epigraphy. The knowledge that the stone came from the lands belonging to the Carolingian dynasty, and that black stones were treasured and valued as a scarce resource in the Carolingian as well as the Roman worlds, adds a new dimension to our understanding of the impact of the gift when it arrived in Rome. Einhard claimed that Charlemagne's imperial coronation by Pope Leo III during the Christmas feast in 800 was unplanned and that the king would never have entered Saint Peter's on that day had he known what was to occur. But the care and attention lavished on the production of the memorial for Leo's predecessor suggests otherwise. The black stone was chosen in conscious imitation of classical expressions of imperial control, and in conjunction with the outstanding quality of epigraphy and poetry, the choice of marble and conspicuous display of a scarce resource can have left those who saw the inscription in little doubt of the imperial ambitions of its patron, who was crowned as Emperor in Rome, in sight of the inscription, on the fifth anniversary of Hadrian's death at Christmas 800.

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Acknowledgements

This project could not have been carried out without the assistance of a number of people. We thank especially S.E. Monsignor Vittorio Lanzani (Delegato della Fabbrica di San Pietro) for his interest in the project and for permission to obtain fragments for analysis; Prof. Nazzareno Gabrielli and Dr Pietro Zander (Fabbrica di San Pietro) for their help and stimulating discussions; Prof. Eric Groessens (Service Géologique de Belgique, Brussels) for his guidance around the carboniferous limestone quarries of Belgium; and Dr Helen Patterson and Ms Maria Pia Malvezzi (British School at Rome). Prof. Sebastiano Sciuti has been unfailing in his enthusiasm and assistance from the outset — without him, we could not have started. This study (and the wider analysis that is being prepared) has benefited from insights by Prof. David Ganz, Dr John Higgitt, Dr Carol Richardson, Prof. Greg Woolf, Dr Clare Woods, and Lida Cardozo (The Cardozo Kindersley Workshop, Cambridge). Thanks are also extended to the British Academy, which provided a grant; to the Istituto Suore Benedettine di Priscilla for permission to publish Fig. 1; to the Natural History Museum, London, for permission to publish the drawings in Fig. 5; and to the University of Leicester, which granted Joanna Story study leave to complete this article.