

Augustus, Domitian and the So-called Horologium Augusti

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In 1976 Edmund Buchner published an article suggesting that the obelisk which is now in Piazza Montecitorio in Rome originally cast a shadow for an immense sundial which had been built by the emperor Augustus and which spread across an expanse of the Campus Martius the size of several football fields. Furthermore, Buchner claimed that this sundial, or Horologium Augusti, was integrated with the Ara Pacis in such a way that the shadow of the sundial fell on the altar on Augustus' birthday, and that the obelisk was also aligned with the Mausoleum of Augustus in such a way that the entire complex illustrated the cosmic resonance of the Principate and the destiny of Augustus in his birth, peaceful reign, and death. A few years later these claims were spectacularly verified, or so it seemed, when Buchner published the results of excavations conducted in the Campus Martius by the German Archaeological Institute (DAI), of which he had in the interim become president.¹ The remains of an ancient pavement had been discovered with bronze lines and inscriptions that charted the path of the shadow of the obelisk. So in the following years Buchner's reconstruction and interpretation of this so-called Horologium Augusti found their way with great rapidity into the established picture of the ideology of the Augustan building programme.²

Meanwhile, Rodríguez-Almeida published an article that noted a serious archaeological problem with Buchner's original thesis, and in 1990 physicist Michael Schütz published a brilliant and scathing demolition of Buchner's methods and conclusions.³ The most striking of Schütz's demonstrations was that the shadow of the gnomon on top of the obelisk could not have reached much of the area Buchner had originally supposed, including the Ara Pacis. Some recent work on the Augustan Principate has therefore been more circumspect in discussing the Horologium.⁴ Once Buchner's original reconstruction has been swept away, however, there remains one important question that has not been addressed at any length: what is the significance of the object that the excavations actually brought to light? It may not have been part of a vast sundial, and it may not have been built by Augustus, but it is no less fascinating an object for that. Beyond the phantom of the

¹ The first article is E. Buchner, 'Solarium Augusti und Ara Pacis', *Römische Mitteilungen* 83 (1976), 319–65; the second is E. Buchner, 'Horologium Solarium Augusti: Vorbericht über die Ausgrabungen 1979/80', *Römische Mitteilungen* 87 (1980), 355–73; the two articles were published with an afterword as a monograph: E. Buchner, *Die Sonnenuhr des Augustus: Nachdruck aus RM 1976 und 1980 und Nachtrag über die Ausgrabung 1980/1981* (1982); all citations have been taken from the latter. On Buchner's career, see S. Rebenich, 'Alte Geschichte in Demokratie und Diktatur: Der Fall Helmut Berve', *Chiron* 31 (2001), 457–96, at 488 and the brief biographical note in E. Buchner, 'Neues zur Sonnenuhr des Augustus', *Nürnberger Blätter zur Archäologie* 10 (1993–4), 77–84, at 84.

² Buchner's reconstruction appears as established fact in too many monographs to name, and also in reference works: e.g. E. Buchner, 'Horologium Augusti', in E. M. Steinby (ed.), *Lexicon Topographicum Urbis Romae* (1993–2000), vol. 3, 35–7, 392–3 and L. Richardson, Jr., *A New Topographical Dictionary of Ancient Rome* (1992), 190–1.

³ E. Rodríguez-Almeida, 'Il Campo Marzio settentrionale: solarium e pomerium', *Rendiconti della Pontificia Accademia di Archeologia* 51–2 (1978–80), 195–212; M. Schütz, 'Zur Sonnenuhr des Augustus auf dem Marsfeld', *Gymnasium* 97 (1990), 432–57.

⁴ For example, compare A. Wallace-Hadrill, 'Mutatas Formas: the Augustan transformation of Roman knowledge', in K. Galinsky (ed.), *The Cambridge Companion to the Age of Augustus* (2005), 55–84, at 65 and D. Favro, 'Making Rome a world city', in *ibid.*, 234–63, at 247, with fig. 43; for appropriately cautious treatments in recent reference works, see L. Haselberger (ed.), *Mapping Augustan Rome* (2002), 139 (A. B. Gallia) and *Der Neue Pauly*, s.v. 'Horologium (Solare) Augusti', vol. 5, 730–1 (C. Höcker).

Horologium lies a hitherto unknown Domitianic monument with very interesting implications for the self-image of the Flavian dynasty and how it presented itself in relation to the Julio-Claudians.

In order to address the nature of this monument, it will be necessary to review the evidence for and against Buchner's reconstruction, since some people continue to believe that parts of it can be salvaged.⁵ Another reason for going over this material again is that the criticisms of Rodríguez-Almeida and Schütz were made independently of each other and have not been considered in combination.⁶ So we will begin by evaluating these critiques along with the responses published by Buchner and others. Once we have established what we know about the purpose for which Augustus erected his obelisk and what can be said about the interrelationship of the Augustan monuments in the northern Campus Martius, we can finally begin a discussion of the purpose behind the Domitianic pavement that was discovered there.

1 THE HISTORY OF AN ERROR

Buchner's reconstruction of a vast Horologium was not new. In 1650, the polymath Athanasius Kircher published his *Obeliscus Pamphilius*, a gorgeously sumptuous work of sheer nonsense.⁷ This massively erudite volume was devoted to interpreting the hieroglyphs inscribed on a different Roman obelisk, the one that Pope Innocent X was in the course of re-erecting in the middle of Piazza Navona. Despite the impressive apparatus of Latin, Greek, Hebrew, Arabic, and Coptic sources that Kircher deployed, he had no Rosetta Stone, and so could not know that the inscription was really just a dedication to Domitian. Instead, Kircher interpreted it symbolically as a representation of a Neoplatonic, Hermetic meditation on 'the highest mystery of Divinity'.⁸ In the course of his extremely expansive treatment, Kircher included a section on another obelisk, one whose dedication by Augustus as an instrument for casting a shadow and thus measuring the course of the sun had been described by Pliny in his *Natural History*. Kircher assumed that this passage of Pliny, which we will examine in detail below, described a sundial. He simply stated this without argument, and included a visual reconstruction of its form that had been provided to him by his colleague in the Jesuits, the mathematician Giacomo Masi. The major features of this drawing of the sundial anticipate Buchner's reconstruction.⁹

The definitive refutation of Kircher's and Masi's ideas about this sundial was organized by the librarian and scholar Angelo Maria Bandini in a deluxe publication of 1750 that accompanied the project of excavating the obelisk.¹⁰ It was long known that the remains

⁵ On scholars who cite Schütz in their footnotes while ignoring the force of his criticisms in their text, see A. Schmid, *Augustus und die Macht der Sterne: Antike Astrologie und die Etablierung der Monarchie in Rom* (2005), 308 with n. 21.

⁶ As far as Schütz's arguments are concerned, there are a number of treatments available from the point of view of gnomonics; for some interesting amplifications, see K. Schaldach, *Römische Sonnenuhren: eine Einführung in die antike Gnomonik* (2001), 78–93. The fullest treatment of Schütz's criticisms currently available in English is F. Maes, 'The sundial of Emperor Augustus: rise and decline of a hypothesis', *The Compendium, North American Sundial Society* 12 (September 2005), 13–27, which has been translated into a number of languages and published in the journals of various societies of sundial enthusiasts; even so, it may not be easy to obtain. My thanks to Frans Maes for sending me a copy of his article, along with several others from the Bulletin of the Dutch Sundial Society (*Zonnewijzerkring*).

⁷ A. Kircher, *Obeliscus Pamphilius* (1650), on which see D. Stolzenberg, *Egyptian Oedipus: Antiquarianism, Oriental Studies and Occult Philosophy in the Work of Athanasius Kircher*, unpub. Ph.D thesis, Stanford University (December 2003), 287–329.

⁸ J. Godwin, *Athanasius Kircher: a Renaissance Man and the Quest for Lost Knowledge* (1979), 6.

⁹ Kircher, op. cit. (n. 7), 80; the drawing is reproduced by Bandini: A. M. Bandini, *De obelisco Caesaris Augusti e campi Martii ruderibus nuper eruto commentarius* (1750), pl. IV, fig. 3.

¹⁰ Bandini, op. cit. (n. 9).

of Augustus' obelisk lay underneath the Campus Martius, for its base had been discovered in the early sixteenth century when a latrine was being dug for the home of a barber who lived in the area. There was also a report from the previous century of neighbours digging up various astrological figures in bronze embedded in a pavement; we will examine this report below. The inscription on the obelisk was recorded at that point and it was covered up again. In 1748 the pieces were excavated and then some forty years later the obelisk was moved and re-erected in Piazza di Montecitorio, where it stands today, a bit to the south of its original position (see Fig. 1, No. 11).¹¹ The task of investigating the history and purpose of the obelisk that was being excavated was entrusted to Bandini. At the time he wrote Kircher's idea of an expansive sundial still had general currency, so a large part of his work is devoted to refuting it.

The crux of this controversy between Kircher and Bandini is how to interpret the passage of Pliny that describes the purpose for which Augustus erected the obelisk. Bandini was the first to express forcefully the argument that Pliny is here providing a very detailed and accurate account of a solar meridian.¹² This was not merely Bandini's own opinion on the matter; he collected letters of support from eminent scholars throughout Europe concurring with his interpretation of Pliny; these included the concise opinion of Leonhard Euler, one of history's greatest mathematicians, and an extensive discussion by Roger Joseph Boscovich, one of the most eminent physicists and astronomers of the eighteenth century.¹³

II PLINY'S EVIDENCE

In the midst of his discussion of obelisks, Pliny gives a detailed account of the obelisk that Augustus had erected in the Campus Martius. It is not surprising that this passage has sometimes casually been understood as depicting a sundial, since it describes an instrument for measuring the position of the sun's shadow, and the sundial is the most familiar such instrument. Here, however, Pliny is describing something else: a solar meridian, which is a long line running true north from an object that casts a shadow. Pliny has occasion to discuss both sundials and meridians elsewhere in his work and does so with clarity and precision; he understands the difference.¹⁴ A solar meridian is like a sundial with only a single hour-line that indicates noon on each day: since the shadow of an object falls exactly to the north at local noon, when the sun is at its highest point, one can plot the position of the shadow as it changes every day. This indicates the waxing of daylight in the summer, as the noontime shadow grows shorter every day, and its waning, as the noontime shadow grows longer. The translation that follows is from Healy's Penguin edition, with some supplements in brackets:¹⁵

Ei [obelisco], qui est in campo, divus Augustus addidit mirabilem usum ad deprendendas solis umbras dierumque ac noctium ita magnitudines, strato lapide ad longitudinem obelisci, cui par fieret umbra brumae confectae die sexta hora paulatimque per regulas, quae sunt ex aere inclusae, singulis diebus decresceret ac rursus augesceret, digna cognitu

¹¹ A meridian line with signs of the zodiac marked along it was laid in Piazza di Montecitorio on the basis of Pliny's information; it is strikingly similar in conception to what was found in the excavations. The piazza is too small, however, to accommodate a line as long as the shadow of the obelisk at noon on the winter solstice. On the history of the discovery and erection of the obelisk, see Bandini, *op. cit.* (n. 9), 94-107 and C. D'Onofrio, *Gli obelischi di Roma* (3rd edn, 1992), 387-402, 414-17. A plaque in Piazza del Parlamento approximately marks the original site (see Fig. 1, No. 1).

¹² Bandini, *op. cit.* (n. 9), 108-10; Bandini notes that Ziegler had tentatively suggested this possibility in the sixteenth century; Ziegler's diagram depicts a simple meridian strip: J. Ziegler, *In C. Plinii de naturali historia librum secundum commentarius* (1531), 307, reproduced in Bandini, *op. cit.* (n. 9), table IV, fig. 1.

¹³ On Buchner's scorn for Bandini and his collaborators, see Schütz, *op. cit.* (n. 3), 436.

¹⁴ Plin., *NH* 2.182-7, 6.211-18, 7.212-15, and 18.326-33 with Schütz, *op. cit.* (n. 3), 433.

¹⁵ Plin., *NH* 36.72-3 and J. F. Healy, *Pliny the Elder, Natural History: A Selection* (1991), 351f.

res, ingenio Facundi Novi mathematici.

is apici auratam pilam addidit, cuius vertice umbra colligeretur in se ipsam, alias enormiter iaculante apice, ratione, ut ferunt, a capite hominis intellecta.

haec observatio XXX iam fere annis non congruit, sive solis ipsius dissono cursu et caeli aliqua ratione mutato sive universa tellure a centro suo aliquid emota (ut deprehendi et aliis in locis accipio) sive urbis tremoribus ibi tantum gnomone intorto sive inundationibus Tiberis sedimento molis facto, quamquam ad altitudinem inpositi oneris in terram quoque dicuntur acta fundamenta.

Augustus used the obelisk in the Campus Martius in a remarkable way — namely to cast a shadow and thus mark the length of days and nights. A paved area was laid out commensurate with the height of the monolith in such a way that the shadow at noon on the shortest day might extend to the edge of the paving. As the shadow gradually grew shorter and longer again, it was measured by bronze rods fixed in the paving. This device deserves study; it was the result of a brainwave of [the scientist] Facundus Novius.

Novius placed a gilded ball on the apex of the monolith so that the shadow would be concentrated at its tip; otherwise the shadow cast would have been very indistinct [i.e. the tip would have cast its shadow in an ill-formed manner]. He got this idea, so it is said, from seeing the shadow cast by a man's head.

These measurements, however, have not agreed with the calendar for some thirty years; either the orbit of the sun itself is out of phase or has been altered by some change in the behaviour of the heavens, or the whole earth has moved slightly off-centre. I hear this phenomenon has also been observed in other places. [Or it could be that a merely local tremor has shifted the gnomon, or the mass has subsided due to the flooding of the Tiber, despite the claim that its foundations were driven as deeply into the earth as the obelisk on top is high.]

Some things to note about this passage are: it says nothing about telling time; it speaks only of the extent of the pavement in a single dimension; and it says that the purpose of the instrument was to measure the changing length of days and nights. This is a precise account of a solar meridian: it is a single line whose longest extent marks the shadow at noon on the winter solstice, which is the shortest day of the year. Its purpose is to mark the progress of the solar year: as the noontime shadow shortens and then lengthens, it shows the days growing longer and then shorter. Pliny begins by describing the shadow cast by the obelisk on the winter solstice, its point of longest extent. He then describes with great precision its function from that point in time onwards: how the observer could see on a daily basis (*singulis diebus*) how the noontime shadow would gradually (*paulatim*) grow shorter (*decreceret*) as summer approached and the days grew longer. Then on the longest day of the year, when the shadow was at its shortest, the noontime shadow would begin to grow longer again (*rursus augesceret*) as the days grew shorter. This daily progress of the noontime shadow was indicated by means of lines (*per regulas*) in the pavement.

Even after Bandini, it frequently happened that Pliny was mistakenly understood to have described a sundial.¹⁶ Scholarly opinion varied between those who imagined that Augustus had constructed a full sundial, and those who followed Bandini.¹⁷ In order to try

¹⁶ For example, Moretti's paraphrase of Pliny demonstrates clearly how easily one can slip into making such a mistake: '... un grande obelisco, la cui ombra, proiettata sopra un pavimento, accorciandosi o allungandosi durante il giorno, indicava le ore passando a mano a mano su determinati punti di linee segnate sulle lastre di pietra.' G. Moretti, *Ara Pacis Augustae* (1948), vol. 1, 205, n. 2. The problem is that *singulis diebus* does not mean *durante il giorno* and Pliny says nothing about indicating the hours, only about indicating the length of the days and nights. So some sources continued to depict a full sundial in the style of Kircher, such as Lanciani's *Forma Urbis Romae*, reproduced in R. Lanciani, *Storia degli scavi di Roma e notizie intorno le collezioni romane di antichità* (2nd edn, 1989–94), vol. 1, 178.

¹⁷ Contrast S. B. Platner and T. Ashby, *A Topographical Dictionary of Ancient Rome* (1929), 366–7, who describe a meridian line, though strangely they also speak of a pavement extending east and west, and E. Nash, *Pictorial Dictionary of Ancient Rome* (1961–2), vol. 2, 134–6, who describes a full sundial.

to reconcile Pliny's emphasis on measuring the length of the days and nights with a full sundial, Buchner added a few lines to his reconstruction that would have allowed one to measure the length of the day; these are modelled on lines that appear on a handful of small sundials from antiquity.¹⁸ Grafting these extra lines onto a sundial does not change the fact that Pliny's account does not speak of hours and months at all; he describes an instrument whose primary purpose was to indicate the progress of the sun from solstice to solstice, as reflected in the daily-changing length of the shadow at noon. Even with Buchner's extra lines added on, it is perverse to suppose that when Pliny wanted to describe such a sundial, he would completely omit to mention its primary functions of indicating the hour of the day and the day of the year, and only choose to discuss an extra detail. On Buchner's reading, Pliny's emphasis on the length of the instrument being equal to noontime shadow on the shortest day of the year is equally perverse and inexplicable.¹⁹

Why would Augustus have wanted to construct such a solar meridian? The main reason Buchner gives for rejecting this explanation is that he claims that such an instrument would have been useless in antiquity. This is an unsound objection, as Schütz points to many accounts from ancient Rome of meridians and their usefulness.²⁰ More importantly, Schütz has suggested with great plausibility a very likely context for the construction of this particular meridian. A meridian line has various uses, such as marking the local time of noon, and indicating true north; but it is also useful for checking the congruence of the civil calendar with the solar year. The observer can check to make sure that the shadow of the sun reaches the correct point on the meridian at noon on the correct day of the civil calendar, and then can repeat the process year after year. For example, on the days of the solstices the shadow should fall on either end of the meridian line.

At the time of the erection of the obelisk, the Roman civil calendar had recently been corrected by Julius Caesar, so that it lasted 365¼ days, with a leap year every fourth year. Unfortunately, the pontifices did not properly understand the instructions they were given, and, as Macrobius tells us, they wrongly made every third year a leap year instead of every fourth, because they were using inclusive reckoning. This mistake went uncorrected for thirty-six years until 9 B.C., when under Augustus the omission was decreed of the next three occasions on which leap days would normally be added, to compensate for the excess three that had been added inadvertently.²¹ Schütz points out an extremely interesting sequence of events: after the death of Lepidus, Augustus was finally made Pontifex Maximus in 12 B.C., and so received official responsibility for the Roman calendar; the obelisk with its meridian, an instrument to check the correctness of that calendar, was erected in 10 B.C.; in the very next year, 9 B.C., the calendar was proclaimed to have been in error,

¹⁸ Normal-sized sundials with such lines are illustrated and explained by S. L. Gibbs, *Greek and Roman Sundials* (1976), 80–4, with nos 4001G, 1068G, 1072G, 3046, 1044. In Buchner's early diagrams these lines are curved, but are later corrected silently to straight lines; on that problem, see F. de Vries, 'De Daglichtdriehoek op de Zonnewijzer van Keizer Augustus', *Bulletin, De Zonnewijzerkring* 84.3 (1984), 17–18; R. R. J. Rohr, 'Von babylonischen und italischen Stundenlinien und von der Sonnenuhr des Kaisers Augustus', *Bulletin, De Zonnewijzerkring* 85.1 (1985), 28–9; and Maes, *op. cit.* (n. 6), 19 and 23.

¹⁹ A full sundial would normally extend north of the meridian, in order to indicate the time of day before and after noon in midwinter, when the shadow of the obelisk would have been even longer. Buchner originally attempted to take Pliny's words into account by limiting the northward extent of the sundial to a line running perpendicular to the far end of the meridian. But as Schütz, *op. cit.* (n. 3), 452, fig. 5 demonstrated (see below), and as Buchner tacitly accepted in his later, circular reconstruction, the shadow of the gnomon would not have reached most points on that perpendicular line. If, on the other hand, the sundial was circular, it is most remarkable that Pliny was so careful to specify the exact radius, but completely neglected to mention that it was a circle.

²⁰ Buchner, *Sonnenuhr*, *op. cit.* (n. 1), 9, countered by Schütz, *op. cit.* (n. 3), 433–5.

²¹ Macrobius, *Sat.* 1.14.13–15 and Solinus 1.45–7 with A. E. Samuel, *Greek and Roman Chronology: Calendars and Years in Classical Antiquity* (1972), 156–8.

and Augustus ordered the necessary adjustments.²² So we have strong circumstantial evidence that the meridian line was erected in the context of Augustus taking custody of the Roman calendar.

It would be wrong to imagine that the monumental meridian itself was the means by which the flaw in the calendar was detected: more than a single year of observations would have been required to detect the error, and the size and diffuseness of the shadow cast made the massive meridian a poor instrument for precise observations.²³ On the contrary, the enormous scale of the monument indicates that its function was symbolic rather than utilitarian. The message the meridian projects is that, as the new Pontifex Maximus, Augustus will have the resources to ensure that his father's calendar is implemented properly, in contrast to the impotent and exiled Lepidus. It might have been the case that the problem with the calendar was detected some time before, but that pontifical authority to make the correction was felt to be lacking. When Augustus became Pontifex he arranged for two parallel interventions: for the calendar to be corrected and for a meridian to be constructed so that all of Rome could see that the civil calendar stayed in harmony with the progress of the sun through the year. The inscription on the obelisk is consistent with this message, as it gives particular emphasis to the name 'Augustus' and to the office of Pontifex Maximus. This one office is written without abbreviation and is given a line of its own, in contrast to the abbreviated and more crowded line of titlature below it.²⁴

III THE EXCAVATIONS

After the publication of Buchner's hypothetical reconstruction of a vast sundial, the DAI promptly began excavations in 1979 under the direction of Friedrich Rakob. The first dig in the middle of Via di Campo Marzio found nothing of note (see Fig. 1, No. 5), but the next dig in the basement of a house on the east side of that street was spectacularly successful. The excavators managed to uncover a travertine pavement embedded with a line running north-south and Greek lettering in bronze, just as Pliny had described (see Fig. 1, No. 4). The surprise was that the level at which the pavement was found was a metre and a half too high for an Augustan date. The level of the flood-prone Campus Martius had been raised after the time of Augustus, and it was expected that the Horologium would be found at the same level as the Ara Pacis, which was built contemporaneously and which subsequently required a retaining wall built around the depression in which it came to sit.²⁵ The higher level at which the pavement was found and the dating of the Greek lettering originally suggested to Buchner a date under the emperor Domitian, who had done quite

²² Schütz, *op. cit.* (n. 3), 447-8. The date of Augustus becoming Pontifex Maximus is given by the *Fasti Praenestini* (*CIL* 1, p. 233, with A. Degrassi, *Fasti Capitolini* (1954), 82, and see T. Mommsen (ed.), *Res Gestae Divi Augusti* (1883), 45); the year of his correction of the calendar is given by the passages of Macrobius and Solinus cited above; and the year he erected the obelisk is given by the inscription cited below.

²³ Contrast Schütz, *op. cit.* (n. 3), 447-8. On Schütz's discussion of the difficulties with the shadow in respect to Buchner's original reconstruction, see below.

²⁴ The text of the inscription (*CIL* 6.701 and 702; *ILS* 91) is:

IMP·CAESAR·DIVI·F
AUGUSTUS
PONTIFEX·MAXIMUS
IMP·XII·COS·XI·TRIB·POT·XIV
AEGUPTO·IN·POTESTATEM
POPULI·ROMANI·REDACTA
SOLI·DONUM·DEDIT

The text and layout are secure, since the same inscription appears in four places: on either side of both of the two obelisks erected by Augustus; the other one was originally in the Circus Maximus and is now in Piazza del Popolo.

²⁵ Moretti, *op. cit.* (n. 16), vol. 1, 116.

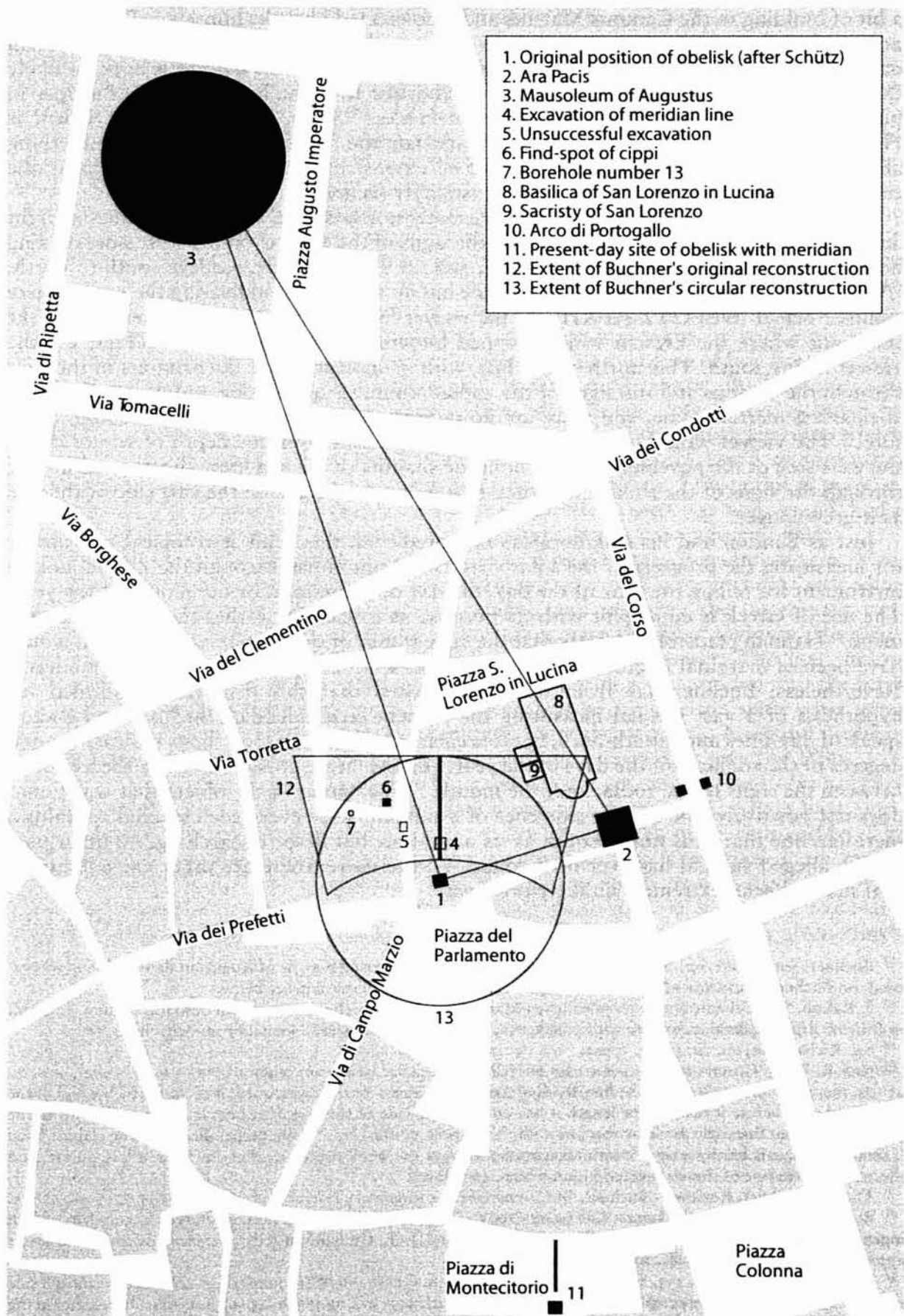


FIG. 1. Plan showing position of obelisk, Ara Pacis, Mausoleum and other features mentioned in the text.

a bit of building in the Campus Martius and who erected obelisks himself.²⁶ The dating of pottery found in subsequent explorations underneath the pavement confirmed a Flavian date.²⁷ Pliny tells us that the instrument was already awry in his day, so it appears likely that Domitian subsequently fixed and re-established it. Some have followed Buchner in putting the word 'Domitianic' in quotation marks.²⁸ Since, however, the pavement is Flavian and Pliny, who was a friend of Vespasian and Titus, did not mention anything about plans for this project of restoration in his extensive discussion of the monument, the conclusion that Domitian built it seems reasonably secure.

A single long line was found travelling exactly north–south, with shorter lines at right angles to it. The long line is labelled with the signs of the zodiac: on the west side, reading north to south, [ΚΡΙ]ΟΣ and ΤΑΥΡ[ΟΣ], and on the other side, reading south to north, [ΛΕ]ΩΝ and ΠΑΡΘ[ΕΝΟΣ]. The west side has an inscription indicating the point where summer began (ΘΕΡΟΥΣ ΑΡΧΗ) for the viewer facing north, and the other side marks the point where the Etesian winds stopped blowing (ΕΤΗΣΙΑΙ ΠΑΥΟΝΤΑΙ) for the viewer facing south. This north–south line, with its indications of the progress of the year through the seasons and the signs of the zodiac, running up one side and down the other, is clearly a meridian line, and there are no indications that it was part of a larger structure.²⁹ The viewer would follow the progress of the year from the depth of winter down the west side of the pavement as the noontime shadow of the sun grew shorter and moved through the signs of the zodiac, and then follow it up the signs on the east side of the line as it grew longer.

Just as Bandini and his collaborators had predicted, this is an astrological instrument for measuring the progress of the solar year as the sun moves through the zodiac, not an instrument for telling the time of the day, the day of the month, or the month of the year. The use of Greek is consistent with its purpose as a scientific rather than a civil instrument.³⁰ Hannah plausibly suggests that the appearance of the Etesian winds, which would have been of marginal interest in Rome, indicates a close dependence on Greek models.³¹ Nevertheless, Buchner has from the start insisted that this discovery confirmed his hypothesis of a vast sundial measuring the Roman civil calendar. Buchner and Rakob speak of day-lines and month-lines, but it is clear that the small cross-lines indicate the 360 degrees of the zodiac, not the days of the year, and the larger cross-lines mark the divisions between the signs of the zodiac, not the month.³² The nature of the object that was found does not positively rule out the existence of a sundial, since every such sundial contains a meridian line that runs north–south as its noon-line; but despite searching, no other part of this alleged sundial has ever been found. Furthermore, there are other considerations that make this an extremely unlikely prospect.

²⁶ Buchner, *Sonnenuhr*, op. cit. (n. 1), 66. He suggests that the lettering may be of Augustan date and thus was re-used; on Buchner's subsequently revised dating of the pavement to Vespasian, see below.

²⁷ F. Rakob, 'Die Urbanisierung des nördlichen Marsfeldes: neue Forschungen im Areal des Horologium Augusti', in *L'Urbs: Espace urbain et histoire* (1987), 687–712, at 693–4 and Buchner, *Sonnenuhr*, op. cit. (n. 1), 76.

²⁸ e.g. Richardson, op. cit. (n. 2), 190–1.

²⁹ *pace* R. Beck, 'Cosmic models: some uses of Hellenistic science in Roman religion', *Apeiron* 27 (1994), 99–117, at 104, there is no indication that the line dividing Aries and Taurus extends westward; it is cut off by the end of the excavated area before it reaches the length it has on the other side of the meridian line. It is not evident from the photographs that the angle made by this line with the meridian differs by 2° from perpendicular, as he claims. Even if this were so, it is hardly a significant inexactitude; some of the small degree-markers seem even less square, and there is an extra one of these squeezed in (on which see below).

³⁰ Thus W. Hübner, Review of Buchner, *Die Sonnenuhr des Augustus*, *Trierer Zeitschrift* 46 (1983), 333–8, at 335.

³¹ R. Hannah, *Greek and Roman Calendars* (2005), 129; see also P. Fleury, 'Les sources alexandrines d'un ingénieur romain au début de l'Empire', in G. Argoud and J.-Y. Guillaumin (eds), *Sciences exactes et sciences appliquées à Alexandrie* (1998), 103–14, at 110.

³² Hübner, op. cit. (n. 30), 335, Schütz, op. cit. (n. 3), 454. A. Guerbabi, 'Chronométrie et architecture antiques: le gnomon du forum de Thamugadi', *L'Africa romana* 10 (1992), 359–402, at 366, n. 25 suggests that the sundial in the forum of Timgad may provide a parallel for Buchner's reconstruction, in that it seems to have had small indications of the zodiac along the noon-line, in addition to hour-lines.

IV PAVEMENT AND POMERIUM

Early in the 1980s, Rodríguez-Almeida wrote an article that pointed out a serious problem with Buchner's reconstruction.³³ In 1930, two *cippi* outlining the route of the *pomerium* were found *in situ* in a building on Via di Campo Marzio, right in the midst of Buchner's reconstruction (see Fig. 1, No. 6). One was Vespasianic, the other Hadrianic, so by the time of the Domitianic reconstruction of the meridian, the *pomerium* had been extended to cut through the western part of the proposed sundial. Tacitus tells us that Claudius extended the *pomerium more prisco*, which must mean that in his time, and likely in Vespasian's time too, the augurs yoked a bull and a cow in the traditional manner to plough the boundary.³⁴ If there had been a sundial with a travertine pavement in place, the *pomerium* would surely have gone around it. Rodríguez-Almeida therefore suggested that, if the Horologium of Augustus was not just a meridian, perhaps it was just half of a sundial, showing only the afternoon hours.³⁵ This suggestion was taken up with enthusiasm by the excavator Rakob, but no parallel for the extraordinary notion of building only half of a monumental sundial has been suggested.³⁶ In later publications, Buchner does not accept this proposal of a monumental sundial deliberately left half-completed by Augustus, and instead admits that his putative Augustan sundial must later have been reduced not just to half-size, but indeed to a mere strip.³⁷ Effectively, this is to admit that the Flavian monument which was discovered was a meridian line.³⁸ Once this is granted, the claim that the Augustan pavement, of which no surviving trace has been found, had a larger extent than a meridian is based on nothing other than a misreading of Pliny.

This response to the observations of Rodríguez-Almeida entails postulating a large-scale redevelopment of the area under Vespasian, which would have included extending the *pomerium*, destroying the Augustan pavement, and re-laying the instrument in a reduced form. This is the approach Buchner now takes, even though it involves arbitrarily re-dating the pavement he discovered from Domitian to Vespasian.³⁹ The first improbability here is the idea that a Flavian emperor would shrink a vast sundial into the form of a narrow meridian strip that would have been tiny in comparison with what went before. That was not the Flavian way of building; quite the opposite. A second problem arises when we try to reconcile this explanation with the information given by Pliny.

Pliny's *Natural History* is dedicated to Titus, who is not yet emperor and who has held the consulship six times; this narrows the date down to A.D. 77 or 78. As we have seen, Pliny describes the instrument and its present-day deficiencies quite thoroughly. The inscription on the *cippus* dates it to A.D. 75, so the fact that Vespasian or an earlier emperor had ploughed the *pomerium* right through it, surely would have merited a mention as part of his description of its impaired usefulness. If Vespasian fixed and remodelled the instrument, that too would have merited a mention, especially given Pliny's

³³ Rodríguez-Almeida, *op. cit.* (n. 3), drawing on the publication of two *cippi* by P. Romanelli, 'Roma: Reg. IX — Via della Torretta — cippi del pomerio', *Notizie degli Scavi* ser. 6 vol. 9 (1933), 240–4.

³⁴ Tac., *Ann.* 12.23, on which see Richardson, *op. cit.* (n. 2), 295, who argues that Vespasian and Hadrian did little more than to renew Claudius' boundary. Varro describes the ploughing *Etrusco ritu* (*De ling. Lat.* 5.143).

³⁵ Rodríguez-Almeida, *op. cit.* (n. 3), 210–11 with fig. 7.

³⁶ Rakob, *op. cit.* (n. 27), 694–7, with fig. 4. Guerbabi, *op. cit.* (n. 32) suggests that the Timgad sundial, of which only part of the lines for the afternoon hours survive, may not have had all of the morning lines represented, since the surrounding buildings would have blocked the sun during those hours; but no such consideration obtains in the open space of the Campus Martius.

³⁷ 'Streifen': Buchner, 'Neues zur Sonnenuhr des Augustus', *op. cit.* (n. 1), 83 and Buchner, *op. cit.* (n. 2), 36.

³⁸ Buchner says that it is likely that there was another north–south line running next to it with a civil calendar in Latin, but there is of course absolutely no evidence for this: Buchner, *op. cit.* (n. 2), 36; the hypothesis is illustrated in Buchner, *Sonnenuhr*, *op. cit.* (n. 1), 71, fig. 6.

³⁹ Buchner, *op. cit.* (n. 2), 36 and see also Rakob, *op. cit.* (n. 27), 698. The latter reports (694, n. 22) that, according to Dr M. La Torre, the pottery found under the level of the pavement dates it 'in flavische Zeit', without further specifics.

close relationship to Vespasian. Pliny and Vespasian both died in A.D. 79 (the year of Titus' seventh consulship), so if Vespasian remodelled the sundial after Pliny's work was finished in A.D. 77 or 78, he had an extremely narrow window of opportunity to do so. If Vespasian had such a project even in the planning stages, it is hard to imagine Pliny not knowing about it. In contrast to these unlikely hypotheses, there is a simple explanation of the relationship of the *pomerium* to the obelisk. Augustus built a meridian strip, which was respected by Claudius or Vespasian, whichever of them expanded the *pomerium* to include this part of the Campus. The new boundary ran along the western side of the meridian, parallel to it, and when Domitian remodelled the instrument, he did not drastically change its nature.

There is one more way in which the existence of the Vespasianic *cippus* casts doubt on the interpretations of Buchner and Rakob. In order to bolster the case that there was a vast pavement for the sundial, Buchner arranged for fourteen bore-holes to be drilled in various places around the Campus Martius.⁴⁰ In only two of these was any direct evidence of a pavement found; both were hard by the original site of the Ara Pacis, well away from the proposed reconstruction of the sundial. In eight of the others, Buchner claimed to have found not any pavement, but what he called the foundations of the Augustan and the Flavian pavements. He put this forward as evidence that both structures must have been much more expansive than the meridian line. Since these results were published before the appearance of Rodríguez-Almeida's paper, Buchner did not know that one of the bore-holes in which he claimed to have found evidence of both foundation levels came in fact from the other side of the Vespasianic *pomerium* (See Fig. 1, No. 7).⁴¹ This makes it unlikely that the 'foundations' found in the bore-hole cores were the basis of expansive, unified pavements, unless one is willing to imagine that the later of the two pavements straddled the *pomerium*.⁴² In other words, the bore-hole cores may reflect phases of building in this area of the Campus, but they do not provide evidence of a continuous pavement built for a large sundial, and the failure to discover any relevant pavement despite many attempts in fact provides some evidence against it.⁴³

V SAN LORENZO IN LUCINA

Since no archaeological evidence for the Horologium beyond the confines of the meridian strip has materialized, Buchner has had to rely upon the early records of the discovery of the obelisk. The earliest such record comes from the notes of a student of the humanist Pomponio Leto, who collected some of Leto's comments on ancient Roman topography, presented as the record of a walk around the ruins of Rome:⁴⁴

UBI EST ecclesia sancti Laurentii in Lucina cum hortis, ibi fuit campus appellatus Martius: in quo habebantur comitia. Et ubi est domus nova facta, quae est capellanorum [aedituorum] cuiusdam capellae s. Laurentii, fuit basis orologii nominatissimi.

⁴⁰ Buchner, *Sonnenuhr*, op. cit. (n. 1), 73–5.

⁴¹ This is the bore-hole in Via della Toretta, numbered 13 in fig. 1 on pp. 60–1 of Buchner, *Sonnenuhr*, op. cit. (n. 1), discussed on p. 74.

⁴² In theory, one could maintain that Vespasian had the Augustan pavement disturbed to plough the *pomerium* through it and then had the pavement relaid again, but it is hard to imagine what could motivate such a complex procedure when the line could simply have been run around it.

⁴³ In addition to the excavation in the middle of Via di Campo Marzio, and the excavations in San Lorenzo in Lucina discussed below, seven bore-holes were drilled in Buchner's proposed grid: Buchner, *Sonnenuhr*, op. cit. (n. 1), Bore-holes 1, 2, 3, 7, 11, 12, 13 in fig. 1, pp. 60–1. In none of these explorations was any pavement found outside of the meridian line.

⁴⁴ G. B. de Rossi, 'Note di topografia romana raccolte dalla bocca di Pomponio Leto, e testo pomponiano della *Notitia regionum urbis Romae*', *Studi e documenti di storia e diritto* 3 (1882), 49–86, at 55–7, 59–60, conveniently reprinted in Lanciani, op. cit. (n. 16), vol. 1, 101.

IN CAMPO MARTIO, ubi est ephm [ephebeum / epitaphium?] capellanorum, ibi fuit [vidimus] effossum orologium: quod habebat VII gradus circum, et lineas distinctas metallo inaurato. Et solum campi erat ex lapide amplo quadrato, et habebat lineas easdem: et in angulis quatuor venti ex opere musivo cum inscriptione ut BOREAS SPIRAT etc.

Where the church of San Lorenzo in Lucina stands with its gardens, is where the so-called Campus Martius was, in which electoral assemblies used to be held. And where a new house was being built for the chaplains of a certain chapel in the church of San Lorenzo, there was found the base of that famous sundial.

In Campus Martius, in the place where the dormitory [tomb?] of the chaplains is located, is where the sundial was dug up (I saw it myself); it had seven steps around it and lines decorated with golden metal. And the pavement was made of large square blocks that had the same lines, along with mosaics of the four winds in the corners and an inscription saying 'the north wind blows' etc.

This description coheres well with the appearance of the discovered Flavian pavement, so it would be interesting to know where exactly these items were found. The church of San Lorenzo in Lucina is north-east of the original site of the obelisk (see Fig. 1, No. 8), and it is just within range of Buchner's first reconstruction of the sundial, so if this passage were to refer to the church or one of its chapels, this would be proof that the pavement of the sundial extended a long distance east of the meridian line. But that is not what the passage says. It refers to a house built for the chaplains and perhaps to a tomb, also for the chaplains.⁴⁵ This was not the church itself, or a chapel in the church, but property associated with the church nearby, presumably close to the spot where some decades later the barber who rediscovered the obelisk lived.⁴⁶ De Rossi, the editor of these notes, points out that they were written down some time after 1484, since they refer to Sixtus IV in terms not appropriate to a living Pope, and that the word *nova* applied to the chaplains' house implies that these excavations were seen by Leto's student not long before he wrote.⁴⁷ These discoveries cannot therefore belong to the construction of the chapel in San Lorenzo itself, which happened some decades earlier, around 1463. Thus when Buchner baldly asserts that these artifacts were found during the construction of the personal chapel of Cardinal Calandrino in the church of San Lorenzo, he has not only the wrong place, as Schütz has observed, but also the wrong date.⁴⁸

Nevertheless, Buchner promised future excavations under the present-day sacristy of San Lorenzo in order to try to discover proof that Augustus built an instrument that extended well to the north-east (see Fig. 1, No. 9).⁴⁹ It appears that these excavations were conducted and, although they brought to light the baptistery of the early Christian basilica under a room adjacent to the sacristy, there has been no word of any further traces of the

⁴⁵ Bandini, *op. cit.* (n. 9), 95 follows the MS and the early printing of this text in giving *Epithaphium*, but de Rossi, *op. cit.* (n. 44), 55 points out that the abbreviated form *ephm* given in red in the margin of the MS was surely what was in the original, and that *epitaphium* must be the scribe's conjecture. He thinks this should indicate the same place as *domus nova* above, so he tentatively conjectures *ephebeum* as a residence for young chaplains, and he is hesitantly followed by Lanciani, *op. cit.* (n. 16), vol. 1, 101.

⁴⁶ Subsequent accounts have versions of this story that imply that the pavement was found in the church, but Bandini had already shown that these were just corruptions of Leto's version: Bandini, *op. cit.* (n. 9), 96 and de Rossi, *op. cit.* (n. 44), 56; a point emphasized by Schütz, *op. cit.* (n. 3), 440.

⁴⁷ De Rossi, *op. cit.* (n. 44), 55 observes that the word *vidimus* in the margins of the MS indicates that the student not only had Leto's word for it, but saw the excavations himself.

⁴⁸ Buchner, *Sonnenuhr*, *op. cit.* (n. 1), 51.

⁴⁹ Buchner, *Sonnenuhr*, *op. cit.* (n. 1), 80.

Horologium.⁵⁰ Schütz pointed out that Leto did not in fact say that pieces of the Horologium were dug up in the chapel, but to little effect.⁵¹ In a subsequent publication, in which he does attempt to respond to a few of Schütz's other criticisms, Buchner reiterates and amplifies his error, without any reference to Schütz's correction.⁵² In this later article, he claims specifically that part of the Horologium was found during the construction of Calandrino's tomb in the chapel around 1463. In fact, Calandrino died away from Rome in 1476, and his body was not transferred to San Lorenzo until much later.⁵³

What is more, Buchner uses this erroneous assertion as the basis for the surprising idea that the size of the Augustan Horologium was even bigger than he originally described. He now claims that an even vaster circle circumscribed a circular Horologium, with the winds indicated on the outer circle (see Fig. 1, No. 13).⁵⁴ The 'evidence' for this is the inscription BOREAS SPIRAT, quoted above, which Buchner still claims was found in the church of San Lorenzo, at the north-east edge of the Horologium, despite the fact that Schütz had already pointed out that this is not at all what the student of Pomponio Leto said. Furthermore, Buchner has to claim that the phrase *basis orologii* in the passage above refers to the pavement rather than the base of the obelisk, which is possible but not likely, since the passage also refers to four corners and seven steps around it. These words are hard to reconcile with a discovery of a small portion of the outer edge of the pavement. Buchner's solution is to dismiss these inconvenient parts of the passage as a 'fantasy'.⁵⁵ The real fantasy is this 'wind-rose' with its vast circular pavement, which is an attempt to salvage the erroneous claim that part of the sundial was found in San Lorenzo in the face of Schütz's demonstration that the shadow of the obelisk could not usefully have reached that far.⁵⁶ The tragedy is that this pure fiction is now enshrined in such a fundamental reference work as the *Lexicon Topographicum Urbis Romae*.

VI AUGUSTUS AND THE NORTHERN CAMPUS MARTIUS

The most striking of Buchner's original claims was that the east–west line on the sundial that marked the path of the sun's shadow on the day of the equinoxes passed right through the middle of the Ara Pacis. Buchner claimed as a consequence that the shadow cast by the

⁵⁰ The sacristy is the southernmost of the two westernmost side-chapels (see Fig. 1, No. 9); a plan of the church with a key is given at M. E. Bertoldi, *S. Lorenzo in Lucina* (1994), 134–5, and see p. 39 on Calandrino's chapel. According to M. E. Bertoldi, 'L'area archeologica di San Lorenzo in Lucina', *Bollettino di Archeologia* 13–15 (1992), 127–34, at 133 and M. E. Bertoldi, 'The recognition of Jean Le Jeune's tomb and of the chapel of St John the Baptist in San Lorenzo in Lucina in Rome', *Opuscula Romana* 28 (2003), 28–31, at 28, the DAI was looking for traces of the Horologium pavement when the remains of the baptistery were found under the Sala dei Canonici, which is just north-west of the sacristy. See the sketch provided by F. Rakob at fig. 16, p. 133 of 'L'area archeologica', and the photograph at A. Manfredi, 'San Lorenzo in Lucina, Jean Le Jeune, Jean Jouffroy and the search for manuscripts in France during the papacy of Nicholas V (1447–1451)', *Opuscula Romana* 28 (2003), 9–28, at fig. 4, p. 12. From the sketches, it appears that there may also have been a trench dug in the sacristy, which was originally the chapel built by Calandrino: fig. 9, p. 130 of 'L'area archeologica' = Bertoldi, *S. Lorenzo in Lucina*, fig. 4, p. 17. Presumably no pavement was discovered under either of these rooms.

⁵¹ Schütz, *op. cit.* (n. 3), 439f.

⁵² Buchner, 'Neues zur Sonnenuhr des Augustus', *op. cit.* (n. 1). This evasion is noted by Schaldach, *op. cit.* (n. 6), 80 and Maes, *op. cit.* (n. 6), 23.

⁵³ See Manfredi, *op. cit.* (n. 50), 12, n. 15 and compare the slightly different information of C. Gennaro, 'Calandrini, Filippo', in *Dizionario biografico degli Italiani* (1960–), vol. 16, 450–2, at 452.

⁵⁴ Buchner, 'Neues zur Sonnenuhr des Augustus', *op. cit.* (n. 1).

⁵⁵ Buchner, 'Neues zur Sonnenuhr des Augustus', *op. cit.* (n. 1), 79–80, as noted by Maes, *op. cit.* (n. 6), 23.

⁵⁶ On the shadow, see below. The two circles that delimit the extent of the sundial and its circumscribed wind-rose in Buchner's later reconstruction reflect fairly closely the two circles that Schütz drew to illustrate the minuscule size of the shadow at increasing distances: compare Buchner, *op. cit.* (n. 2), 392, fig. 22 with the circles labelled K1 and K2 in Schütz, *op. cit.* (n. 3), 452, fig. 5. See Fig. 1, No. 13, which roughly corresponds to Schütz's circle K1, at which point he calculates that the ellipse of the shadow would measure only 8 by 21 cm. Thus in Buchner's later reconstruction the sacristy no longer overlaps the sundial, but rather the newly-invented, circumscribed wind-rose.

ball on top of the obelisk would fall on the altar on the afternoon of the autumn equinox, which he claimed was Augustus' birthday.⁵⁷ The two most arresting criticisms that Schütz, a physicist, made of Buchner's work both have to do with his failure, despite the apparatus of technical detail regarding the theory of sundials that he displays, to realize two fundamental physical facts that render his original reconstructions impossible.

The first of Buchner's technical failures was that he spent many pages attempting to deduce the original height and position of the obelisk, not subsequently realizing after the discovery of part of the meridian line that the original height and position could be straightforwardly calculated from that. Schütz demonstrates that the obelisk was in fact about 4 m to the south-west of the position Buchner had reckoned, and the ball at its top was about 2½ m higher (see Fig. 1, No. 1).⁵⁸ These alterations would seem to have the potential to change the position of the equinox line that Buchner drew, but in fact they tend to cancel out so that, according to the calculations of Schaldach, the revised position of the line is only about half a metre south of where Buchner put it, which is within the margin of error for the calculation.⁵⁹

Despite the fact that Schütz's corrections to the position and height of the obelisk do not make an enormous difference in the placement of the equinox line, Buchner in his more recent publications has been so keen to retain his original reconstruction of the *horologium* that he has posited without evidence that the Flavian reconstruction of the instrument must have involved uprooting the obelisk from its original position and putting it down again in the position Schütz calculated for it. If we recall that Pliny said that the foundations of the obelisk were as deep as it was high, it is quite clear that shifting the obelisk by a distance of only 3 or 4 m would have been a sheer waste of effort, as it would have involved digging out the old foundations in the course of laying the new.⁶⁰

The second major technical criticism that Schütz made of Buchner's attempt to link the obelisk and the Ara Pacis was that Buchner's original illustrations depict the obelisk casting a sharp shadow across the Campus and on the altar. Schütz points out that shadows grow more diffuse the farther they fall, until at a certain distance they disappear. Thus the shadow of the ball on top of the obelisk would have disappeared well before it hit the Ara Pacis.⁶¹ Many will have seen meridian lines in Italian churches, such as the one that Francesco Bianchini installed in Santa Maria degli Angeli on Piazza della Repubblica, which was constructed by Michaelangelo out of the cavernous *tepidarium* of the Baths of Diocletian. These instruments were set up in part to help check the accuracy of the Gregorian reform of the calendar, just as Augustus' meridian had been constructed in connection with the Julian reform. In order to avoid the very problem of the blurring of shadows that will have impaired the usefulness of Augustus' obelisk as an instrument for precise measurement, meridians like Bianchini's were set up indoors, with the noontime

⁵⁷ Buchner, *Sonnenuhr*, op. cit. (n. 1), 37.

⁵⁸ Schütz, op. cit. (n. 3), 455–7.

⁵⁹ Buchner had insisted that the height of the obelisk must have been 100 Roman feet, on which insistence see Schütz, op. cit. (n. 3), 436–42. In this light it is interesting to note that Schaldach, op. cit. (n. 6), 88, calculates, on the basis of Schütz's method, that the height was approximately 100 Doric, not Roman, feet. In reply to Schütz's calculations, Buchner has pointed out that he did not notice the presence at the beginning of Virgo / end of Aries of an additional cross-stroke intercalated between two of the regular strokes indicating the degrees of the zodiac. This is true, though Schütz can hardly be blamed for not noticing it, as it is very obscure in Buchner's original sketch of the pavement. It is scarcely discernible in Buchner, *Sonnenuhr*, op. cit. (n. 1), fig. 5, p. 70, though it is visible in the photographs, e.g. Buchner, *Sonnenuhr*, op. cit. (n. 1), fig. 4, p. 110. Buchner's subsequent sketches do show it clearly: Buchner, 'Neues zur Sonnenuhr des Augustus', op. cit. (n. 1), fig. 85, p. 82 and Buchner, op. cit. (n. 2), fig. 23, p. 392. Though the presence of this extra degree marker does affect the calculation of the height and position of the obelisk, it does not change it to a new value, as Buchner claims; it adds a larger margin of error to the calculations, as the calculations fundamentally assume that the degree markers are evenly spaced.

⁶⁰ Schaldach, op. cit. (n. 6), 89–90.

⁶¹ The obelisk is shown with a ball on top, just as Pliny describes, on the relief from the base of the column of Antoninus Pius that shows the apotheosis of the emperor and his wife as they rise from the Campus Martius.

elevation of the sun indicated by a beam of light that passed through a pinhole high up on the building and landed at noon on a strip in the floor of the church.⁶²

There are also technical objections to do with Buchner's claim that Augustus' birthday was precisely on the autumn equinox, but these do not concern us here.⁶³ In a way, it is a shame that Schütz laid so much emphasis on these narrow technical errors, though it is perhaps natural that a scientist would do so. For these are not in fact the most serious weaknesses that Schütz pointed out in Buchner's argument, though they are the most spectacular.⁶⁴ Much more damning is his account of the skewed way Buchner presented the evidence from Pliny, from the excavations, and from Pomponio Leto. As a result of the focus not on these errors in handling the evidence, but on the narrow technical criticisms, some have chosen to imagine that Schütz merely refuted some of the details of Buchner's reconstruction rather than exploding it entirely. Some have therefore wanted to modify Buchner's original proposal slightly so as to side-step the technical problems. For those who wish to salvage Buchner's connection between altar and obelisk, the answer has been to imagine that the viewer would see the shadow of the topmost globe heading eastward toward the altar on the equinox even if it never quite made it there.⁶⁵ The problem is that there is no evidence to suggest that the viewer's attention would have been drawn to the position of the shadow of the obelisk at any time but noon. The shadow of the obelisk would have pointed at the Ara Pacis every single afternoon of the year, so without an east–west line in the pavement to draw attention to the path of the globe after noon, the viewer would be unlikely to make a connection with any particular day or season of the year. On the other hand, the two monuments would certainly have been seen as related, due to their very close physical proximity in the open spaces of the northern Campus.

In regard to the significance of the physical positioning of the monuments, Buchner was on the right track, as the altar and obelisk were built so close together in time and in space, and in this one respect, the general force of Buchner's ideas do broadly withstand Schütz's narrow technical criticisms.⁶⁶ Buchner claimed that the angle at which the obelisk was placed made it face directly at the Mausoleum of Augustus in the distance. Schütz pointed out that this argument required the original angle of the obelisk base to be $18^{\circ} 37'$ west of north, whereas this angle was measured by one of Bandini's collaborators, James Stuart, to have been 15° when the base was found *in situ*.⁶⁷ In reality, however, this discrepancy was unlikely to have been disturbing to the viewer. The striking thing will have been that the obelisk was clearly not aligned with the true north–south line described by the meridian below it. Instead it was aligned roughly with the course of the Via Flaminia, which ran through the northern Campus at an angle of about 18° west of true north.⁶⁸ The fact that the visual line between the obelisk and the Mausoleum is parallel to the Via Flaminia (both about 18° west of north) is surely no coincidence.⁶⁹ The spectator's eye would have been drawn to this alignment by the conspicuous fact that the sides of the

⁶² J. L. Heilbron, *The Sun in the Church: Cathedrals as Solar Observatories* (1999).

⁶³ Schütz, *op. cit.* (n. 3), 446–9 and Schmid, *op. cit.* (n. 5), 311–13. On the date of Augustus' birthday, see W. Suerbaum, 'Merkwürdige Geburtstage', *Chiron* 10 (1980), 327–55, at 334–5; on Buchner and Augustus' association with Capricorn, see T. Barton, 'Augustus and Capricorn: astrological polyvalency and imperial rhetoric', *JRS* 85 (1995), 33–51, at 44–7.

⁶⁴ *pace* Schmid, *op. cit.* (n. 5), 308–9, and Beck, *op. cit.* (n. 29), 105.

⁶⁵ Beck, *op. cit.* (n. 29), 105 and Hannah, *op. cit.* (n. 31), 129.

⁶⁶ See also T. S. Barton, *Power and Knowledge: Astrology, Physiognomics, and Medicine under the Roman Empire* (1994), 46–7.

⁶⁷ See Schütz, *op. cit.* (n. 3), 449–50, with fig. 4.

⁶⁸ This is the approximate angle of the modern Via del Corso, as measured on a satellite image of the Campus Martius provided by Google (<http://maps.google.com>, accessed 15 August 2006). That this satellite image is not skewed from true north can be confirmed by the vertical orientation of the present-day meridian line in Piazza Montecitorio.

⁶⁹ Buchner, *Sonnenuhr*, *op. cit.* (n. 1), 54, gives the angle of the line from the obelisk to the Mausoleum as $18^{\circ} 37'$, but this would have to be modified in the light of Schütz's adjustment to the position of the obelisk. In any case, the figure is approximately 18° .

obelisk were orientated well away from the north–south line of the meridian, even if its westward tilt of 15° was slightly less than the 18° of the rest of the northern Campus.

In fact, the connection between the positioning of these three Augustan monuments in the northern Campus Martius does not depend on any complex mathematical calculations, but arises from straightforward considerations of urban design. When Schütz's correction to the location of the obelisk is taken into account, a line drawn through the obelisk and perpendicular to the Via Flaminia will pass through the centre of the Ara Pacis.⁷⁰ In other words, the connection between the altar and the obelisk is not dependent on an imaginary equinox line of a fictitious sundial, but was immediately evident in the positioning and orientation of the monuments themselves. This is not surprising given that the two monuments were erected nearly contemporaneously. The building of the Ara Pacis was decreed in 13 B.C.; Lepidus died in 13 or 12 B.C.; the obelisk was erected in 10 B.C.; the Ara Pacis was dedicated in 9 B.C., on Livia's birthday, probably her fiftieth.⁷¹ How should we interpret these carefully composed juxtapositions? Buchner claimed that the complex of three monuments provided a unified symbolism of Augustus' birth (via the equinoctial line that was supposed to have special significance on his birthday), and his death (via the Mausoleum).⁷² This is untenable, as there is no evidence for an east–west equinoctial line, but that does not mean that these monuments cannot be interpreted as a group.

Let us imagine what would have been evident to a group of visitors to this complex in Augustus' day. If they leave Rome travelling north on the Via Flaminia, they will find the Ara Pacis just off the road on the left, its face parallel to the road. Standing in front of the altar, they see the obelisk rising directly from behind the centre of the altar. The obelisk faces them almost as squarely as the altar (about $18-15 = 3^\circ$ off square). The privileged nature of this vantage point was emphasized by a later builder, who put an arch over the Via Flaminia right after this spot (see Fig. 1, No. 10).⁷³ If our travellers leave the road, pass through the altar precinct and proceed in a straight line, they come right to the obelisk. From there the meridian line points north, but it will in fact have seemed to point 18° east with respect to the dominant axis of the area as defined by the Via Flaminia, which is echoed in the orientation of the Augustan monuments. When looking off into the distance, their eyes would therefore not follow the line of the meridian, but would follow the direction of the dominant axis, which would point from the obelisk directly at the Mausoleum (again, give or take an angle of 3°).⁷⁴ So the northern side of the obelisk faced the Mausoleum, while its eastern side and the western side of the Ara Pacis faced each other squarely.

So it is clear that this trio of monuments was deliberately arranged in the form of a right triangle, and that the orientation of the individual monuments emphasized this mutual relationship.⁷⁵ This triangle has symbolic possibilities in the light of Augustus' career. We

⁷⁰ See Fig. 1, line connecting 1 and 2. This was noted in passing by Schütz, *op. cit.* (n. 3), 452, fig. 5, and has rightly been emphasized by Schaldach, *op. cit.* (n. 6), 91–2.

⁷¹ A. A. Barrett, 'The year of Livia's birth', *Classical Quarterly* 49 (1999), 630–2, at 632.

⁷² Buchner, *Sonnenuhr*, *op. cit.* (n. 1), 55.

⁷³ The so-called Arco di Portogallo, now destroyed and of uncertain date: Platner and Ashby, *op. cit.* (n. 17), 33. For the position, see Bertoldi, *op. cit.* (n. 50, 1994), 13, fig. 2 = Rakob, *op. cit.* (n. 27), 699, fig. 5.

⁷⁴ Alföldy suggests that the obelisks in front of the Mausoleum were put there by Augustus, and so the eye would have been moving from one obelisk to another: G. Alföldy, *Der Obelisk auf dem Petersplatz in Rom* (1990), 52 with n. 102, 57, 64 with fig. 14. The difficulty is that these obelisks are not mentioned in Strabo's description of the Mausoleum or in Pliny's discussion of the obelisks of Rome, so they are usually thought to have been put there at a later date (cf. Ammianus 17.4.16). On the possible alignment of the Ustrinum with this axis, see J. R. Patterson, 'The city of Rome: from Republic to Empire', *JRS* 82 (1992), 186–215, at 199 and F. Coarelli, *Il Campo Marzio: dalle origini alla fine della Repubblica* (1997), 599.

⁷⁵ Though misled by Buchner about the size of the *horologium*, and though the position of the obelisk in his illustration needs to be adjusted slightly to the south-west, Alföldy had already suggested that this was a triangular composition: Alföldy, *op. cit.* (n. 74), 64 with fig. 14. Schaldach, *op. cit.* (n. 6), 91 with fig. 51 furthermore notes that it may be a perfect right triangle with a 90 degree angle at the obelisk; he cautions that exact measurements would have to be taken to confirm this. If we move away from the expectations of gnomonics and mathematics, however, to the urban perspective of the casual viewer, the right triangle is already clear enough.

have seen that the occasion for the erection of the obelisk was the death of Lepidus in exile and that its message was that Augustus was the right man to manage his father's calendar. The Mausoleum of Augustus had likewise been built as a pointed riposte to an absent triumvir: it emphasized Octavian's commitment to staying in Rome upon his triumphant return from the East in pointed contrast to Antony's reported desire to be buried on Alexandria.⁷⁶ A triangle of monuments, one for each triumvir: the Mausoleum that was built after the violent defeat of Antony, the meridian that was built after the peaceful supersession of Lepidus, and the Ara Pacis for the blood-stained Octavian who was transformed into Augustus, bringer of peace. The inscription on the obelisk implicitly refers to each of the three triumvirs: the dedicator, Augustus, having just received the office of Pontifex Maximus from Lepidus in a peaceful succession, looks back pointedly to Actium and the young Octavian's violent usurpation of Antony's dominions in the East ('Aegypto in potestatem populi Romani redacta'). The meridian not only measured the progress of the sun through the year; it also recorded the dedicator's progress from triumvir to princeps, from man of war to man of peace.

Each pair of monuments in the triangle can be read together. The obelisk, which marks the final, lingering end of the triumvirate, was dedicated exactly twenty years after Octavian's entry into Alexandria and looks across the Campus at the Mausoleum, a monument built upon his return thence; its Egyptian origin and the inscription on it are reminders of the opposition between East and West in the years before Actium. The Mausoleum, a building for death, was built just after a bloody time of civil war, and it faces the altar that celebrates peace, fecundity, and new life. Hannah points out that the Egyptian origin of the obelisk reflects the pacification of the East, just as the Ara Pacis is associated with the pacification of the West.⁷⁷ The meridian, which illustrates the passing of the days and the return of the years, looks with one face at death and with another at life. Each of the three is a family monument for the Julii: the Mausoleum for their burial; the altar, which was dedicated on Livia's birthday, depicting them in procession; and the meridian that celebrates the moment when finally, late in life, as an ostentatious token of his unsurpassed clemency and forbearance, Augustus took over the position of Pontifex Maximus that his father had occupied early in life, as a token of his unprecedented ambition.⁷⁸

VII DOMITIAN AS BUILDER AND PONTIFEX

Now that we have a sense of the symbolic purposes of the monumental solar meridian constructed by Augustus, we can try to understand what motivated Domitian to reconstruct the Augustan instrument that Pliny tells us had grown inaccurate over time. Presumably the obelisk and/or the pavement had settled, perhaps unevenly, in the alluvial soil of the flood-prone Campus and presumably Domitian's astronomers felt that the settling had now stopped, so that the path of the noonday shadow had ceased to swerve from its previous course.⁷⁹ A new pavement was therefore laid that made the readings accurate once more. The fact that this pavement was reused as the base of a water basin not long afterwards may suggest that the obelisk or the pavement had not in fact ceased to

⁷⁶ According to Suetonius (*Aug.* 100), the Mausoleum was built in 28 B.C., the year after Octavian's triple triumph.

⁷⁷ Hannah, *op. cit.* (n. 31), 129.

⁷⁸ For the emphasis Augustus wished to put upon his indulgence with respect to Lepidus and the pontificate, see *Res Gestae* 10.2.

⁷⁹ The other possibility is that the obelisk was re-erected by Domitian at the same time that the new pavement was laid, as Buchner now claims: Buchner, *op. cit.* (n. 2), 36. If so, it is most unlikely that it would have been re-erected a few metres away from its original position, as Buchner wishes, so we have to confront the possibility that Domitian moved it from an entirely different position in the Campus. On balance, however, this seems a very unlikely scenario. The precise triangulation of Augustan monuments is more likely to have been designed under Augustus than Domitian.

subside, and that the Domitianic meridian went out of true as fast as the Augustan one had done.⁸⁰ There may have been a practical element involved in Domitian's refurbishment, to make the instrument useful again, but his main innovation as custodian of the Roman calendar was symbolic rather than practical: to name two months of the year after himself. Renewing the monumental meridian will have been similarly symbolic of Domitian's inheritance of Augustus' mantle.⁸¹

Refurbishing the meridian was also a gesture in keeping with one particular aspect of the great Flavian building programme of reconstruction and renewal. The Flavians emphasized continuity with the pre-Neronian Julio-Claudian dynasty in such a way that there was often implicit criticism of Nero.⁸² In some cases this was fairly obvious, such as when Vespasian completed the Temple of the Deified Claudius in spite of Nero, who was accused of having destroyed it.⁸³ In other cases, it was more subtle, as with the three major structures that took the place of Nero's Golden House: the Colosseum, the Baths of Titus, and the Domus Flavia. The Colosseum and Baths were built on the site of Nero's Golden House and near his colossal statue, and in deliberate contrast to those structures. Whereas the colossal statue was useless and decorative, the Colosseum and Baths were built for the use of the people. Whereas the Golden House blurred the distinction between city and country, public and private in a way that emulated Greek models, the amphitheatre and baths were quintessentially Roman structures that enforced distinctions of social hierarchy. Whereas the house was stigmatized as a private structure, the works of the Flavians were celebrated as a public good.⁸⁴ The Colosseum followed an Augustan precedent, the stone amphitheatre of Statilius Taurus, which had burned down under Nero in the Great Fire, and the superposition of orders on its façade echoed the design of the theatre of Marcellus.⁸⁵

A similar point can be made with respect to the Flavians' own residence. The deliberately low-key dwelling of Augustus on the Palatine had been added to piecemeal until Nero built his grand Domus Aurea, which wound its way down from the Palatine, into the Forum valley, and up the Esquiline again.⁸⁶ In contrast to Nero, the Flavians returned squarely to the Palatine, and built a house that emulated Augustus in its location even as it massively surpassed his house in scale. If Nero was the bad Julio-Claudian builder whose works the Flavians turned away from, then Augustus was the good, but somewhat modest builder, whose works were to be amplified. In the Campus Martius, Augustus had built a wooden stadium for Greek games in celebration of the victory at Actium; Nero built a wooden amphitheatre there; Domitian, emulating Augustus rather than Nero and out-doing them both, built a permanent stone stadium for Greek games there.⁸⁷ Augustus erected an obelisk in the Campus Martius; so did Domitian.

Also relevant for our purposes is the way in which Domitian emulated Augustus as Pontifex Maximus in his concern for private morality and public religion.⁸⁸ Suetonius gives a long list of measures he took to regulate sexual behaviour, and also mentions edicts to

⁸⁰ On the date of the water basin, see Rakob, *op. cit.* (n. 27), 700 and Buchner, *Sonnenuhr*, *op. cit.* (n. 1), 76.

⁸¹ On Domitian's renaming of September and October, see K. M. Coleman (ed.), *Status, Silvae IV* (1988), 80.

⁸² On the Flavian building programme, see M. Griffin, 'The Flavians', in *The Cambridge Ancient History*, (2nd edn, 2000), vol. 11, 1–83, at 19–21; M. P. Charlesworth, 'Flaviana', *JRS* 27 (1937), 54–62, at 54–60; and J. Leberl, *Domitian und die Dichter: Poesie als Medium der Herrschaftsdarstellung* (2004), 25–86.

⁸³ Suet., *Vesp.* 9 with Griffin, *op. cit.* (n. 82), 19–20.

⁸⁴ These are the themes of Mart., *Lib. Spect.* 2.

⁸⁵ Cass. Dio 62.18.2., and see Richardson, *op. cit.* (n. 2), 383.

⁸⁶ Suet., *Nero* 31.1.

⁸⁷ On Augustus' stadium, Dio 53.1.5; on Nero's amphitheatre, Suet., *Nero* 12.1; Domitian's stadium is now Piazza Navona: Platner and Ashby, *op. cit.* (n. 17), 495–6. Both also built venues for sea-fights along the Tiber: *Res Gestae* 23 and Suet., *Dom.* 4.2, on which see K. M. Coleman, 'Launching into history: aquatic displays in the early Empire', *JRS* 83 (1993), 48–74, at 51–5.

⁸⁸ On the Flavian programme of moral reform, see F. Grelle, 'La "correctio morum" nella legislazione flaviana', *Aufstieg und Niedergang der römischen Welt* 2.13 (1980), 340–65 and more briefly A. Wallace-Hadrill, *Suetonius: The Scholar and His Caesars* (1983), 186–7.

prohibit castration and to discourage the planting of vines. He also punished several Vestal Virgins and their lovers for unchastity.⁸⁹ The poets credit Domitian with having given renewed force to Augustus' Lex Iulia de adulteriis.⁹⁰ He carried out an extensive programme of construction and refurbishment of temples, which also recalls the priorities of Augustus.⁹¹ Many of these measures were taken in his capacity as censor, but others, such as his punishment of the Vestals, will certainly have been taken as Pontifex.⁹² All of this suggests that Domitian was keen to show that he was taking those offices as seriously as Augustus had done. Refurbishing the meridian was therefore in keeping with the general thrust of the Flavian building programme as harking back to Augustan models. It may also be worth speculating on a more specific message it may have carried.

VIII PHAETHON AND NERO

The meridian constructed by Augustus had a positive message, that the calendar was in good hands again, and a negative one, that the feckless pontificate of Lepidus, who had allowed Caesar's calendar to drift into error, was over. Just so, Domitian's refurbishment of that monument had a positive implication, that the institutions of Augustus were in good hands again, and a negative one, that over the later years of the Julio-Claudian dynasty, things had managed to drift into error.⁹³ The failure of the noonday shadow to fall where it should would have been a vivid visual representation of a world out of joint. Pliny, even though he knew that the error may have been due to local subsidence, allowed himself to speculate that it might be due to the sun shifting from its course or the earth moving from its position. The erroneous position of the meridian's shadow could thus have been read as a visual representation of the sun swerving from its path, as happened in the myth of Phaethon, a story that exemplified the dangers of an unfit son succeeding to his father's position. There is some evidence to suggest that this myth was particularly associated with Nero in Flavian ideology, and so we can speculate on how the symbolism of the re-aligned meridian might function in such a context.

The claim that Nero sought to associate himself to some degree with the sun-god has a long history, but it continues to be controversial.⁹⁴ Some have gone so far as to claim that Nero deliberately cultivated an association with Phaethon, turning a paradigm of folly into a hero of noble ambition.⁹⁵ The difficulty of interpreting the evidence is illustrated by the preface to Lucan's epic, in which the deified Nero is pictured as taking control of the chariot of the sun in terms that cannot help but bring to mind the myth of Phaethon. Opinions differ on whether we are to imagine Nero as succeeding brilliantly where Phaethon failed ('telluremque nihil mutato sole timentem', 1.49), or as failing just as badly as Phaethon did in the traditional version, as in Ovid's *Metamorphoses*.⁹⁶ Whatever the answer to these questions about Nero's self-identification, there is no doubt that in Flavian ideology the traditional myth of Phaethon could have been taken as an apt account of how the feckless Nero found himself unequal to his position.⁹⁷ Given that Nero claimed to be the equal of Apollo as a singer and the equal of the Sun as a charioteer, and given that he

⁸⁹ Suet., *Dom.* 7.1 and 8.3–4 with Griffin, *op. cit.* (n. 82), 79–80.

⁹⁰ Martial 6.7 and Stat., *Silv.* 5.2.101–2 with Grelle, *op. cit.* (n. 88), 346.

⁹¹ See B. W. Jones, *The Emperor Domitian* (1992), 79–94.

⁹² See B. W. Jones (ed.), *Suetonius, Domitian* (1996), 73 and 76; Grelle, *op. cit.* (n. 88), 345; and Coleman, *op. cit.* (n. 81), 107.

⁹³ Pliny's figure of thirty years for the length of time that the meridian had been in error puts the start of it back to the middle of Claudius' principate, but the longest period of error would have been Nero's reign.

⁹⁴ See M. T. Griffin, *Nero: The End of a Dynasty* (1984), 215–20 for a sceptical view, and contrast E. Champlin, *Nero* (2003), 112–44.

⁹⁵ L. Duret, 'Néron-Phaëton, ou la témérité sublime', *Revue des Études Latines* 66 (1988), 139–55, followed by Champlin, *op. cit.* (n. 94), 134–5.

⁹⁶ Compare S. Hinds, 'Generalising about Ovid', *Ramus* 16 (1987), 4–31, at 28–9 and M. Dewar, 'Laying it on with a trowel: the proem to Lucan and related texts', *Classical Quarterly* 44 (1994), 199–211, at 211.

⁹⁷ Thus C. E. Newlands, *Statius' Silvae and the Poetics of Empire* (2002), 315–16.

presided over the Great Fire of A.D. 64, the retrospective association with Phaethon seems inevitable.⁹⁸ That such a metaphor was available is shown in another context when Suetonius quotes Tiberius calling Caligula a Phaethon for the world.⁹⁹ We have some indirect evidence that Domitian himself found Phaethon a congenial topic. When the boy Q. Sulpicius Maximus competed successfully in Domitian's games in honour of Capitoline Jupiter in A.D. 94, he did so with an impromptu composition in Greek hexameters of the rebuke delivered by Zeus to Helios for lending his chariot to Phaethon.¹⁰⁰ The subject of the compositions on these occasions was always Jupiter/Zeus, and the emperor presided in person.¹⁰¹ In order to prevent contestants from preparing their extempore entries in advance, the specific theme must have been set by the judges on the spot.¹⁰² Since the presiding judge in this case was Domitian, Phaethon was presumably his own personal choice of topic. Perhaps the success of the young poet was due to the way he picked up on the allegory that the emperor wanted the contestants to articulate: Phaethon for Nero, Helios for Augustus, and Zeus for Domitian.¹⁰³

IX CONCLUSION

There have always been reasons to be sceptical of Buchner's reconstruction of a vast sundial in the Campus Martius. There existed large public sundials in the Roman world, but these were of a size that left them legible at one glance; Buchner's would have been ten times larger.¹⁰⁴ Furthermore, we have Strabo's extensive report of the appearance of the Campus Martius in the age of Augustus, which, though it dwells at length on the Mausoleum, does not mention a monument that could have covered an area of ground as large as the Mausoleum itself.¹⁰⁵ Nor do the Augustan poets mention it.¹⁰⁶ All this proves nothing, but it does mean we should perhaps hesitate before adding a massively expansive monument to the Roman landscape.

Buchner's general reconstruction had already been proposed by Kircher and Masi in the seventeenth century and was comprehensively refuted by Bandini and his collaborators in the eighteenth. The recently-discovered archaeological evidence does nothing to change their conclusions. There have been excavations on both sides of the meridian, in the middle of Via di Campo Marzio to its west and under the side-chapels of San Lorenzo in Lucina to its east, and numerous bore-holes have been drilled elsewhere in Buchner's proposed grid, but no trace of pavement outside the meridian line has been discovered. So the discovery of the meridian line and the failure to discover anything else adds circumstantial weight to Bandini's interpretation of Pliny. Of course, Buchner's reconstruction cannot ever be disproved absolutely, even if the entire Campus were dug up. Current evidence, however, compels us to accept the simpler explanation.¹⁰⁷

The complex symbolism that Buchner claimed was articulated by the monuments is appealing, and some of it, as we have seen, can withstand scrutiny. One of the attractions of his interpretation lies in the purported exactness of his calculations, which were claimed

⁹⁸ Suet., *Nero* 53. On Nero's passion for chariot-racing and lyre-playing, see also Tac., *Ann.* 14.14.

⁹⁹ Suet., *Cal.* 11.1.

¹⁰⁰ *CIL* 6.33976 with M. L. Caldelli, *L'Agon Capitolinus* (1993), 126, no. 7.

¹⁰¹ Quint., *Inst. Or.* 3.7.4 and Suet., *Dom.* 4.4 with Caldelli, *op. cit.* (n. 100), 65, 68.

¹⁰² I owe this point to Kathy Coleman.

¹⁰³ On the association Domitian cultivated with Capitoline Jupiter, see Caldelli, *op. cit.* (n. 100), 62–7 and Leberl, *op. cit.* (n. 82), 51–2.

¹⁰⁴ Thus Schaldach, *op. cit.* (n. 6), 80; see also Guerbabi, *op. cit.* (n. 32) and Buchner, 'Neues zur Sonnenuhr des Augustus', *op. cit.* (n. 1), 79.

¹⁰⁵ Strabo 5.3.8. Ammianus mentions this obelisk, but says nothing more about it (17.4.12), which is to be expected if the meridian pavement lay underneath a water basin by his day.

¹⁰⁶ *pace* C. J. Simpson, "'Unexpected" references to the *Horologium Augusti* at Ovid *Ars Amatoria* 1, 68 and 3, 388', *Athenaeum* 80 (1992), 478–84.

¹⁰⁷ *pace* Beck, *op. cit.* (n. 29), 104, who wishes to invert the burden of proof, saying that 'Nothing in the excavations disconfirms a full grid [of an extensive sundial]'.

to have been precisely confirmed by the excavations.¹⁰⁸ Mathematical precision promises to take the doubt and subjectivity out of the interpretation of these monuments, but this is a chimera. Another scholar who was convinced that he had a skeleton-key for interpreting the obelisks of Rome was Athanasius Kircher, from whom the idea of the Horologium as a vast horizontal sundial ultimately derives. Kircher persisted in insisting that the hieroglyphs on Rome's obelisks contained ancient Egyptian, hermetic wisdom, despite the fact that the antiquity of the *Corpus Hermeticum* had already been debunked famously by Casaubon.¹⁰⁹ Nonetheless, his industry won him the title he bears today as the founder of Coptic studies. Buchner's similarly single-minded pursuit of an utterly erroneous vision, along with the resources that he brought to bear as the head of the DAI, had the positive and quite unexpected result of uncovering an important Flavian monument whose existence had never even been suspected, and which otherwise would never have been found.

That monument provides us with fascinating evidence for the ideological subtlety of the Flavian building programme. It has long been known that the Flavians emphasized that they were bringing back the stability of the pre-Neronian Julio-Claudian period.¹¹⁰ Even Augustus was not beyond criticism, however, as we see when Statius celebrates the seventeenth consulship of Domitian:¹¹¹

ter Latios deciesque tulit labentibus annis
Augustus fasces, sed coepit sero mereri:
tu iuvenis praegressus avos.

Augustus held the consulship thirteen times over the years, but only late in life did he begin to deserve it; you as a young man have outstripped your ancestors.

Augustus was a model to be emulated as the founder of the only previous Roman imperial dynasty, but he had his flaws: he began his reign drenched in the blood of endless civil wars, and of course he never managed to sort out the succession very well.¹¹² By contrast, Vespasian came to the principate after a brief struggle, already equipped with an heir and a spare.¹¹³ The Julio-Claudian succession gave Caligula to Rome and ran into the ground with the reign of Nero, whom the Flavians painted as the anti-type of the good emperor. By contrast, the Flavian dynasty supposedly got better and better, culminating in the glory that was Domitian. When, after his death, Juvenal called Domitian a 'bald Nero' the phrase bit particularly deep because the Flavians had expended so much effort in distinguishing themselves from Nero, and associating themselves with the 'good' Julio-Claudians.¹¹⁴ What the refurbishment of Augustus' meridian did was to represent graphically this sense that the world was being put back to rights after having run off the rails during the end of the previous imperial dynasty. The Flavian building programme thus communicated a sophisticated message: that the institutions founded by Augustus were praiseworthy in principle but imperfect in execution and that they had been re-founded on a more secure basis.

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¹⁰⁸ On the specious exactitude of Buchner's calculations, see Schütz, *op. cit.* (n. 3), 442–6, F. de Vries, 'De Antieke Zonnewijzer van Keizer Augustus', *Bulletin, De Zonnewijzerkring* 84.2 (1984), 19–21 and Maes, *op. cit.* (n. 6), 20 with fig. 10.

¹⁰⁹ In this error, Kircher was following in the footsteps of Pliny, *NH* 36.71.

¹¹⁰ e.g. Griffin, *op. cit.* (n. 82), 11: 'Continuity with the Julio-Claudian Principate in its respectable form, i.e. with Augustus, Tiberius and Claudius, was advertised. The *Lex de Imperio Vespasiani* ... cites all of these emperors as precedents in four of its eight clauses and Claudius alone in one.'

¹¹¹ *Stat., Silv.* 4.1.31–33.

¹¹² See Coleman, *op. cit.* (n. 81), 76f.

¹¹³ See Tac., *Hist.* 2.77 with Griffin, *op. cit.* (n. 82), 15–16.

¹¹⁴ *Juv.* 4.38, *contra* E. Courtney (ed.), *A Commentary on the Satires of Juvenal* (1980) and S. M. Braund (ed.), *Juvenal, Satires, Book 1* (1996), ad loc.