CHAPTER 3

The Julian Calendar and the Solar Meridian of Augustus

Making Rome Run on Time

Peter Heslin

Perhaps the most striking connection to have been discovered in recent decades between an ancient text and an Augustan monument in the city of Rome is the solar meridian in the Campus Martius.[1] The text in question is Pliny's *Natural History* (36.72–3), which records that Augustus created a scientific instrument integrated with an obelisk he had erected in the Campus Martius. Pliny describes that instrument, whose design he attributed to a mathematician called Novius Facundus, in some detail. It consisted of a gilded ball on top of the obelisk and bronze markers embedded in a pavement, which was as long as the noontime shadow cast by the ball on the shortest day of the year. The markers permitted the position of the shadow of the ball to be measured every day at noon as the shadow of the obelisk became shorter with the lengthening days and then as it grew longer again with the shortening days. Pliny's account was long ago recognized as describing a solar meridian, which is to say a line running precisely north from the obelisk, which measured the progress of the noontime shadow every day through the sidereal year.[2]

In 1980 the text of Pliny was confirmed by a remarkable discovery. The German Archeological Institute (DAI), at the instigation of its president, Edmund Buchner, conducted excavations directly to the north of the original location of the obelisk. There, beneath a building on Via di Campo Marzio, the excavators discovered part of a pavement with

[1] Following the example of La Rocca 2014, I use the term "solar meridian" instead of the misleading "horologium." For feedback on this chapter, I am grateful to Amy Russell, Bernard Frischer, and the editors of the volume. I am particularly indebted to Professor Frischer for sharing his draft of an important forthcoming article in advance of its publication.

[2] Prompted by the excavation of the obelisk in 1748, Angelo Maria Bandini organized a discussion of Pliny's text by an international group of experts who concluded that Pliny had described a solar meridian: Bandini 1750.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

embedded bronze markings just as Pliny had described. There is a long line oriented due north, which is divided into sections corresponding to the signs of the zodiac, whose names are inscribed in Greek. Each section of the main line is further divided by smaller cross-hatchings that indicate each of the 30 degrees into which the 12 signs of the zodiac divide the 360 degrees of the sun's apparent annual path across the fixed stars.[3] The text of Pliny, interpreted as describing a solar meridian, was spectacularly confirmed in monumental form. There were just two problems. The first is that the pavement was found at a level much higher than expected, apparently consistent with a Flavian rather than an Augustan date.[4]

The second problem with Buchner's discovery is that he conducted the excavation in the firm but erroneous belief that Pliny had described not a meridian, but a full horizontal sundial of enormous east–west extension. In publishing the results of the excavation, he persisted in maintaining that this is what he had discovered, and as a result the notion of a large Augustan "sundial" in the Campus Martius became widespread.[5] In 1990, however, Michael Schütz published an article demonstrating that the pavement which had been discovered clearly belonged to a meridian and not a sundial. The fundamental purpose of such a device is to measure the progress of the sidereal year, and thus to check the alignment of the civil calendar with it. As Schütz pointed out, the dating of the obelisk to 10/9 BCE is strongly suggestive of a link between the construction of the meridian and Augustus' promulgation of a correction to the Julian calendar in 9/8 BCE.[6]

The purpose of the present work is to examine in further detail the implications of Schütz' demonstration of the connection of the construction of the monumental meridian with Augustus' calendrical reforms. This entails considering the meridian in relation to a different kind of "text," namely the precise specifications of the Julian calendar. I begin by considering the likely chronology of events in the years between Augustus' investiture as *pontifex maximus* in 12 BCE and his reform of the calendar some three years later. I offer a new account of this gap of three years which implies the existence of a solar meridian in Rome prior to the erection of

[3] For a plan, see Haselberger 2014a: 22, fig. 7.
[4] For discussion of this aspect, see below, "Reception." [5] Buchner 1982.
[6] Schütz 1990: 447–8. Polverini 2016: 110–11 points out that it is unlikely that the building of the monumental meridian brought to light the error of the calendar, as Schütz originally proposed; rather, it was surely Augustus' correction of the calendar that prompted the construction of a monumental version of a device to demonstrate and celebrate its correctness. On the Julian calendar, see Feeney 2007: 196–201.

the monumental version. This hypothesis suggests a new picture of the design and construction of the monumental meridian, which is based upon the pragmatic considerations of Roman large-scale construction; it would naturally have been constructed upon an empirical rather than a mathematical basis. This discussion can in turn shed light on its relationship with the other Augustan monuments in the northern Campus, especially the Ara Pacis, and thus clarify its ideological function. Finally, the contrasting treatment of the monumental solar meridian and the Ara Pacis by Domitian and Hadrian demonstrates the continuing centrality for imperial ideology of the model established by Augustus as *pontifex maximus*.

Chronology

One of the great achievements of Julius Caesar was the systematization of the traditional Roman calendar, which had fallen very badly out of synchronization with the solar year.[7] His Julian calendar, which, with some tiny adjustments, is still the one we use today, began running at the start of January, 45 BCE. He undertook this work as *pontifex maximus*, chief priest and custodian of the Roman calendar. But he was assassinated the following year, which hampered its correct implementation. The resulting error persisted long after the civil wars were over, for, in the confusion after Caesar's death, the triumvir Lepidus had succeeded him as *pontifex*. For many years after Augustus had become master of Rome, Lepidus continued to hold the office; he was mainly living in exile and was politically irrelevant, but the office of *pontifex* was held for a life term and there was no constitutional mechanism for removing him until he died.[8] Augustus was finally able to become *pontifex maximus* in 12 BCE, and thus to correct his adoptive father's calendar. But the correction was not implemented until 9 or 8 BCE, and it is worth considering what the new *pontifex* did during this three-year gap.[9] In this section, I offer an account of that gap and a suggestion as to the role played in that period by a solar meridian, though it is not a monumental one.

[7] On the ideological significance of Caesar's reform, see Feeney 2007: 193–211.

[8] *Res Gestae* 10.2.

[9] The date of Augustus' investiture as *pontifex* in 12 BCE is given by the *Fasti Praenestini*. Macrobius' account of Augustus' calendrical reform, quoted below, implies that it was promulgated at some point after the leap day at the end of February, 9 BCE. Censorinus (22.16) tells us that the name of the month of Sextilis was changed to Augustus in 8 BCE, and Suetonius (*Aug.* 31.2) implies that this change of name was more or less contemporary with Augustus' calendrical reform. Hence the reform may be dated to 9/8 BCE. This evidence is discussed in further detail below.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

One of the most important features of Caesar's calendar was the addition of a leap-day once every four years. In the period of civil war that followed his assassination, the priests who implemented the calendar misunderstood their instructions and inserted a leap-day every three years, by a mistake of inclusive counting.[10] This is the error that was eventually corrected by Augustus, as documented by Macrobius:[11]

> sic annum civilem Caesar habitis ad limam dimensionibus constitutum edicto palam posito publicavit, et [error] hucusque stare potuisset, ni sacerdotes sibi errorem novum ex ipsa emendatione fecissent. nam cum oporteret diem qui ex quadrantibus confit quarto quoque anno confecto antequam quintus inciperet intercalare, illi quarto non peracto sed incipiente intercalabant. hic error sex et triginta annis permansit, quibus annis intercalati sunt dies duodecim cum debuerint intercalari novem. sed hunc quoque errorem sero deprehensum correxit Augustus, qui annos duodecim sine intercalari die transigi iussit, ut illi tres dies qui per annos triginta et sex vitio sacerdotalis festinationis excreverant sequentibus annis duodecim nullo die intercalato devorarentur. post hoc unum diem secundum ordinationem Caesaris quinto quoque incipiente anno intercalari iussit et omnem hunc ordinem aereae tabulae ad aeternam custodiam incisione mandavit.

> When the precise calculations that had been made placed the civil year on a firm footing, Caesar published it with a decree that was publicly posted, and it would have continued in that form down to the present day, if the priests had not introduced a new error in the course of their corrections. For though they were supposed to insert the day that made good the four quarters at the completion of every fourth year, before the fifth began, they were intercalating not at the end of the fourth year but at the beginning. This error continued for thirty-six years, in the course of which twelve days were intercalated instead of the nine that were needed. But though it was caught only late, the error was corrected by Augustus, who ordered that twelve years pass without an intercalated day, so that the three excess days the priests' hasty error had produced over those thirty-six years would be swallowed up when no days were intercalated during the next twelve. After that, he ordered that one day be intercalated at the start of every fifth year, as Caesar ordained, and he ordered that the whole system be inscribed on a bronze tablet and so be preserved forever.

Macrobius' account is clear, coherent, and consistent. He has no reason to enumerate precisely which years had leap days before and after the correction, but this information can be inferred straightforwardly from the text.

[10] On the question of how the error arose, see Polverini 2016: 100–1.

[11] *Sat.* 1.14.13–15; text and translation: Kaster 2011. Many of these details are corroborated by Solinus (1. 45–7).

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

The standard interpretation of this passage was first put forward by the younger Scaliger in his *De emendatione temporum* of 1583, and there is no good reason to doubt it.[12] On Scaliger's account, the Julian calendar began in 45, and the first leap day was supposed to be inserted after four years, in 41, but by error it was inserted one year early in 42 and every three years thereafter. The final leap day was inserted by the erroneous rules of Lepidus' calendar in 9 BCE. At some point after February of that year, Augustus made his correction, and for the next twelve years the leap day was omitted. This omission of three leap days compensated for the fact that Lepidus' calendar had inserted twelve leap days over a thirty-six-year period instead of nine. Thus, after 9 BCE, there was no leap year until 8 CE.[13]

As L. Polverini has observed, it was important for Augustus to make his correction after the leap day of 9 BCE had been observed, for that marked a date thirty-six years after the commencement of the Julian calendar, a point when the three-year cycle of Lepidus and the four-year cycle of Caesar happened to coincide (as thirty-six is evenly divisible by both three and four).[14] This meant that, after the period of transition was over (in 8 CE), leap days would be celebrated on precisely the years they had been designed to do in Caesar's original calendar. If Augustus had begun his correction earlier, by omitting the leap day of 9 BCE, celestial observations would have been slightly different in perpetuity than had been intended by Caesar. In practice, this would not have made much difference to anyone, but by waiting Augustus was able to claim truthfully that he had restored exactly the calendar designed by his father. This afforded him yet another way to show himself to be a loyal

12 Scaliger 1583: 159; Bennett (2003: 222–3) surveys the alternatives to Scaliger's model. His own preferred alternative posits that a leap day was added in 44 (and thus under the supervision of Caesar, as it would have come a few days before the Ides of March). This implies that Caesar designed his calendar with the first leap day inserted in the second year of the four-year cycle, rather than at its start or end, which seems inherently unlikely. Scaliger's model is predicated on a more natural reading of Macrobius and has the virtue of positing that Augustus' reform of the calendar was designed to bring it precisely back into alignment with Caesar's original design. Having decided to implement such a careful, gradual, and elegant correction, Augustus would scarcely have been satisfied with a calendar that would remain in perpetuity one day out of sync with Caesar's, despite the arguments of Bennett (2004: 166–7). Every one of the eight possible solutions enumerated by Bennett (2003: 225–6) stipulates that Augustus as Pontifex Maximus knowingly and wrongly intercalated a day in one of the years between 11 and 8 BCE. Only Scaliger's model explains why he did so: to permit bringing the calendar eventually back into sync with Caesar's.

13 According to the text and table of years given by Scaliger 1583: 158, the leap years actually celebrated were thus: 42, 39, 36, 33, 30, 27, 24, 21, 18, 15, 12, 9 BCE; and then 8, 12 CE, and so on. The question of whether a leap day was also inserted in 45 BCE, the first year of the new calendar, does not bear directly upon the matter at hand.

14 See Polverini 2016: 102.

son and a worthy heir. Augustus therefore had a good practical reason to wait until after 9 BCE to make his change.

The question then is: what did the new *pontifex maximus* do in the years between 12 and 9 BCE? An advance declaration of the specifics of the intended correction would have been confusing to the layman, and would have prompted some awkward questions: if Lepidus' calendar was in error, why did Augustus deliberately persist in making 9 BCE a leap year in accordance with the erroneous three-year cycle? Why insert knowingly a superfluous leap-day in 9 BCE only to remove it later? There was in fact a good answer to these questions: it permitted the Augustan reform to replicate the precise intention of Caesar. But the easiest strategy was simply to wait to announce the correction after the final leap-day of Lepidus' calendar at the end of February in 9 BCE, thus avoiding the need to explain all this in advance to the Roman people. What did Augustus do in the meantime? Simply ignoring the broken calendar for three years was not an option. The problem was not a secret, and it was imperative for Augustus to demonstrate promptly his authority and efficacy as *pontifex maximus*. The obvious solution to the conundrum was to announce a period of public investigation into the damage wrought by Lepidus. This would have demonstrated his intention to take charge of his father's calendar while postponing the correction to a more convenient point in the future.

It is very likely that Augustus already knew of the problem with the calendar before he became *pontifex maximus*. By 12 BCE, the equinoxes and other sidereal landmarks had already slipped from their appointed dates by two days and three-quarters. The reason he did nothing about it while Lepidus was alive is obvious. It was part of his outward show of absolutely scrupulous respect for the office of *pontifex maximus*. Lepidus could do nothing; Augustus had placed him in an utterly impotent position.[15] Whatever displeasure Augustus might have felt about the drift of the calendar would have been balanced against the satisfaction afforded by this continuing demonstration of Lepidus' unfitness for the role he had usurped. Augustus had plenty of time to prepare in advance his calendrical reform. The delay in announcing that reform until at least 9 BCE must have been part of the plan.

As Augustus says in the *Res Gestae* (10.2), his belated investiture as *pontifex maximus* was an occasion of great public importance, with massive crowds from all over Italy in attendance. The precise date of that occasion is given as March 6, 12 BCE by the *Fasti Praenestini*.[16] This was merely six

[15] On Augustus' treatment of Lepidus in this period, see Dio Cass. 54.15.4–7.
[16] *CIL* 1^2.233: *Fe[riae ex s.c. quod eo die I]mp. Caesar August. Pont M[ax factus est Quir]inio et Valgio Cos.* See also Degrassi 1954: 82.

days after Rome had observed a leap-day, which had been inserted into the calendar for that year according to the erroneous practice of Lepidus. Augustus therefore knowingly permitted that extra day, just as he would do three years later. His intention was to exploit the propaganda value of Lepidus' error, and to delay the correction until after the convenient date of 9 BCE. The idea of leap days was in the Roman public mind on account of the leap day observed in the previous week, so it is very likely that Augustus mentioned the Julian calendar when he first spoke in public as the new *pontifex*. What did he say? If he went into specifics about the calendar, that would have implied that he had already been looking at it while Lepidus was alive, effectively shadowing him as *pontifex*, which would have contradicted his scrupulously hands-off attitude of absolute respect for the office during Lepidus' lifetime, which he advertised so very prominently in the *Res Gestae* (10.2).[17]

I think it is a reasonable hypothesis that, upon becoming *pontifex*, Augustus began his tenure by announcing a public investigation into the unfortunate state of his father's calendar. Thus, the seemingly odd gap of pontifical inactivity in the years between 12 and 9 BCE was, in fact and by design, a period of calendrical observation and investigation. The natural instrument for testing the correctness of the calendar is a solar meridian. But what meridian was used? Not the monumental one, for its obelisk was not dedicated until 10/9 BCE. No obelisk had ever been brought to Rome before, and it would have been foolhardy to make the correction of the calendar depend on its successful and timely erection. The monumental meridian was a spectacular way for Augustus to advertise his successful custody of the calendar, but for the more limited and immediate aim of demonstrating the error of Lepidus, all that was needed was a solar meridian on a normal, human scale. It is possible that there already existed in Rome such an instrument, constructed by Julius Caesar at the time of the promulgation of his calendar. If so, all that was necessary was to take careful readings from it. Alternatively, Augustus could have proclaimed on March 6, 12 BCE the rapid computation and creation of a non-monumental meridian. Something on a human scale: not thirty meters tall, but perhaps three meters.

There are two ways to use a meridian to check the accuracy of the civil calendar. The straightforward way is to examine the noontime shadow on a particular day of the year and check that the reading of the sidereal year is correct: for example, on September 26 (or 25, in leap years), which was supposed to correspond with the autumn equinox in

[17] See Scheid 2005: 187–92.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

the Julian calendar.[18] In 12 BCE, a meridian would have shown that measurement to be about two days and three quarters off, thanks to Lepidus. But declaring an error in the calendar on the basis of a reading in this manner presumes that one has calculated and constructed the meridian with absolute precision. One would need to be completely confident in the accuracy of all of the tables of astronomical and mathematical data on which it was based. As Schütz has shown, ancient astronomers were capable of a very high degree of precision in these calculations, but creating a practical instrument of such accuracy was not easy, and one could always debate its correctness. It happens that there is another way in which a solar meridian could have demonstrated the inaccuracy of Lepidus' calendar. This method would have been easily explained to the layman, and it did not require the cross-hatchings on the meridian to have been measured with any great precision. In fact, the cross-hatch degree-markings could have been placed quite arbitrarily without affecting the result.

This other method also has another feature to recommend it: it required three years of observations, which is precisely the length of time Augustus needed if he wanted to delay the promulgation of his correction until the most convenient moment: after the end of February, 9 BCE. My hypothesis is that in 12 BCE Augustus staged a three-year process by which the error was "discovered" with the help of a solar meridian under his auspices as *pontifex*. I should point out that this argument would also work if this was a genuine process of discovery. In that case, the observations over these three years were not just a public-relations pantomime, but genuinely helped to convince Augustus and the other priests of the nature of Lepidus' error. But given the long time Augustus had to prepare for this moment, it is more likely that he knew exactly what he was doing and that in 12 BCE he already knew full well the answer to the question he put to the Roman public.

The other way a solar meridian can demonstrate the harmony of the civil calendar with the movement of the sun consists of observing how the noontime shadow on the pavement returns to the same place on the same date every year. Except that it does not, not quite. The year, which is to say the period of the revolution of the earth around the sun, is not divisible into a whole number of days (the period of the rotation of the earth). So no calendar of whole days can keep perfectly in synchronization with the solar year. In fact, the year is almost exactly 365 1/4 days

[18] Schütz 1990: 447.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

long.[19] The Julian calendar thus adds a leap day every four years to account for the extra quarter-day which is accumulated each year. Let us imagine, assuming a correct Julian calendar, that a group of observers records the precise location of the shadow at noon via a solar meridian on any given date in a leap year after the end of February. If they return on that same date one year later, they will find that the shadow is almost exactly in the same place. But if the resolution of the meridian is precise enough, it will reveal a very small drift in position, the equivalent of 1⁄4 of a day.[20] The next year it will slip further by that same margin, and again in the third. Returning on that same date in the fourth year, after the insertion of a leap day, our observers will find that the accumulated drift has been corrected: the position of the shadow will have jumped back precisely to the position of its initial observation in the first year of the cycle, thanks to the addition of a leap day in the interim. In other words, in the properly functioning Julian calendar, if you make an observation on any given date, the position of the noontime shadow will return to precisely the same position on that same date four years later.

Under the calendar of Lepidus, however, this demonstration will have failed, for it presumed a three-year cycle and thus an incorrect length for the solar year of 365 1⁄3 days. Let us assume that Augustus publicly ordered the observation of a human-scale meridian at Rome in 12 BCE, immediately after his investiture on March 6. The priests took precise observations of the position of the shadow on various dates of that year. They repeated these observations on the same calendar dates in the next year (11 BCE) and again in the next (10 BCE). Each year they will have found the position of the shadow of the gnomon to be in almost the same place as on that date the previous year, with a tiny amount of drift, just as expected. Then a leap day was inserted at the end of February in 9 BCE, and, if the calendar of Lepidus had been correct, this should have corrected the drift quite precisely: the observed position of the shadow ought to have returned to the exact position it was for the original observation on that same calendar date in 12 BCE. But the observations in 9 BCE will have failed. The insertion of the leap day after three years would indeed have moved the shadow against the direction of the annual drift, but the shadow will

[19] In this discussion, I ignore the fact that, as was already known in antiquity, the figure of 365 1⁄4 is itself an approximation, though a very close one; that discrepancy is what eventually necessitated the Gregorian reform.

[20] See Albèri Auber 2014: 63.

have moved too far, beyond the point of the original observation: there was an overcorrection of the drift.

This three-year cycle of observations did not depend in any way on the accuracy of the zodiacal divisions and degree markings on the meridian. It was an extremely robust, practical, and Roman demonstration of Lepidus' failure. The priests would have been able to announce an uncontrovertibly secure demonstration of the incorrectness of Lepidus' calendar soon after the leap day was inserted at the end of February, 9 BCE. At some point not very long afterward, Augustus announced his edict correcting the calendar. In 8 BCE, in connection with the edict of correction, the Senate passed a *senatus consultum* changing the name of the month Sextilis to Augustus, just as July had earlier been given that name after his father, the creator of the calendar, Julius Caesar.[21] The intimate connection between Augustus' correction of the calendar, his construction of the meridian and the Senate's renaming of Sextilis in his honor can be seen most vividly in the very words of the *senatus consultum* that renamed the month, for it quoted verbatim the text of the obelisk's dedicatory inscription. In 8 BCE, the Senate's proclamation included the words *Aegyptus hoc mense in potestatem populi Romani redacta* (Macrob. *Sat.* 1.12.35), which is a clear echo of the text which had been put on the base of the obelisk just one or two years before: *Aegupto in potestatem populi Romani redacta* (*ILS* 91, 10/9 BCE).

At the end of the passage quoted above (*Sat.* 1.14.13–15), Macrobius adds that Augustus monumentalized his calendrical decree in bronze. He does not say where, but one natural place for it would have been as part of the monumental solar meridian. This monument appears to have been designed to document the (eventual) proper functioning of the calendar of Caesar, and it is reasonable to suppose that its construction was connected with Augustus' decree correcting the calendar in 9/8 BCE. The monumental meridian was inspired by a combination of three things: the prior existence in Rome of a small-scale solar meridian, erected by Augustus as an instrument of religious policy from 12 BCE onwards, in order to demonstrate publicly the error of Lepidus; the presence of a new obelisk in the Campus; and the desire of Augustus, as reported by Macrobius, to publicize and document his correction of the calendar. The stroke of genius in creating this massive monument was not primarily

[21] Suetonius (*Aug.* 31.2) attributes the change of the name of the month to Augustus himself, but Macrobius (*Sat.* 1.12.35) preserves the text of the *senatus consultum*, which is also mentioned by Censorinus (*de die natali* 22.16), who gives its year (8 BCE).

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

scientific but political. The task of building it was made straightforward by the existence of a meridian that just needed to be copied on a larger scale. Indeed, as we will now see, scaling up a small meridian is by far the most convenient strategy for building a monumental one.

Construction

Discussions of the design of the solar meridian of Augustus tend to start from the assumption that it was fundamentally a scientific instrument rather than a monument, albeit one which imitates the form and functionality of a scientific instrument. This might seem a trivial semantic distinction, but conceptualizing the meridian primarily as a monument has several important consequences for how it was designed and constructed and for how it was read by different groups in Rome.[22] The usual premise is that the location of the bronze markings on the meridian pavement were directly computed by a formula which took the height of the monumental gnomon as a mathematical input, but there is another possibility. Chronology suggests that there already existed in Rome, from at least 12 BCE, a normal-scale meridian which would have been set out using the ancient computational methods described by Schütz. All that was necessary was to scale that meridian up to a massive size, at a factor of perhaps ten times larger.[23]

In support of the principle that the great solar meridian was fundamentally a monument, the point needs to be made that its great size did not make it a better scientific instrument; quite the contrary. It is true that its large scale increased the length of the pavement and thus gave a more generous spacing to the bronze cross-hatch marks which indicated the degrees of the zodiac. This could, in theory, yield an instrument of increased precision. The problem is that increasing the height of the gnomon also inevitably increases the fuzziness of the shadow it casts. The edges of shadows cast by the sun become increasingly indistinct as the distance between the object and the ground increases.[24] This is easily appreciated by looking at the shadow cast by an object such as a tall lamppost. Near the bottom, the shadow has sharp edges; further out, the shadow itself is still quite unmistakable; but at the edges there is a gradual transition from light to dark such that it is impossible to tell exactly where the side edges should be measured.

22 For an account of the cultural meaning of monumental form in imperial Rome, see Thomas 2007.
23 Schütz 2014a: 44 mentions in passing the possibility of working from a smaller-scale model.
24 Schütz 1990: 450–3.

So, for a higher gnomon, the increase in resolution potentially afforded by a longer pavement tends to be swiftly cancelled out by the increasing difficulty of deciding where the shadow starts and ends. This stands in contrast to the later practice of constructing solar meridians inside churches, as in, for example, the one constructed by Francesco Bianchini in S. Maria degli Angeli, which is situated in the former baths of Diocletian.[25] These instruments use a beam of light falling on the floor from a pinpoint hole. The beam does expand as it falls, but its edges remain relatively sharp and the resulting oval of light on the floor has a clearly defined perimeter. In this case, the large size of the meridian does yield higher precision. But that is not the case for a meridian which operates by means of a shadow. The monumental size of Bianchini's meridian is a useful and necessary consequence of its function as a scientific instrument of maximal accuracy, but the monumentality of the meridian of Augustus needs to be accounted for in terms of its public message rather than in purely scientific terms.

The other important principle of design that must be established is that, if there existed a solar meridian with a gnomon of any size at the latitude of Rome, the layout of the monumental pavement could have been determined without employing any astronomical computation or without writing down a single number. It is well known to astronomers that, for a given latitude, the features of a meridian are directly proportional to the height of the gnomon.[26] It was certainly not necessary to preordain an exact height for the globe on top of the obelisk, as many scholars have supposed; it was not necessary even to measure it directly. A non-astronomer could observe by means of trivial geometry that all of the measurements on a small meridian pavement for a given latitude could be straightforwardly scaled up for a meridian with a gnomon of a larger size. In other words, provided that the mathematician Novius Facundus had an elementary knowledge of Euclidian geometry, he need not have had any specialized knowledge of astronomy whatsoever.

This is easily demonstrated. Figure 3.1 represents the relationship between any given feature of the small meridian at a distance m from the small gnomon and the equivalent feature on the large pavement at a distance M from the tall gnomon. Both gnomons are vertical, both pavements are horizontal, and we may simplify for the present purpose by assuming that the rays of the sun are

[25] Heilbron 1999.
[26] Schütz 1990: 455: "Bei einer Horizontalsonnenuhr sind alle Maße des Liniennetzes proportional zur Gnomonhöhe." Thus the formula given by Schütz 2014b: 99 for computing the measurements of the meridian according to ancient techniques includes the height of the gnomon as a simple multiplicative factor.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

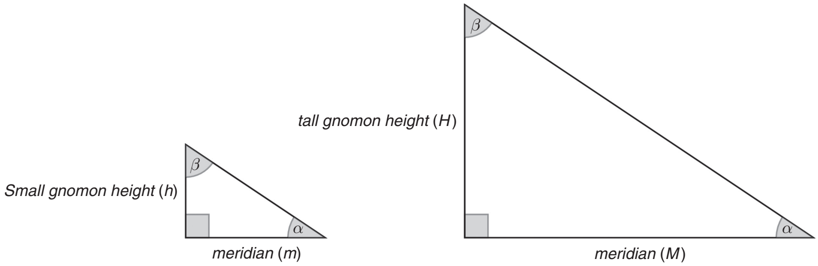

Figure 3.1: Scaling a solar meridian: $M = H/h \times m$.

parallel. Since all of the sides of the triangles are parallel, their internal angles are the same and the triangles are *similar* by definition. The proportionality of the dimensions of *similar* rectilinear figures is a fundamental observation of geometry. This is, in fact, the first definition in Book 6 of the *Elements* of Euclid, who goes on to prove explicitly that the corresponding sides of triangles facing identical angles are proportional to each other.[27] Since they stand opposite to equal angles, H is proportional to h as M is to m. Thus the dimensions of the new pavement simply need to be scaled by the same proportion as the gnomon. In other words, to determine the position of any point on the big meridian pavement, all we need to do is multiply the distance of the corresponding point on the small pavement by the ratio of the gnomon heights (i.e. $H/h = M/m$, so $M = H/h \times m$). If there already existed at Rome a meridian with a gnomon three meters tall, all of the features for a meridian with a gnomon thirty meters tall could be determined by copying the small pavement and enlarging all of its measurements by a factor of ten.

The really tricky part of constructing a meridian, which requires expert astronomical knowledge, is determining the angle β, which is equal to the declination of the sun from the zenith at noon. This depends upon two variables. The first is the current point in the sidereal year as the earth revolves in its elliptical orbit around the sun at a speed which varies with the seasons; this causes the sun to appear to travel with varying speed across the background of the fixed stars of the zodiac. The second variable is the geographical latitude of the observer. So a meridian computed for one latitude cannot be used at another latitude. The first meridian at Rome in the time of Julius Caesar or Augustus must have been designed by means of the astronomical computations explained by Schütz, but this step was not

[27] Book 6, Proposition 4: "In equiangular triangles the sides about the equal angles are proportional where the corresponding sides are opposite the equal angles."

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

necessary for subsequent local copies. Of course, this does not absolutely rule out the possibility that the monumental meridian was designed by direct computation, as most scholars have assumed, rather than by copying. But if we consider the practicalities of monumental construction, the advantages of avoiding direct mathematical computation are overwhelming.

Whereas a scientific instrument on a human scale could be constructed by people who understood its design, a monument would have been built by large numbers of illiterate and innumerate laborers, who certainly would not understand the fine points of astronomical calculations. What they would have understood very well, however, are precise scale drawings. We now know a great deal, thanks especially to the fundamental research of L. Haselberger, about the vital role played by architectural drawings in ancient construction projects.[28] All a Roman building crew needed for this project was an accurate plan drawn to scale, which seems to be what Vitruvius meant by the term *ichnographia* (1.2.2). Roman builders were not accustomed to working with plans in which every feature was given a numerical, astronomically derived measurement. And if they were given such a plan, they might not have been able to read it. Nor were they accustomed to working in a way that depended upon the use throughout the project of an externally defined unit of measure.

If a Roman architect were to provide the contractor with a scale drawing of a new building, he would only need to agree upon the absolute measurement of a single reference length, such as the width of the foundation; this could be used as a point of reference for the rest of the project and all other features would be built as proportions of that measurement.[29] He could then rest secure in the knowledge that the remainder of the project would take its measurements relative to that agreed standard, regardless of local variances from the accuracy of standard units. Augustus made great efforts to standardize units of measurement in the Roman world, but this needs to be understood in the context of pre-modern culture. An advantage of working with scale drawings was that, if the reference length was measured out in a way that turned out to be a bit different from what had been intended, as must have happened often, the project would still be properly proportioned and structurally sound, even if it was a fraction

[28] See for example Haselberger 1980; Haselberger 1983; and Haselberger 1994. For a recent analysis of the use of scale drawings in ancient construction, see Senseney 2011.
[29] On the use of scale plans in Roman architectural practice, see Wilson Jones 2000: 49–68.

larger or smaller overall than the architect had intended.[30] The foreman could easily ensure that all his workers were using the same unit, even if it was an arbitrary one; that was easy. What was not easy was ensuring that the workers used a universally standardized Roman foot. So a plan drawn to scale, copied from an existing instrument somewhere in Rome, would have been much preferable to a mathematically calculated plan.

The first step was to create an accurate scale drawing of the existing human-scale meridian. It would have been very long and very thin, perfect for copying onto a roll of papyrus.[31] The next step was the provision to the builders of a reference length for the monumental pavement. The obvious choice for this would be the total length of the meridian pavement, from solstice to solstice. One method of determining the length of the monumental meridian was to measure the height of the obelisk, divide it by the height of the smaller gnomon, and multiply that by the length of the smaller meridian. The same procedure would determine the distance of the near end of the pavement from the center of the base of the gnomon. Then the workers would have needed to ensure that the monumental meridian was centered and ran precisely to the north. This method would therefore have left a number of problems to solve, which would have required close supervision of the project by someone who understood astronomy. Fortunately, there was an even easier way.

It is reasonable to suppose that Novius Facundus directed the construction in a way that was easiest for the builders to understand and which required the least hands-on supervision. Accordingly, in 9 BCE or shortly thereafter, he ordered a bronze globe to be added to the top of the obelisk which had been set up the previous year (assuming that the obelisk had been erected before the meridian was conceived; see below). He then flattened the ground and marked out a temporary line running precisely north from the obelisk. He waited for the next solstice, which could be anticipated by observing the readings of the small meridian. He ordered the contractor in charge of construction to lay down a single slab of paving. At high noon on each of the days around the solstice, he lightly marked the location of the shadow. The farthest mark indicated the solstice and this was permanently marked in the pavement with an incision. He then waited for six months. Around the next solstice, he ordered the contractor again to lay down a slab and again he noted the position of the noontime shadow at

[30] On variations from standard units as evidenced in the measurements of surviving Roman buildings, see Wilson Jones 2000: 71–2. On margins of error in building from a plan, see Taylor 2003: 66–75.

[31] For the use of papyrus in Roman architectural designs, see Wilson Jones 2000: 52–4.

its opposite extremity. He then told the contractor to connect the two slabs with a continuous pavement and to embed a straight line in bronze which connected his two incised marks. He then handed over the papyrus with an exact scale drawing of the smaller Roman meridian and explained that he should make a copy in bronze of all of the markings on the papyrus, with every feature scaled as carefully as possible, using the length of the newly created line connecting the solstice marks as his reference length. At this point, the building contractor could be left alone to get on with doing his work in his usual fashion without any expert supervision. This method had the disadvantage of involving some delays in waiting for the solstices, but it was foolproof as a means of monumental construction.

In practice, the workers need not have used Roman feet or any official unit of measure; they would have used whatever units were convenient for the project. For example, they might have used a unit which was a convenient divisor of the length of the meridian line. They may not have measured every cross-hatch separately, which would have been tedious. Instead, they might have covered the papyrus plan in a grid of fine lines and marked out a corresponding grid on the ground with stakes and twine.[32] The workers could then use the grid to approximate the placement of the bronze markers on the pavement with reasonable accuracy. The fact that the work of copying was not always done perfectly is demonstrated in the excavated portion of the meridian, where there is one badly anomalous cross-hatch.[33] It looks like the workers forgot to copy one degree marker and then inserted it as an afterthought at the end of one zodiacal section to bring the total number of cross-hatches up to the correct total of thirty.[34]

This construction procedure implies a certain lapse of time after the erection of the obelisk before the construction of the meridian could begin. First, the builders had to wait for a solstice; then they had to wait six months for another solstice; only then could construction of the line connecting them begin. An inscription dates the dedication of the obelisk to 10/9 BCE, with the earliest date being June 26, 10 BCE, just after the summer solstice.[35] This suggests a *terminus post quem* for the meridian of 9/8 BCE, which is also the date of the calendrical reform of Augustus that it

[32] On the use of cords and stakes to translate a scale plan to a building site, see Taylor 2003: 64–6.
[33] This is the degree marker at the end of Aries/start of Virgo which overlaps with the last letter of the word ΕΤΗΣΙΑΙ; for photographs, see Buchner 1982: 110–12.
[34] The 360 degrees of the zodiac were apportioned by astronomers into 12 equal signs of 30 degrees each; see Schütz 2014a: 43.
[35] La Rocca 2014: 141.

was evidently designed to celebrate. The question remains as to whether the obelisk was transported from Egypt and erected in the Campus Martius with the original intention of serving as the gnomon for a solar meridian. I now incline to agree with the arguments of P. Albèri Auber that it was not.[36] There are two pieces of evidence which suggest that the meridian may have been a brilliant afterthought; neither is decisive, but in combination they are suggestive.

The first issue is the orientation of the obelisk. When its fragments were being excavated, James Stuart measured the orientation of the base and found, to his puzzlement, that it was not rotationally aligned with the north–south axis of the meridian that was described by Pliny. He suggested that this indicated that the meridian was added after the obelisk had been erected.[37] It does seem strange that the sides of the obelisk were not aligned with the meridian, which is the object with which it came to be most closely connected. The second piece of evidence is the language of Pliny, who twice uses the word "added" (*addidit*) to describe the transformation of the obelisk into a gnomon for the meridian. First, he says that Augustus "added" the functionality of the solar meridian to the obelisk, and then that Novius Facundus "added" the gilded ball to the top, to serve as the tip of the gnomon.[38] This language is not decisive, but it fits very well with the idea that the newly erected obelisk was cleverly pressed by Facundus into an unforeseen role.

The obelisk was not oriented with respect to the meridian, but it was oriented with respect to the Ara Pacis, the construction of which was already underway in this period. It was vowed in 13 BCE and was dedicated in 9 BCE, a span which overlaps the dedication of the obelisk in 10/9.[39] So the erection of the obelisk probably happened in the period after the location and orientation of the Ara Pacis had already been chosen, and it is clear that its position was determined primarily by its relationship to the altar. It was placed so that a line through the center of the Ara Pacis along its main axis also passed through the center of the obelisk.[40] The distance of the obelisk from the altar was then determined by choosing a point along that line at which the obelisk forms approximately a right angle between that axis and the center of the

[36] See Albèri Auber 2014: 69, rejected by Haselberger 2014b: 193–4.

[37] See Bandini 1750: letter 13, 74 with Schütz 2014a: 47.

[38] Albèri Auber 2014: 69.

[39] The altar was dedicated on January 30, 9 BCE and the latest date for the dedication of the obelisk is June 25 of that year, so it is possible that they were dedicated in tandem.

[40] Haselberger 2014b: 171 with 172, fig. 4 points out that this axis was identified as early as 1940 by G. Gatti. See also Schütz 2014a: 44, fig. 1.

Mausoleum of Augustus.[41] Because the Ara Pacis was aligned with the Via Flaminia, the combination of right angles from it to the obelisk and from the obelisk to the Mausoleum means that the line of sight from the obelisk to the Mausoleum ran parallel to that road, which was the main axis of the area (see Figure 3.2).[42]

This precise right triangle satisfactorily explains the positional juxtaposition of the three monuments, but there is one additional piece of information that needs to be taken into consideration.[43] As we have seen, James Stuart was surprised that the base of the obelisk was not oriented toward true north. His careful measurements determined that its sides were turned fifteen degrees west of north. This is nearly, but not quite, the same orientation as the Via Flaminia, for the present-day Via del Corso runs about eighteen degrees west of north, and so too does the line connecting the obelisk and the Mausoleum. The rotational orientation of the obelisk was therefore three degrees skewed with respect to the right angle it represented within the large triangle. This rotational variance does not take anything away from the precision with which the three monuments form that triangle by virtue of their position, but it is nonetheless an anomaly.

The most plausible explanation is that the orientation of the obelisk was a slight and unobtrusive error resulting from the large distances involved. The Mausoleum was about 350 meters away from the obelisk and the altar about 90 meters away, so a skew of three degrees in the faces of the obelisk facing them would not have been readily apparent. The site of the Ara Pacis may have been covered in scaffolding when the obelisk was erected, which might have contributed to the error. To give a similar example of a near-miss in orientation on the Campus Martius, the present-day Pantheon, which replaced Agrippa's structure, clearly faces the Mausoleum of Augustus over 700 meters to the north.[44] But the line connecting them runs a few degrees west of true north, and the entrance to the

[41] See Heslin 2007: 15n75. This right triangle was first illustrated clearly by Schaldach 2001: 92, fig. 51; *pace* Haselberger 2014b: 179n35, Buchner 1982: 54, fig. 19 does not make that particular point. As A. Claridge points out (in Häuber 2017: 664) the circular shape of the Mausoleum does not naturally lend itself to precise rectilinear alignments.

[42] For the rotational alignment of the Ara Pacis, see Moretti 1948: pl. 36, a plan which shows it *in situ*, square with the orientation of the building over it and thus with the dog-leg corner in Via in Lucina, which is perpendicular to the Via del Corso.

[43] Haselberger 2014b: 179n35 has misrepresented the force of my earlier proviso "give or take an angle of 3 degrees" (Heslin 2007: 15). My caveat does not apply to the right triangle, as Haselberger implies. It only applies to the rotational alignment of the obelisk and its base with respect to that triangle.

[44] La Rocca 2014: 125–32 and Claridge in Häuber 2017: 666.

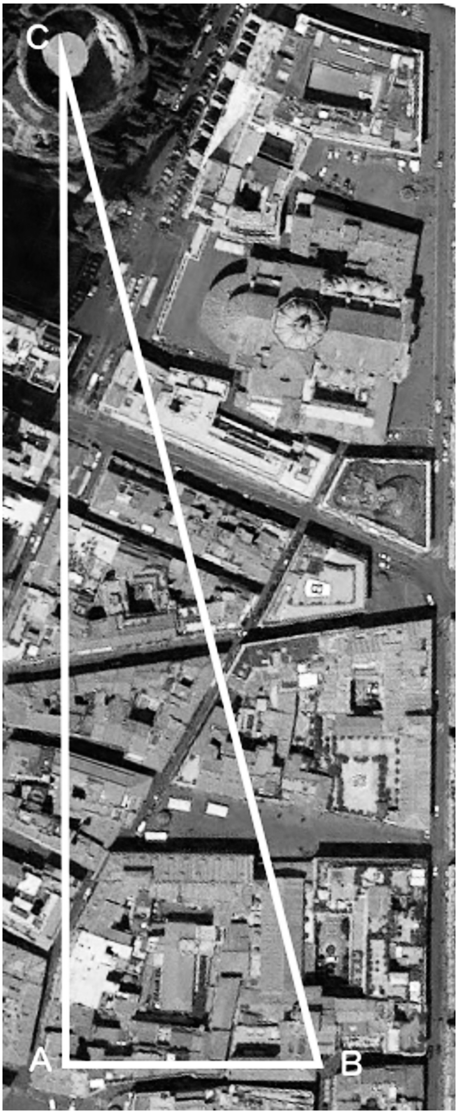

Figure 3.2: The right triangle approximately formed by the obelisk (A), the Ara Pacis (B) and the Mausoleum of Augustus (C). The image has been rotated eighteen degrees clockwise from true north so that both the Via del Corso at the right edge of the image and the line AC are vertical. The image is from Google Earth, version 7.1.5.1557.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

Pantheon is not exactly oriented toward the Mausoleum, but a few degrees still further west of north.[45] Urban juxtapositions of large structures, as opposed to astronomical alignments, need not be mathematically precise to be striking to the casual viewer and therefore significant.[46]

We thus have the following chronology:

13 BCE	Commencement of work on the Ara Pacis
10/9	Dedication of obelisk
9	Dedication of the Ara Pacis
9/8	Edict correcting the calendar
After 9/8	Construction of monumental meridian

The site of the Ara Pacis was chosen first, perhaps by the Senate rather than Augustus, to lie at a point along the Via Flaminia one mile before it crossed the Augustan *pomerium*. It was thus natural to align it with the road; the obelisk then shared that orientation as a matter of course. The orientation of the meridian toward true north clashes awkwardly and obviously with that of the two preceding monuments. This suggests that the trio of monuments was not designed in advance by an all-knowing Augustus. One feature of Buchner's vision which has tended to persist is the idea that the obelisk, the solar meridian, and the Ara Pacis were conceived together as part of a "unitary program."[47] But if the complex had been built to a preordained design, we would expect the obelisk and Ara Pacis to be oriented in their rotation with respect to true north, as the meridian absolutely had to be, rather than with the Via Flaminia. It appears that the three monuments were erected separately and individually as part of a dynamically ongoing and evolving dialogue about the nature of Augustus' new role as *pontifex maximus*.

It follows that the juxtaposition of any particular astronomical feature on the meridian pavement with the Ara Pacis was of necessity purely fortuitous. Buchner claimed that the entire complex was part of a unified, preordained design, and a crucial feature of that design was that an east–west line drawn through the equinox mark on the meridian would hit the Ara Pacis. But if my account of the empirical manner of construction of the monumental meridian is correct, the eventual position of the equinox point was not even known in advance.[48] The fact that a line

[45] See La Rocca 2014: 131n32 with Hannah and Magli 2011.

[46] *Contra* Haselberger 2014b: 179n35. [47] The quote is from La Rocca 2014: 144.

[48] The position of the equinox point could have been determined by using the technique demonstrated by Vitruvius (9.7.2–3) for a meridian at the latitude of Rome. But there was no need to do so.

drawn through it happens to pass through the Ara Pacis is simply a result of the proximity of the monuments. All of the available evidence can be explained without positing any connection between the equinox-point on the meridian and the Ara Pacis (except for the three-degree rotational skew of the obelisk – but the other hypotheses cannot explain that, either). Against my own previous statement of this position, Haselberger has objected that Occam's razor is not a probative principle.[49] Indeed so; I had already acknowledged that very point: "Of course, Buchner's reconstruction cannot ever be disproved absolutely, even if the entire Campus were dug up."[50] The burden of providing evidence remains with those who wish to posit a link between the equinox point on the meridian and the altar. No one would deny the much weaker claim that "On Augustus' birthday, the end of the obelisk's shadow pointed at the Ara Pacis."[51] But that is a statement of no consequence whatsoever, for it is true that the shadow pointed in the general direction of the altar at some point in the day on many days of the year.[52]

Even among those who reject Buchner's attempt to connect the equinox point on the meridian and the Ara Pacis, many scholars still wish to salvage a connection between the afternoon shadow of the obelisk and the altar.[53] But there is no aspect of their mutual positioning that cannot be explained much more simply by their juxtaposition as monuments.[54] The sheer number of potential juxtapositions of the shadow and the Ara Pacis on so many days of the year is what tells against the significance of any of them. The shadows cast by tall objects are a routine fact of life; they do not

[49] Haselberger 2014b: 201n100, responding to Heslin 2014. Note, however, that the principle of the *lectio difficilior* is not the opposite of Occam's razor, as Haselberger claims. On the contrary, it is an elegant example of the application of that razor in the field of textual criticism, where the diversity of variant readings is explained by the single, economical hypothesis of progressive banalization.

[50] Heslin 2007: 19. [51] Hannah 2014: 114.

[52] I once loosely said that the shadow points toward the Ara Pacis on every afternoon of the year, by which I meant simply that it veered in an eastward direction. Hannah 2014: 114 helpfully corrects my misstatement, pointing out that the shadow would not travel sufficiently eastward to point at the altar in midwinter. The matter is discussed in greater technical detail by D. Dearborn in an appendix to Frischer forthcoming. Frischer and Dearborn also exclude the summer period when the afternoon shadow is too short to reach all the way to the altar (though the shadow still points directly toward it at some point every day in summer). Even so, by Frischer's calculations there remain forty-eight days of the year when the shadow falls upon the Ara Pacis (in February/March and again in September/October).

[53] See passim, the contributors to Haselberger 2014c and Frischer et al. 2017.

[54] The question is explicitly framed by Frischer et al. 2017: 78–82, but the specific issue under discussion there, the distance between the altar and obelisk, is more straightforwardly explained by the right triangle formed with the Mausoleum than by the production of "hundreds of solar-shadow alignments throughout the year."

have an inherent meaning unless something else, like the marks on the meridian pavement, calls attention to them. This is not to say that the ideological dialogue between the Ara Pacis on the one hand and the obelisk and meridian on the other was unimportant: quite the contrary.[55]

Ideology

The Greek writing on the meridian pavement suggests strongly that it is a copy of an implement whose origins were from elsewhere. Its generic model was presumably found somewhere in the Greek world, but it could not have been copied exactly from a Greek exemplar. There are no major Greek cities on the same latitude as Rome, so the internal proportions of the meridian would have to have been computed specifically for Rome. The small-scale meridian which I have hypothesized to have been constructed for the priests in charge of the calendar by Augustus in 12 BCE would naturally have been in Greek, as it was a purely scientific instrument. The process of monumental copying preserved that aspect of its model and did so deliberately. A public monument in the city of Rome with Greek inscriptions is most unusual, so a decision must have been taken not to translate the pavement into Latin. Considering the meridian as a Roman monumental copy of a Greek scientific instrument can inform our view of how it was read. A scientific instrument is designed to give specific technical information to a very specific group of people who have been educated in reading it. But a monument has a vastly broader audience with various levels of education, and the solar meridian could speak to these people, too. It advertised the scientific expertise with which Augustus rescued the Julian calendar from the error into which Lepidus had left it to drift. And, crucially, the use of Greek did not impair the most important public functionality of the instrument: the demonstration that the shadow fell at noon on precisely the same place every year on the same day of the Roman civil calendar.

Those viewers who did not know Greek were not limited to staring at the technical aspect of the meridian in dim incomprehension. Anyone at any level of education could use it to check the correct working of the Julian calendar. All you had to do was to visit the instrument at noon on a particular date – for example, your birthday – and then return again at noon on the same date the next year and see that the shadow was in the

55 Heslin 2007: 15–16.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

same place.[56] Thus the way that Caesar and Augustus had finally rectified the chaos of the Roman calendar would be evident to all. Even a completely illiterate Roman could interpret that aspect of the functionality of the instrument. And all Romans truly did benefit from the civil calendar finally keeping in synchronization with the seasons.

The current zodiacal position of the sun in the sidereal year was information of much more limited interest. Of course, the ancient audience would include people who were quite familiar with this sort of instrument and knew how to read it. They would understand the Greek inscriptions and would immediately know which side of the pavement was relevant to the present half of the year. They could determine what degree of what sign of the zodiac the solar year had reached, and they could go home to look that information up in their *parapegmata* in order to connect it with meteorological and other phenomena.[57] On the other hand, a primary purpose of the Julian calendar was to eliminate the need to keep track of the solar year separately from the civil calendar. Paradoxically, the monumental meridian proclaimed the obsolescence of its zodiacal readings for the educated Roman layman who was not interested in Greek astronomy for its own sake.

This monument therefore spoke to the many Roman citizens who could not read Greek at all. The inscriptions on the pavement functioned like the hieroglyphs on the obelisk above it: a sign of something foreign and powerful. The hieroglyphs contributed to the allure of the obelisk by emphasizing its antiquity, its Egyptian-ness, and its projection of royal authority even to those who could not interpret them.[58] In a similar way, even a Roman who could not read Greek would be able to recognize the inscriptions on the pavement as signifying the scientific credentials of the instrument. The combination of Egyptian hieroglyphs and Greek lettering would have conveyed even to an illiterate viewer an unmistakable reference to the ambience of Alexandria. Everyone knew that this was the scientific capital of the ancient world, whose experts had been consulted by Caesar

[56] As explained above, technically one would have to return after four years to see the shadow in precisely the same place after a leap-year cycle. But that exercise was not possible for the first twelve years of the life of the instrument, because in that period Augustus had ordered the leap days to be omitted to shift the calendar back to exactly what Caesar had intended.

[57] See Lehoux 2007: esp. 70–97 on the connection of *parapegmata* with the sidereal year. The supplementary inscriptions on the pavement derive from a similar source to the *parapegmata*: Albèri Auber 2014: 65.

[58] This is not to deny the convincing case made by Swetnam-Burland 2010 that the specific meaning of the obelisk in its Egyptian context would have been legible to at least some Romans.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

when he designed his calendar.[59] This is not to say, as has been claimed, that the pairing of obelisk and meridian was a copy of an equivalent monument in Alexandria.[60] The monument was strikingly polyglot: Egyptian on the obelisk, Latin on its base, and Greek on the pavement. It was thus a testament to Rome's political dominion over Egypt, and also of its appropriation and assimilation of Alexandrian knowledge.

As Polverini notes, in choosing to implement a purely solar calendar at Rome to replace the Republican calendar, which was lunisolar, Caesar was explicitly adapting an Egyptian calendar, for the Greek world also preferred lunisolar calendars.[61] The monumental meridian points not just to the astronomical learning of Hellenistic Alexandria, but back beyond that to the timeless wisdom of the Egyptians, whose civil year followed a solar calendar of 365 days. Later, Ptolemy Euergetes tried to reform that particular calendar by adding an extra day every four years, but he was foiled by the conservatism of the Egyptian priests.[62] Caesar's reform of the Roman calendar was therefore based on an unsuccessful Greek attempt to reform a traditional Egyptian calendar; the combination of Egyptian obelisk and Greek meridian celebrates this dual heritage and the Roman perfecting and surpassing of it, however belatedly, by Augustus.

In a recent study, E. La Rocca has greatly advanced our understanding of how the obelisks Augustus brought to Rome furthered the ideological connection of Augustus with the sun, with Apollo, with the Pharaohs, with Alexander, and with the Ptolemies; and this point has since then been elaborated at much greater length by several other scholars.[63] I would not wish to deny the fundamental validity of this view, but it is only half of the story. The Ara Pacis is not a Pharaonic monument; but that is what it may seem if we treat it as nothing more than a subsidiary part of a larger, preordained, top-down imperial plan. Rather, the altar, obelisk, and meridian were the product of an evolving conversation between Augustus and the Senate: the obelisk was built and dedicated by Augustus, whereas the Ara Pacis was vowed and dedicated by the Senate.[64] Some might view that as nothing more than a cosmetic distinction, and it is certainly true that the

[59] See Feeney 2007: 197. [60] Alföldy 1990: 55–67; Alföldy 2014.
[61] See Polverini 2016: 97–100; on the Republican calendar: "Si trattava di un calendario lunisolare tanto imperfetto da non seguire né il sole né la luna."
[62] The intervention is documented in the Canopus Decree (*OGIS* 56); the innovation did not outlast the reign of Euergetes.
[63] La Rocca 2014, followed by the contributions to Frischer et al. 2017; see also Häuber 2017.
[64] These reflections were inspired by Amy Russell's work on Senatorial monuments, in particular a lecture on "The Senate and the Creation of Augustan Imagery on the Ara Pacis" (Durham, November 21, 2014). On the "strong senatorial and even Republican ethos" of the Ara Pacis,

altar is a quintessentially Augustan object. Yet the fact was important enough to Augustus that he carefully recorded the role of the Senate in its creation.[65] Any discussion of the relationship between obelisk and altar must pay attention to this fundamental difference.

The obelisk and altar, although they were part of the same Augustan conversation, spoke in different voices. The obelisk was a symbol of how the power of Egypt, the homeland of absolute autocracy, had descended from the Pharaohs, through Alexander, to Augustus. The titulature in its inscription emphasized the absolute uniqueness of its dedicator: son of the deified Caesar, bearer of the unique honorific Augustus, *pontifex maximus*, holder of unprecedented constitutional powers, master of Egypt. The custody of the Julian calendar emphasized his position as worthy successor to Caesar. The obelisk speaks in the voice of individual power. This rhetoric of uniqueness is also the voice of the Mausoleum. Its size and its isolated position in the north of the Campus were a clear sign of the separateness of not only Augustus, but also of his family: his descendants and the heirs to his power and that of Caesar.

The Ara Pacis is different. On that monument, erected by the Senate, Augustus appears as a senator among senators, a priest among priests: *princeps*, first among equals. Augustus appears as a *pontifex* both in the inscription of the obelisk and in the frieze of the Ara Pacis.[66] But on the altar he is the very opposite of a unique, distant, Pharaonic, semi-divine autocrat. The same is true of his family; the distancing gesture of the Mausoleum is inverted here. Regardless of how one identifies specific women and children on the frieze, it is clear that the Ara Pacis presents the family and descendants of Augustus as an intermingled part of the larger Roman family of the senatorial aristocracy. The Ara Pacis delivers an Augustan message, but speaks in the voice of collegiality and consensus.

It would be a mistake to try to gloss over these opposing voices, or to assert that one is more important than the other. What makes the ideology of Augustus so remarkable is the way he managed to produce a self-representation in which he was both an autocrat and a republican. Both aspects, the distant and the familiar, are equally vital. If the obelisk and the altar were conceived in relation to each other, it was in a spirit of complementarity. What made the Pharaonic gestures of Augustus acceptable was the way he scrupulously insisted upon acting in accordance with the

see Mayer 2010: 120. See also Zanker 1988: 123 and Stewart 2008: 113–14. See also the response of A. Claridge in Häuber 2017: 663–6.

[65] See Cooley 2009: 154–6 on *Res Gestae* 12.2.

[66] On the importance of priesthoods in the Ara Pacis frieze, see Zanker 1988: 121–2.

traditional Roman constitution. It may have been mere spin, but it was a vitally important ingredient of the message. The obelisk was a grandiose appropriation of the iconographical vocabulary of Egyptian autocracy, but the way Augustus was represented on the Ara Pacis was a very Roman illustration of the claim that Augustus did not take on any extra-constitutional powers.[67]

When Octavian returned from Alexandria, he brought with him a sense of what a world city could look like. But the fate of his adoptive father at the hands of the senatorial aristocracy made an even stronger impression. However appealing to Augustus the idea might have been to build a royal quarter in the Campus on the model of Alexandria, he was very careful to observe traditional Roman forms of patronage. Hence his frequent recourse to projects that he could describe as rebuilding, renovation, and rededication. Where Augustus did build something new and potentially destabilizing to the republican veneer of his program, he often mitigated it by juxtaposition.[68] For example, the gleaming marble facade and huge size of the Temple of Palatine Apollo contrasted deliberately with the affected modesty of Augustus' own house, an anti-palace, which stood nearby.[69] Similarly, the gleaming symmetrical interior of the Forum of Augustus advertised the unique position he held at the center of the Roman state and in Roman history. But viewed from the outside, both the existence of its massive fire-wall (rather than open space as a fire-break) and the asymmetry of its course advertised his official status as a citizen who refused to appropriate private property from anyone unwilling to sell.[70]

The meridian and Ara Pacis play out a similar dialectic between autocracy and the rule of law. The event which precipitated the need to correct the Julian calendar was the assassination of Julius Caesar. The new calendar began at the start of the year 45 BCE, and a little after a year later, Caesar was dead. Hence the origin of the confusion in the calendar; hence the civil strife that permitted Lepidus, as Augustus says, to usurp the office of *pontifex maximus*; and hence the perpetuation of the error for thirty-six years. By drawing a line under that period of history, the meridian necessarily alluded to it, howsoever obliquely. The senatorial harmony depicted on the Ara Pacis drew a similar line under the history of civil strife, the final end of which was marked by the death of Lepidus. If the meridian indirectly recalled the chaotic circumstances that followed upon

[67] *nullum magistratum contra morem maiorum delatum recepi* (*Res Gestae* 6.1).
[68] For another example, with particular relevance to the appropriation of an Alexandrian model, see Heslin 2015: 197–202.
[69] Suet. *Aug*. 29.3. [70] Suet. *Aug*. 56.2; Zanker 1988: 155.

the assassination of one *pontifex maximus* by the senatorial order in the Campus Martius, the frieze on the Ara Pacis shows its inverse: his successor, dressed as a priest, followed closely but respectfully by his colleagues in an orderly procession, carrying not daggers but the implements of priestly office.

Perhaps, bearing the chronology in mind, we could even see the obelisk and meridian as a pointed riposte to the collegial identity that the Ara Pacis attempts to construct for Augustus as priest. By juxtaposing and aligning the obelisk with the altar, Augustus acknowledged its presence and thereby affirmed its message that he was first among equals in the Senate at Rome; but with the same gesture he pointed out that he was also the Pharaoh in Egypt, *pontifex maximus*, son of Julius Caesar, and custodian of his calendar. The triangulated position of the obelisk on the Campus Martius highlights the implicit tension between the dynastic monument that was his Mausoleum and the more inclusive frieze on the Ara Pacis. The meridian thus provides a clarifying gloss on the representation of Augustus on the altar as one priest among many. My account of the empirical construction and improvisational design of Augustus' meridian, evolving over time in dialogue with the Senate, runs counter to the current view of the complex of monuments as preordained and designed as a unified conception on a mathematical basis by an all-seeing Augustus.[71] But if we stop chasing shadows and solar chimeras, a much richer and more subtle ideological interplay between the monuments comes into view.

Reception

At some point after the meridian was completed it became inaccurate. Pliny tells us that the error had been evident for around thirty years (*HN* 36.73). Presumably, as Pliny guessed, this was due to settling of the obelisk in the soil of the Campus, despite its deep foundations, helped along by the regular flooding of the Tiber. Vertical subsidence or tilting to the north or south would have introduced subtle errors, but any tilt of the obelisk to the east or west would have been glaringly obvious at noon.[72] Assuming that the north–south walls on either side of the meridian pavement are representative of the Augustan phase, the disappearance of their shadows would have clearly shown when it was local noon. If at that moment the shadow

[71] For that view, see Frischer et al. 2017.

[72] James Stuart concluded that the error noted by Pliny was due to the uneven subsidence that he observed for the base of the obelisk, when he examined it *in situ*. Stuart found that the southwest corner of the base was two inches lower than the opposite corner (Bandini 1750: 78).

of the ball or gnomon was not on the meridian line, it would have been a malfunction evident to everyone. Pliny expressed uncertainty as to whether the error was due to the subsidence of the obelisk. This would be consistent with a situation where the base of the obelisk had settled with a slight irregularity, such that the deviation of the obelisk itself from the vertical was not immediately evident, but the shift of the shadow to one side or the other from the meridian was obvious at noon.

So Domitian, it seems, decided to repair the instrument, for the pavement discovered by Buchner sits below the modern street level at an elevation of 10.8 meters above sea level. This came as a surprise to the excavating team, as, according to the usual stratigraphy of the northern Campus Martius, this level is consistent with a Flavian rather than an Augustan date.[73] Due to frequent flooding, the level of the Campus rose substantially in the post-Augustan era. In 1930, a Vespasianic cippus was found *in situ*, in a position about 20 meters west of the path of the meridian line at an elevation of 10.64 meters.[74] This gave a *prima facie* indication that the pavement should be dated to roughly the same period or slightly after. Furthermore, the excavators claimed to have found fragments of pottery dated to the Flavian period at a level below that of the pavement. The excavator, F. Rakob, alluded in passing to the pottery finds and to their stratigraphy when dating the pavement to the Flavian period, but without a substantive treatment.

B. Frischer has done a great service by revisiting the archives of the excavation and clarifying where the pottery was found, as set out in a forthcoming publication.[75] Frischer believes that the Flavian dating of the pavement is a fundamental error. He thinks that Buchner's disappointment in finding a pavement that did not match the nature and scope of his grandiose predictions led him to fabricate a Flavian date for the actual pavement in order to preserve the viability of his hypothesized Augustan original.[76] Furthermore, Frischer has obtained permission to drill a small core through a section of the meridian where the paving had previously been removed; he interprets the results of this coring as proof that there was no earlier level beneath the existing meridian pavement. Frischer correctly

[73] For a table comparing the elevations and dates of the relevant monuments in the northern Campus, see Rakob 1987: 707–12.

[74] Romanelli 1933, from which the distance of 20 meters was estimated on the basis of the plan given by Frischer forthcoming, fig. 1 and Google Earth.

[75] Frischer forthcoming.

[76] Haselberger 2014b: 183 more aptly notes Buchner's "palpable disappointment" at having to date the pavement to the Flavian period.

starts from the position that Buchner's grotesquely tendentious interpretations of the evidence are never to be trusted (though he is beating a nearly dead horse in this regard), but he is wrong to doubt the reliability of Rakob, who directed the excavations. For political reasons, Rakob was probably obliged to adhere to the overall hypothetical reconstruction of Buchner, his superior at the DAI, but he was a superb archaeologist and would not have misrepresented basic facts about the stratigraphy of the site to please his boss.

Rakob stated briefly that the pottery found beneath the level of the pavement was dated to the Flavian period by Dr. M. La Torre, but her report has never been published. Frischer has found that report in the archives and has interviewed Dr. La Torre. In the unpublished report, she stated that the pottery which she dated to the age of Domitian was found in the area where the pavement was discovered. Frischer shows that the pottery came not from the dig where the pavement was found, an area labeled G IV and V, but from an earlier excavation, labeled G III, which was a few meters east of the meridian. Frischer has also clarified a number of other important points: that Dr. La Torre never visited the excavations and that no excavations were conducted under the pavement itself. In her interview, Dr. La Torre acknowledged that her statement that the Flavian pottery was found where the meridian was located must be an error. Since she never visited the dig, it is not surprising that her information on the location of the finds was unreliable. Frischer argues that Rakob in his own publication copied that error, and thus the pottery contributes nothing to the dating of the pavement.

I have not seen any of the archival material from which Frischer adduces this evidence, but it does not support the conclusion he draws. The fundamental problem is that Frischer presupposes that Rakob's claim was that the Flavian pottery was excavated directly under the pavement; this is the claim he sets out to disprove. But that is not what Rakob said. His statement about the stratigraphy is this: "Die Fundkeramik unter dem Pavimentniveau datiert die grosse Neuanlage in flavische Zeit."[77] Rakob did not in fact say that the pottery was found directly beneath the pavement, but that it was found beneath the level of the pavement. Admittedly, his formulation is ambiguous, but I do not believe Rakob intended to mislead. Thanks to Frischer's archival researches, we now know that there was never any digging under the meridian pavement. As lead excavator, Rakob knew that, but Dr. La Torre did not. She could

[77] Rakob 1987: 693–4.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

imagine an excavation under the pavement, because she had not visited the site. It is impossible for Rakob to have simply copied her mistake; he could only have done so if he had imagined an entire excavation that he, as lead excavator, knew never happened. He did not make a mistake; he was only guilty of ambiguous phrasing.

Thanks to Frischer, it is now clear what Rakob must have meant when he said that Flavian pottery was found beneath the level of the pavement. He meant that, in a large trench dug a few meters to the east of where the meridian pavement was later discovered, Flavian pottery was found in strata lower than the level of the pavement. This is not absolute proof of a Flavian date for the meridian, but it is strong circumstantial support for the traditional stratigraphy of this part of the Campus Martius.

That stratigraphy is not disproved by the core that Frischer and his team have drilled through a small part of the pavement. It would have been wasteful for the Roman workers to leave the original slabs with their bronze lettering in place when re-laying the pavement, so we should not expect to find them lying beneath. The only thing we should expect to find is whatever substructure they had, perhaps nothing more than a thin bed of mortar. Frischer's interpretation of his coring is that it shows nothing but alluvial deposits beneath the existing pavement and its preparatory layer, thus disproving the notion of an earlier phase of building. The problem here is that what Frischer calls the "preparatory layer" is absolutely enormous; it should more accurately be described as post-Augustan fill.

Frischer helpfully provides as an appendix the report prepared by the geologist, Stefano Floris, who made the coring, which was 32 mm in diameter. Floris reports that directly beneath the travertine slab there is a thin bed of mortar and brick fragments; after that there comes a series of layers, running from 0.1 m to 0.8 m beneath the lower surface of the slab, consisting of landfill mixed occasionally with fragments of brick, mortar, and tufa. Then at a level of 0.88 m beneath the slab sits a hard tufa block, with nothing but alluvial soil beneath it. Floris, who does not consider the possibility of two phases of building, suggests that the tufa block might have been part of a drainage system, with the fill above it used to level off the bed of the pavement, but the provision of a deep drainage facility for a simple outdoor pavement seems to me utterly implausible.[78] A much more straightforward explanation of the tufa layer is that it is a remnant of

[78] If the brick walls running along the sides of the meridian are original, drainage for any water trapped inside could have been provided by small holes in the walls at ground level.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

the Augustan level and that the mixed fill above it was added during the Flavian re-laying. This would put the Augustan meridian at approximately 9.58 m above sea level, which is a bit higher than expected, but not implausibly so.[79]

Another line of argument used by those, including Frischer and Haselberger, who support an Augustan date for the excavated pavement, is to attempt to connect its level with the level of nearby Augustan monuments, such as the obelisk base or the Ara Pacis.[80] Both of those objects pose similar problems: they are now not easy to access and we have to rely on archival reports of their excavation. Both monuments were subject to later repaving and reworking, so it is not entirely self-evident where to locate the Augustan level. Both monuments have massive underground substructures with complex multi-level bases, and it is a subjective question as to where to place the Augustan level among the many possibilities. There is no such ambiguity for the meridian pavement and the nearby Flavian *cippus*, which were both by nature simple ground-level objects.[81]

The common-sense position remains that the traditional stratigraphy is correct and that the level of the meridian pavement is most consistent with a Flavian date, though there is no decisive proof either way, and there may never be. The keenness of many excellent scholars, including Frischer and Haselberger, to insist on an Augustan date for the pavement, despite the indications of the currently available evidence, is perhaps a testament to the tremendous lure of making a direct and unmediated connection between a monument in a text and one in the ground. But experience shows that excavations usually turn up surprises that even the most detailed textual discussions do not prepare us for. The most plausible explanation for the elevation of the

[79] The top surface of the slabs sits at 10.8 m above sea level, and the slabs are 0.34 m thick (10.8 m – 0.34 m – 0.88 m = 9.58 m). The elevation of the Mausoleum of Augustus, completed two decades earlier, is 9.25 m above sea level, and the west side of the Ara Pacis is at 9.5 m; see Rakob 1987: 707 and Haselberger 2014b: 184.

[80] See Frischer forthcoming and Haselberger 2014b: 181–4.

[81] We may dismiss as improbable the desperate hypothesis of P. Albèri Auber that Augustus constructed the meridian pavement on top of a massive embankment 1.5 m high, and that this artificial elevation gave a false impression that the pavement was found at a Flavian level. See Albèri Auber 2014, accepted by Frischer and Fillwalk 2014: 78 and Hannah 2014: 115; see also Haselberger 2014b: 181–4. Albèri Auber argues that the embankment was necessary in order to adjust the effective height of the gnomon to be exactly 100 Roman feet. But in a response published in the same volume, Schütz 2014b has shown that a round figure of 100 Roman feet was in no way particularly convenient for ancient mathematicians to work with. Furthermore, according to the empirical method of construction outlined above, the effective height of the gnomon did not even need to be measured, much less specified. There was no reason to adjust the pavement at massive expense to match a pre-computed mathematical model.

pavement is that it was pulled up and laid anew by Domitian, after Pliny's death.[82]

Repairing the meridian would only make sense if it seemed, at least for a time, that the margin of error noted by Pliny was stable from year to year and was not getting any worse. In other words, it must have seemed that the obelisk had stopped settling. One way of repairing the error would be to adjust the position of the globe that served as the gnomon on top of the obelisk.[83] Implementing the correct adjustment would have been extremely tricky to achieve either by computation or empirically. The slight list of the monolith was not evident to Pliny, so it still seemed to be vertical. If the position of the globe were adjusted, it would have appeared to be leaning off to one side of the obelisk, immortalizing the error as much as correcting it. The listing of the obelisk was not obvious, but the asymmetry of an adjusted globe leaning askew on top of it might have been.

Fortunately, there was another way to remedy the error which had the advantage of requiring no precise astronomical manipulations; it required no computation at all. This was to re-lay the pavement in a slightly adjusted position, such that the markings agreed with the new position of the shadow cast by the ball at the top of the obelisk. This had the additional advantage of bringing the level of the pavement up to the current level of the surrounding terrain, which had risen considerably since the Augustan period. This Flavian reconstruction of the pavement would have been accomplished using the very same techniques used in its original construction. After a lapse of nearly a century, it may be that neither the original papyrus plan nor the human-scale meridian of Caesar or Augustus was still available to copy. But that was not a problem, for the Augustan monumental pavement could have served as the basis for the Flavian copy. In that case, the old pavement needed to be documented precisely before it was pulled up.

The Flavian builders would have started by making a meticulous scale drawing of the old Augustan pavement on a roll of papyrus, and once again they could have used a grid of twine and pegs to create it. Then the old pavement was pulled up and the area was filled in to raise it to the new ground level. Now the builders repeated the process of observing the shadow at noon on both solstices, six months apart. A new pavement was laid with a bronze line embedded in it connecting those two points. A new string grid was staked out, and the scale drawing of the old,

82 On the precise dating of the Flavian pavement, see Heslin 2007: 9–10.
83 For this suggestion, see Frischer forthcoming.

https://doi.org/10.1017/9781108635806.004 Published online by Cambridge University Press

Augustan monumental meridian was copied from papyrus onto the new pavement. The resulting meridian would have been approximately 1 m higher, very slightly offset in position, and a bit smaller in scale than the Augustan one, because the effective height of the gnomon had been reduced. But there was no need to adjust the position of the gnomon or even to measure its position directly if the Flavian workers carried out the task in this eminently practical manner.

This opens up a fascinating perspective on Flavian ideology: that Augustus had founded institutions that were worthy of emulation but which had run badly off course during the later Julio-Claudian dynasty. After the reign of Nero, the sun-god turned Phaethon, and after the cataclysmic eruption of Vesuvius in 79 CE, Domitian was putting heaven and earth back into proper alignment again.[84] He proclaimed himself to be the heir of Augustus as *pontifex maximus* – only better.[85] Where Julius Caesar and Augustus each had one month named after him, Domitian renamed both September and October after himself, proclaiming himself the equal of both his great predecessors together.[86] Caesar was so honored for having created the new Roman calendar; Augustus was so honored for fixing it. What services for the Roman calendar did Domitian perform as *pontifex maximus*? Apparently nothing more substantial than simply re-laying the meridian pavement. But this was enough for him, and for doing this he claimed glory equal to both Caesar and Augustus.

The Pharaonic, autocratic aspect of the obelisk/meridian complex was attractive to Domitian, but the egalitarian republicanism of the Ara Pacis was not. The historiographical tradition preserves the view of the senatorial class that he was nothing more than a despot. Certainly he did not pay the Senate the respect Augustus had done, nor did he shy away from the image of an absolute ruler: he was *dominus et deus*.[87] This accords with his neglect of the Ara Pacis. The altar is apparently shown in its original, Augustan state on a coin of Domitian, so his renovation work in this area seems to have been limited to the meridian.[88] The meridian pavement was rescued by Domitian from the rising ground level, but the Ara Pacis was not. The ground level continued to rise so high that the altar came to sit in a deep depression in the earth. The precinct was renovated and a retaining

[84] For further detail, see Heslin 2007. [85] On Domitian and Augustus, see Heslin 2007: 16–18.

[86] Suet. *Dom.* 13.3, Plut. *Num.* 19.4, Macrob. *Sat.* 1.12.36. Suetonius also reports (*Gai.* 15.2) that Caligula had earlier tried to give September the very same name that Domitian later did (*Germanicus*), but the other sources do not mention this (though see Censorinus, *de die natali* 22.17: *multi principes*); it may be a confusion.

[87] Suet. *Dom.* 13.2. [88] Rakob 1987: 694n22.

wall was built by Hadrian, who may also have been the emperor who made the final intervention in the life of the meridian. The meridian and the Ara Pacis continued to have intertwined destinies.

As part of the *damnatio memoriae* after Domitian's death, the months he had named after himself were given their old names back and inscriptions using those obsolete month-names had to be altered accordingly. Macrobius (*Sat.* 1.12.37) points out that this unhappy omen put future emperors entirely off the idea of renaming months of the year after themselves. The final phase of the solar meridian was itself a kind of *damnatio* of Domitian as *pontifex*: the pavement and its long walls were waterproofed and it was turned into a long, thin water basin.[89] Perhaps this had, in part, a practical motivation. If the obelisk subsided once again, rather than opting to renovate the meridian pavement once more, a later emperor abandoned it. If the creeping error of the Augustan meridian came to symbolize the instability of the Julio-Claudian dynasty he had founded, and if the Flavian meridian came to repeat inadvertently that same symbolism, it is no wonder that later emperors came to view it as an ill omen and an embarrassment, just like the practice of renaming a month of the year after oneself. But it is possible to view the final transformation of the Flavian meridian as more than just a gesture of embarrassment. If, as Buchner claimed, the water-basin was the work of Hadrian, it may be considered as an ideological counterpoint to that same emperor's renovation of the Ara Pacis.[90] It served to continue the earlier *damnatio memoriae* of Domitian's works, rejecting his custody of the calendar and his failure to heed the precedent of Augustus in his treatment of the Senate. A crucial feature of the *damnatio* is that the act of erasure remains visible by means of a gap, a blank space, or an evident omission. Hadrian did not simply pave over the whole area around the meridian; he preserved its memory by means of a long, thin replacement object of equal dimensions but very different purpose.

Hadrian's rehabilitation of the Ara Pacis and his *damnatio* of the meridian pavement thus may be interpreted in tandem as a pointed contrast to Domitian's building priorities in the same area. Hadrian retrospectively characterized Domitian as an emperor who was interested only in the Pharaonic, autocratic side of Augustus' obelisk/altar complex.

[89] Rakob 1987: 700 and Buchner 1982: 76n11.

[90] B. Frischer points out to me that Rakob 1987: 709 dates the final transformation of the meridian into a water basin to the Severan rather than the Hadrianic period, though without explaining why. If that is correct, the argument below would have to be adjusted, though it would still be possible to read the basin as an act of visible *damnatio*.

Domitian's renovation of the meridian went hand in hand with his hubristic usurpation of the names of two months of the year. If the meridian came, via the vanity of Domitian, to represent the "bad emperor," the Ara Pacis naturally represented the other side of the legacy of Augustus. Hadrian's renovation of the Ara Pacis thus highlighted Domitian's failure to pay sufficient respect to the Senate. Despite his personal interest in things Egyptian, Hadrian was not attracted by the solar symbolism of the meridian. And despite his personal difficulties with the Senate, he was careful not to offend its dignity.[91] The antiphonal, twofold legacy of Augustus was thus split apart. Its Pharaonic aspect had been so much abused by Domitian that a subsequent "good emperor" obliterated the meridian and excavated the Ara Pacis as a symbol of good government and concord between emperor and Senate. The weakness of the hereditary dynastic principle of Augustus, which the creeping, long-term error of the meridian came to symbolize, was rejected along with its Flavian imitation in favor of the principle of adoptive, collaborative succession.

We can therefore view the water feature which replaced the meridian as something more than a negative choice, a pointed and enduring reversal rather than a simple act of obliteration: a *recusatio* of its autocratic, dynastic rhetoric of control over the *longue durée* of history and an acknowledgment of the hubris of subjecting the sun to the measure of man. The public utility of the meridian was replaced with a similarly practical gift to the people of Rome: a basin of drinking water, presumably fed by an aqueduct. The long, thin meridian with its low walls on either side was a perfect shape for a long, thin reflective pool, which was a popular feature of Roman gardens. But its bright, reflective surface was also an inversion of the darkness of the noon shadow of the obelisk that had been measured there before. The meridian pavement had reckoned the path of the sun by capturing the shadow it cast upon the earth. It was replaced not with a blank, unmarked pavement, but with an object that did the opposite of capturing the sun, reflecting it and the obelisk back to the sky. The sun was returned to its own realm. Viewing the pool from the north, an observer could have seen the reflection of the obelisk captured elegantly in its length. From other positions, he or she would have seen only the reflection of an occasional cloud floating through the sky, except when the sun itself was reflected: dazzling, blinding, distant, and inscrutable.

91 *SHA Hadr.* 8.