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Author(s): EMANUELE LUGLI

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# Hidden in Plain Sight: The *Pietre di Paragone* and the Preeminence of Medieval Measurements in Communal Italy\*

EMANUELE LUGLI

Kunsthistorisches Institut, Florence

## Abstract

*In the squares of many Italian cities, unnoticed by most passersby, incisions carved in stone reproduce the dimensions of the measurements that were employed locally until 1861, when the nation endorsed the metric system. By gathering the evidence pertaining to these forms of display, this essay hopes to bring them back into historical consciousness. The story that follows is a rich one, for these carvings—here called *pietre di paragone*—performed many key functions in medieval society. Besides regularizing trade, they were at the center of a concordance of gazes and bodies, social rituals that contributed to the construction of collective identity, and the political establishment of the Italian communes. An investigation into the nexus between politics and measurements shows how the latter originated in the crumbling of imperial authority at the end of the tenth century. In addition, the political significance of the *pietre* is underscored by the tremendous attention that local authorities have paid to their preservation. These maneuvers lend weight to the cause of those scholars who challenge the idea of the Middle Ages as a dark, uncivilized era.*

## The Invention of the Middle Ages as Metrological Bedlam

A seeming paradox informs our view of late medieval society in Italy. Even though from the eleventh century on, Italy enjoyed an economic boom, scholars are largely convinced that until the mid-fourteenth century Italians failed to develop reliable systems of measurement.<sup>1</sup> Contributing to this misunderstanding is the fact that different units were used to measure products we today consider similar (for instance, the unit for silk was not the same as that for wool cloth). Also, many scholars assume that the dimensions of medieval measurements fluctuated over time, perhaps decreasing with the erosion of their metal standards.<sup>2</sup> Thinking of the Middle Ages as lacking any coherent system of measurements has become such an ingrained habit that this deficiency has become in the popular consciousness one of the era's defining traits, one of those characteristics by which we distinguish, for instance, between medieval and modern times. With the present article, however, I want to reverse such claims by presenting evidence that will show that medieval systems of measurement were stable and scrupulously controlled and that regulation of measurements waned during the early Renaissance. Although many questions about the medieval genesis of metrological systems remain controversial (for example, what was the dimensional relationship

between classical, Carolingian, and medieval systems?), I argue that Italy's medieval measurements were standardized at the end of the tenth century. This move spurred economic regeneration and was particularly decisive for the consolidation of the communes, political associations between citizens created to safeguard their practical interests over those of the ruling aristocratic and ecclesiastical classes.<sup>3</sup> The communes, whose origins and overall structure varied notably from city to city, established themselves throughout the twelfth century also against the interests of other organizations within the city. Internal as well as external competition required enforcement, and yet the communes strove to displace a sense of oppression on the part of the citizens by promoting a desire for societal action and representation. Measurements perfectly served this twofold purpose: they essentially worked as the communes' tools of control while (and because) citizens took them as the very source of egalitarian justice.

Propelled by an active engagement with measurements, the medieval communes devised a revolutionary method to preserve these measurements, which I call *pietre di paragone*. This expression refers to series of grooves that reproduce the city's measurements incised on the facades of the cathedral, communal palace, or canopies in the center of one of the main squares (Figs. 1–5). Although many *pietre* still exist, today their presence is hardly noticed. When scholars mention them, it is in relation to mercantile practices, since the square that the *pietre* overlook usually was the site of the local market. While such a function is undeniable—the *pietre* did allow standards to be checked during business transactions—their role extended far beyond this one. This essay aims to address this shortcoming and thus restore the wide-ranging cultural impact of the *pietre*. Not only did they contribute to the political establishment of the commune, but they also generated a new perception of space.

This revolution has gone undetected since the sixteenth century, that is, since the period that first gave a historical definition of medieval times. The Florentine Vincenzo Borghini (1515–1580) lamented that the measurements of his time were most unstable and confusing (“e si può dire generalmente la cosa delle misure, e de' pesi incertissima, ed instabilissima”), an effect, he claimed, of the despicable conduct of his ancestors, who were responsible for the disintegration of Rome's cultural system.<sup>4</sup> Many shared his view: in modern treatises it is quite common to find a remark on measuring as a source of problems. Luca Pacioli (1446/47–1517), the famous mathematician, went

so far as to provide clear definitions of the measurements he mentioned in his *Tractatus Geometriae*, lest his geometrical demonstrations be questioned.<sup>5</sup>

Since the consequences of this lack of standards were far-reaching—the absence of precise measurements was felt to affect trade as well as justice—some progressive lords decided to take the problem into their own hands. In 1554 in Mantua, the ruling Gonzaga family commissioned a set of new standards to put an end to the disorder that vexed merchants and citizens alike. Milan, more ambitiously, standardized its system and tried to expand its use to the whole Lombard region between 1597 and 1608. It failed, though a second attempt in 1781 succeeded, one year before Grand Duke Pietro Leopoldo (1747–1792) imposed the stable Florentine system across Tuscany.

In Italy, the problem of measurements—its diagnosis and solution—can be said to trace a modern parabola, reaching its apex with Napoleon. After taking over northern Italy, Napoleon substituted all local measurements with the brand-new metric system, which he enforced throughout Europe.<sup>6</sup> To facilitate the use of the new system in Italy, Napoleon commissioned tables recording all the measurements of the subjected areas and quantifying them in meters. Collected into a book—known simply as *Tavole di Ragguaglio*—these tables were painstakingly precise and offered, for the first time, a reliable survey of what measurements were used and where.<sup>7</sup> If the *Tavole*, with their meticulous transcriptions of all local measurements in numbers, represented the ultimate product of modern standardization, they also, indirectly, strengthened the idea of medieval Italy as metrological bedlam. The charts go so far as to report dimensions down to the millimeter, thus creating visible differences between systems that were practically identical. The reader of the *Tavole* cannot help but feel lost in a sea of numbers; this graphic discomfort resulted in winning political support for the meter, which was endorsed by the whole of Italy only with unification in 1861.<sup>8</sup>

The national debate over whether to endorse the metric system, which ensued from the political bar set by the Congress of Vienna in 1814–15, gave momentum to studies on measurements.<sup>9</sup> Besides sharpening historians' perception, the meter finally provided them with a neutral unit by which all ancient standards could be compared and to which every European scholar could relate. Still, the treatises of the time, repetitive and short on evidence, were historically poor. Because they mostly served the cause of reintroducing the meter, they made use of Borghini's convenient characterization of the Middle Ages as unruly.

In the nineteenth century, Borghini's stance was so common that even the Romantic intellectuals who were reevaluating the Middle Ages did not resist it. I find it symptomatic of their credulity that they took the incommensurable Gothic cathedral as the ultimate expression of the medieval spirit. The Romantics celebrated the cathedral because they believed that medieval society turned its back on down-to-earth quantification, an insouciance that they found inspirational for modern

aesthetics. In his intoxicating essay "Von deutscher Baukunst," Johann Wolfgang von Goethe (1749–1832) vigorously states that the classicist principles, to which he relates proportionality and measurement, no longer need be at the foundation of art criticism. Those who are enslaved by these rules, he says, those who "have measured rather than felt," miss the source of art, which is autonomous, unconcerned, free feeling.<sup>10</sup> Many followed Goethe's soul-filling amazement before the staggering void of the cathedral and, like him, championed sublime instinct. There is little need to dwell on this.<sup>11</sup> Yet, in this context, it is important to stress the consequences of the historical outlook these opinions endorsed. Maintained by both nineteenth-century Italian reformers and Romantic thinkers, the view of the Middle Ages as metrologically chaotic grew over time into an incontrovertible truism.

This condensed history indicates that thinking of the Middle Ages as unfocused is a historical construct that served to support ideological as well as aesthetic views. Reconsider for a moment the case of Borghini. As a courtier of Cosimo and Francesco de' Medici as well as a most influential critic, he used his writings vigorously to uphold the cultural achievements of his own times.<sup>12</sup> It is thus likely that instead of seeing metrological chaos as a product of his own people, he attributed it to an earlier era, which was commonly classified as anticlassical. (In the eyes of the Renaissance, the Middle Ages were what the Renaissance was not.) His definition of the Middle Ages as metrologically chaotic is, after all, not based on any hard evidence.

When we look at medieval data, meanwhile, some hints point to a society intensely engaged with measuring and surveying. Eric Fernie, for instance, showed that Francesco Balducci Pegolotti (d. 1347), the author of a compilation of European mercantile practices, had a firm grip on the dimensional relationships between the measurements employed throughout Europe.<sup>13</sup> Olivier Reguin, whose research focuses on economics in southern France, has also shown that various measurements were effectively compared with each other in both Carolingian and late medieval times.<sup>14</sup> Evidence of this sort also exists for northern Italy, the focus of this essay. In Bologna, thirteenth-century surveys usually called *libri terminorum* report the dimensions of all the city's public spaces down to the inch.<sup>15</sup> The Modenese *braccio* recorded in the 1803 Napoleonic *Tavole* can be used to explain, with the utmost degree of precision, the geometric plan of Modena Cathedral (1099–1130s), thus hinting at the continuity of the local measurements for more than seven centuries.<sup>16</sup> Other examples could be presented, yet they would not add to a picture that remains only hypothetical as long as these cases continue to be regarded as exceptions. Most scholars overlook the studies I have mentioned as too tortuous and skeptically stress the lack of outright, firsthand evidence. Indeed, no physical metal bar has survived from the Middle Ages, and written sources are mute.

This silence seems to derive from the classical authors venerated in medieval times, such as Plato and Aristotle, who

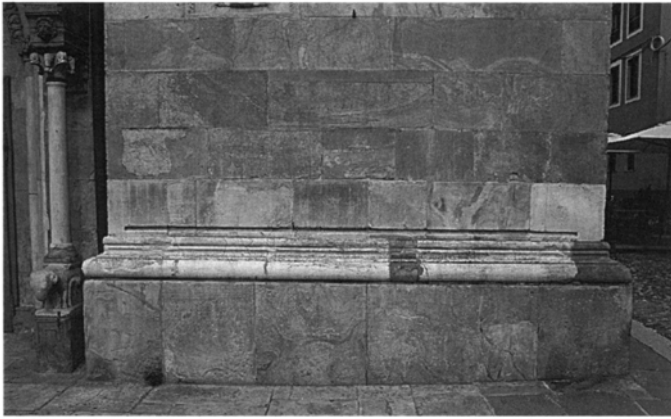


FIGURE 1. *Fidenza, S. Donnino, socle of the south tower, pietra di paragone representing the local pertica (photo: author).*

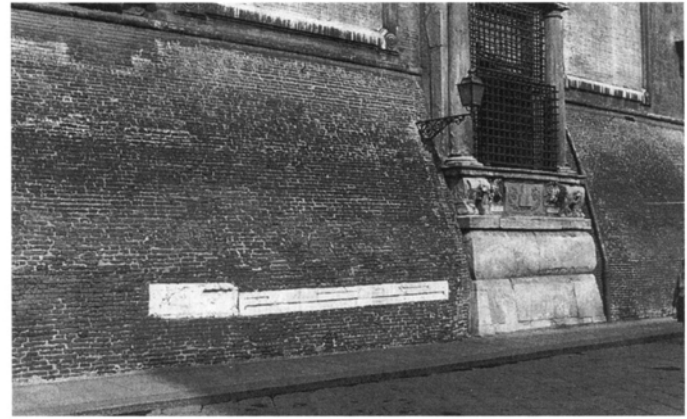


FIGURE 2. *Bologna, Palazzo d'Accursio, socle of the west facade, pietre di paragone (photo: author).*

rarely touch on measurements.<sup>17</sup> Patristic literature also lacks metrological references. When theologians talk of measurements, they speak of biblical or Roman standards, that is, of measurements that have attained the status of literary tropes and can then fit into their atemporal, symbol-ridden discourse. St. Augustine (354–430) writes that numbers are the hidden principle and soul of everything (*De libero arbitrio* 2.16.42), a stance that affected measurements as well, since measurements were treated as numeric surrogates. Measuring, then, served theologians to link any physical object—from churches to holy relics—to numbers and thence to associate them with the mystery that is at the core of the exegetical tradition.

The belief that measurement standards disappeared, the silence of classical as well as medieval sources, and the open-endedness of religious literature have all contributed to supporting Borghini's stance that medieval people were metrologically incompetent. With this essay, I set out to examine the possibility that this silence about measurements as well as the recourse to *pietre di paragone*, that is, to negative incisions rather than to positive metal standards, was intrinsic to their preservation.

### The Pietre di Paragone

As noted above, many northern Italian cities still display their local units of measurement. The *pertica* runs, unnoticed, above the dado of the south tower of S. Donnino, in Fidenza (Fig. 1), and measurement standards are carved into the socle of Bologna's Accursio Palace (Fig. 2) and a pillar of Piacenza's Palazzo Comunale (Fig. 3). They rise vertically, like the grooves of a Corinthian column, on the pillars of Verona's ciborium (Fig. 4) and are spread in an orderly fashion, to great decorative effect, on both sides of the apse window of Modena Cathedral (Fig. 5). The list goes on and on.

Historians hardly ever refer to these incisions, mentioning them only as one might comment on curios of folkloric appeal. They are evoked as material traces of these cities' histories as thriving, independent economic centers, but sometimes

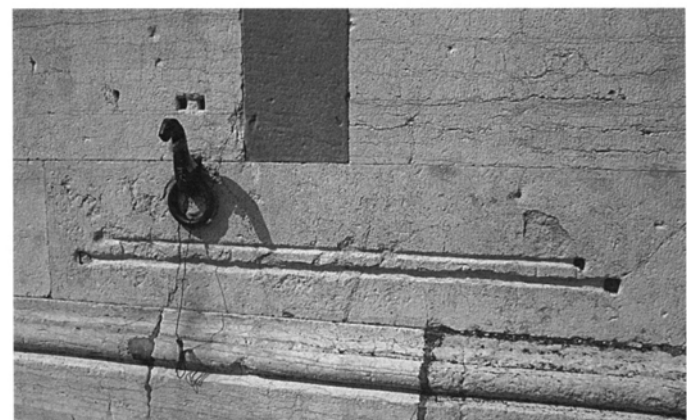


FIGURE 3. *Piacenza, Palazzo Comunale, north facade, pietre di paragone (photo: author).*

this exultation, with its patently nostalgic overtones, shifts and becomes a more nationalistic reading. Nineteenth-century politicians did not remove local standards because they considered them useful in recalling Italy's dreadful babel of past economies and narrow-minded *campanilismo*. They warned people of the miserable state to which dissolution might eventually return them. Yet, at the same time, the faded, washed-out appearance of the incisions reassured people of the remoteness of that possibility and of the unequivocal rightness of the present, unified system.

Despite damage, most of these carvings have resisted time. Their course may now be uneven, but the stone has to some degree preserved their dimensions. In the Middle Ages, as in antiquity, stone was the material believed to be best at resisting time and into it was carved everything worth preserving, from tomb slabs to inscriptions. In 1116, when Pope Paschal II was afraid that Henry V would conquer Canossa and thus alienate the Church's property, he made sure that the official record of its legitimacy was carved in stone.<sup>18</sup> The 1173 statutes of Ferrara were inscribed on the walls of the city's cathedral for the





FIGURE 4. Verona, Piazza delle Erbe, capitello, end of the 14th century (photo: author).

same reason. Stone did preserve them: Ferrara's are the earliest statues handed down to us.

Still, it was less stone than the metal plaques at the ends of the carvings that guaranteed the incorruptibility of measurement standards. The communal promulgations explicitly ordered that the impressions should be "ferrata" in order to prevent their deformation over time.<sup>19</sup> The prescription regarding metal plaques is the only explicit indication about construction of the standards; the method and quality of the carving are never discussed, and its supplier is unnamed. The communal directives leave the physical exemplars of measurement standards unaddressed, perhaps because there were none. This is most clearly seen in Parma, where iron plaques stick out of the facade of the cathedral and identify a void (Figs. 6 and 7). All the incisions indicate empty space; the very few metal bars that fill them are recent additions. In Bergamo, for instance, these bars are inscribed with meter markings, indicating a post-unification casting (Fig. 8). In order to be checked, any dubious tool was inserted into the groove between the metal ends. Carving the magnitude of local measurements into buildings was a cleverer way of preventing alteration than, for instance, attaching iron bars to the wall. Faced with an empty groove, a

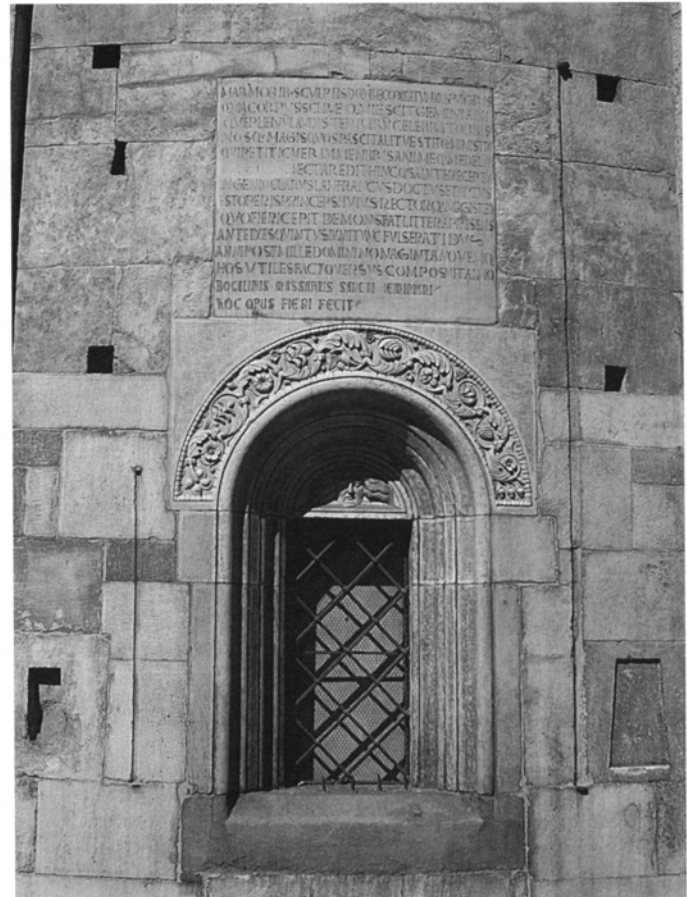


FIGURE 5. Modena, cathedral, east apse, pietre di paragone, first recorded there in 1547 (photo: author).

vandal's only recourse was to chip away a piece of stone from the frame, increasing its size and thus achieving precisely the opposite of what any forger would wish, which is to fabricate shorter, not longer, standards.

Showing standards as negatives was also a consequence of the definition of measurement as an immaterial ratio, a distance between two points. This view circulated among the medieval elites through the geometric investigations of Boethius (ca. 480–524/25), St. Augustine (*De qualitate animae*), and Gerbert d' Aurillac (946–1003). In his *Isagoge geometriae*, Gerbert clearly states that a foot is two-dimensional. Like other geometric abstractions, it can be understood only intellectually and not experienced in reality, since everything in the real world has three dimensions.<sup>20</sup>

This stance was embraced by the communal administrations, which understood that the dematerialization of measurements was crucial for their preservation and hence for the city's economic stability. A physical standard can be easily falsified, while a void is incorruptible, because it is simply not there. The Bolognese statutes of 1250 record the local brick as 9-by-4-by-2 *once*, stressing its relationship with the 12-*once* foot in case the standard is not available.<sup>21</sup> They imply that a unit of

measurement was not immanent to its physical standard but could be retrieved mathematically from another. Similarly, the 1336 statutes of Modena (a copy of the 1327 legislation as approved by Modena's new lord Obizzo III) represent measurements by a drawing, thus showing that standards could be replicated graphically.<sup>22</sup>

Yet the ideas of Gerbert, an intellectual monk, and the statutes, compiled by learned jurists, were not commonplace, and an approach to measurements as physical, three-dimensional objects can also be found. Bonvesin de la Riva (1240–1313/15) in his *De magnalibus urbis Mediolani*, a celebration of Milan's wonders, identifies a *cubitus* with the metal bar that reproduces it and thus, besides its length, assigns it a specific width.<sup>23</sup> Bonvesin here displays a practical experience of measurements, far from their judicial value or their intellectual apprehension as immaterial, which is likely to have derived from the duties of the Umiliati, a Milanese order in charge of safekeeping of measurements and of which Bonvesin may have been a member.<sup>24</sup>

This dual conceptualization of measurements, as both physical objects and immaterial ratios, came from the Roman twofold tradition. On the one hand, the Romans guarded their standards in the Temple of Jupiter Optimus Maximus on the Capitol (medieval people probably recalled that the Bible records the Jewish standards inside the Temple of Jerusalem).<sup>25</sup> On the other, they engraved them, in a highly stylized manner, on a slab in the market of Leptis Magna.<sup>26</sup>

In the Middle Ages, the two customs were not in conflict. Quite the opposite. The statutes of Viterbo, of 1251–52, explicitly require their coexistence. The commune's official *passus* was in fact both the wooden standard in the possession of Angelo Burgundione and the incision on the column of Sta. Maria Nuova.<sup>27</sup> The 1265 statutes of Parma order that both the carvings and the physical standards ("ferratum et bullatum") should be made available whenever required.<sup>28</sup> Duplication was the standard technique used to guarantee incorruptibility in the Middle Ages, as the practice behind the *Schreinsurkunden* confirms. The trustworthiness of these documents was guaranteed by keeping an original in the safes of the issuing community and by making a duplicate to circulate in public.<sup>29</sup>

The medieval church absorbed many aspects of the classical temple, and in the case of measurement, Emperor Justinian (483–565) made this continuance unequivocal. In his *Corpus iuris civilis*, which became the backbone of communal legislation, he stated that measures and weights had to be kept in one ("unus cuiusque") church per city.<sup>30</sup> In Italy, this is recorded as early as 1147, when the measurement standards were in the custody of the canons of Pisa Cathedral, the city's most important church.<sup>31</sup> Whether these measurements were incisions on the church's exterior walls or metal bars is not clear, but their association with the city's most important church is indisputable.

Even though the communal statutes are casual about differentiating between the two types of standards—usually they are both referred to as "mensura" or "moduli"—the distinction is important, because the two modalities of existence (tangible/



FIGURE 6. Parma, west facade of the cathedral, the pertica (photo: author).



FIGURE 7. Detail of Fig. 6.

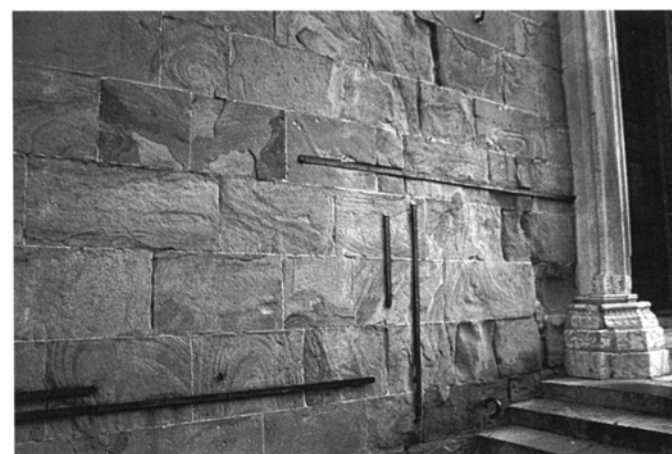


FIGURE 8. Bergamo, Sta. Maria Maggiore, pietre di paragone, first recorded there in 1204 (photo: author).



immaterial, movable/fixed) prompted two different forms of engagement (private/public, practical/symbolic).<sup>32</sup> I thus use *pietre di paragone* to identify the incisions displayed in open air. Originally an expression used in alchemy, meaning “touch-stones,” *pietre di paragone* in Italian today simply means “standards of comparison,” but I employ the term here because it evokes the stone support of the incisions (*pietre*) as well as highlighting their prevalent function as visual markers (*paragone*). I found specific references to measurements and their supports only in the statutes of Modena,<sup>33</sup> but I nevertheless expand its use to encompass all similar displays, stressing a difference that the technical documents may not have handed down but that nevertheless affected life in the medieval communes.

### *In the Custody of Hundreds*

Both types of measurement (the incisions and the metal bars) required protection. The official guarding of physical objects hardly needs much comment, besides recalling that Italian communes had no all-purpose police but only discrete monitoring bodies, each of which acted more or less independently. Those responsible for measurements went under many names, such as *officarii bollettarii* in Modena, *scarii* in Bologna, and *iusticeri* in Padua.<sup>34</sup> Their role was to keep one set of measurement standards, but they also supervised trade within the city: they regularly inspected tools, kilns, and sellers, fined counterfeiters and arranged for their public derision, a punishment particularly dreaded by merchants, who feared loss of credibility.<sup>35</sup>

In Parma the office was held—the 1240s statutes inform us—by four *fraters*, a term that has been interpreted as referring to either penitents or friars.<sup>36</sup> Their authority had a broad scope, since they were also given oversight of sales in grain, flour, and wine. (One official even had to test bread for weight, quality, and color.)<sup>37</sup> Yet these commissions were fluid in composition and they changed over time. The Parma statutes of twenty-five years later, in 1265, already show a different, more complex situation with increased traffic and tighter controls. Generic ecclesiastics (*religiosi viri*) had taken over the duties. Their number remained at four, but the two most experienced officers worked permanently at the market, where they collected fines and authentication fees. Four more inspectors were elected and assigned to control business in the entire bishopric, outside the city walls: each year they inspected the standards that every community with more than eight hearths (*focis*) was required to keep at the local church. This is another indication that the measurements functioned as one of the commune’s mechanisms of control over the surrounding territory.<sup>38</sup>

All payments for the checking of measurements were registered in record books, which were inspected by the *massario*, who eventually had to respond to the *podesà* and the council of elders. The communes controlled measurements at various levels, without necessarily following a hierarchical, pyramidal structure. This differed from Carolingian times, when certification mostly depended on the approval of the bishop or count.

The cross-checks of the communes’ policing system responded to a new form of political culture that, instead of radiating from one authority, was enmeshed in the actions of the dominant groups of society.

The communal notaries insisted on the role of the citizens as a group in bestowing legitimacy on a document. Reversing the terms latent in Carolingian law, the notaries stressed that a document presented to a popular assembly (*in plebe*) was equivalent to its being examined by the bishop.<sup>39</sup> The popular assembly could eventually be substituted by a notary because of his knowledge of the code, the tool for the preservation of communal welfare. Indeed, Goffredus of Trani (d. 1245), in his *Summa*, defines the documents approved by the notary as “public.” Goffredus also emphasizes that the reliability of a private agreement increases with the number of eyewitnesses, thus revealing the juridical rationale of his times, when legitimacy was understood as plural agreement.<sup>40</sup> Although responsibility fell on the individual (the council appointed only people of elevated standing to communal offices), the brevity of each appointee’s mandate was an attempt to reproduce plurality. To avoid its opposite, tyranny, was perhaps the most vexing political problem for the communes; the countless counter-verifications and reliance on associative bodies were a means of preventing a single individual from dominating. For all that, the communes were still far from democratic and remained the political domain of the elite.<sup>41</sup>

The visibility of the *pietre di paragone* can be taken as a way to solve this problem. The incorruptibility of the standards was ensured not only by the reputation of the singular officers but also by diffused monitoring as endorsed by the whole population. Parma statutes repeat several times, almost to excess, that any citizen could call any other a counterfeiter, including the *podesà*.<sup>42</sup> If proved right, the accuser was rewarded with half the fine paid by the guilty party, an incentive offered by many other communes.<sup>43</sup> By relying on the concerted watchfulness of the whole population, the communes obtained, without much effort, effective, constant vigilance. The eyes of the people were indeed wide open, as Salimbene de Adam (1221–ca. 1290) typifies in his *Chronica* with the character of Guidolino of Enzola, a busybody:

And every day he heard Mass in the cathedral and, when he could, the Divine Offices. He then sat with his neighbors under the community portico near the bishop’s palace. He spoke of God, and gladly listened to others speaking of Him. He also used to stop the boys from damaging the bas-reliefs and the frescoes of the baptistery and the cathedral. . . . He acted as though he were an official custodian.<sup>44</sup>

The display of the *pietre di paragone* on a main square, the pulsating heart of a city’s public life and the site of crowded happenings, created the ideal conditions for secure monitoring. Their location (on vertical pillars or on central,

slightly elevated structures) as well as their architectural framing can be interpreted as both an attempt to facilitate visual control and as an effect of this primacy of gaze.<sup>45</sup> The statutes of Reggio of 1268 are clear about the fact that the *pietre di paragone* should be placed somewhere on the communal palace for all to see.<sup>46</sup> Total exposure was regarded as a form of control as effective as total concealment, and the citizens embraced diffused monitoring as an inevitable, almost natural, consequence of communal living.

Control by sight was possible also because of an increasingly optimistic belief in certitude as a product of vision. This idea, which is so embedded in the way we think now that we may find it hard to imagine any other possibility, emerged with particular force at the end of the twelfth and throughout the thirteenth centuries in the writings of Robert Grosseteste (ca. 1168–1253), John Peckham (ca. 1230–1292), Witelo (ca. 1230–before 1314), and, most notably, Roger Bacon (ca. 1220–1292), with his treatise *Perspectiva* (dated to 1263). Strengthened by his unique mastery of Alhazen's (965–1039) teachings and with a profusion of explanatory geometric drawings, Bacon's work systematized all previous knowledge on optics in a reliable compendium. There, he presented vision as a bodily faculty that, despite being embedded in psychology, could nevertheless produce certitude ("It must be understood that when these nine conditions do not depart from moderation—that is, when they are met, neither in excess nor in deficiency—then vision achieves certainty").<sup>47</sup>

As Katherine Tachau has shown, vision became a crucial epistemic tool, which affected the intellectual discourse on truth.<sup>48</sup> However, scientists were not the only ones who were adopting this new stance. As Marvin Trachtenberg has proved for Florence, the model provided by optics was rapidly embraced by a communal institution, which put it to use for the structure of its urban projects.<sup>49</sup> In addition to being designed as sites for spectacular assemblies, squares were laid out according to a logic that stemmed from optics. Because the signing of important documents as well as marriages and funerals took place in loggias, private events were turned into social performances. From a legal point of view, as Goffredus reveals, a large crowd increased the reliability of any contract, but from a social perspective, it also strengthened the bonds between people and between them and the commune.<sup>50</sup>

The *pietre di paragone* were made visible not simply so they could be efficiently controlled but also because they were part of a program that reinforced the political agenda of the groups at the head of the communes, legitimizing their behavior. The architecture of squares and loggias should then be seen as crucial elements of this project, since they standardize the movement of bodies and gazes. The political value of these structures could hardly be expressed more patently than in the fourteenth-century Cremonese statutes, which allow citizens to gather only in the squares and in the district loggias.<sup>51</sup>

Although communal life required a level of participation that must have felt unprecedented to medieval people, life was

highly regulated, and, through the constant repetition of actions, sights, and events, the citizens themselves contributed to the constitution of a diffused power. This concatenation, by which a singular act was linked to others, was seen in positive terms. Opicino de Canistris (1296–ca. 1336) revealed some optimism when presenting Pavia as a tightly knit fabric of people: "All citizens know one another so well that they may meet several times during a day: once in the communal palace, another in the piazza. And each of them, if requested, would be able to indicate on the spot where another's house was even if it stood in the farthest corner of the city."<sup>52</sup> Urban life, as described by Opicino, is highly regulated: the Pavese frequent the same places, the palace or the square, both of which were constructed by the commune. They do not question the communal nature of their living and they do not seek privacy. Their proximity makes them well versed in each other's habits, a state of things that, even without noticing, leads to reciprocal control. This is the socio-cultural context in which the very existence of the *pietre di paragone* was made possible. Generally regarded only as technical tools for regulating the market, the *pietre* were also important in their role as enforcers of a collective identity that, through plural monitoring, produced cohesion among the citizenry and substantiated communal authority. The association between the *pietre* and the commune was by no means spontaneous, however. Everything within the city did not naturally refer to its government. (Quite the reverse: the city was punctuated by many examples of political forces resisting the commune.) Instead, as the history of the emergence of medieval measurement systems will now reveal, it was a bond that was laboriously constructed by the communes themselves over the years.

### *The Origin of Medieval Measurements*

As far as I am aware, the earliest surviving record of the existence of *pietre di paragone* in Italy comes from 1195 Faenza.<sup>53</sup> In that year the *Chronicon Faventinum* mentions that the standard of the foot was positioned near the doors of the cathedral ("ante ianuas maioris ecclesiae posuit mensuram pedis ad terram mensurandam").<sup>54</sup> It is not possible to say precisely where the foot was located, since we do not know the appearance of the twelfth-century church.<sup>55</sup> Federico Manfredi (d. 1488), bishop of the city and brother of Faenza's lord Carlo II, rebuilt the cathedral beginning in 1474 following a plan by Giuliano da Maiano, which swept away the old cathedral and its standards with it.

After Faenza, we have a 1204 record for Bergamo that explicitly states: "all *pareti* [linear standards] must be shaped according to the standard that is above the ground, near the main door of the church of Sta. Maria Maggiore." Other measurements were carved in 1248 near the *parete*, and, although heavily restored, *pietre di paragone* are still in place there (see Fig. 8).<sup>56</sup> After Bergamo, a profusion of other documents reveal that *pietre di paragone* were present in the squares of most thirteenth-century cities.<sup>57</sup>



The carving of *pietre di paragone* was, however, not the origin of medieval units of measurement, which had been used since 973, as a document by Bologna's bishop Adalbertus indicates. Adalbertus wrote to the bishop of Parma to reclaim the church of S. Stefano. Not only was S. Stefano one of the city's crucial devotional centers, but the large estate surrounding it was also very profitable. The wealthy church had been given to Parma in 887 by Bishop Maimbertus who wanted to insult Bologna, in retaliation for its having opposed his investiture.<sup>58</sup> Besides presenting utilitarian reasons (a church should be administered by those who use it), Adalbertus offered the bishop of Parma a payment of thirty *tornature* of vineyards.<sup>59</sup>

The *tornatura* is Bologna's distinctive unit of measurement for surface area, and from 973 on it appears in documents fairly regularly. A document from 983 reports a vineyard that was 24-by-12 *perticae*, which is 2 *tornature*. Another document, from 1008, reports on a small piece of land—overlooking the street outside the city that led to S. Tommaso—of 4 *clusori*, which are specified as subdivisions of the *tornatura* (“qui sunt clusorios quatuor tornaturiis”).<sup>60</sup> The frequency of these references and, especially, the proportionality between measurement units leave little doubt that a homogeneous system based on the *tornatura* was established in Bologna by the end of the tenth century.<sup>61</sup>

This dating seems acceptable, considering northern Italy's political climate. With the death of Charles the Fat in 888, rule of Italy was disputed among several military families, all claiming links to the Carolingian dynasty. The royal chancery in Pavia continued to function, but, symptomatic of the lack of clear direction, it did not issue norms of general validity, granting privileges only to specific addressees.<sup>62</sup> Amid this antagonism, at the beginning of the tenth century, Italy also suffered the Hungarian and Saracen depredations. The first post-Carolingian rulers, Berengar I (d. 924) and Louis the Blind (d. 928), took charge of the situation and issued many diplomas that reconfirmed alleged rights of possession.<sup>63</sup> Witnesses were asked to corroborate claims, but many institutions took advantage of the chaos to snap up new privileges. Among these was the bishop of Cremona, who in 916, on behalf of the city devastated by Hungarian raids, obtained many commercial rights in the territory of neighboring Brescia.

We do not have charters explicitly granting a Lombard bishop the right to use independent measurement systems, but we do have a diploma dated 27 May 945 in which King Lothair (941–986) grants the church of Mantua the right to coin money for that city as well as for Verona and Brescia.<sup>64</sup> The passage from local currency to local measurement units cannot be taken as straightforward, despite the fact that in the Middle Ages the two systems were not perceived as completely detached. (From Carolingian times, weight and monetary systems were defined together.<sup>65</sup>) Yet this can be seen as exemplary of a period in which economic regeneration was not undertaken on a large scale by the empire but was instead prompted by the cities themselves.

The use of local measurement standards is first acknowledged as customary by a 996 imperial diploma. The purpose of the diploma is petty—to grant the use of a field to Pisa—but its cultural significance is wide. When Ottonian secretaries defined the size of the field, they pointed out that it is expressed in the units of measurement as determined by the city (“secundum mensuram legitimam et nominationem patrie”).<sup>66</sup> The expression “mensura legitima” comes straight from Carolingian chancery,<sup>67</sup> but “nominationem patrie” is not a recurring formula. *Patria* unmistakably refers to the territory of Pisa and not to the kingdom of Italy, for which the imperial scribes would have employed the word *regnum*. This linguistic differentiation is confirmed by several charters of the late and post-Carolingian periods, in which *regnum* is clearly opposed to *patria*.<sup>68</sup>

The 996 diploma, of course, relates only to Pisa, but considering the geographic proximity and political cohesion of the Italian cities, all of which were requesting similar privileges at the same time, it is unlikely Pisa would have been an isolated case. Pisa created Italy's first recorded commune in 1085. It is thus not impossible that the city should have developed a precocious sense of independence.<sup>69</sup>

The diploma, together with Bologna's contemporaneous use of *tornature*, seems to indicate that toward the end of the tenth century Italian cities were equipping themselves with local systems of measurement.<sup>70</sup> Yet, it is not until the carving of *pietre di paragone* that we detect a growing awareness of measurement. Starting from the second half of the twelfth century, we have in fact an unprecedented number of documents that attempt to clarify precisely the value of units.

A document from 1173 for the transfer of property between the S. Cipriano di Murano monastery and the marquis d'Este makes it explicit that a *mansus* equals a surface of 40-by-100 12-foot *pertichae*. A second document from 1118 specifies that a *mansus*—in the territory of Reggio Emilia—corresponded to twelve *iugera* (“et per unoquoque manso iugera duodecim legitimos”), and a third one, dating to 1170, sees the *mansus* as 48 *biolche* (“unusquisque mansus est quadraginta et octo bubulcarum”).<sup>71</sup> Scholars have read these documents as proof of the confusion of medieval measurement systems and twelfth-century people's lack of clarity in that regard.<sup>72</sup> In doing so, they overlook the fact that these documents tend to regulate transfer of property between communities using different local systems, and, because some of the fields were in regions unfamiliar to the people involved in the contracts, an explanation was necessary. (This was particularly important for the *mansus*, which seems to have been a generic term to designate a surface unit).<sup>73</sup> In my eyes, then, these twelfth-century documents do not denote a situation of chaos, but—on the contrary—signal the interest of their authors in unequivocally identifying a specific magnitude.

Bonvesin de la Riva, almost a century later, espoused the same spirit when he described Milan's units of measurement for the sake of foreigners and the ignorant.<sup>74</sup> The terminology of medieval measurements is pervasive throughout the Po valley, with all Lombard measurement systems employing similar

terms (they pretty much all had feet and palms as well as *per-ticae* and *once*) to refer to different magnitudes, which thus needed the territorial specification (“of Florence,” “of Bologna”) to be correctly understood.<sup>75</sup>

### *The Battle for the Control of Measurement*

Bergamo’s first record of *pietre di paragone*, in 1204 (cited above), appears in the statutes of the local guild of weavers, hinting that the guilds may have been the cradle of the *pietre di paragone*. This has been taken to show that the *pietre* were produced for utilitarian reasons and were identified above all with the guilds, not the commune.<sup>76</sup> Given the lack of documentation for the twelfth and early thirteenth centuries, it is impossible to say whether Bergamo exemplified a generalized situation. But since in later documents the *pietre* are frequently mentioned in the communal statutes, a composite account that acknowledges interest in them from various political bodies can be developed.

It is in fact important to observe that the communes, throughout their fluid history, remained heterogeneous, fragmented entities. The communes were forms of power that aimed not at democracy (they only relaxed the structures of power) but at maintaining the status of the ruling elites, whatever their composition over time. Merchants and bankers, if particularly successful, could join the landowners and military elite in the administration of the communes, but the large majority of the population was politically impotent. Self-employed artisans and small-scale tradesmen thus organized themselves into guilds (*societates artium*), groups of mutual interests bound by oath and with common property as well as private military forces. The *societates artium* often antagonized the commune, which, far from being a politically comprehensive overarching authority, often followed self-serving agendas. Struggles occurred at different levels, and control over the measurement system was one of them.

One example of the antagonism over measurements between the communes and the *societates artium* comes from 1164 Pisa, when the commune opposed the guild of stonecutters and tile makers, the “*compagnias magistrorum lapidum seu tegularum*.” The second half of the twelfth century saw Pisa’s commercial power in the Mediterranean rise, which resulted in a growth in architectural projects and unprecedented urban expansion. Strengthened by the increase in commissions, the stonecutters organized themselves into a guild, which, as a self-legislating association, could raise wages and, eventually, obtain political power. The commune, meanwhile, already struggling with other *compagnie*, denied the legitimacy of the stonecutters’ guild, accusing it of going against communal honor (“*contra communem honorem factas*”). Further, it antagonized the guild by appropriating an important source of income: the approbation of the shape of bricks and roof tiles. These, it was decided, had to be verified by the commune.<sup>77</sup> The move was economic but also symbolic, since the commune, in

this way, obtained control over a key aspect of the city’s building industry.

This is the only explicit documentation of a conflict over measurements I have found. Nonetheless, the documents are sprinkled, if not with signs of such antagonism, then with indications of the political stress caused by measurements. The repetition by the statutes explicitly referring to the commune as the sole association in control of standards reveals the statutes’ ideological content. It is thus as a sign of background difficulty (and less as a sign of triumphant leadership) that I read the decision to make compulsory the application of the commune’s official seal of the Virgin to all standards in Parma (or the seal of Virgil in Mantua).<sup>78</sup> I detect a similar anxiety behind the appointment of the communal *militi di giustizia* to the duty of visiting the kilns that manufactured bricks and tiles to compare them with the standards kept by the abbot of the monastery of S. Prospero.<sup>79</sup>

The communes’ interest in assuming political control of measurements also led to physical appropriation. In an unprecedented move, as early as the 1250s, Bologna’s standards were carved below the loggia of the communal palace and not on the facade of the church, as was customary.<sup>80</sup> In Reggio the *podestà* himself had to duplicate the *pietre di paragone* within two months of his election.<sup>81</sup> (Similarly, at his investiture in Parma, the *podestà* swore an oath to preserve measurements and provide for their restoration.)<sup>82</sup>

I have expressed my doubts over the degree of success that the communes achieved in taking control of measurements (after all, the documentation we have was produced by the communes themselves—the dominant parties—and is therefore biased). Yet the story of the *pietre di paragone* cannot be streamlined into a series of clashes. Quite the opposite. It is also a story of identification and mutual exchange, with the *societates* themselves accepting that they were a part of the commune and the communal statutes taking on some aspects of the internal organizations of the guilds.

Further, *societates* largely relied on the commune as their representative with external powers. In 1159 Frederick Barbarossa (1122–1190) conceded to the commune of Asti some royal rights including “*mensure et bancatica*,” those regulating taxation over measurement standards.<sup>83</sup> Although the communes received these rights, they, no doubt, largely benefited the guilds. And it is the communes that enforced the use of the measurement system throughout the hinterland, thus homogenizing trade. Bologna did so with the statutes of 1288, when it obliged all the communities of its territory to use the 10-foot *pertica*, imposing it as the only valid measurement system for all commercial transactions.<sup>84</sup>

Despite incessant effort, the medieval measurement systems never became self-legitimizing. The communes’ disciplinary system reinforced people’s belief in the usefulness of a stable measurement system—people did increase their aptitude as measuring and economic operations became faster (and profits larger). The systems’ legal status, however, was considered

an emanation of communal authority.<sup>85</sup> Indeed, once the *signori* seized control over the Lombard communes, attention to local measurement systems faltered, an indication that the systems worked mostly as political tools for territorial control rather than as neutral economic regulators.<sup>86</sup> In the Middle Ages, a system of measurement could not be substituted for another in the same way that we switch today between the metric system and the imperial or English. Measurement systems were seen to be in conflict, and that tension was a by-product of the tension between their validating authorities. The history of medieval measurements is inscribed within that of politics, not economics.<sup>87</sup>

As the communes fashioned themselves as representatives of the people as a whole and stark opponents of tyranny, they also emphasized the belief that measurements ultimately derive their utility from social agreement. The *pietre di paragone*, publicly displayed and accessible to everyone, were the physical means by which the communes comforted the citizens with the knowledge that their government was the very embodiment of their collective needs. And the people understood. Petrus Iohannis Olivi (1248–1298), who lectured in the *studium* of Sta. Croce, in Florence, about 1287–89, stated that if every citizen employed the same corrupted standard, it could not be considered a case of counterfeit, since it is all people together, and not a superior ruler, who determine the acceptability of a standard.<sup>88</sup> Olivi's views were unorthodox (his writings were burnt after his death and were partially rehabilitated only with the council of Vienne in 1311–12), but he did express communal antimagnate and anti-*signore* policy, and he used measurements as his case in point, thus characterizing, once and for all, measurements as tools of power.<sup>89</sup>

#### *Modena's Bonissima as Personification of the Just Measure*

All the points on which we have touched in this essay (the struggle over the control of standards, the establishment of protective measures, the concerted distribution of the public gaze, the location of the incisions and their immateriality) are brought to bear when discussing Modena's *pietre di paragone*, whose abundant documentation makes them an exemplary case.

In Modena, the units of measurement are today carved on the apse of the cathedral (Fig. 5). This, however, is not their original location but only the end point of a spatial trajectory that lasted three centuries. According to the communal statutes of 1327, the measurements were once carved on a stone set in the middle of the square. At the end of the fifteenth century, the historian Jacopo dei Bianchi (1440–after 1502) reported that standards were part of a ciborium made of four pillars, which supported a marble slab topped by a statue.<sup>90</sup> The structure—dei Bianchi goes on—was destroyed in 1468, and the supporting slab was cut into columns for the adornment of the Campo Marzo. Only the statue, made of stone, was spared: it still exists today, mounted at the corner of the communal palace (Figs. 9 and 10).



FIGURE 9. Modena, southwest corner of the Palazzo del Comune, the Bonissima, first half of the 13th century (photo: author).

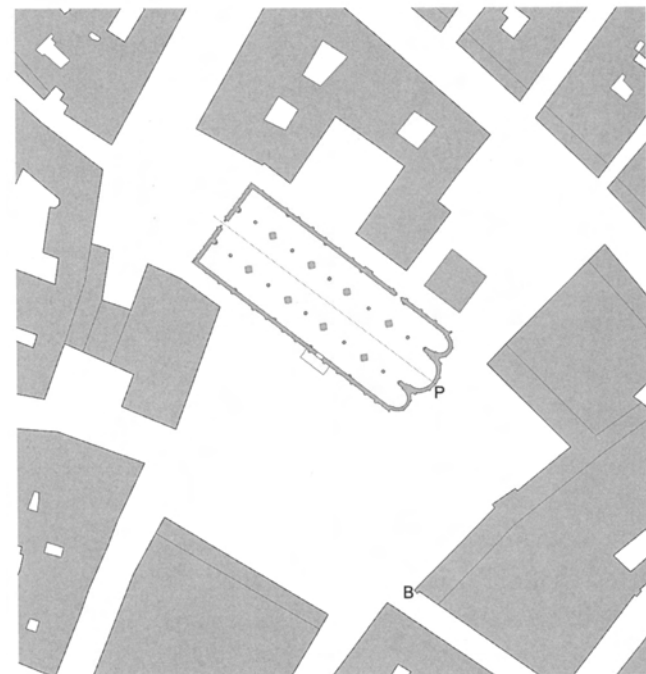


FIGURE 10. Ground plan of Piazza Grande, Modena, showing today's positions of the Bonissima (B) and the pietre di paragone (P).





FIGURE 11. Ferdinando Manzini, *View of Piazza Grande in the Middle Ages, Modena*, Museo di Arte Civica (photo: Museo di Arte Civica, Modena, by permission).



FIGURE 12. Alessandro Tassoni, *La Secchia Rapita (Modena, 1744)*, letter S, p. 195 (photo: Biblioteca Estense, Modena, by permission of the Ministero per i Beni Culturali).

The statue represents a stout woman with a long braid whose elevated position and sympathetic smile must have been read as expressing an almost-religious beatitude. Sturdy and healthy, she embodies all the benefits that could be enjoyed throughout the community that follows the principles for which she stands. To prevent equivocation, she may have held a scale,

as the hole in her left hand seems to suggest.<sup>91</sup> Without mantle or veil, she is not pious or noble but is dressed as an honest citizen. She wears a tunic and a short vest with narrow sleeves fastened by a crumpled sash, an outfit that resembles that of two caryatids in the Museo Civico of Verona dated to 1220–30.<sup>92</sup>

Such was the importance of this statue that Modena's *pietre di paragone* were referred to—by synecdoche—by its name, the Bonissima. This is a vulgarization of the expression “bona opinione” (good judgment), the title of the officials (“illi de bona opinione”) who were in charge of supervising the trading professions and making sure that their members conformed to the principles of goodwill and honest trading.<sup>93</sup> Every year, the guilds swore to honor a long, meticulously worded manifesto, which, in sum, required them to respect common tenets that would guarantee commercial fairness. The Bonissima sculpture was the allegorical embodiment of these values. Not only was the statue “bona,” it was “bon-issima,” an attempt to verbalize, with a touch of popular irony, their ideal accomplishment.<sup>94</sup>

Apart from dei Bianchi's description, we do not know what the Bonissima structure looked like. The painter Ferdinando Manzini (1817–1886) attempted a hypothetical reconstruction in his large fresco *View of Piazza Grande in the Middle Ages*, today in Modena's Museo di Arte Civica (Fig. 11). Manzini's work is expressive of the taste of his time, for which the evocation of a lively—yet tending toward the miserable—population and theatrical effects were more important than historical accuracy (look at the backlit figures and the use of architecture as stage wings). Manzini derived the ciborium from a previous reconstruction, part of an opening initial in the 1744 edition of the epic-comic poem *La Secchia Rapita* (Fig. 12). There, the Bonissima statute stands on a low stage supported by four legs,

as mentioned in dei Bianchi's report, which explicitly describes the columns as "short." Manzini must have known this reconstruction because, besides reprising all its architectural elements, he reproduced its location, setting it just in front of the southwest corner of Modena's communal palace. However, he stretched the columns in order to make the canopy look like the one preserving the *pietre di paragone* in Verona (see Fig. 4).

The Veronese ciborium, or *capitello*, is a minimal structure: four unadorned columns support a pyramidal canopy. The *pietre di paragone* take up most of the lower part, running vertically along the columns and horizontally along the marble base. The inconspicuousness of the *pietre* is counterbalanced by the architecture of the *capitello*, standing sturdily in the middle of Piazza delle Erbe, Verona's large market square, on a three-step marble plinth. The *capitello* not only supports the *pietre*, it also monumentalizes them, highlighting their presence from a distance and working as the physical pivot for the concordance of the citizens' controlling gazes.

The existence of the *capitello* can be securely dated only to 1284, but it was modified in 1378, when Antonio and Bartolomeo della Scala ordered the renovation of the area.<sup>95</sup> Indeed, the Gothicizing lettering of the names of the measurements, carved at the edges of the *pietre*, are similar to the inscriptions found on the della Scala family tombs, built in the second half of the fourteenth century. In any case, the *capitello* we see today has been modified since. The roof, for instance, cannot be original, since its base is smaller than the perimeter sketched by the capitals of the columns, which extend beyond the roof. These must have been designed to support a larger covering, which probably had no cross, as I found no medieval source referring to any religious function for the *capitello*.

Despite scholars' cautious acceptance, Manzini's reconstruction is twice flawed.<sup>96</sup> It mixes the *Secchia Rapita* letter S, a hypothetical representation of dei Bianchi's laconic description, with the much-restored Veronese *capitello*. A reconstruction of the Modena and Verona ciboria eventually proves impossible, and not because of a lack of information but because of the temporary nature of the supports of the *pietre* themselves. Because the *pietre* were often recarved because of wear, the architecture of their supports was adapted to the changes both in people's taste and in the functions of the piazza. Our investigation of the *pietre* then faces a structural problem, and it is because of this complication as well as (art) historians' discomfort with dealing with ephemeral objects that the *pietre* have been marginalized. Still, although we cannot fully reconstruct the visual evolution of the Bonissima's appearance in isolation, we can at least provide some basic historical coordinates and its relationship to power.

The Bonissima can be dated to before 1220: a document describing the reordering of the main square states that by then the Bonissima already stood on its perimeter.

And at that time, the commune of Modena acquired the market. Its limits were defined and the same was done for

the housing lots extending from the old communal palace as far as the Bonissima and as far as the canal. Giulio di Giberti di Parma did all this during his mandate as *podestà* of Modena and bought the square for the benefit of the commune of Modena.<sup>97</sup>

This record shows that about 1220 the Bonissima stood on the edge of the square, somewhere opposite the communal palace, thus far from today's location of the *pietre* and from the center of the square, as shown in the *Secchia Rapita* initial. The entry is also important because it clearly stresses that the repositioning of the complex was consequential to the commune's taking control of the marketplace.

Some fifty years later the Bonissima was moved. Two chroniclers—Alessandro Tassoni (1488–1562), author of *La Secchia Rapita*, and Bonifacio da Morano (d. 1349)—both report that on 30 April 1268 the Bonissima was placed in the square of Modena.<sup>98</sup> (The record offers insight into the great value that the statue must have had in fostering an image of economic stability, since chronicles usually report momentous battles and the deaths of institutional figures, not the movements of decorative elements.) Bonifacio da Morano is more precise and adds that the Bonissima was positioned near the office of the *bona opinione* created for its supervision. (It was also called "officium bullettarum," from *bullare*, the operation of sealing a standard for its approval.) According to the statutes of 1327, which codify current political customs, the officers were two: a supervisor (an office that could only be held by someone who was at least forty years old) and a notary. Their appointment lasted six months, and they were elected by the General Assembly one month before the election of the *podestà*, in order to guarantee a degree of independence.<sup>99</sup>

As was the case with other cities, officials and notaries together oversaw the production of butchers, bakers, wine sellers, milliners, masons, and other commercial activities. They checked the bread on a weekly basis and the measurement tools owned by the other vendors once every six months. During such controls, the officials put a seal on the measurement tools as a guarantee for the customer, who, furthermore, reported to them any abuse to which they fell victim. For their regular controls the officials must have had their own standards, but in case of disagreement, they had recourse to the figures on the Bonissima.

The statutes are consistent about the presence of measurements at the feet of the sculpture: these included the *braccio*, the shape for tiles and bricks, the *passus*, and even the size for shoe soles. (I infer they were all incised, in accordance with regional praxis, even if the statutes say so only for the foot: all the other records make use of generic terms.)<sup>100</sup> Only two types of measurements seem not to have found their place on the structure. Because of their volume, complex divisions, and peculiar curvature, standards of capacity (for both solids and liquids) could not easily be abstracted into linear shapes, so a few specimens were kept in the sacristy of the commune



(located in the communal tower), which, the statutes add, had to be accessible and guarded by the officials of the *bona opinione*.<sup>101</sup> Another standard that was absent from the feet of the Bonissima was the *pertica*. It was simply too long and was thus incised on the pillar of the staircase of the communal palace, not far from the other standards.<sup>102</sup> It is likely that it stayed in place until 1495, when the monumental protruding staircase (a common feature of communal palaces in northern Italy) was destroyed, a move in line with Renaissance taste, which preferred squares free of cumbersome structures recalling communal power.<sup>103</sup>

The demolition occurred almost thirty years after the destruction of the Bonissima. On 4 July 1468 the Bonissima structure was dismantled to provide material for the columns that would decorate the new garden of the lord of Modena to be created in the Campo Marzo.<sup>104</sup> The demolition is confirmed by the deliberation of the elders, who authorized the transfer of the statue on 19 June the same year.<sup>105</sup> It is particularly telling that the Bonissima, a structure devised in the thirteenth century by the commune to enforce commercial as well as social order, was destroyed for the private enjoyment of the *signore* of Modena.

The statue, however, survived and was employed as an advertising sign of the *officium bollettatum*, which, despite its questionable efficacy (as we will see), was relocated to the southwest corner of the old communal palace. The sculpture remains there today. Its only other documented movement—in 1498—was being repositioned a few feet higher to make room for a higher ceiling for the colonnade.<sup>106</sup>

Some scholars believe that with the dismantling of the Bonissima complex, the linear units of measurement appeared on the apse of the cathedral, where we see them today (see Fig. 5).<sup>107</sup> This is uncorroborated, however, since the earliest surviving record confirming their presence on the apse of the duomo dates to 1547.<sup>108</sup> Whether or not the units of measurement were carved there before this date, it is unlikely that they appeared as we see them today: in 1527 Modena, after sixteen years of papal domination, returned to the dominion of the duchy of Este and had to conform to the standards used in its capital, Ferrara.<sup>109</sup> Already in 1419 the elders had deliberated recarving the standards on the base of the Bonissima in order to guarantee that trade in the Modena market conformed to the Ferrarese measurements.<sup>110</sup> The units of measurement we see today on the apse of the duomo may not have appeared before 1598, when, with the fall of Ferrara to Rome, Modena became the capital of the duchy and its original measurement system was revived.

The location of the standards on the apse was apparently deliberately chosen. They flanked a little Medusa in the lunette (Fig. 13), an apotropaic symbol with wild eyes and hair that protected them, perhaps turning into stone whoever attempted to get closer.<sup>111</sup> Unlike the Bonissima ciborium, whose elevated statue (regardless of the height of the columns) was easily seen and whose standards at street level eased comparison, the carvings on the duomo apse evaded contact. At more than eight feet

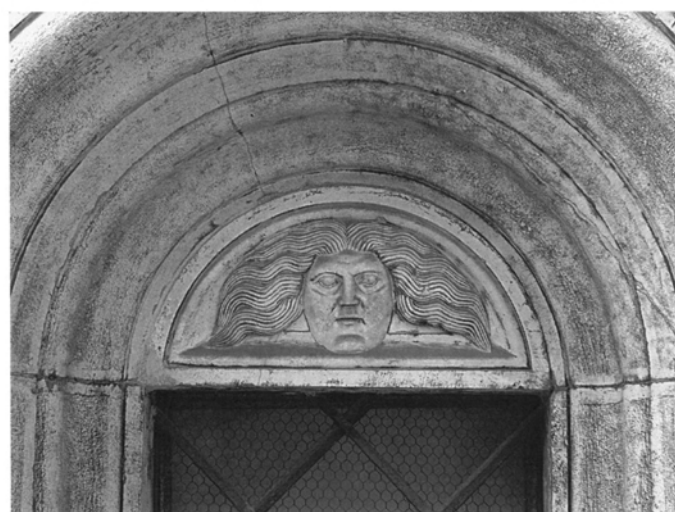


FIGURE 13. Modena, east apse of the cathedral, Medusa lunette above the *pietre di paragone* (photo: author).

off the ground, they are still out of reach. Their range has also been simplified by omitting the most commercial standards (such as units of capacity, shoe soles, and bread shapes). The cathedral wall displays only the brick, the tile, the *pertica*, and the *passus*, that is, the most formal, abstract standards whose rigorous symmetrical arrangement betrays a decorative intent.

The changes, however subtle, tell of the different cultural climate of modern times. The Este family continued the time-honored incision of *pietre di paragone* just as they endorsed the communal statutes, because they fostered an idea of continuity with the communal spirit, containing opposition and facilitating their rise to power. Placing the *pietre* out of reach, however, transformed them into purely visual markers of power. The *pietre* are presented to the eyes only, like a family crest decorating the ceiling of a private chapel. Their remoteness reminds the beholder of the distance that separates him or her from actual power and his or her irrelevancy in the preservation of the key tools of justice. The *signore* must have felt that the commune's reliance on the population's controlling gazes was no longer necessary, since by the sixteenth century his authority and judgment were undisputed.

This cultural shift had conspicuous practical consequences. Following the demolition of the Bonissima structure, the city entered a phase of metrological confusion. During the third decade of the sixteenth century, it suffered from famine, and the price of wheat skyrocketed. Tommasino dei Bianchi, son of Jacopo, commented on this decline in his chronicle (1503–54). He was the city's officer *sopra a l'abondantia* (a euphemistic expression indicating the supervisor for victuals) and was therefore directly involved. He remarked explicitly and harshly on the behavior of many traders (especially of cereal traders, since the price of bread was tragically unstable) who sold their goods paying no heed to any system of measurement, some of them even mocking the idea that such a measurement



system ever existed.<sup>112</sup> This belief was perhaps caused by the disappearance (or the disempowerment) of the team of *bona opinione*, whose office was re-created as an aid to the victual supervisors' only with the 1547 statutes.<sup>113</sup>

Metrological chaos during the sixteenth century seems to have been a common situation, thus upending our traditional idea of the Middle Ages as an age of confusion and the Renaissance as an age of order. In Mantua, two edicts of 1554 describe the standards as so corrupted that "the sellers could deceive themselves."<sup>114</sup> And in Parma a document of 1493 reports that it was impossible to find one single "baker or wine seller or butcher or milliner or fisherman or merchant that had a correctly gauged tool and that sold his goods fairly."<sup>115</sup> Some corrective measures must have been undertaken, for we know of a decree (on 24 March 1509) by the Parmesan *podestà* Antonio Malvicini that ordered a check, using seals, of all measurement tools.<sup>116</sup>

No evidence indicates that a similarly chaotic situation ever existed in the Middle Ages. The communes devised the *pietre di paragone* precisely to avoid it and thoroughly thought through their system of display. The *pietre* spread knowledge of the standards by advertising them in a main square, making them accessible to everyone. Far from being solely of use in trade,

the *pietre* generated a series of social rituals that encouraged a sense of collectivity and eventually were useful in supporting the communal organizations against their many opponents. Also, the *pietre* avoided corruption by turning the measurements they represented into intangible incisions. Borghini and the intellectuals who espoused his view deprecated the metrological confusion of the Middle Ages also because they had lost touch with the *pietre*. With the fifteenth century, the carvings progressively disappeared from the urban landscape of Italian cities as a consequence of their declining cultural significance. In Borghini's time, people conceived of measurements first and foremost as physical standards, to which rulers throughout Italy were resorting in order to put an end to the metrological confusion. In Mantua, after Giulio Romano's rebuilding of the duomo and the consequential destruction of the local *pietre* incised on its facade, the ruling Gonzaga commissioned the sculptor Bernardino Arrigoni to cast a set of bronze standards, which they considered the sole exemplars of correct local measurements.<sup>117</sup> Borghini's defamation may have been the result not of ignorance but of blindness. Shallow incisions in stone, hardly visible in dim light after the destruction of a monumental canopy, the *pietre di paragone* stood invisible under his gaze, as they have under ours for many years.

#### NOTES

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1. Measurements do not appear in P. J. Jones' treatment of Italy's commercial revolution in his authoritative *The Italian City-State: From Commune to Signoria* (Oxford, 1997). Scholars believe Italians became acquainted with measuring only after the spread of trading practices known as *mercatura* and the diffusion of *abbaco* schools. See M. Baxandall, *Painting and Experience in Fifteenth Century Italy: A Primer in the Social History of Pictorial Style* (Oxford, 1972), 86–102. On *abbaco* schools and *libri di mercatura*, see also L. Travaini, *Monete, Mercanti e Matematica* (Rome, 2003), 61–73.
2. Gaetano de Sanctis' famous aphorism, "La metrologia più che una scienza è un incubo" (Rather than a science, metrology is a nightmare) is frequently repeated in the literature. See, for example, V. Banzola, "Le Antiche Misure Parmigiane e l'Introduzione del Sistema Metrico Decimale negli Stati Parmensi," *Archivio Storico per le Province Parmensi*, 18 (1966), 139–78, at 139. And, even when not directly quoted, de Sanctis' view is pervasive. See J. Schulz, "Le Antiche Misure Lineari Secondo Sebastiano Serlio e il Problema dei Loro Valori," in *Lezioni di Metodo: Studi in Onore di Lionello Puppi*, ed. L. Olivato and G. Barbieri (Vicenza, 2002), 363–71; and B. Andreolli, "Misurare la Terra: Metrologie Altomedievali," in *Uomo e Spazio nell'Alto Medioevo*, 2 vols. (Spoleto, 2003), 1:151–88, at 172–73.
3. J. K. Hyde, *Society and Politics in Medieval Italy: The Evolution of Civil Life, 1000–1350* (London, 1973), 48–60; and D. Waley, *The Italian City-Republics* (London, 1969), 56–109.
4. V. Borghini, *Discorsi*, 2 vols. (Florence, 1755), 1:133–35.
5. L. Pacioli, "Tractatus Geometriae," in *Summa de Arithmetica, Geometria, Proportioni et Proportionalita* (Venice, 1494), Distinctio 1, chap. 5, fol. 6v: "E benché alcuni dichino che 1600 braccia quadre da panno siano uno staio, non è po' vero, che io lo volsi a questi di provare in questo modo."
6. The best book on the genesis of the meter is K. Alder, *The Measure of All Things: The Seven-Year Odyssey and the Hidden Error That Transformed the World* (New York, 2002). Also important is Paris, Musée National des Techniques/CNAM, *L'aventure du mètre* (Paris, 1989). The metric system was adopted in Italy with article 13 of the law of 27 October 1803; see *Bollettino delle Leggi della Repubblica Italiana dal 1 Gennaio al 31 Dicembre 1803* (Milan, 1803), 257–62.
7. The full title is *Tavole di Ragguaglio fra le Nuove e le Antiche Misure e fra i Nuovi e gli Antichi Pesi della Repubblica Italiana Pubblicate per Ordine del Governo* (Milan, 1803). This source is today overlooked, since scholars employ A. Martini, *Manuale di Metrologia ossia Misure, Pesi e Monete in Uso Attualmente e Anticamente presso Tutti i Popoli* (Turin, 1883, rpt. Rome, 1976). Martini's measurement list mostly draws on the 1803 *Tavole di Ragguaglio*, yet it contains many errors, so the 1803 source should be consulted for reliable historical research.
8. The intellectual Cesare Beccaria chaired the commission for the unification of the Milanese measurements after realizing that he could not find two identical *trabucchi*, not even in the hands of the census officials. See

- C. Beccaria, "Della Riduzione delle Misure di Lunghezza all'Uniformità per lo Stato di Milano," in *Elementi di Economia Pubblica con Varii Opuscoli* (Milan, 1822), 451. Equally active was the engineer Giuseppe Cadolini, who held lectures throughout Italy promoting the advantages of the metric system. Among his publications, see *Sulle Odierne Condizioni della Metrologia Italiana: Necessità di una Riforma e Mezzi di Conseguirla* (Milan, 1846).
9. Awareness of measurements was also sparked by the 1816 discovery of a Roman *mensa ponderaria* in Pompei. See L. de Samuele Cagnazzi, *Sui Valori delle Misure e dei Pesi degli Antichi Romani desunti dagli Originali Esistenti nel Real Museo Borbonico di Napoli* (Naples, 1825). Only a few, occasional metrological researches had been undertaken before the nineteenth century, such as L. Peto, *De Mensuris et Ponderibus Romanis et Graecis cum His Quae Hodie Romae Sunt Collatis*, 5 vols. (Venice, 1573); and A.-J.-P. Paucton, *Métrologie* (Paris, 1780).
  10. J. W. von Goethe, "Von deutscher Baukunst," in *Werke*, vol. 12, *Schriften zur Kunst, zur Literatur, Maximen und Reflexionen* (Hamburg, 1953), 7–15, at 8: "Hättest du [, Italian connoisseur,] mehr gefühlt als gemessen, wäre der Geist der Massen über dich gekommen, dir du anstauntest, du hättest nicht so nur nachgehamt, weil sie's taten und es schön ist." On the Romantic fascination with cathedrals, see E. Castelnuovo, "Il Fantasma della Cattedrale," in *Il Medioevo al Passato e al Presente*, *Arti e Storia nel Medioevo*, 4, ed. Castelnuovo and G. Sergi (Turin, 2004), 3–29, at 3.
  11. P. Frankl, *The Gothic: Literary Sources and Interpretations through Eight Centuries* (Princeton, 1960), 442–88; K. Clark, *The Gothic Revival: An Essay in the History of Taste* (London, 1928), 50–75; and M. McCarthy, *The Origins of the Gothic Revival* (New Haven, 1987). The influential art critic Pietro Selvatico Estense, for instance, in his 1856 introductory lecture, reproduced Goethe's essay almost point for point, more than eighty years after its first publication. See P. Selvatico, "Prelusione al Corso di Storia Architettónica," in *Scritti d'Arte* (Florence, 1859), 298–99.
  12. J. R. Woodhouse, "Towards a Revival of Borghini Scholarship: A Review Article," *Modern Language Review*, 95/1 (January 2000), 85–91.
  13. E. Fernie, "Pegolotti's Cloth Lengths," in *The Vanishing Past: Studies of Medieval Art, Liturgy and Metrology Presented to Christopher Hohler*, BAR International, 3, ed. A. Borg and A. Martindale (Oxford, 1981), 13–28.
  14. O. Reguin, "La réforme des mesures d'Arles en 1406: Retour vers le chaos," *Memini*, 11 (2007), 133–48; and idem, "Les étranges mesures agraires du Faucigny et Monsieur de La Poix de Fréminville," *Cahiers de métrologie*, 22–23 (2004–5), 43–54.
  15. J. Heers, *Espaces publics, espaces privés dans la ville: Le Liber Terminorum de Bologne* (Paris, 1984); and F. Bocchi, *Bologna*, vol. 2, *Il Duecento* (Bologna, 1995–96), 47–48, 97–98, and 104–5.
  16. E. Casari, "Osservazioni sulla Planimetria del Duomo di Modena: Lanfranco, i Quadrati, le Diagonali," in *Lanfranco e Wiligelmo: Il Duomo di Modena*, ed. E. Castelnuovo, V. Fumagalli, A. Peroni, and S. Settis (Modena, 1984), 223–27.
  17. On Aristotle's disregard for measurements, see S. Drake, "Measurement in Galileo's Science," *History of Technology*, 5 (1980), 39–54. Plato is slightly more eloquent. In his *Timaeus* 35a–c, he describes God as measuring the quantity of Being before generating creatures with a different amount accorded each. Besides metaphysics, he also touches on measurements on two other occasions. In the *Laws* 746e, he advocates the standardization of all weights and measures as a source of social justice, while in the *Politics* 283d–84d, he introduces the principle of the mean, namely, that the arts as well as politics should search for the just proportion, which guarantees virtue. However, both discussions are short. See A. E. Taylor, *Plato: The Man and His Work* (London, 1926), 399 and 479.
  18. G. M. Cantarella, *Pasquale II e il Suo Tempo* (Naples, 1997), 170–71.
  19. *Statuta Civitatis Mutine: Anno 1327 Reformata*, Monumenti di Storia Patria: Serie degli Statuti, vol. 1, tome 2, ed. C. Campori (Parma, 1864), 1.90–91, at 76–79, and 2.10, at 230–33. The term reappears in the statutes of 1547; see *Libri Quinque Statutorum Inclutae Civitatis Mutinae*, ed. I. de Nicolis (Modena, 1547), Book 5, rubric 149.
  20. All passages come from Gerbert d'Aurillac, *Isagoge geometriae* 2.6: "linearis pes est, per quem lineas vel longitudinem aliquam metimur nihil interim de altitudine vel latitudine curantes," and 2.2–3: "quae ita intellectu capienda est," in *Opera Mathematica*, ed. N. Bubnov (Berlin, 1899; rpt. Hildesheim, 1963), 46–97.
  21. *Statuti del Comune di Bologna dall'Anno 1245 all'Anno 1267*, ed. L. Frati, 3 vols. (Bologna, 1869–84), 7.147, at 2:149–54.
  22. A. Lodovisi, "In Domo Bone Opinionis," in *La Bona Opinione: Cultura, Scienze e Misure negli Stati Estensi, 1598–1860*, ed. D. Dameri, Lodovisi, and G. Luppi (Campogalliano, 1997), 21–62, at 21.
  23. Bonvesin de la Riva, *De magnalibus urbis Mediolani* 2.5: "Et nota quod cubitus . . . duorum pedum in longum et totidem digitorum in latum . . . longitudinem contingit."
  24. L. Zanoni, *Gli Umiliati nei Loro Rapporti con l'Eresia, l'Industria della Lana ed i Comuni nei Secoli XII e XIII sulla Scorta di Documenti Inediti* (Rome, 1970), 236–38. Zanoni's remarks at 217 on the relation between the commune and the Umiliati are also useful.
  25. J. Rykwert, *The Idea of a Town: The Anthropology of Urban Form in Rome, Italy, and the Ancient World* (London, 1976), 107.
  26. G. Ioppolo, "La Tavola delle Unità di Misura nel Mercato Augusteo di Leptis Magna," *Quaderni di Archeologia Libia*, 5 (1967), 89–98. Less known but equally important is the Thibilis-Announa slab whose inscription explicitly states its utilitarian function. The two most famous antique measurement reliefs (in Oxford's Ashmolean Museum and Piraeus' Archaeological Museum) represent, rather than reproduce, measurements and were used for advertisement rather than actual comparisons. See B. Slapšak, "The 302mm Foot Measure on Salamis," *Dialogues d'histoire ancienne*, 19/2 (1993), 119–36; and E. Fernie, "The Greek Metrological Relief in Oxford," *Antiquaries Journal*, 61 (1981), 255–63. For good pictures of all the reliefs, including the Leptis Magna slab, see M. W. Jones, "Doric Measure and Architectural Design 1: The Evidence of the Relief from Salamis," *AJA*, 104/1 (January 2000), 73–93.
  27. E. Guidoni, *Storia dell'Urbanistica: Il Duecento* (Rome-Bari, 1989), 368.
  28. *Statuta Communis Parma*, vol. 2, *Statuta 1266*, ed. A. Ronchini (Parma, 1856–60), 75: "Praedictum vero passum . . . debeat semper stare ferratum et bullatum, et teneri ubi et sicut videbitur Potestati, Capitaneo, Ancianis et aliis. Ponatur in tali loco quod possit haberi inde copia, et esse testimonium quociens et quando in hoc fuerit aliqua quaestio, vel dubietas eriretur."
  29. M. Welber, *I Sigilli nella Storia del Diritto Medievale Italiano*, Sigillografia: Il Sigillo nella Diplomazia, nel Diritto, nella Storia, nell'Arte, 3 (Milan, 1984), 190.
  30. Quoted from Andreolli, "Misurare la Terra," 182. For its context, see C. Radding and A. Ciaralli, *The Corpus Iuris Civilis in the Middle Ages: Manuscripts and Transmission from the Sixth Century to the Juristic Revival* (Leiden, 2007), 67–68.
  31. U. Tucci, "Pesi e Misure nella Storia della Società," in *Storia d'Italia*, 5/1, I Documenti, ed. R. Romano and C. Vivanti (Turin, 1973), 581–612, at 595.
  32. In Reggio Emilia the standards are called "tabelle" of "moduli." It is hard to see, however, whether these referred to carvings or physical standards. Quoted from Guidoni, *Il Duecento*, 373.
  33. Campori, *Statuta Mutine 1327*, 2.37, at 251–53: "Passus incisus in petra Bonissime firmus permaneat ita quod non minuatur," and 2.33, at 249–50: "ad modum antiquum designatum in petra Bonissime."

34. On Modena, see *ibid.*, 1.89–90, at 74–78; on Bologna, see Bocchi, *Bologna*, 2:16 and 50; on Padua, see S. Bortolami, “La Città del Santo e del Tiranno: Padova nel Primo Duecento,” in *Sant’Antonio, 1231–1981: Il Suo Tempo, il Suo Culto e la Sua Città* (Padua, 1981), 244–61, at 252–53.
35. *Consuetudini e Statuti Reggiani del Secolo XIII*, Corpus Statutorum Italicorum, 16, ed. A. Cerlini (Milan, 1955), Consuetudini 1242, 13, at 9–10: “Statuimus quod potestas Regii teneatur et debeat mercatum in die sabbati facere custodiri, ne pannus falsus pilis bovis asine canipe vel alterius generis falsitatis ibi portetur vel vendatur; et si alicui inventus fuerit pannus falsus in e soldi rexan. puntiatur et pannum perdat.”
36. A. Thompson, *Cities of God: The Religion of the Italian Communes, 1125–1325* (University Park, PA, 2005), 94. Thompson interprets “fraters” as referring to lay ascetics (*penitenti*). His interpretation is not, however, universally accepted. Measurement checkers in Bologna, for instance, are also “fraters.” Yet Francesca Bocchi has taken the expression to refer to Franciscans. See Bocchi, *Bologna*, vol. 1, *Da Felsina a Bononia: Dalle Origini al XII Secolo*, 50. For the statutes, see Frati, *Statuti Bologna*, 7.147, at 2:153: “et ordinamus quod potestas bon. infra iii menses ab ingressu sui regiminis teneatur facere inquiri modum lapidum et cupporum per fratres penitentie et videri diligenter et interrogari si lapides et cupi, qui modo fiunt, sunt croci et ampli et lingi ad modum designatum sub voltis comunis.”
37. Ronchini, *Statuta Parmae*, vol. 1, *Statuta 1255*, 157.
38. Ronchini, *Statuta 1266*, 71–72.
39. Welber, *I Sigilli*, 67.
40. *Ibid.*, 198–219. Goffredus of Trani takes the division between private and public documents from Bernard of Pavia’s *Summa*. The theorization was not limited to canon law, as the *Speculum iudiciale* by Guglielmus Durand reveals.
41. Waley, *The Italian City-Republics*, 59–64. See also J. H. Mundy, “In Praise of Italy: The Italian Republics,” *Speculum*, 64 (1989), 815–34, at 826.
42. Ronchini, *Statuta 1266*, 75.
43. *Ibid.*, 71–72: “quilibet possit accusare contrafacientes, et haveat medietatem banni,” 2:73: “quilibet possit accusare, et habeat medietatem banni,” and 2:75: “et quilibet possit accusare, et habeat medietatem banni.” For a similar case in Bologna, see *Statuti di Bologna dell’Anno 1288*, ed. G. Fasoli and P. Sella, 2 vols. (Vatican City, 1937–39), 9.17, at 2:121.
44. Salimbene de Adam, *Cronica*, ed. G. Scalia, 3 vols. (Bari, 1966), 3:888: “In qua [ecclesia] qualibet die missam audiebat et totum diurnum offitium atque nocturnum temporibus opportunis. Et, tempore quo in ecclesiastico offitio occupatus non erat, sedebat cum vicinis suis sub portu communi iuxta palatium episcopi et loquebatur de Deo vel loquentem de Deo audiebat libenter. Non patiebatur quod aliquis puer prohiberet lapides contra baptisterium vel contra maiorem ecclesiam, ad destruendum celaturas et picturas. Quod cum videret . . . ac si pro custodia deputatus fuisset ibidem.”
45. These observations are inspired by P. Joyce, *The Rule of Freedom: Liberalism and the Modern City* (London, 2003); and M. Foucault, *Discipline and Punish: The Birth of the Prison* (London, 1979), 200–204.
46. Quoted in Guidoni, *Il Duecento*, 376.
47. R. Bacon, *Perspectiva* 1.10.1: “Sciendum igitur quod quando hec novem non egrediuntur temperamentum, scilicet nec excellunt nec diminuuntur, tunc fit visus certificatus.” For the date of Bacon’s *Perspectiva*, see D. C. Lindberg, *Roger Bacon and the Origins of “Perspectiva” in the Middle Ages* (Oxford, 1996), xxiii. On vision and certainty, see G. Simon, *Archéologie de la vision: L’optique, le corps, la peinture* (Paris, 2003), 125–30.
48. K. H. Tachau, *Vision and Certitude in the Age of Ockham: Optics, Epistemology and the Foundations of Semantics, 1250–1345* (Leiden, 1988), xvi and 78–80.
49. M. Trachtenberg, *Dominion of the Eye: Urbanism, Art, and Power in Early Modern Florence* (Cambridge, MA, 1997), 232–41.
50. D. Friedman, *Florentine New Towns: Urban Design in the Late Middle Ages* (Cambridge, MA, 1988), 212–13.
51. M. Visioli, “La Piazza Maggiore dal Medioevo all’Età Moderna,” in *Il Palazzo Comunale di Cremona: L’Edificio, la Storia delle Istituzioni, le Collezioni*, ed. A. Foglia (Cremona, 2006), 17–57, at 22.
52. Quoted from E. Guidoni, “Appunti per una Storia dell’Urbanistica nella Lombardia Tardo-Medievale,” in *Lombardia: Il Territorio, l’Ambiente, il Paesaggio*, vol. 1, *Dalle Incisioni Rupestri alla Sintesi Leonardesca*, ed. C. Piovano (Milan, 1981), 109–62, at 152.
53. By way of chronological comparison, I should mention the foot “sculpted” in the base of a column in St. Paul’s Cathedral, London, which is first documented in the 1180s. See P. Grierson, *English Linear Measures: An Essay in Origins*, The Stenton Lecture, 1971 (Reading, 1972), 18–19.
54. Maestro Tolosano, *Chronicon Faventinum*, *Rerum Italicarum Scriptores: Raccolta degli Storici Italiani dal Cinquecento al Millecinquecento*, 121, ed. G. Rossini (Bologna, 1936), 114.
55. The church is first mentioned in 1143. See P. Porta, “La Cattedrale Paleocristiana nelle Fonti Storico-Monumentali,” in *Faenza: La Basilica Cattedrale*, ed. A. Savioli (Florence, 1988), 13–25, at 15.
56. L. Angelini, “Le Antiche Misure Segnate sulla Fronte di S. Maria Maggiore in Bergamo,” *Atti dell’Ateneo di Scienze Lettere e Arti di Bergamo*, 28 (1953–54), 103–8, at 104. The original texts read: “omnes parietes debeant amuelari ad parietem antiquam quae est super rezzios [main door] selciati eccl. S. Mariae Maioris” and “in muro eccl. S. Marie Maioris prope parietem textorum signatam in ipso muro.”
57. For examples, on Ravenna, see *Statuto del Secolo XIII del Comune di Ravenna*, ed. A. Zoli and S. Bernicoli (Ravenna, 1904), norms 273 and 297, at 121–22 and 138; on Brescia, see F. Spinelli, *Gli Statuti del Comune e delle Corporazioni della Brescia Medievale: Alle Radici dell’Umanesimo Civile e del Razionalismo Economico* (Brescia, 1997), norms 128 and 568; and on Mantua, see C. d’Arco, *Della Economia Politica del Municipio di Mantova e i Tempi in cui si Reggeva a Repubblica* (Mantua, 1842), 341–43: “mensurare ad perticam pedis Aripandi qui pes et eius forma fiat in porta Sancti Petri et Sancti Andree expensis Communis Mantue in lapide vivo, si factum non est.”
58. *Diplomata regum Germaniae ex stirpe Karolinorum*, 2, Karoli III diplomata, *MGH*, 2 vols. (Berlin, 1937), 2 (year 887): 277.
59. L. Savioli, *Annali Bolognesi* (Bassano, 1784), 1.2, at 56 n. 32.
60. *Ibid.*, 1.2, at 67–68 n. 31.
61. A 918 contract for the rent of two Bolognese houses is the first document recording the application of linear units of measurement to land; see G. Cencetti, *Le Carte Bolognesi del Secolo Decimo* (Bologna, 1936), 84 n. 25. The two houses are said to measure 30 by 31 and 32 by 25 1/2 feet. Yet it is not clear whether these referred to Bologna’s medieval foot of 38 cm or the Roman foot of 29.6 cm because both measurements were used at the time. For instance, a portion of a wall of Bologna’s imperial fortress, built in the tenth century and demolished in 1115, seems to have been built following a module of 10 Roman feet; see Bocchi, *Bologna*, 2:73. (She also reports the 918 contract at 2:62.)
62. G. Tabacco, *Egemonie Sociali e Strutture del Potere nel Medioevo Italiano* (Turin, 1974; rpt. Turin, 2000), 189.
63. K. Fischer Drew, “The Immunity in Carolingian Italy,” *Speculum*, 37/2 (April 1962), 182–97, at 192.
64. L. Schiaparelli, *I Diplomi di Ugo, Lotario, Berengario II e Adalberto* (Rome, 1924), 1:250. See also Fischer Drew, “Immunity,” 195. The right to mint was originally conceded by King Berengar I in 894, but Verona and Brescia were included only after King Lothar’s 945 territorial expansion. The right was granted to the bishop, but citizens were involved in running the mint, and they eventually claimed rights of consuetude. See R. Salvarani, “La Struttura Territoriale delle Diocesi in Italia



- Settentrionale in Età Carolingia: Il Caso di Mantova,” in *Alle Origini del Romanico: Monasteri, Edifici Religiosi, Committenza tra Storia e Archeologia (Italia Settentrionale, Secoli IX–X)*, Studi e Documenti, 3, ed. Salvarani, G. Andenna, and G. P. Brogiolo (Brescia, 2005), 31–57, at 46–47.
65. H. A. Miskimin, “Two Reforms of Charlemagne? Weights and Measures in the Middle Ages,” *Economic History Review*, 20/1 (April 1967), 35–52.
  66. *Diplomatum Regum et Imperatorum Germaniae*, 2, Ottonis II, MGH (Hannover, 1888), 636–37 n. 223.
  67. The expression “mensura legitima” appears in a diploma signed on 20 April 962 by Otto I in Pavia. See “Otto bestätigt der bischöflichen Kirche zu Reggio alle Besitzungen und Besitztitel, die Immunität, des Inquisitionsprivilegium und andere Vorrechte,” in *Diplomata Regum et Imperatorum Germaniae*, 1, Otto I, MGH (Hannover, 1879), 343–46 n. 242. “Mensuram iustam” appears in another diploma dated 15 February 952; *ibid.*, 225–26 n. 145.
  68. The distinction is made clear by two diplomas (of 883 and 925): “In quibuscumque patriis ac provinciis regni nostri . . . esset” and “in quibuscumque patriis ac provinciis regni nostri” (my emphasis), for both of which see *Medie Latinitatis Lexicon Minus*, ed. J. F. Niermeyer and C. van de Kieft, 2 vols. (Leiden, 2002), 2:1007–8. In the Middle Ages, *patria* referred to the native hamlet, village, township, or province. After the term was used in the *Digest*, in the twelfth century, it was commonly used to mean “fatherland” regardless of geographic size. See also E. H. Kantorowicz, *The King’s Two Bodies: A Study in Medieval Political Theology* (Princeton, 1957), 232–36.
  69. The 1162 collection of statutes known as *Breve Consulum* seems to indicate that Pisa’s system of measurements was old. See F. Bonaini, *Statuti Inediti della Città di Pisa dal XII al XIV Secolo* (Florence, 1854), 1:11: “Ante kalendas aprilis, duos de capitaneis murorum magistris iurare faciam, ut pisanae civitatis murorum magistris capitaneos iurare faciant, ne turrium Pisanorum aliquam supra mensuram antiquitus constitutam studiose aedificent, vel aedificare faciant. Ita quod, si ad iuramentum faciendum eos compellere non potuerint, Consulibus id vel Consuli renuntient: quo renuntiato, in faciendo iuramento eis auxilium porrigam.”
  70. In Mantua, the first mention of a local measurement system dates to 1055. A document regarding a field of Beatrix of Canossa, quoted in d’Arco, *Della Economia Politica*, 344, reads: “Id est nominative terras arabiles iuris ipse domne Beatricis in loco qui vocabatur prato longo, a pertica legitima de pedibus duodecim a pede Liprandi mensurata.” The same definition is repeated in a document of 1068.
  71. Andreolli, “Misurare la Terra,” 173.
  72. *Ibid.*, 152–53.
  73. In Roman times, the word *modus* indicated the same: a “measured quantity,” a “defined area.” See B. Campbell, *The Writings of the Roman Land Surveyors: Introduction, Text, Translation and Commentary*, Journal of Roman Studies Monograph, 9 (London, 2000), “modus” in the glossary.
  74. Bonvesin de la Riva, *De magnalibus urbis Mediolani*, 4.11: “et ne quis dubitet quid quantitatis intelligatur per modium, noverit quia modius mensura est octo sextarios apud nos continens, et est unius viri ponderatio gravis.” In the prologue, Bonvesin explicitly defines his readership as one of foreigners and the ignorant.
  75. Gerbert, *Isagoge geometriae*, 3, lists measurements as proportions, deprived of any specific value.
  76. Angelini, “Le Antiche Misure,” 104.
  77. G. Volpe, “Studi sulle Istituzioni Comunali a Pisa, Città e Contado, Consoli e Podestà: Secoli XII–XIII,” *Annali della R. Scuola Normale Superiore di Pisa*, 5 (1902), 250 n. 3.
  78. Ronchini, *Statuta 1266*, 71–72. For Mantua, see *Bonaccolsi Statutes*, 5.5: “et deputatus ad maleficia . . . bullari [faciat] ad sculpturam Virgili perpetuo duraturam.”
  79. Quoted from Guidoni, *Il Duecento*, 373.
  80. Frati, *Statuti Bologna*, 7.147, at 2:153: “lapides et cuppi, qui modo fiunt . . . ad modum designatum sub voltis comunis.” Another mention is *ibid.*, 1.27, at 1:189: “staro et sadio lapideo sive marmoreo comunis, qui est solitus esse sub voltis palatii veteris comunis.”
  81. The statutes of Reggio of 1268, quoted from Guidoni, *Il Duecento*, 376, say that within two months of his election, the *podestà* must provide a plate, probably in stone, with the size of the tile and two types of bricks, whose standards are usually preserved by the abbot of S. Prospero.
  82. Ronchini, *Statuta 1266*, 75.
  83. *Frederici I Diplomata*, MGH, 10/2 (Hannover, 1797), 65. See G. Andenna, “Il Monastero e l’Evoluzione Urbanistica di Brescia tra XI e XII Secolo,” in *Santa Giulia di Brescia: Archeologia, Arte, Storia di un Monastero Regio dai Longobardi al Barbarossa*, ed. C. Stella and G. Brentegani (Brescia, 1992), 93–118, at 98.
  84. Fasoli and Sella, *Statuti Bologna 1288*, 9.17, at 2:121.
  85. “Discipline,” it is well known, is a term employed by Foucault (*Discipline and Punish*, 215–24) to identify a series of processes for the ordering of humans and their actions. For Foucault, however, discipline is the product of modernity and should not be applied, in the full sense of the term, to the Middle Ages.
  86. On the subordination of country to town, see Jones, *The Italian City-State*, 161–63.
  87. For instance, conflicts between the leaders of the *popolo* and the duke of Modena over measurements are described in Dameri, Lodovisi, and Luppi, *La Bona Opinione*, 22–23.
  88. Petrus Iohannis Olivi, *Quodlibeta Quinque*, ed. S. Defraia (Grottaferrata, 2002), 5.12, at 326: “Sed forte non peccat mortaliter quando est corruptio comunis, quia satis ex hoc data est ratio quod huius modi corruptio omnibus innotescat. Si vero omnes, tam domestici quam forenses, communiter sciunt quantitatem ponderum et mensuram qua nunc post factam corruptionem, utuntur, tunc non cadit fraus vel falsitas in mensuris” and “an scienter utens corruptis ponderibus vel mesuris, non per superiorem sed per plebeios in tota urbe communiter introductis, peccet mortaliter.” For a presentation of Petrus’ thought, see Pietro di Giovanni Olivi, *Usure, Compere e Vendite: La Scienza Economica del XIII Secolo*, ed. A. Spicciari, P. Vian, and G. Andenna (Milan, 1990).
  89. Anti-*signore* policy was common toward the end of the thirteenth century. Perhaps the best example of this resistance can be found in Ambrogio Lorenzetti’s fresco in Siena’s Palazzo Pubblico. See N. Rubinstein, “Political Ideas in Sienese Art: The Frescoes by Ambrogio Lorenzetti and Taddeo di Bartolo in the Palazzo Pubblico,” *JWCI*, 21 (1958), 179–207, at 185.
  90. J. dei Bianchi, *Cronaca Modenese*, Monumenti di Storia Patria delle Province Modenesi, 1, Serie delle Cronache, ed. C. Borghi (Parma, 1861), 1.6, entry for 4 July 1468: “era in su uno quadro grande e grosso di malmore in sui quatro colonele basse.”
  91. The statue would then be an allegory of Justice. For example, a miniature preceding the fourth Gospel of the Monte Cassino Gospel book presented by Henry II in 1022 or 1023 pictures Justice as a woman holding a scale with one hand. The representation of Justice as a woman with a scale returns also in a legal dialogue, the *Quaestiones de iuris subtilitatibus* written by Placentinus (d. 1192), the leading lawyer of the twelfth century. In the prologue, Placentinus recalls the Templum Iustitiae, a shrine that the Bonissima complex may allude to. See Kantorowicz, *The King’s Two Bodies*, 107–9.
  92. On the caryatids, see F. T. Lang, *Veroneser Skulpturen um 1200*, Europäische Hochschulschriften, 28/146 (Frankfurt am Main, 1992), 53–61. I find some of its features comparable to the sculptures decorating the Parma baptistery, such as the queen of Sheba (for the oblong face) and the allegory of Spring as well as Mary’s maiden (for the outfit). See W. Sauerländer, “Benedetto Antelami: Per un Bilancio Critico,” in *Benedetto*

*Antelami e il Battistero di Parma*, ed. C. Frugoni (Turin, 1995), 3–69, at 51–52.

93. In Modena's 1327 statutes, all mentions of the "bona opinione" refer to the office. See, for instance, the oath of the butchers (Campori, *Statuta Modena*, 2.1, at 28): "Teneatur potestas facere jurare omnes becharios et carnes vendentes . . . quod vendent et facient carnes bovinas et porcinas et cavinās ad justam staderiam et ad pondus sibi datum a Comuni et ab illis *de bona opinione*" or that of the bakers (ibid., 2.3, at 222): "Statuerunt quod Potestas teneatur primo mense rui regiminis facere jurare omnes pistores masculos et faminas quod facient panem de frumento bene mundo et bene coctum ad pensam eis datam pro Comuni et quod observabunt precepta illorum *de bona opinione* in hiis que ad eorum offitium spectant." Many other cases may be cited. On the Bonissima, see also F. Bocchi, M. Ghizzoni, and R. Smurra, *Storia delle Città Italiane: Dal Tardoantico al Primo Rinascimento* (Turin, 2002), 228.
94. Another reading presents the term *bonissima* as deriving from "Bonèsmā," which means "buona stima" (good judgment). The linguistic transformation is not very clear, but, even if this possibility were true, it would not invalidate my point. See G. Bertoni and E. P. Vicini, "La Bonissima," *Studi e Documenti*, 5/1 (March 1941), 1–13, at 11.
95. It is dated to 1284 because a document of that year reminds the "portitoribus vini" to bring water to the fountain of the *capitello*. See T. Lenotti, *Piazza Erbe* (Verona, 1954), 66. Girolamo della Corte, a sixteenth-century chronicler, thinks that the *capitello* should be dated to 1207, but this is unsure, as he sometimes mistakes it for the tribune, which also stands in the square. For a general overview of Verona's medieval market and the della Scala restoration, see A. di Lieto, "Una Piazza Comunale e Scaligera: Piazza delle Erbe," in *Gli Scaligeri, 1277–1387*, ed. G. M. Varanini (Verona, 1988), 245–54. On the *capitello*, see L. Simeoni, *Verona: Guida Storico-Artistica della Città e Provincia* (Verona, 1909), 4.
96. O. Baracchi, *Modena Piazza Grande* (Modena, 1981), 27; and G. Gualdini, *Il Palazzo Comunale di Modena: Le Sedi, la Città, il Contado* (Modena, 1985), 48–49.
97. Johannes de Bazano, *Chronicon Mutinense*, *Rerum Italicarum Scriptores*, 15, ed. L. A. Muratori (Milan, 1729), cols. 555–638, at 559: "Et dicto tempore Mercatum em[p]tum fuit a Comuni Mutinae, et Mercatum ibi ordinatum fuit, et domos, quae sunt a Palatio veteri communis usque ad Bonissimam et usque ad canale[m], suo tempore [Gilioli Giberti di Parma] potestas Mutinae emit pro comuni Mutinae."
98. Bonifacio da Morano: "Dicto tempore die ultimo Aprilis erecta fuit Bonissima in statua marmorea in plateis civitatis Mutine, ante offitium bulettarum." Alessandro Tassoni: "Eodem anno die ultimo Aprilis erecta fuit statua marmorea Bonissimae in plateis civitatis Mutinae." Both passages can be found in *Cronache Modenesi di A. Tassoni, di G. Bassano e di B. da Morano*, *Monumenti di Storia Patria per le Province Modenesi*, 15, ed. L. Vischi, T. Sandonnini, and O. Raselli (Modena, 1888), 70. See also Bertoni and Vicini, "La Bonissima," 3.
99. The duties and requirements of the officials of the *bona opinione* are described in Campori, *Statuta Modena*, 1.90–91, at 76–79.
100. For the *braccio*, see Campori, *Statuta Modena*, 4.177, at 479: "Ad brachium comunis quod est in lapide Bonissime in platea Comunis"; for the tiles and bricks, see ibid., 2.8, at 229n: "Et quia lapides seu quadreli et cupi consueverunt fieri maioris amplitudinis, grossitudinis et longitudinis quam nunc fiant prout evidenter apparet ex lapidibus et cuppis antiquis et etiam in modo et forma ipsorum lapidum et cuporum existente in lapide Bonissime existente in platea"; for the *passus*, see ibid., 2.37, at 251: "Passus incisus in petra Bonissime firmus permaneat ita quod non minuatur"; and for shoe soles, ibid., 2.33, at 249: "Debeant ad modum antiquum designatum in petra Bonissime calzolari et calegarii designare in coramine et maxime in croppis et ad ipsum modum vendere solas tantum."
101. In the sacristy you could find the "mod[i]us" for wine or bread as described in ibid., 2.5, at 225: "Modus qui est in sacrestia Comunis super pensa panis et vini observari debeat et teneri per illos de bona opinione in dandis mensuris et pensis et habeant dicti officiales dictum modum exemplatum et autenticatum et semper sit in sacrestia Comunis." The sacristy also held six copper *mine*, units of capacity (ibid., 1.91, at 78–79). The profiles and dimensions of the containers could instead be found on the base of the Bonissima; see ibid., 1.90, at 76: "Et omnes et singule mine de blado et de sale et cum quibus mensurabitur bladum vel sal sint et esse debeant eiusdem latitudinis a parte superiori scilicet facte ad latitudinem designatam in lapide Bonissime, et sumatur sive sazetur ipsa mina extra oredellum mine nec aliter bullentur." In 1547 the measurements for volume were still owned by the officials of the *bona opinione*. See De Nicolis, *Libri Quinque Statutorum*, 5.7, at fol. 102v.
102. Campori, *Statuta Modena*, 1.92, at 79: "Pertica rationis sit et esse debeat ad magnitudinem et longitudinem designatam in pilastro scalarum palatii Comunis et sit essere debeat ferrata a quolibet capite et bollata cum bullo Comunis."
103. This can be inferred from an entry (Saturday, 17 December 1530) by the chronicler Tommasino dei Bianchi: "Fu levato de piazza doe scale grande che andavano in palazzo quale occupavano la piazza et fu bela opera, e fu de l'anno 1495." See T. dei Bianchi, *Cronaca Modenese*, *Monumenti di Storia Patria delle Province Modenesi: Serie delle Cronache*, 4 (Parma, 1865), 172.
104. J. dei Bianchi, *Cronaca Modenese*, 1.6: "1468, adi 4 luio: Fu tolto via la Bonissima de su la piazza, et era in su uno quadro grandio e grosso di malmore in su quatro colonele basse, e fu posta in el muro del palazzo de Modena sopra a le bolete, e del quadro dove era posta suxo, ne fu fatto colonelle e messe in el zardin del Signor in Modena, e prima quello logo dove fu fatto dito Zardino si se chiamava Campo marzo, e chiamavase Campo marzo, perchè quando si voleva amazzare un cavallo o altra bestia per aver la pelle, o cani si andava in quel logo e lì marciva."
105. Modena, Archivio Storico Comunale, Registri delle Deliberazioni Consiliari, vacchetta 51, year 1468 (session of 19 June), fol. 59r.
106. Bertoni and Vicini, "La Bonissima," 7–8. The authors also record that the base on which it stands today was replaced in 1825. On the employment of statues as "posters in stone," see W. Sauerländer, "Romanesque Sculpture in Its Architectural Context," in *Romanesque Art: Problems and Monuments*, 2 vols. (London, 2004), 2:1–35, at 2–3.
107. Daveri, Lodovisi, and Luppi, *La Bona Opinione*, 54 n. 2.
108. On the *perica*, see De Nicolis, *Libri Quinque Statutorum*, 5.14, at fol. 111v: "pertica rationis sit et esse debeat ad longitudinem perticae rationis insculptae in pariete ecclesiae cathedralis Mutinae"; on the *passus*, see ibid., 5.15, at 111v: "passus sit et esse debeat aius longitudinis cuius est passus insculptus in pariete ecclesiae cathedralis Mutinae et brachium esse debeat dimidium dicti passus communis."
109. The oscillating relationship between Modena and Ferrara started in 1289, when the Modenese noblemen called on the Este family of Ferrara as a way of resisting the excessive democratization of their city. The dependence ended in 1306, but in 1336 the Estes were officially recognized as lords of Modena. Throughout the fourteenth and fifteenth centuries, Modena enjoyed a certain degree of autonomy, and Marco Folin defines the Estense state as a "political system of states." See Folin, *Rinascimento Estense: Politica, Cultura, Istituzioni di un Antico Stato Italiano* (Bari-Rome, 2001), 50–68. See also L. Marini, *Per una Storia dello Stato Estense* (Bologna, 1973), 19–25; and G. Panini, *La Famiglia Estense da Ferrara a Modena* (Modena, 1996), 13–14 and 68–71.
110. Modena, Archivio Storico Comunale, Registri delle Deliberazioni Consiliari, Vacchetta della Comunità, year 1419. See also Baracchi, *Piazza Grande*, 43–44.
111. The Medusa head (or *erotos*) was a customary decoration for sarcophagi in Roman times, and many local specimens can today be found in Modena and Ferrara's Lapidari, in Brescia's Museo di Santa Giulia, and in Pavia's Museo Civico. For the apotropaic functions of animal and Medusa heads

- in the Middle Ages, see M. Camille, *Images on the Edge: The Margins of Medieval Art* (London, 1992), 72.
112. The entry for 17 December, in T. dei Bianchi, *Cronaca Modenese*, 170, reads: “parte ge ne deteno a pexo e parte non volseno che el se pesasse, dicendo che innovatione era questa de pesare el frumento, che mai non fu olduto nè veduto in Modena questa sutiglieza de questo pesare, e di più fu io reпре infra li altri da M. Lodovigo Belencino al presente capo deli Sig.ri Conservatori che io non volese introdure questa usanza in Modena da pesare el frumento che el non mi seria comportato, et io ge respoxe che la justitia lo voleva, perchè se li fornari hano a dare el suo dovere ala republica del pan che sia ala pesa, el bisogna che lori habiano el frumento de tal pesa che ge rovano la farina da fare el pan, altramente ge forse inganare chi compra el pan, e faciando a questo modo ogni homo ha el suo dovere.”
  113. Daveri, Lodovisi, and Luppi, *La Bona Opinione*, 23.
  114. R. Navarrini, “I Pesi e le Misure a Mantova in Antico Regime,” in *I Gonzaga: Moneta, Arte, Storia*, ed. S. Balbi de Caro (Milan, 1995), 112–23, at 118.
  115. A. Pezzana, *Storia della Città di Parma*, 5 vols. (Parma, 1837–59), 5:210: “Un solo de’ fornaciai, de’ tavernieri, de’ beccai, de’ mugnai, de’ pescatori, de’ rivenditori nostri, che tenesse misura e bilance giuste, ne’ che il giusto vendesse a’ compratori.”
  116. U. Benassi, *Storia di Parma: 1501–1534*, 5 vols. (Parma, 1899–1906), 1:174–75. On the history of measurements in Parma, see Banzola, “Le Antiche Misure Parmigiane.” Cf. the case of Ferrara, in which it seems that the whole organizational structure and economic controls between the fifteenth and the early sixteenth century ran efficiently; see G. Guerzoni, “La Camera Ducale Estense tra Quattro e Cinquecento: La Struttura Organizzativa e i Meccanismi Operativi,” in *Storia di Ferrara*, vol. 6, *Il Rinascimento: Situazioni e Personaggi*, ed. A. Prosperi (Ferrara, 2000), 160–83.
  117. In Mantua, the Liutprandus foot was once visible on the facades of the cathedral, S. Pietro, and S. Andrea (the statutes report: “in porta sancti Petri et Sancti Andree . . . in lapide vivo”). See d’Arco, *Della Economia Politica*, 342. On the Gonzaga’s commission of casts, see Navarrini, “I Pesi e le Misure a Mantova,” 118–19.