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Writing the body: Andrea del Verrocchio's *Measured Drawing of a Horse*

ELIZABETH KASSLER-TAUB

Abstract This article sheds new light on Andrea del Verrocchio's *Measured Drawing of a Horse Facing Left (recto)*, c.1480–88 (Metropolitan Museum of Art, 19.76.5), by scrutinizing the artist's unique approach to the representation of measurement. It takes as its focus the complex apparatus of annotations traversing the horse, which painstakingly translates the proportions of the equine body into words. A close reading of these "written vectors" fundamentally transforms our understanding of the function of text in a measured drawing. For Verrocchio, writing is not merely a descriptive tool but rather a powerful vehicle for the construction of a spatialized body within the boundaries of the pictorial field. His experimentation with the graphic potential of the written word challenges the traditional tension between *pictura* and *scriptura* and speaks to a broader shift in how drawn images were constructed and conceptualized during the Renaissance.

Keywords Renaissance drawing, measurement, writing, Andrea del Verrocchio, anatomy

A mottled sheet attributed to the fifteenth-century Florentine sculptor Andrea del Verrocchio bears a simple ink drawing of a horse in profile set against an unarticulated ground (figure 1).¹ Bounded by a sharp outline, the equine form is laid bare, save isolated pen strokes that indicate the furrows of the brow and evoke the undulating gesture of the wiry tail. Taut, angular lines gird the horse's silhouette, refracting the imagined contours of muscle and flesh into a series of interlocking planes. This schematic underdrawing is entangled with a complex web of measurements composed entirely of text which detail the precise distances between the horse's anatomical termini according to a fractional system of proportion.2 Each line of writing is perfectly aligned with, and spans the entire length of, the very distance that it measures; a phrase extending from ear (orecchio) to chest (petto) notes: "dal osso del orechio insino al petto una testa e cinque sedecimi e mezzo," while a descriptor descending from croup (groppa) to knee (ginocchio) observes: "da questo o dela groppa insino al ginochio una testa e dieci sedecimi."3 At close range, the surface of the page seems to pulsate, as tight coils of script collide, overlap, and strain against their linear confines (figure 2). The written word choreographs the eye's restless movement between flank and limb, giving rise to a bizarre visual experience that is as much an act of reading as it is one of looking.

Literature on the drawing, which was acquired by the Metropolitan Museum of Art in the early twentieth century, has long made note of these textual expressions of measure. However, the experimental form and function of what I will call Verrocchio's "written vector" has never been considered on its own terms. Carmen Bambach, who has written most extensively on the drawing and related works to date, is alone in recognizing what she calls its "great draftsmanly quality and conceptual elegance," though she credits the "innovative" quality of the composition to Verrocchio's proportional system rather than to his inscriptions.⁴ Modern scholarship at large

has dismissed the drawing as a dilettante effort. Wilhelm Valentiner remarks upon its "sharp, hard lines" and "primitive conception," which he perceives as consistent with the quality of Verrocchio's late draftsmanship.⁵ Martin Kemp similarly ascribes the "rather graceless line" to the "strictly functional nature of the study."⁶ The historiographical ambivalence toward Verrocchio's capacity for invention evidently has deep roots. In the 1550 edition of *Le vite*, Giorgio Vasari admits: "To tell the truth, he had a rather hard and crude style in both sculpture and painting, as if he had acquired it after endless study rather than because of any natural gift [...]."⁷

The work, which has been widely published, is nevertheless a familiar touchstone for scholarship on Verrocchio's artistic practice. Considerable attention has been devoted to the relationship between the drawing and contemporary sculptural commissions.⁸ Verrocchio's use of the Vitruvian unit of the testa, or head, to express the horse's dimensions is thought to have served as a point of origin for the proportional system governing his pupil Leonardo da Vinci's studies for an unexecuted equestrian monument to Francesco Sforza, then Duke of Milan.⁹ The Metropolitan sheet is, however, most commonly associated with the commission to erect a bronze equestrian monument to the Bergamese condottiere Bartolommeo Colleoni in the foreground of the Campo SS. Giovanni e Paolo in Venice. It has accordingly been dated to between 1483 and 1488 with a terminus ante quem of the casting of the monument, executed after Verrocchio's death by Alessandro Leopardi, in 1490.¹⁰

The precise relationship of the drawing to the Colleoni commission remains the subject of debate.¹¹ In the context of a 2014 exhibition at the Isabella Stewart Gardner Museum, it was identified as a study for a possible sculptural *modello* that Verrocchio might have used to assess a pose for the Colleoni monument.¹² There is ample evidence to support the notion



Figure 1. Andrea del Verrocchio, Measured Drawing of a Horse Facing Left (recto), c.1480–88. Pen and dark brown ink over traces of black chalk. 24.9 × 29.7 centimeters. New York, The Metropolitan Museum of Art, Frederick C. Hewitt Fund, 1917, n. 19.76.5.

that the Metropolitan sheet was not a direct study for the bronze cast. Unlike the other drawings for equestrian monuments that are known to have been in Vasari's possession, the composition is not squared or scaled for direct enlargement. Moreover, it has been observed that several measurements are the product of miscalculations; for instance, where a written vector describes a length of 1/16 *teste*, Verrocchio might append a numerical notation of 1/6 – an error that is surprising for an artist considered so well-versed in the mathematical arts.¹³ If the drawing is therefore unlikely to be directly preparatory in nature, how are we to understand Verrocchio's preoccupation with recording the dimensions of the equine body? And, most importantly, what may have informed his decision painstakingly to translate each measurement into words?

This article proposes a new perspective on the Metropolitan sheet by scrutinizing Verrocchio's conscious integration of text into the very facture of the composition. I argue that the written vector is not simply an *aide-mémoire*, gesturing toward the eventual crafting of a sculptural form, but is itself a powerful vehicle for the construction of a spatialized body within the confines of the page. By privileging the graphic potential of text over its didactic function, the composition responds to a humanist tradition that increasingly defined language in spatial terms, and participates in contemporary experiments in drawing that collapsed the boundary between



Figure 2. Detail of figure 1.

the descriptive and representational dimensions of an image. In essence, the Metropolitan sheet demands that we question the limits of what the written word can do in a drawing.¹⁴ For it is the sinewy lines of text traversing the horse that carve volume and mass from the space of the page, animating the figure's stark outline with a startling sense of kinesis.

I. The written vector

A renewed interest in early modern workshop practice has encouraged a more nuanced view of the place of the working sketch or sculptural *modello* in the design process.¹⁵ However, comparatively little literature exists on the emergence of the measured drawing as a coherent artistic category. Only isolated efforts have been made to account for the theory and practice of measurement in late medieval and early Renaissance Italy, with a dominant focus on the development of an ideal canon of anatomical proportion.¹⁶ It is perhaps unsurprising, then, that we lack an interpretive framework adequate to a drawing in which the expression of measure is neither obviously functional, nor the product of a purely aesthetic exercise. Indeed, Verrocchio's written vector not only signals a shift in the basic mechanics of measurement (the process by which a body's dimensions are recorded by instrument and eye), but also fundamentally restructures how measurement is communicated visually-that is, the manner in which a statement of length, breadth, or depth asserts its presence on the page.

The lines of script engirding the Metropolitan horse appear to be without precedent beyond Verrocchio's œuvre. The sole direct point of reference for the work is a frontal view of a horse in the collection of the Istituto Nazionale per la Grafica in Rome. The drawing probably represents the second of two equestrian studies in Verrocchio's hand included in Vasari's Libro de' disegni (c.1524), the first of which is commonly considered to be the Metropolitan sheet: "There are also two horses [in our book]," Vasari describes, "with the dimensions and center points required to enlarge them such that they come out proportionally and without error."¹⁷ The verso of the Roman sheet depicts a frontal study of a horse flanked by a view from the rear at left and a fragmented foreleg from a lateral perspective at right (figures 3 and 4).¹⁸ Here, as in the case of the former drawing, Verrocchio employs carefully bounded lines of text to describe the length of the horse's neck and foreleg and the breadth of its chest and hindquarters.¹⁹

While fifteenth- and sixteenth-century draftsmen routinely annotated measured drawings in a composite textual-numerical vocabulary, I have not identified a work that treats the written word in precisely the same manner as the drawing at hand, whether in a figural or an architectural context. Leonardo, whose studies of equine anatomy are invariably invoked in association with the Metropolitan sheet, never emulated his master's overwhelming use of text to represent measure. Though he



Figure 3. Andrea del Verrocchio, *Horse in Profile Facing to the Right (recto)*, late fifteenth century. Pen and dark brown ink over traces of black chalk. 293×275 millimeters. Rome, Istituto Centrale per la Grafica, FC 127615. Reproduced with permission of the Ministero per i Beni e le Attività Culturali.



Figure 4. Andrea del Verrocchio, *Measured Drawings of a Horse in Rear View, a Horse in Frontal View, and a Detail of its Foreleg in Profile (verso)*, late fifteenth century. Pen and dark brown ink over traces of black chalk. 293 × 275 millimeters. Rome, Istituto Centrale per la Grafica, FC 127615. Reproduced with permission of the Ministero per i Beni e le Attività Culturali.

consistently appropriated Verrocchio's canon of proportion, Leonardo's annotations across the body of work associated with the Sforza commission are exclusively numerical in nature. Two such studies of a horse in left profile in the collection of The Royal Library at Windsor most closely mirror the pose and graphic conventions of Verrocchio's horse. In the first, Leonardo charts the relationship between anatomical termini with a system of lines, though absent any indications of measure; in the second, the figure is more assertively mapped with numerical notations added (figures 5 and 6). Martin Clayton argues that Leonardo was likely exposed to Verrocchio's drawing, particularly given that the former Windsor study similarly includes numerical measurements written over a network of lines.²⁰ The second drawing more clearly parallels the Metropolitan sheet; in this case, the anatomical points that Leonardo connects with line are almost identical to those emphasized by Verrocchio, perhaps suggesting that the drawing was directly modeled on his master's work.

Looking beyond such predictable comparisons with Leonardo's graphic œuvre to consider the broader scope of early modern anatomical drawing, we find the closest approximation of Verrocchio's written vector in two early sixteenthcentury works by Michelangelo Buonarroti. The first, a sensitively modeled red-chalk study of a male nude dated to between 1515 and 1520, includes three lines of script that describe its proportions in fractional values of the *testa* (figure 7). Scholars



Figure 5. Leonardo da Vinci, A Horse in Profile Divided by Lines, c.1480. Pen and ink over black chalk. 29.8×29.0 centimeters. Windsor, The Royal Library, RCIN 912318. Reproduced with permission of the Royal Collection Trust/© Her Majesty Queen Elizabeth II 2018.



Figure 6. Leonardo da Vinci, A Horse in Left Profile, with Measurements, c.1490. Metalpoint and pen-and-ink on blue-gray prepared paper, the upper half damaged. 32.4 × 23.7 centimeters. Detail. Windsor, The Royal Library, RCIN 912319. Reproduced with permission of the Royal Collection Trust/© Her Majesty Queen Elizabeth II 2018.

have observed that Michelangelo rarely included notations of measure in his drawings; like the Metropolitan sheet, then, this study may be the product of a "didactic" or exploratory—rather than a directly preparatory—purpose.²¹ A second drawing of 1525, which has been associated with Michelangelo's design for the tombs of Giovanni and Lorenzo de' Medici in the New



Figure 7. Michelangelo Buonarroti, A Male Nude with Proportions Indicated (recto), c.1515–20. Red chalk (two shades). 28.9 × 18.0 centimeters. Windsor, The Royal Library, RCIN 912765. Reproduced with permission of the Royal Collection Trust / © Her Majesty Queen Elizabeth II 2018.

Sacristy of San Lorenzo in Florence, bears a looser system of textual annotations (figure 8). Here, Michelangelo maps the arched poses of two recumbent figures, indicating their axes of movement with linear vectors that originate in brief textual descriptions of measure. In multiple junctures, these passages of script unravel into line, combining both vocabularies into a single visual grammar.

These works deviate from the Metropolitan sheet in one significant respect. Whereas Verrocchio's textual apparatus functions as a kind of skeleton, Michelangelo disassociates the descriptive infrastructure of each drawing from its subject. In the first study, the measurements are displaced onto the surrounding ground, while in the second, the loose web of line and text overlays, rather than inheres in, the figures. The unique composition (and disposition) of Verrocchio's written vector aside, Michelangelo's flexible approach to recording the body's dimensions suggests that, in the hands of the Renaissance draftsman, the expression of measure was anything but a rote exercise. Rendered with the same instrument and in the same material as line, measure became a veritable representational mode. Conceptualizing notations such as these in the same way as we would the shadowed recesses of a joint or the gestural outline of a limb changes the stakes of text in a measured drawing. This perspective subverts the implicit association between measure and empiricism, and allows us to articulate the written vector and its typological cousins in graphic terms.

II. Between scriptura and pictura

By placing writing at the forefront of our experience of a drawn image, the Metropolitan sheet taps into an essential tension between scriptura and pictura that was deeply rooted in visual culture well before Verrocchio's time. As Jeffrey Hamburger recently argued, medieval texts manifest an especially deep engagement with what he terms the "iconicity of script." In this respect, we might look to the illustrations of a ninth-century French manuscript of Cicero's Aratea, which are composed entirely of massed lines of inscription, or to the micrographic marginalia of the Duke of Sussex's German Pentateuch (c.1300), where lines of script act as the outline of fantastical creatures (figure 9).²² While medieval interventions in this *paragone* prompt us to reconsider language as a pictorial medium, Verrocchio's written vector is instead the product of a development in early Renaissance theoretical discourse that invested the written word with spatial—rather than merely visual—meaning.

In Italian intellectual circles of the fifteenth and sixteenth centuries, the burgeoning field of epigraphy cast the aesthetics of text into sharp relief. Notable humanists such as Felice Feliciano and Fra Giacondo began to catalogue and imitate ancient Roman inscriptions in earnest.23 Treatises like Luca Pacioli's *De divina proportione* (1509) posed anatomical proportions as the ultimate sources for the ideal design of the Roman letter.²⁴ Decades later, Gian Paolo Lomazzo's Trattati dell'arte della pittura, scoltura et architettura (1584), which addressed subjects from the history of the automaton to the physics of a horse in motion, reiterated the claim that the ancients directly modeled the alphabet on human anatomy.²⁵ By treating inscriptions as "visual objects," Giancarla Periti suggests, humanistic efforts to deconstruct the ideal form of the letter were intended to elevate the practice of *scriptura* to the pantheon of the visual arts. As she argues, an inscription transgresses the rigid dichotomy between scriptura and pictura—it is legible both linguistically and visually.²⁶ In response to this conceptual shift, painters began to assimilate the written word or linear interpretations of pseudo-script into their compositions. Stephen Campbell notes that Cosmè Tura self-consciously adopted a "calligraphic" stylistic mode that, in turn, "assumed the quality of writing."27 Marzia Faietti has similarly reconsidered the significance of this paragone for Andrea Mantegna, arguing that the painter's well-documented antiquarian and epigraphic interests not only inspired his close engagement with the design of the alphabet and ancient letters but also were in fact at the root of his artistic praxis. His



Figure 8. Michelangelo Buonarroti, Working Drawings for a Recumbent Statue (recto), 1525. Pen and brown ink. 137 \times 209 millimeters. London, The British Museum, 1859-0625-544.



Figure 9. Marginalia from The Duke of Sussex's German Pentateuch: Book of Ecclesiastes, c.1300. Detail. London, The British Library, ms. 15282, f. 302^v.

"vocabulary" of painterly line, she suggests, acquired the same value of a "prismatic' alphabet," with the ability to convey the "three-dimensionality" of inscribed, printed, or cast letters.²⁸

The evolving interest in epigraphy similarly bled into sixteenthcentury architectural drawing. In the albums of the so-called Codex Corner, for instance, Bernardo della Volpaia incorporates inscribed panels in his studies of Roman ruins and fragments—as seen in a meticulous rendering of Roman the Arch of Constantine —and often stylizes his annotations in Roman capitals, thereby disguising them as formal inscriptions (figure 10). Similarly, two richly ornamented cornices are described in the bottom-right corner of the composition as "SPOGLIAE," while a plan of the Basilica of Constantine is prominently identified as "TENPLI PACIS" (figures 11 and 12).²⁹ These "inscriptions" are not the casual memoranda of an artist rapidly committing an encounter with an ancient fragment or monument to paper, but offer evidence of a deliberate attempt to rethink the status of an annotation as a purely descriptive entity. Whether imagined within the frame



Figure 10. Bernardo della Volpaia, Arch of Constantine from the Codex Corner, early sixteenth century. Pen and ink. 460 × 330 millimeters. London, Sir John Soane's Museum, vol. 115, f. 53.



Figure 11. Bernardo della Volpaia, *Study of a Cornice from the Codex Corner*, early sixteenth century. Pen and ink. 460×330 millimeters. London, Sir John Soane's Museum, vol. 115, f. 88.

of a drawn panel or relegated to the margins, drawn inscriptions evoke a surface that has been carved, chiseled, and chipped away. In other words, to pose an identifier as an inscription is to acknowledge text's capacity to occupy space.



Figure 12. Bernardo della Volpaia, *Plan of the Basilica of Constantine from the Codex Corner*, early sixteenth century. Pen and ink. 460×330 millimeters. London, Sir John Soane's Museum, vol. 115, f. 16.

Though the textual apparatus of the Metropolitan sheet makes no claim to an epigraphic interpretation of the written word, the apparent spontaneity of Verrocchio's script belies a remarkable sensitivity to the spatial relationship between writing and the pictorial field. Most notably, the form and orientation of each written vector establishes a direct visual equivalency between a given measured space and its expression in words. Through a series of subtle adjustments, Verrocchio largely confines his descriptions of measure between the relevant anatomical termini. For example, the vector that details the dimensions from the horse's ear to its chest does not exceed that distance; instead of appending a numerical translation to the line of text and lengthening it past the ear, Verrocchio displaces that fractional value above the writing. In contrast, the vector directly across ends with the abbreviated phrase "e cinque sedicimi 1/2," perhaps suggesting that writing "e mezzo" in words would have caused the description to transgress the linear boundary that descends from the horse's withers. Throughout, Verrocchio also adjusts the amount of space between words; an especially detailed written vector might be compressed tightly within its reference points, whereas a simpler description might be

stretched to fill as much of the empty space as possible. What we encounter, then, is a striking visual *double entendre* whereby Verrocchio's script is at once a translation of bodily measurements and is itself measured by those same anatomical features.

The Metropolitan sheet thus fits uncomfortably within the epigraphic discourse of its time, instead anticipating a later moment in which the modern alphabet was theorized, described, and represented in explicitly spatial terms. For instance, in his *Champ fleury* (1529), an early typographical treatise, Geoffroy Tory explicitly reframes the letter as a spatial, rather than purely graphic, entity. An illustration from the treatise envisions a capital "O" as the base of a foreshortened musical instrument:

Imagine and pretend that you are seated in a place of study, and that on the table before you, you see a flageolet lying, and that you are looking at the lower end, as it were in a straight line: you will find that the end will represent an O lying on its side, as if it were beginning to turn and move like a wheel $[...]^{3^{\circ}}$

In the accompanying image, he positions the "O" as the terminus of two orthogonal lines, thereby detaching the letter from the surface of the page and affixing it to the edge of an imagined plane (figure 13). Tory's commentary rehearses a central tenet of Euclidian geometry that was reflected in period texts such as Leon Battista Alberti's *Della pittura* (1435), where the theorist poses drawn lines as "demarcations" of "the borders of surfaces."³¹

More broadly, by casting the letter in the guise of an object, Tory at once acknowledges its spatial properties and re-imagines writing as an index of pictorial space. In Tory's wake, figures such as the French philologist Guillaume Postel openly



Figure 13. Geoffroy Tory, Le flageol de virgile en perspective, et moralite in Champ fleury, au quel est contenu lart et science de la deue et vraye proportion des lettres attiques, quon dit autrement lettres antiques et vulgairement lettres romaines, proportionnees selon le corps et visage humain (Paris: Petit Pont, 1529). Detail. Los Angeles, The Getty Research Institute, Special Collections, f. XVI^V. Internet Archive.

sought to codify the geometric principles underlying the written word.³² As Arielle Saiber convincingly argues, Cinquecento theorists expressed an interest in what she terms the "geometry of language," with especially notable contributions to this discourse in the final decades of the century by the polymath Giordano Bruno, who crafted a linguistic system informed by a distinctly "geometric rhetoric."³³ For Bruno, Saiber observes, text is not merely visual or figurative, but inherently spatial; it both "speaks about shape and space" and actively "molds and models it."³⁴

In the context of a measured drawing, where language and line inevitably interpenetrate, the spatiality of the written word takes on new significance. Freed from the surface of a facade or the sterile confines of a grid, text is implicated in the broader pictorial space of the composition. It can even—as in the case of the Metropolitan sheet—evoke volume, mass, and motion. In short, writing does the visual and conceptual "work" of the drawing.

III. Measure and making

Closer scrutiny of the spatial construction of Verrocchio's drawing reveals the unique capacity of script to act as an instrument of perspective. As we follow each description of measure from its origin to conclusion, we chart a recessional axis that originates at the picture plane and terminates in the background of the image. To take just one example, the vector delineating the lower boundary of the horse's neck draws the volumetric mass of the chest to the foreground of our gaze while holding the bony contours of the withers at a distance. The directional thrust of Verrocchio's script thus elicits a clear sense of depth.³⁵ Verrocchio was not alone in exploiting the perspectival quality of text in a measured drawing. Once again, we find an especially compelling correspondence between the Metropolitan sheet and works by Michelangelo executed in the early sixteenth century. In a group of marble studies no doubt intended for use at the quarry, Michelangelo records the measurements of each rough-hewn block in purely textual descriptors. Throughout, he orients each line of text obliquely with the respective faces of the block, effectively inscribing each marble surface with its dimensions and reinforcing its planar recession (figure 14).³⁶

Leonard Barkan argues that these studies manifest a puzzling "semantic logic" that obfuscates the traditional relationship between picture and caption. The excessive wordiness of Michelangelo's annotations, coupled with the lack of visual clarity of the blocks, suggests that the quarry sheets may represent private musings rather than straightforward "order forms."³⁷ As such, they deviate from other drawings in which Michelangelo similarly employs textual expressions of measure. In a study of a column probably intended for the facade of San Lorenzo, for example, the artist uses such annotations to establish a direct equivalency between the drawn image and the unit of measure to be used in construction.³⁸ Privileging the aesthetic value of these



Figure 14. Michelangelo Buonarroti, Study of Marble Blocks, sixteenth century. Pen and ink. Florence, Fondazione Casa Buonarroti, AB I 130, f. 245.

studies over their functionality, as Barkan does, perpetuates a binary in which the descriptive apparatus of a drawn image is either intrinsically "necessary" or entirely "supplementary" to its "communicative structure."³⁹ This reading strips text of its graphic potential—of its ability visually to "do," and not simply linguistically "mean" within an image. Yet, in the quarry sheets, the perspectival orientation of each line of text transcends its descriptive function to reify the block's dimensionality.

Whereas Verrocchio and Michelangelo called into question the spatial implications of text in a measured drawing, Renaissance draftsmen widely co-opted more conventional markings of measure—the linear vectors and numerical values that litter studies for bodies and buildings alike—to craft threedimensional space. Evidence for this phenomenon appears in a series of equestrian studies in the sixteenth-century Codex Huygens, an incomplete manuscript attributed to the Cremonese painter Carlo Urbino that is thought to have been based on lost notes and drawings by Leonardo. Across the Huygens studies, angular brackets, gridding, and fractional notations deconstruct equine proportions according to the unit of the testa. In one profile view, this apparatus lies flat against the picture plane, while a folio depicting a horse's engaged foreleg instead converts it into an armature that entirely circumscribes the body (figures 15 and 16).40 The latter work is an obvious copy of a surviving drawing of a foreleg by Leonardo, which casts a profusion of anatomical measurements as a pseudo-architectural scaffolding surrounding the horse's limb (figure 17). By externalizing this scaffolding, Leonardo emphasizes the corporeality of the leg within. So, too, does his controlled use of hatching to evoke the tautness of tendons lying just beneath the surface of the horse's skin give each descriptor an unmistakable materiality. Leonardo's re-conception of a line as an object reemerges in a number of drawings in the Codex Huygens where a system of jointed linear vectors is used to chart the progressive movement of a figure as it pivots in space. One such study of a male nude placed within a radial frame elevates line-here a description of motion rather than measure-to a fully embodied structural support.



Figure 15. Carlo Urbino, Measured Drawing of a Horse from the Codex Huygens, sixteenth century. Pen and brown ink on paper. 130 to 135 mm x 180 mm. New York, The Morgan Library, ms. 1139, f. 84.

At right, the figure even reaches his hand behind his back to curl his fingers around a horizontal vector, thereby fully absorbing it into the pictorial space of the drawing (figure 18).

A common Cinquecento genre of architectural drawing inverts this paradigm, instead transforming a real object into an instrument of measure. In this context, the representation of weighted plumb lines thematizes the twin practices of surveying and measurement. For example, in a crowded sheet of plinth studies from the aforementioned Codex Corner, della Volpaia incorporates the vertical axes of these devices into the organizational framework of the composition (figure 19). At right, each weight rests on the cornice below, simultaneously emphasizing

Figure 16. Carlo Urbino, *Measured Drawing of a Horse's Foreleg from the Codex Huygens*, sixteenth century. Pen and brown ink on paper. 130 to 135 mm x 180 mm. New York, The Morgan Library, ms. 1139, f. 77.

the material presence of the stone block and repurposing its uppermost edge as the horizontal strut of a linear grid. At left, the hanging string of each plumb line doubles as a spine for marking off the dimensions of the cornice. A drawing of an Ionic capital attributed to the circle of Antonio da Sangallo the Younger similarly reduces the plumb line from an object to a line, further affirming the currency of this seemingly idiosyncratic graphic convention (figure 20). Together, these drawings give voice to a desire to suspend the annotations of a measured drawing in space. Transforming a modest linear marking into an object (as in the case of the Codex Huygens), or co-opting an object as a functional vector (as in the case of the Codex Corner), renders the descriptive elements of an image representational.

The Metropolitan sheet pushes the boundaries of such annotations yet further by modeling the capacity of a measured drawing to convey not only space but also movement. In both language and line, Verrocchio re-imagines the expression of kinesis as part of the facture of the equine body. Most subtly, the linear armature underlying figure is punctuated by a series of markings indicating joints of motion. In the



Figure 17. Leonardo da Vinci, A Horse's Left Foreleg, with Measurements, c.1490. Pen and ink over charcoal. 25.0×18.7 centimeters. Windsor, The Royal Library, RCIN 912294. Reproduced with permission of the Royal Collection Trust/ \mathbb{C} Her Majesty Queen Elizabeth II 2018.

hindquarters, for instance, a constellation of small circles maps the form of the pelvic bone (figure 21). Verrocchio is in fact thought to have drawn the horse from life, first articulating its potential for movement and later connecting those indications to the system of measured axes.⁴¹ It bears note that Michelangelo adopts the same vocabulary of motion in his aforementioned *modello* for the Medici tombs, where small circles mark the figures' knees, elbows, and hips as they twist and bend. Even more than these familiar visual cues, however, it is Verrocchio's written vector that most clearly conveys a sense of kinesis. The very act of reading each line of script activates the sense of motion implicit in all written language. Whether printed or scrawled, a succession of letters fuels the movement of the eye from point to point.⁴²

The viewer is not immune to this animation of the pictorial field. As we trace the gesture of the pen within Verrocchio's grasp, we are forced to crane our necks and contort our bodies to follow the text as it unspools across the page. We might similarly imagine Verrocchio rotating the page as he writes, the outline of the horse blurring beneath the frenetic motion of his wrist. In effect, our most immediate



Figure 18. Carlo Urbino, *Study of the Human Body in Motion from the Codex Huygens*, sixteenth century. Pen and brown ink on paper. 130 to 135 x 180 millimeters. New York, The Morgan Library, ms. 1139, f. 16.

experience of the drawing-our reflexive impulse to read and decipher-sets the body of the horse in motion, transforming an otherwise schematized portrait into a fully kinetic being. To borrow a phrase from the late David Rosand, here "writing becomes drawing" (Lo scrivere diventa il disegnare).43 For Rosand, the marginalia of Leonardo's drawings assume a calligraphic quality that defy the constraints of written language. Thus disentangled from the clearly defined structure of a letter, he argues, Leonardo's flourish of the pen reinvents itself graphically: as a line, suspended in pictorial space. If Leonardo's annotations chart a seemingly irrepressible evolution from language to line, the Metropolitan sheet, in all its remarkable strangeness, defies that distinction altogether. Indeed, Verrocchio's written vector lends text the very same visual agency as line. When writing overwhelms a drawn image, supplanting modeling and hatching to convey both form and space, it yields an entirely new way of seeing-one that we are only just beginning to find the words to describe.



Figure 19. Bernardo della Volpaia, *Study of Plinths from the Codex Corner*, early sixteenth century. Pen and ink. 460×330 millimeters. London, Sir John Soane's Museum, vol. 115, f. 87.

By definition, a measured drawing gestures beyond the limits of the page: it envisions something yet unrealized in bronze or stone while simultaneously anchoring that object in our own space by quantifying its length, breadth, and depth. Verrocchio's translation of the process of invention into words —his act of quite literally "writing the body"—blurs this boundary between the imagined and the real. The conscious manipulations that dictate the form and content of each line of script not only record the challenge of calculating and recalculating anatomical measurements, but also lay bare the complex visual and spatial negotiations underpinning every attempt to project a three-dimensional form onto the page. As viewers, we participate in the horse's conception, and, as readers, we repeatedly reenact its construction. No longer simply a form of drawing, writing itself becomes a mode of making.

NOTES

1 – Andrea del Verrocchio, Measured Drawing of a Horse Facing Left (recto), c.1480-88. Pen and dark brown ink, over traces of black



Figure 20. Circle of Antonio da Sangallo the Younger, *Ionic capital found in Santa Maria in Trastevere Measured and Drawn in Three Ways, c.*1530–46. Pen and brown ink and wash. 296 mm × 219 millimeters. Detail. Florence, Gabinetto dei Disegni e Stampe degli Uffizi, 1620 A.



Figure 21. Detail of figure 1.

chalk. 24.9 × 29.7 centimeters. New York, Metropolitan Museum of Art, n. 19.76.5. Giustina Scaglia has identified a resemblance between the annotations on the drawing and the script of a *catasto* (tax declaration) of 1481 penned in Verrocchio's hand; Giustina Scaglia, "Leonardo's Non-Inverted Writing and Verrocchio's Measured Drawing of a Horse," *Art Bulletin* 64, no. 1 (1982): 32–44. Dario Covi has instead argued that the quality of line is "too impersonal" to support a secure attribution; Dario C. Covi, *Andrea del Verrocchio: Life and Work* (Florence: Leo S. Olschki, 2005), 234. More recently, Carmen Bambach maintained the attribution to Verrocchio, suggesting that there is insufficient evidence to cast doubt on his authorship; Carmen C. Bambach, "Measured Drawing of a Horse in Profile Facing to the Left (Cat. No. 9)," in *Leonardo da Vinci: Master Draftsman*, ed. Carmen C. Bambach (New Haven and London: Yale University Press, 2003), 267–270, at 267.

2 – Verrocchio's division of the *testa* into sixteen units is thought to be based upon Vitruvius's division of the body into eighths, with each section constituting the length of a human head; Bambach "Measured Drawing of a Horse," 169.

3 - The annotations, as transcribed by the Metropolitan Museum of Art, read: from the ear to the chest ("T" = Testa): "u[na] T $5/16 \frac{1}{2}$ / dal osso del orechio insino al petto una testa e cinque sedecimi e mezzo"; from the ear to the withers, "u[na] T 3 1/6 1/2 / dal orechio al guidalescho un testa e tre sedecimi $\frac{1}{2}$ "; from the chest to the withers, "una T e 1/2 sedecimo / dal petto al guidalescho una testa e mezo sedecimo"; from the chest to the front side of the upper leg, "sei 1 /6 1/2 / dal petto alacchomincio dela ghanba se sedecimi"; from the chest to the back side of the upper leg, "10 sedecimi e nezo [sic mezzo] / dal petto al chomincio de la ghanba dieci sedecimi"; from the beginning of the front leg to the withers, "una T e dua 1 /6 / dal chomincio dela chanba insino al guidalescho una testa e dua sedecimi"; at the front of the left hoof, "tre sedecimi 1/2 / 3 1/6 1/2"; from the front fetlock to the knee, "nove sedecimi / da questo nodello al ginochio 9 16"; from the front of the left knee to the belly, "undici 16 1/ 2 / dal ginochio al chomincamento / undici parti e mezzo"; from the withers to the top of the rump, "una T e 11 1/6 / dal gudalesch a p[r] incipia dela groppa una testa e undici sede-cimi"; from the chest to the rump, "dua T e 10 1/6 / dal petto alla groppa dua teste e dieci sedecimi"; from the top of the front leg bone to the top of the back leg bone, "una T e 4 1/6 / dal ginocho al chomincio dela choscia una testa e quaettro 1 6"; across the front thickness of the belly, "una T 5 1/6 1/2 / grosso una testa [cancelled: e mez] e cinque 1/6"; from the top of the back leg to the rump, "undici 1/6 / da qu al osso dela gropa undici 1 /6"; from the rump (or crupper) to the tail, "nove 16 / dal gropa alla choda nove 16"; from the lower rump to the top of the tail, "14 16 1/2 / da qui alla choda di sop[r]a 14 1/6 e 1/2"; from the top of the haunch bone to the knee, "u[na] T e 10 1/6 / da questo o dela groppa insino al gnochio una testa e dieci sedecimi"; from the top of the back leg to the knee of the back leg, "da questo o insino al ginochio 13 1/6 1/2"; from the rear knee to the lower rump, "otto sedecimi / dal ginochio a questo 8"; and from the rear fetlock to above the knee, "dodici 16 / da questa guntura al disop[r]a del ginochio dodici 1/6"; Carmen C. Bambach, "Disegno di cavallo che guarda a sinistra, con misure (Cat. No. 2)," in Leonardo: Dagli studi di proporzioni al trattato della pittura, ed. Pietro C. Marani and Maria Teresa Fiorio (Milan: Electa, 2007), 59-61, at 59.

4 - Bambach, "Measured Drawing of a Horse," 267-270, at 267.

5 - As quoted in Covi, Andrea del Verrocchio, 236.

6 – Martin Kemp, "Leonardo's Drawings for "Il Cavallo del Duca Francesco di Bronzo: The Program of Resarch," in Diane Cole Ahl, ed., *Leonardo da Vinci's Sforza Monument Horse: The Art and the Engineering* (Bethlehem: Lehigh University Press, 1995), 64–78, at 65.

7- Giorgio Vasari, *The Lives of the Artists*, trans. Julia Conaway Bondanella and Peter Bondanella (New York: Oxford University Press, 1991), 232.

8- See, for instance, Bambach's discussion of the sparse documentation concerning Verrocchio's identity as both a painter and a draftsman; Carmen C. Bambach, Drawing and Painting in the Italian Renaissance Workshop: Theory and Practice, 1300–1600 (Cambridge: Cambridge University Press, 1999), 259.

9 – Regarding the Sforza commission, see Ahl, *Leonardo da Vinci's Sforza Monument Horse*; Pietro C. Marani, "Leonardo, l'antico, il rilievo e le proporzioni dell'uomo e del cavallo," in Marani and Fiorio, *Leonardo*, 17–27. For the dating of the Metropolitan sheet, see Bambach, "Measured Drawing of a Horse," 269.

10 – On the Colleoni commission, see Maud Cruttwell, *Verrocchio* (London: Duckworth, 1904), 179; Covi, *Andrea del Verrocchio*, 153; Bambach, "Measured Drawing of a Horse," 267–70; and Marani, "Leonardo, l'antico, il rilievo," 20. On the contested attribution of the drawing, see Covi, *Andrea del Verrocchio*, 236–37.

II – Covi argues unequivocally that the drawing was not executed in preparation for a specific painting or sculptural commission, identifying it as "neither more nor less than a study of the ideal proportions of a horse [...]"; Covi, Andrea del Verrocchio, 234.

12 – "Donatello, Michelangelo, Cellini: Sculptors' Drawings from Renaissance Italy" (October 2014–January 2015). Christina Neilson, "Measured Drawing of a Horse Facing Left (Cat. No. 7)," in *Donatello, Michelangelo, Cellini: Sculptors' Drawings from Renaissance Italy*, ed. Michael Cole (Boston: Isabella Stewart Gardner Museum, 2014), 142–44, at 142. 13 – Bambach, "Measured Drawing of a Horse," 269.

14 – For the modern concept of the "performative utterance," see J. L. Austin, *How to Do Things with Words* (New York: Oxford University Press, 1965).

15 - Within the context of sculptural practice, see, for instance, Michael W. Cole, "Why Did Sculptors Draw?," in Cole, Donatello, Michelangelo, Cellini, 12-39; Joris van Gastel, "Senza sostanza di corpo? Bernini and the Problem of the Sculptor's Drawing," Sculpture Journal 24, no. 1 (2015): 23-35. 16 - On the subject of medieval and early modern measurement as it relates to anatomical proportion, see, in particular, Emanuele Lugli, "Measuring the Bones: On Francesco di Giorgio Martini's Saluzzianus Skeleton," Art History 38, no. 2 (2015): 347-63. On measurement within an architectural and urban context, see also Emanuele Lugli, "Hidden in Plain Sight: The Pietre di Paragone and the Preeminence of Medieval Measurements in Communal Italy," Gesta 49, no. 2 (2010): 77-95. On the genre of the functional architectural drawing more broadly, see Cristina Modonutti, "Bussola e rilievo architettonico nei disegni di Antonio da Sangallo il Giovane e Baldassarre Peruzzi," Annali di architettura 26 (2014): 7-28. For a discussion of measurement within the context of architectural surveying, see Chloé Demonet, "Théorie et pratique du relevé d'architecture au XV^e siècle et au début du XVI^e siècle," ArtItalies 21 (2015): 64-76. On scale, see Paul Davies, "The Hidden Signature: Scale Keys in Italian Renaissance Architectural Drawings," Pegasus: Berliner Beiträge zum Nachleben der Antike 16 (2014): 123-50.

17 – "Sono alcuni disegni di sua mano nel nostro libro fatti con molta pacienza e grandissimo giudizio [...] sonvi ancora due cavagli con il modo delle misure e centine da fargli di piccioli grandi, che venghino proporzionati e senza errori"; Giorgio Vasari, *Le vite de' piúeccellenti pittori, scultori e architettori, nelle redazioni del 1550 e 1568*, ed. Rosanna Bettarini and Paola Barocchi, 6 vols (Florence: Sansoni, 1971), III: 538. Regarding Vasari's collection of drawings, see Licia Ragghianti Collobi, *Il Libro de'Disegni del Vasari* (Florence: Vallecchi, 1973); and Otto Kurz, "Giorgio Vasari's "Libro de' Disegni," *Old Master Drawings* no. 45 (1937–38): 1–15, at 14.

18 – Bambach notes that the exhibition "Leonardo da Vinci: Master Draftsman" at the Metropolitan Museum of Art in 2003 was the first time the drawings had appeared together. For Bambach's respective discussions of the Roman sheet, see Carmen Bambach, "Horse in Profile Facing to the Right; Unrelated Small Figural Sketch at Bottom Center (*recto*), Measured Drawings of a Horse in Rear View, a Horse in Frontal View, and Detail of its Foreleg in Profile (Cat. No. 10)," in Bambach, *Leonardo da Vinci*, 271–73; and Bambach, "Disegno di cavallo," 60–61.

19 – Bambach draws a subtle (albeit telling) distinction between this "scientific" study and a naturalistic rendering of a horse in profile, devoid of any textual or numerical notations, which appears on the *recto* of the sheet; Bambach, "Disegno di cavallo," 60. The annotations

on the Roman sheet, as transcribed by Enrichette Beltrame Quattrocchi, read: "parte tredici / dall'uno osso all'altro 15 1/6 / dall'uno osso all'altro tredici 1/6; da questa forcella in sotto la ghola 13 1/6 / undici 1/6 $\frac{1}{2}$; larghezza del peto undici se' decimi e mezzo; T [esta?] una sei 1/6 / dal ginocchio attera una testa e se [...]"; Enrichette Beltrame Quattrocchi, *Disegni toscani e umbri del primo Rinascimento dalle collezioni del Gabinetto Nazionale delle Stampe* (Rome: De Luca, 1979), 24. The Roman sheet is also mentioned in Martin Clayton, *Leonardo da Vinci: The Divine and the Grotesque* (London: Royal Collection, 2002), cat. no. 6, 34, n. 1.

20 - Clayton, Leonardo da Vinci, cat. no. 6, n. 1.

21 – Paul Joannides, Michelangelo and His Influence: Drawings from Windsor Castle (Washington, DC: National Gallery of Art, 1996), 116 (cat. No. 33a); Cammy Brothers, Michelangelo, Drawing, and the Invention of Architecture (New Haven: Yale University Press), 4. Neither author addresses the use of written vectors in the composition.

22 – Jeffrey F. Hamburger, "The iconicity of script," *Word & Image* 27, no. 3 (2011): 249–61.

23 – Lucia A. Ciapponi, "A Fragmentary Treatise on Epigraphic Alphabets by Fra Giocondo da Verona," *Renaissance Quarterly* 32, no. 1 (1979): 18–40.

24 – The treatise, which is considered the definitive French work on the design of letters, is also known as *L'art et la science de la vraye proportion des lettres attiques: ou antiques, autrement dictes romaines, selon le corps et visaige humain* [...]; Tom Conley, *The Self-Made Map: Cartographic Writing in Early Modern France* (Minneapolis: University of Minnesota Press, 1996), 62. For a modern publication of Pacioli's treatise, see Luca Pacioli, *De divina proportione* (Milan: Mediobanca di Milano, 1956).

25 – Gian Paolo Lomazzo, Scritti sulle arti, ed. Roberto Paolo Ciardi (Florence: Marchi & Bertolli, 1973), 258; Horst Bredekamp, The Lure of Antiquity and the Cult of the Machine: The Kunstkammer and the Evolution of Nature, Art and Technology, trans. Allison Brown (Princeton: Markus Wiener, 1995), 49.

26– Giancarla Periti, "Epigraphy and the Semiotics of the Line in Late Quattrocento Italy," in *Linea I: Grafie di immagini tra Quattrocento e Cinquecento*, ed. Marzia Faietti and Gerhard Wolf (Venice: Marsilio, 2008), 191–93, at 197. 27 – Stephen J. Campbell, "*Pictura* and *Scriptura*: Cosmè Tura and Style as Courtly Performance," *Art History* 19, no. 2 (1996): 267–95, esp. 277, 289. For Leonardo's commentary on this *paragone*, see also ibid., 283, n. 67.

28 – Marzia Faietti, "L'alfabeto degli artisti," in *The Power of Line: Linea III*, ed. Marzia Faietti and Gerhard Wolf (Munich: Hirmer, 2015), 227–246, at 231. 29 – On Volpaia's use of Roman font in architectural studies, see Cammy Brothers, "What Drawings did in Renaissance Italy," in *Renaissance and Baroque Architecture: The Companion to the History of Architecture*, ed. Alina Payne (Malden: Wiley Blackwell, 2017), 104–135, at 106.

30 – Geoffroy Tory, Champ fleury, au quel est contenu lart et science de la deue et vraye proportion des lettres attiques, quon dit autrement lettres antiques et vulgairement lettres romaines, proportionnees selon le corps et visage humain (Paris: Petit Pont, 1529), 42–43. 31 – Leon Battista Alberti: On Painting: A New Translation and Critical Edition, trans. Rocco Sinisgalli (Cambridge: Cambridge University Press, 2011), 50.

32 - Arielle Saiber, Giordano Bruno and the Geometry of Language (Burlington: Ashgate, 2005), 16.

33 – Ibid., 2. On the subject of language as a spatial entity, see also Arielle Saiber, "Flexilinear Language: Giambattista Della Porta's *Elementorum curvilineorum libri tres,*" *Annali d'Italianistica* 23 (2005): 89–104.

34 - Saiber, Giordano Bruno and the Geometry of Language, 3.

35 – Robert Felfe suggests that the perspectival manipulation of letters demonstrates "the unique ability to show this primordial connectedness between the physical world and human language"; Robert Felfe, "The Line and its Double Nature in Early Modern Graphic Arts," in Faietti and Wolf, *Power of Line*, 20–37, at 29.

36 – Leonard Barkan, *Michelangelo: A Life on Paper* (Princeton: Princeton University Press, 2011), 218–24. On the nature of text and visual symbols in the quarry sheets, see also ibid., 100–03.

38 - Michelangelo, Corpus 508^r, Casa Buonarroti 64A; ibid., 214.

39 - Ibid., 214, 221.

40 – Codex Huygens, New York, Pierpont Morgan Library, ms. 1139. The manuscript is thought to represent Carlo Urbino's copy of Leonardo's lost treatise on proportion. For the foundational account of the manuscript, see Erwin Panofsky, *The Codex Huygens and Leonardo da Vinci's Art Theory* (London: Warburg Institute, 1940). For a discussion of Carlo Urbino's authorship, see Sergio Marinelli "The Author of the Codex Huygens," *Journal of the Warburg and Courtauld Institutes* 44 (1981): 214–22.

41 - Bambach, "Measured Drawing of a Horse," 267.

42 - Tom Conley, The Graphic Unconscious in Early Modern French Writing (Cambridge: Cambridge University Press, 1992), 5.

43 - David Rosand, "Una linea sola non stentata," in Faietti and Wolf, Linea I, 17–28, at 23.

^{37 –} Ibid., 224.