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Original Paper

Sources of Inspiration in the Early Life of Leonardo da Vinci

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Abstract

Although the early life of Leonardo da Vinci in Florence seems singularly unproductive, particularly considering the acknowledged breadth of his genius, an inferential examination of his early work reveals an interesting scope of likely activities. A self-referential element is his only signed and dated work, a landscape drawing, which is identified as a likely commemoration of the date of his conception in Vinci, a unique concept in art historical analysis. To develop a fuller picture of his accomplishments in this early period requires an interconnected series of analyses and reappraisals, including an interpretation of the otherwise puzzling set of young men in red caps painted by Botticelli as the incipiently famous group of artists that trained in Verrocchio's bottega*. These analyses fill out the picture of Leonardo's formative years in the hillsides and towns around Vinci, as not only a precocious artist based on exposure to works by famous artists before leaving Vinci, but as a handsome studio model, an extempore musician, a leading member of the redcap band of remarkable apprentices in Medici Florence, an engineering assistant to his master Verrocchio, and a collaborative associate of the pioneering group of Florentine perspectivists including Uccello and Toscanelli in their later years.*

Keywords

Leonardo da Vinci, youth, musician, studio model, Masolino da Panicale, Paolo Uccello, Paolo Toscanelli

1. Introduction

While much art-historical analysis depends on documentary evidence, the sparseness of such evidence when analyzing works from half a millennium ago generates the need to rely on as many aspects of the works as possible in order to gain a full picture of the artists in their milieu. Even in the case of Leonardo da Vinci, who provided more of his own documentation than any artist of his era, it has nevertheless been difficult to develop a full picture of his sources of inspiration, particularly in his early life before leaving Florence for Milan. This is a period when many creative geniuses are the most productive and yet

Leonardo is known to have produced only a handful of Madonnas and cartoons of a couple of projected works in his first decade of majority.

Here the strategy is to take a fresh look at the iconographic clues in the pictorial works of Leonardo and his contemporaries, bolstered by some neglected aspects of the documentary evidence, to provide an enhanced picture of the diverse sources of inspiration in Leonardo's early years. Extending beyond the wealth of expanding scholarship on Leonardo da Vinci, the present work employs this iconographic approach to draw out a number of previously unexplored aspects of Leonardo's youthful life and work, although it should be recognized that these remain suggestive hypotheses for further investigation through enhanced scholarship of all available forms (Note 1). Analysis of his renowned dated Landscape Drawing leads to the novel suggestion that it was inscribed in recognition of his own date of conception 21 years earlier. Consideration of his youthful roles give new insight into Leonardo's appearance as an extempore musician, and as a leading member of the group of apprentices in the *bottega* of Andrea Verrocchio, which was a major producer of artworks for the Medici and their sphere of influence. Evidence is further adduced for another likely influence in Leonardo's young career through collaboration with the Florentine perspectivists Paolo Toscanelli and Paolo Uccello, key members of the active artistic community of the time.

2. On Leonardo's Date of Conception

One intriguing mystery of the Leonardo da Vinci oeuvre is why, of his many works of art and science, there was only one work that he ever dated, or even signed (Note 2). Although this one work was signed with a flourish, it was but a simple landscape drawing rather than some large-scale work (Figure 1). A drawing, nonetheless, that has attracted much scholarship and debate. In addition to its autographical interest as his earliest known work, it has often been considered to be the first purely landscape drawing in Western art (Note 3) although there have subsequently been competing claims. At least it was notably influential among Leonardo's contemporaries, such as Perugino, Raphael, Giorgione, Dürer and Michelangelo. In fact, it has the curious property of appearing as a realistic landscape on the left side but an unresolved fantasy landscape on the right. The trees at right appear to be shimmering in the wind and there seems to be a waterfall flowing from the crown of the rock formation into a lakeshore in front of a large hillside at an indistinct distance. These phantasmal aspects tend to support the interpretation that it was most likely drawn from youthful memories rather than being a literal depiction of a specific landscape. This inference is further supported by the fact that he was living in Florence at the time, as evidenced by his payment of the membership dues to the painter's guild of Florence in 1472.

Figure 1. 'Landscape drawing dated 5th August 1473' by Leonardo da Vinci (1473, sanguine on paper, Uffizi, Florence).

The big mystery, then, is not so much the drawing *per se*, but why it is the only work he ever signed or dated, suggesting that it held particular significance for him. Flipped to make the mirror writing explicit for normal readers, we see that the date is specified both numerically and in terms of its feast appellation "*Dì de Sta Maria della Neve*", or the Feast of the Snows (Figure 2). This festival is an annual event celebrated in many parts of Italy, based on the 3rd-century occurrence of the "miraculous" snow in Rome on the occasion that Pope Liberius was laying out the groundplan for the Basilica of Santa Maria Maggiore on the Esquiline Hill. The event is commemorated in the basilica with a C13th mosaic by the painter Cimabue and also with an altarpiece by Masolino da Panicale from the epochal return of the papacy to Rome in 1417 (an event that had played an essential role in the inception of the Renaissance (Note 4)). This altarpiece was commissioned for the Colonna Chapel for the family of the then current pope, Martin V, and is now in the Museo di Capidimonte, Naples.

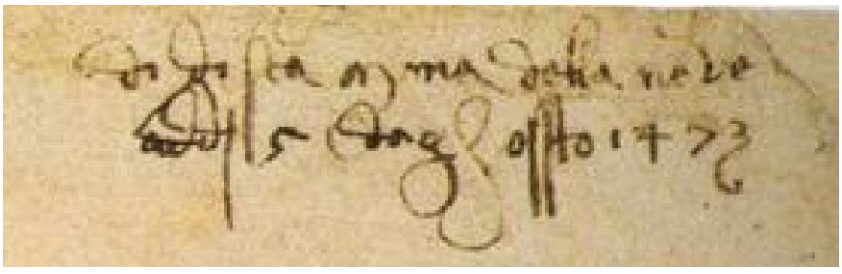

Figure 2. Detail of the inscription in Figure 1, saying *"Dì de Sta Maria della Neve, a di 5 daghosto, 1473*".

The Tuscan landscape represented in the drawing has been the subject of much speculation, but is generally agreed to be a view of a river valley of the Arno (the Valdinievole) (Note 5) looking south towards the town of Empoli from somewhere near Leonardo's natal home in Vinci (Note 6). Nanni (1999) has suggested that the view is actually from the slopes of Montecatini, a mound north of Montevittolini and the hill of Monsummano (Note 7), although the drawing is more recently considered a work of the imagination and memory (Note 8) combined from two sources rather than a specific topographic depiction. Indeed, it seems that Leonardo was living in Florence at the time indicated, about two-day's travel by foot from Vinci in the C15th. There have been suggestions that Leonardo may have made the journey to Vinci for the occasion of this drawing, but it seems equally likely that he did the drawing from his memory of the region where he grew up, prompted by the significance of the date to him.

Figure 3. Above: detail of Leonardo's Tuscan landscape drawing from Fig. 1 showing a hill town at left and a small hill at right. Below: View looking south from the hill behind Vinci, showing old Vinci at left and the Monsummano Alto hill at right (author photo). For comparison with the drawing, the view has been compressed x2 horizontally. (The white church tower was added in the C19th). Note that the steep drop at the right side of the town visible at lower left in the drawing is a physical feature of the town itself, though obscured in the photograph from this viewpoint by the foreground hillside.

Figure 3 compares the distant view in the lefthand side of the landscape and the actual view looking southward to Empoli from a location just to the north of the town of Vinci. It is noteworthy that Vinci has the unusual topography of being built on a narrow promontory extending southward from the foothills of Montalbano behind, with steep drops on either side of the town walls. This elevated topography matches the character of the town at the left side of Leonardo's drawing. At the far right of the view is a "pozzo" or hill topped with buildings including a tower, known as Monsummano Alto. This too is a prominent feature of Leonardo's drawing, suggesting that the depicted scene derived from a childhood memory of the view from the hillside above Vinci itself. However, it should be made clear that the photographic comparison has been compressed horizontally by a factor of 2 in order to bring these features into view. In this respect, it is consistent with a recreation from memory of this scene rather than a literal copy, and it should be noted that the righthand side of the drawing (Figure 1) has very much the flavor of a fantasy view, with sketchy trees, an indistinct transition between the rocky outcrop foreground and the hillside behind it, and the surprising waterfall bursting forth from the top of the rocky outcrop.

Empoli itself should have been of particular significance to Leonardo, since it would most likely have been the first place that he had seen any paintings. Vinci is a small town that even today has only a couple of artworks in the present town church (which itself was only built in the late C18th). In the C15th there would have been none in the small stone church of the time, while Empoli, the local market town for Vinci, was home to several basilicas with influential C15th artworks from before Leonardo's birth date, dating back several centuries to form an impressive range of works by such notable artists as Giovanni Pisano, Mina da Fiesole, Lorenzo Monaco, Filippo Lippi, and Masolino da Panicale (who had headlined with a commemoration of the Festival of the Snows altarpiece in Rome, as mentioned above). It seems plausible that it was these artworks that had inspired the young Leonardo to be such a precocious painter that Ser Piero da Vinci, his father, felt he should be apprenticed to Verrocchio, the master of the most prestigious studio in Florence (indeed, arguably in the whole of Europe) at that time. Thus, Empoli and its longstanding painting tradition was not just a local town downstream from Vinci, but the probable source of Leonardo's lifelong inspiration as an artist.

It is notable that the only other time in any of his works or notes that Leonardo gave a formal dating, with such a repletion of the information, was for the death of his father (Note 9). This may thus be considered as significant indicator of its importance to him. We thus have several key factors to impel a stronger interpretation of this landscape drawing relative to Leonardo's life:

1) It was a breakthrough concept of making a finished landscape drawing.
2) It was the only artwork that he ever signed or dated.
3) It was doubly dated, matching only the notation of his father's death.
4) It is reminiscent of the territory close to his birthplace.
5) It is a view towards likely source of the inspiration for his métier in life.
6) It has a connection to the signification of the date inscribed.
7) The date is about 9 months before his birthday on April 15th.

This concatenation of significance suggests the possibility that Leonardo may have been commemorating his date of his own conception, actually 8 months and 10 days before his birthday on April 15th. There has been little attention paid to the particularity of Leonardo's date of conception, although young Piero, his father, was supposed to have been courting the peasant-girl Caterina for several months before the seminal event. But why should his conception happen to be dated the Festival of the Snows? One may speculate that perhaps there was a celebration of the festival in Vinci. Indeed, it is even possible that young Caterina, who had been engaging his attention during that summer period, could have been the performer for the Mary figurehead, or "festival queen", in the procession for the Festival of the Snows, and Piero was smitten. So this all adds up to a plausible hypothesis as to why Leonardo might have been prompted to do a drawing on the particular date of the Festival of the Snows from the hills overlooking Vinci.

Twenty-one years was the typical date of graduation to adulthood at the time, 7 years after starting the apprenticeship at age 14. Scholarship has often placed Leonardo's initial appearance in Florence as being in 1469 (Note 10), when he was considered to have been 17 (based on the first appearance of his name in Ser Piero's tax records). Such a date is, however, inconsistent with Leonardo's recognition as one of "Two young men the equals in rank and in loves" in Giovanni Santi's paean to the artists of Florence encountered by Federico di Montefeltro on his visit to the city in 1468. This description from this early date seems to indicate that Leonardo must have been recognized as an accomplished apprentice by that year, when he would have been 16 or 17.

The only other evidence we have of Leonardo's artistic maturity is that he was registered as an artist with the Society of St Luke (the painter's guild) by 1472, and this seems precociously early if he had only started in Verrocchio's studio a couple of years earlier, but it seems rather more plausible that it would have been in 1466, when he reached the standard age of apprenticeship, and there is no evidence of his whereabouts during that period. On these grounds, then, a date of the initiation of the apprenticeship at age 14 seems to be the most appropriate, giving Leonardo 6 years to reach the level of accomplishment required for election to the painter's guild.

3. Role in the Verrocchio Studio: The Artist's Model and Chief Apprentice

A prime aspect is Leonardo's role as the epitome of the Renaissance man-about-town, recognized as the most handsome young man of the Florentine social scene. Going along with this is the idea that he would have acted as an artist's model for the studio of his master Verrocchio, which was the principal *bottega* for the ruling Medici at the time. The only description we have of his personal appearance is from the Anonimo Gaddiano (Note 11), that he had beautiful curling hair, wore a short tunic and favoured pink colours (as validated by the one inventory of his clothing among his voluminous notes (Note 12)).

A B C D

Figure 4. A. Verrocchio's 'Statue of David' (~1470, bronze, Bargello). B. Close-up of the face of 'David'. C. 'Portrait of a Musician' by Botticelli/Leonardo da Vinci (oil, Ambrosiana). D. Reconstruction of Leonardo's silver horse-head lyre (Copyright Leonardo3, Milan; leonardo3.net; accessed 11/2/2019).

The prime exhibit in regard to his appearance is Verrocchio's 'Statue of David' Figure 4A,B), commissioned by the Medici for Palazzo Vecchio (decades before the Michelangelo version), which is often considered to have been based on Leonardo as the studio model (Note 13). Consistent with this attribution is that his clothing matches the Gaddiano description of a short tunic (Note 14). Note that the facial expression of the 'David' sculpture (Figure 4B) has another typical feature of the Leonardo ethos, the ambivalent smile of the Mona Lisa. So perhaps this expression was also characteristic of the young Leonardo himself, captured for the first time in the Verrocchio 'David', and subsequently in many of Leonardo's own works. Examples of this ambiguous smile in Leonardo's works are shown in Figure 5 (Note 15), which was a rarity in the facial depictions of the era (as can be seen for example in Figures 6 & 7).

Another construction that Leonardo was certainly involved in, at age 17, was the gilt copper ball and cross, containing holy relics, that was hoisted to the pinnacle of conical roof of Brunelleschi's Duomo by Verrocchio and his team in 1469 (Isaacson, 2017, p. 41). This procedure involved an array of scaffolding and mechanical hoists that were sketched in Leonardo's notebooks, and may well have sparked his lifelong interested in mechanical equipment. Indeed, Leonardo might have also participated in the construction of the bronze ball itself, as stated in the Paris G manuscript: "Remember the way we soldered the ball of Santa Maria del Fiore" (Galluzzi, 1987). This connection helps to explain the genesis of the otherwise puzzling degree of interest that Leonardo exhibited in mechanical contrivances, which sets him so vividly apart from his contemporaries with a similar background.

Figure 5. Details of ambiguous smiles in faces from Leonardo's 'Benois Madonna', the newly attributed 'Virgin with the Laughing Child', the St Anne in the 'Virgin and St Anne', the 'Mona Lisa', the angel in the 'Virgin of the Rocks', and 'St John the Baptist'; Verrocchio's 'Statue of David', and St Thomas in the 'Statue of Christ and St Thomas' (Note 15).

4. The Extempore Musician

One other personal trait that is known of Leonardo is that he was an accomplished musician who even made his own musical instruments. According to Vasari, "He gave some little attention to music, and quickly resolved to learn to play the lyre, as one who had by nature a spirit most lofty and full of refinement: wherefore he sang divinely to that instrument, improvising upon it." (Note 16) And when Leonardo went to Milan to serve Ludovico Sforza in various capacities, he "took with him that instrument which he had made with his own hands, in great part of silver, in the form of a horse's skull, a thing bizarre and new in order that the harmony might be of greater volume and more sonorous in tone; with which he surpassed all the musicians who had come together there to play. Beside this, he was the best improviser in verse of his day." (Note 17) These laudatory quotes give us the picture of Leonardo as a popular entertainer who could delight the assembled company of Florentine cognoscenti with extempore musical innovations whatever the occasion. Such occasions when Leonardo was a young cosmopolitan were the visit of Duke Galeazzo Sforza of Milan to Florence, the opening ceremony of the astronomical gnomon in the Duomo by Toscanelli for charting the sun's movements, the raising of the copper ball to the apex of the Duomo by Leonardo' master, Verrocchio, and the wedding of Simonetta Cattaneo to Marco Vespucci in Florence, as epitomized by Botticelli's 'Birth of Venus'.

This description raises the issue of a Renaissance portrait of a musician at the Brera Gallery, Milan (Figure 4C), which has had a variety of attributions over the years (Note 18). Here it is given the controversial attribution as being a portrait of Leonardo himself, considering that the hairstyle matches that in the Verrocchio David, and that Leonardo himself was an accomplished musician. Unlike previous attributions, however, this hypothesis has been tested by automated computer modeling techniques, showing that the 3D head models fitted to the 'Musician' image matched that of the David (as the young Leonardo da Vinci) within a significantly smaller average error than other candidate portraits from the same period (Tyler, Smith, & Stork, 2010). This result provides quantitative confirmation that the portrait bears a significant resemblance to Leonardo da Vinci, and thus enhances the corpus of evidence as to his appearance when young.

5. Gozzoli and the 'Procession of the Magi'

One major artwork that had recently been completed at the time of Leonardo's arrival in Florence was the wall-sized 'Procession of the Magi' by Benozzo Gozzoli in the Palazzo Medici-Riccardi, completed in 1460 when Leonardo was 8. The identification of the crowd figures in this painting are mostly well established, with the senior Medici brothers, Giovanni de Bicci and Cosimo the Elder leading the processional group, perhaps with their son Piero Medici (the Gouty) between them. Facing us at left are two visitors to Florence, Sigismondo Pandolfo Malatesta and the young Galeazzo Maria Sforza, who were guests of the Medici in Florence in the time the frescoes were painted. Above Sforza are the young brothers Lorenzo and Giuliano Medici. In fact, the procession presumably commemorates the notable parade of the Sforza court and retainers entering Florence in 1459, and the various entries of the Medici into Florence following their succession of exiles. Behind the leaders are ranks of illustrious Florentines, such as the members of the Art Guilds in the second rank of figures, with the humanists Marsilio Ficino and the Pulci brothers along with Benozzo himself in the third rank.

What is notable is the number of the assembled company wearing scarlet headgear, headed up by the elder Medici brothers and Galeazzo Sforza in the first rank. This striking feature of the midcentury attire suggests that a soft red headpiece was a kind of insignia of civic influence at the time, perhaps referencing the red Phrygian caps worn by the Magi in the late-Roman C6th mosaic of the topic in Ravenna. This trope could be an expression of the anti-authoritarian stance of the Medici, whose republican ideals were exerted through democratic influence among the civic leaders as the "first among equals" rather than through military power. It cannot be a coincidence that they are all wearing such similar kinds of headwear, although it does not seem to have been the subject of previous art-historical analysis. Rather than the crowns of kings and emperors, they are shown as wearing soft caps associated not only with populist revolt but also with the spiritual devotion of distant rulers to the religious power of the era, both of which represent an implicit rather than explicit form of authority that is characteristic of the Medici. As will be developed, this mark of identification plays a further role in the identification of other figures in paintings of the era.

In terms of Leonardo's youthful influences, one can well imagine that, as members of the premier artisanal studio of the Medici, both he and Botticelli would have had the opportunity to view this major private Medici commission in the Medici palazzo at some point. With its true-to-life portraits, rocky milieu, spikey trees and realistic horses, this fresco has many features that could be seen as plausible sources of influence in Leonardo's early works.

Figure 6. Detail from the 'Procession of the Magi (East Wall)' by Benozzo Gozzoli (1459-60, fresco, Palazzo Medici-Riccardi, Florence), emphasizing the proliferation of soft red headgear worn by the Medici and their entourage.

6. Botticelli and the Verrocchio apprentices

However, this attribution raises the question of who painted this unfinished portrait? The idea that it was a self-portrait by Leonardo himself, as some have suggested, seems implausible in view of Leonardo's distinctively soft modeling style, as evident in Figure 5. This consideration leads to a possible attribution of the Ambrosiana 'Portrait of a Musician' to Sandro Botticelli on the basis of his edged-enhanced outline style (which is quite unlike Leonardo's notably soft modeling).

This attribution is further supported by considering the detail of the red cap in the context of several other Botticelli portraits of unknown young men in red caps (Figure 7). This remarkably homogeneous group of portraits of young men (scattered across many museums) does not seem to have

previously been considered together, despite the uniformity of their attire and the consistency of their attribution to Botticelli. The significant of this group is underlined by the fact that Vasari's 'Life of Botticelli' made specific mention of a prank Botticelli played on his apprentices featuring the placement of red caps on a group of plaster angels, indicating that he did indeed view red caps as a group identification mark of (non-divine) citizenship in the City of Florence (Note 19). In light of the red cap theme of the Gozzoli procession (Figure 6), it may be further posited that the red caps indicate the known association of this group of apprentices headed up by Leonardo with the Medici orbit, in particular.

Figure 7. Upper row: the Brera 'Portrait of Musician' compared with details from five portraits of young men in red caps by Botticelli. Lower row: the Verrocchio 'David' with details from attributed portraits of other pupils of Verrocchio at that time: Lorenzo de Credi by Perugino, and self-portraits of Pietro Perugino, Domenico Ghirlandaio, Luca Signorelli, and Sandro Botticelli.

The rightmost image is from the painting, 'Portrait of a Man with the Medal of Cosimo the Elder', in the Uffizi Gallery. The identity of the subject is widely disputed, but here it is suggested that the most likely candidate is Botticelli himself, honouring the doyen of the Medici family that he had so ably represented over the years. Given these two attributions of the subjects as Leonardo and Botticelli, and the context of the red caps in the Gozzoli 'Procession' of Figure 6, one is encouraged to consider the iconographic evidence of the comparison the other portraits of young men in red caps (Note 20) with later portraits of the other members associated with the Verrocchio studio at that time (Figure 7). (Botticelli is described by Giovanni Santi, in his panegyric about the contemporary painters of Florence, as working in the Verrocchio studio, along with Signorelli and Perugino).

In relation to Botticelli's connections to the community of Florentine artists, it is well established that he included portraits of many of his contemporaries in his crowd scenes, the paradigm example being the Uffizi 'Adoration of the Magi' (Figure 8), which has been described as including portraits of Old Cosimo and other members of the Medici family, together with a self-portrait of Botticelli himself at far right (see Paoluccii, 2003). What has not been discussed is the identity of the group of young men in the left foreground, who seem to be the retinue of the confident individual in the peaked hat standing just behind the Old Cosimo figure (the kneeling magi Melchior). A clue to the identity of this leading individual is found in Verrocchio's figuration of John the Baptist in his vaunted 'Baptism'. For a variety of reasons, there are good grounds for proposing that this may be a self-portrait of Verrocchio himself (matching his age at the time of painting, for example). On this basis, therefore, it may be proposed that the retinue of young men lined up behind him are actually portraits of the apprentices in his studio, the dominant studio for Medici artworks at this time, anchored by a portrait of Leonardo in a short pink tunic at the far left, next to his emblem of a horse (and nicely symmetric with Botticelli at the far right).

Figure 8. 'Adoration of the Magi' by Sandro Botticelli (detail, ~1475, tempera on panel, Uffizi, Florence), generally agreed to include portraits of Cosimo de Medici kneeling (centre left), and other members of the Medici family in the group at right, with a self-portrait of Botticelli himself (far right, looking out).

Figure 9. Upper: detail of the foreground figures from Figure 8. Lower: portraits from Figure 7 of Leonardo, Ghirlandaio, Perugino, di Credi, and Signorelli, and of John the Baptist from Verrocchio's 'Baptism' reversed, arranged in a visual match to the corresponding figures above.

Proposed identifications with those of the Botticelli redcaps are indicated in the bottom row of Figure 9, who were the current crop of apprentices from Verrocchio's studio at that time. Why Verrocchio's studio in particular? Because, as the premier Florentine *bottega* for the dominant Medici family at this time, it was the one most likely to be included by Botticelli along with the Medici in the crowd portraiture. This indeed was an era when artists were beginning to be appreciated as significant contributors to the cultural life of the power elite, comparable to filmmakers in our present culture. These identification thus complete a picture of the full panoply of the Medici dominating the right and central foreground of the painting, with the array of artisans providing such artwork lined up in the left foreground, based on the individual Botticelli portraits in red caps that had also been such a feature of the Gozzoli fresco (Figure 6).

7. Uccello, Toscanelli and Leonardo: The Florentine Perspectivists

The three notable perspectivists of 1470s Florence were Paolo Uccello, Paulo Toscanelli, and Leonardo da Vinci, illustrated in Figure 10 by Uccello's Louvre portrait or self-portrait (~1450, tempera on panel, Louvre, Paris), a detail from Uccello's depiction of Noah overseeing preparations for the flood

(mid-1400s, fresco, Chiostro Verde, Florence), identified here as a likely portrait of his long-term friend, Toscanelli (Note 21), and the 'Portrait of a Musician' identified as a portrait of the young Leonardo (Figure 4). Toscanelli is reputed to have taught perspective to Brunelleschi and Uccello in the 1420s, and is mentioned by Leonardo as a source for a book in his library on perspective. It therefore seems plausible that Toscanelli had also been instrumental in teaching perspective to Leonardo nearly half a century later, since Verrocchio is not known for his use of perspective in any of his works. It has also been suggested that Toscanelli may have transmitted some of his expertise in cartography, another challenging geometric skill, to the young Leonardo (Tyler, 2017, 2019).

Figure 10. Three notable perspectivists of 1470s Florence: Paolo Uccello, Paolo Toscanelli, and Leonardo da Vinci.

There have been few imputations of any connection between the young Leonardo and the senior Florentine artist, Paulo Uccello, who would have been in his 70s when Leonardo was in his 20s. There are, however, striking similarities in their geometric thinking, not only in the matter of perspective, but in solid geometry. Figure 11 epitomizes this communality of interests with examples of depictions of the stellated dodecahedron (from the marble mosaic in the San Marco Basilica in Venice by Uccello, and in '*De Divina Proportione'* by Pacioli (1509/2014, illustrated by Leonardo) and depictions of *mazzocchi*,

by Uccello and Leonardo, respectively. It is clear that they shared a specific interest in such three-dimensional geometric figures.

A second line of connection between Uccello and Leonardo is found in perspective constructions. Uccello's last fresco was a Nativity for the Hospital of S Martino alla Scala, Florence, following his return to Florence from Urbino in 1469. For the removal of this panel for restoration revealed a detailed underdrawing, or sinopia, of an unusual perspective construction (Figure 12). In addition to the characteristic central vanishing point, it includes construction lines for the two oblique vanishing points for the diagonals of the same grid. This was so unusual that some art historians as a 'bi-focal' form of two-point perspective (as opposed to the usual one-point perspective construction.) Remarkably, a very similar construction may be found in Leonardo's drawings (Figure 12, inset).

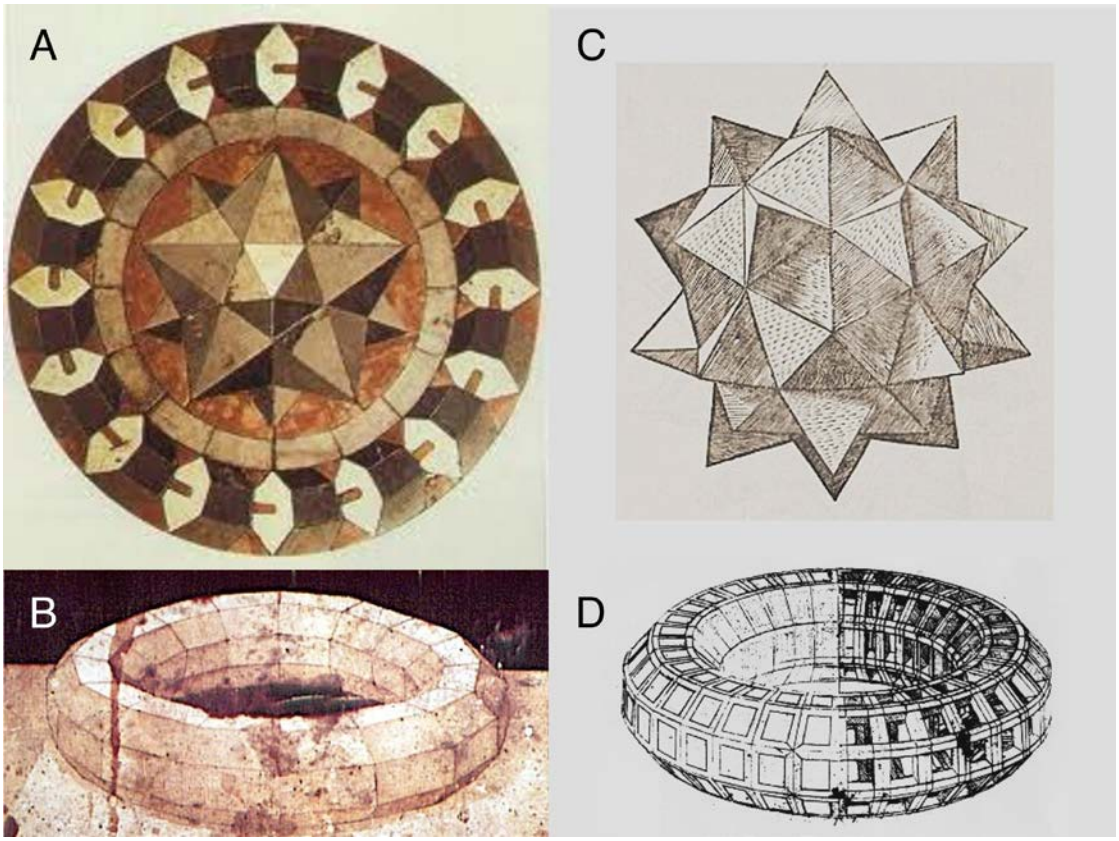

Figure 11. Depictions of a stellated dodecahedron and a *mazzocchio* by Uccello (left) and by Leonardo (right). A: Marble inlay from the Basilica San Marco, Venice; B: drawing from the U.S. Library of Congress, Washington, D.C.; C: drawing from the Louvre, Paris; D: drawing from the Codex Atlanticus, Biblioteca Ambrosiana, Milan.

Although Uccello is credited with a deep interest in perspective, it is noteworthy that his painting of the Nativity (much deteriorated) overlying this *sinopia* does not follow its two-point perspective construction, but renders the ramshackle manger building in the popular construction of oblique frontal perspective. (This form, a frontal view of the near side of the building with recession to one of the oblique vanishing points, is a non-centered vanishing-point construction that Uccello had used in his 'Presentation at the Temple', ~1440, fresco, Prato Cathedral). This discrepancy between the fresco and its *sinopia* is suggestive that two different hands were responsible for the unusual sophistication of the perspective in the s*inopia* as opposed to the conventional oblique frontal construction of the fresco. Since the fresco is universally attributed to Uccello, we need another candidate for the *sinopia* attribution. In this connection, Leonardo would be an obvious choice in view of the fact that his perspective construction for the 'Adoration', which is apparently the earliest surviving analytic perspective drawing in the history of art (Tyler, 2018), is indicative of his rigorous approach to perspective, and that the inset of Figure 12 indicates that he was also well aware of the novel two-point construction (which did not come into common use until the 18th century). It should be noted, however, that this association would require a dating of the fresco to the 1460s, rather than the late 1440s when it is usually attributed. This dating would help to account for Uccello's apparent lack of productivity later in his life.

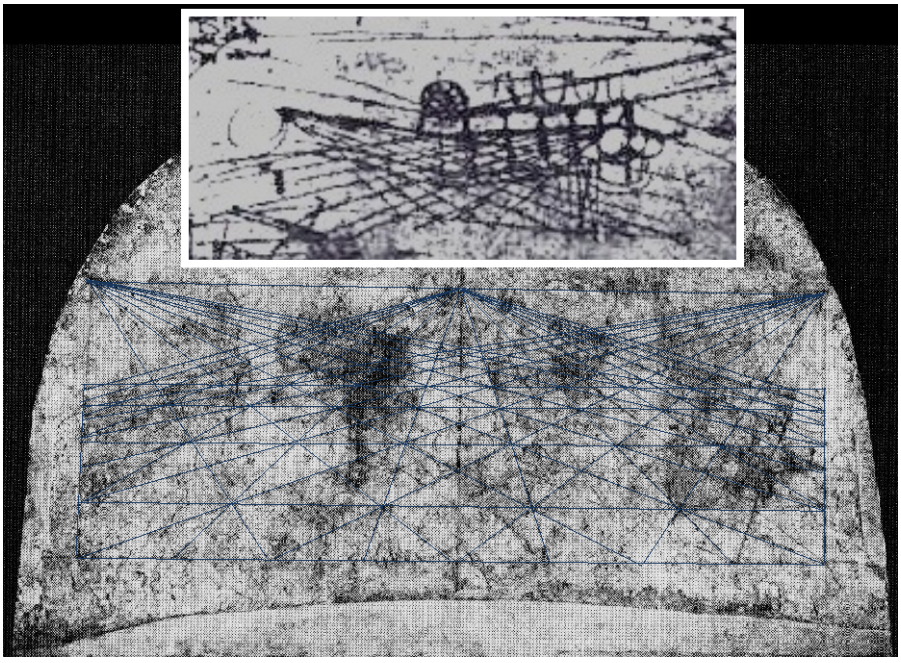

Figure 12. 'Bifocal' perspective grid from the *sinopia* of Uccello's 'Nativity' (Uffizi, Florence). It is overdrawn for clarity with the perspective construction (blue lines). Inset: A two-point perspective construction from Leonardo's Notebooks.
(image from https://www.georgehart.com/virtual-polyhedra/leonardo.html, accessed 11/2/19).

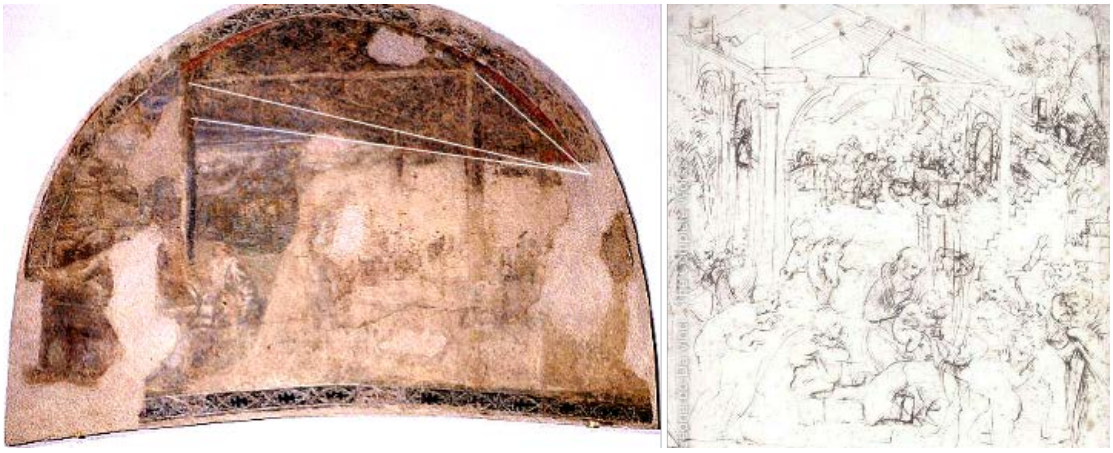

Figure 13. Left: the painting of Uccello's 'Nativity' from the San Martino della Scala in Florence (fresco, Uffizi, Florence). White lines indicated the single vanishing point at the right, in displaced perspective with the transversals in frontal view. Right: a sketch for a 'Nativity' by Leonardo da Vinci in the same type of displace perspective (though converging to the left rather than the right).

On this basis, it may be suggested that Leonardo was collaborating with the aging Uccello and was the one responsible for the perspective construction of the sinopia, only partially followed by Uccello in the design in his much-degraded fresco of the Nativity (Figure 13). Together with the communality in the geometric solids that both depicted (Figure 11), these parallels are suggestive of a previously unsuspected relationship between the young Leonardo and the aging Uccello. This analysis thus draws together evidence of a web of connections between the youthful Leonardo da Vinci and the two doyens of perspective in the Florence of the 1460s.

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Notes

Note 1. The following abbreviations are used: NGAW—National Gallery of Art, Washington, DC; NGL—National Gallery, London; V&A—Victoria and Albert Museum, London; Bargello—Museo Nacionale del Bargello, Florence; Ambrosiana—Biblioteca Ambrosiana, Milan. The media are specified for the original works.

Note 2. Palmer, 2018, p. 114.

Note 3. The sketch is often labeled 'the first landscape drawing in Western art'. Rockett, 2015, p. 12.

Note 4. McCahill, 2013, p. 42.

Note 5. Described by Bambach, 2003, p. 228, as "portraying the River Arno with a view of Mountalbano toward Valdarno and Valdinievole".

Note 6. Kemp & Pallanti, 2017, p. 95-7, make a convincing case that Leonardo cannot have been born in Anchiano, his commonly recognized birthplace, since Ser Piero did not own any property in Anchiano until 1482, and thus Leonardo was most likely born and raised in his grandfather's house in Vinci itself.

Note 7. An identification of Vinci as the possible source of the scene in the drawing, as in Figure 3, has been disputed by Nanni (1999), who favoured an interpretation of it as a view southeastward from a point north of the hill-town of Montevettolini. Although there is a simple square tower on the top of this hill, however, it is a broad round-topped hill that does not have any nearby topographic feature corresponding to the narrow promontory character of the town shown at left the Leonardo landscape. Thus, the attempt to relocate the scene from the view from the town where Leonardo grew up to a neigbouring town with which he had no known connection seems unconvincing.

Note 8. Berrino & Buccaro, 2018, p. 770.

Note 9. Collins, 1997, p. 204, points out the psychological significance of Leonardo citing the time of death twice in the same sentence: "*A di 9 di luglio 1504, mercoledi* ***a ore 7 mori*** *Ser Piero da Vinci, notaio al Palazzo del Podesta, mio padre,* ***a ore 7****, era d'eta d'anni 80, lasci 10 figlioli maschi e 2 femmine*." "On the 9th day of July, 1504, Wednesday **at the 7th hour** died Ser Piero da Vinci, notary to the Palazzo del Podesta, my father, **at the 7th hour**, being 80 years old, leaving 10 male and 2 female children."

Note 10. Pedretti, 2004, p.14, favours the year 1969, but many previous sources have proposed a range of dates for his arrival at Verrochio's studio back to as early as 1463. Here arguments are presented for the compromise date of 1466, including the fact that by 1468 he was an established artist linked with Perugino in Giovanni Santi's 'Rhyming Chronicle' of Florentine painters (Pedretti, 1973, p. 26). See also note 13.

Note 11. Nicholl, 2005, p. 74.

Note 12. Codex Madrid 2:4b "One gown of dusty rose. One rose-colored Catalan gown. One cape of dark purple with wide collar and velvet hood. One coat of dark purple satin. One coat of crimson satin.

One pair of dark purple stockings. One pair of dusty-rose stockings. One pink cap." (These are all the listed items in which the color of the clothing is specified.)

Note 13. Brown, 2003, p. 58: "If the David really does represent Leonardo about age fourteen—and apprentices commonly served as models—then this is the first glimpse of him we catch in the shop."

Note 14. Nicholl, 2005, footnote 6:65.

Note 15. These details are from the 'Benois Madonna' (1478-80, oil on panel, Hermitage, St Petersburg), the 'Virgin with the Laughing Child' (~1485, terracotta, V&A), the St Anne in the 'Virgin and St Anne' (~1503, oil on panel, Louvre, Paris), the 'Mona Lisa', the angel in the 'Virgin of the Rocks' (1483-6, oil on panel, Louvre, Paris); and the 'St John the Baptist' (1513-16, oil on panel, Louvre, Paris). (1503-5, oil on panel, Louvre, Paris), the 'Statue of David' (~1470, bronze, Bargello), the St Thomas in the 'Statue of Christ and St Thomas' (~1467-83, bronze, Orsanmichele, Florence).

Note 16. Vasari, 1568, p. 229.

Note 17. Vasari, 1568, p. 234.

Note 18. Marani, 2003, p.160-3.

Note 19. Lavin (2005, p. 46) cites Vasari as quoting Biagio, the apprentice target of Botticelli's prank of attaching red caps to the angels in the apprentices painting for sale: "Master mine, … when I came in just now, these angels had red caps on their heads, and now they have none." Botticelli is thus developing a jest on the premise of red caps denoting group membership in a band of young notables, in this case the joke being that it was a band of angels rather than of apprentices.

Note 20. Upper row (all by Botticelli): 'Musician (from Figure 4); 'Portrait of a Young Man' (~1475, tempera on panel, NGL); 'Young Man in a Red Cap' (~1485, oil and tempera on panel, NGAW, Andrew W. Mellon Collection); 'Portrait of a Young Man' (~1483, oil on panel, Louvre, Paris); 'Young Man in a Red Cap' (~1477, tempera on wood, V&A); 'Portrait of a Man with the Medal of Cosimo the Elder' (~1475, tempera on panel, Uffizi, Florence).

Lower row: 'David' (from Figure 4); 'Self-portrait' by Domenico Ghirlandaio, from 'The Expulsion of Joachim from the Temple', 1486-90. fresco in the Cappella Tornabuoni, Santa Maria Novella, Florence); 'Self-Portrait' by Perugino, (1497-1500, fresco, Collegio del Cambio, Perugia); 'Lorenzo di Credi' by Perugino (~1488, tempera on wood, NGAW); 'Self-Portrait/ (detail from 'Sermon and Deeds of the Antichrist)' by Signorelli (~1500, fresco, San Brizio Chapel, Orvieto); 'Self-portrait' (detail from 'Adoration of the Magi') by Botticelli (1475-1476, tempera on panel, Uffizi, Florence).

Note 21. The only known portrait of Toscanelli is by Vasari in 'Cosimo Surrounded by Artists and Scholars' (1556-1558, oil on panel, Quarter of Leo X, Palazzo Vecchio, Florence), in which he is shown wearing a turban, uniquely of all the figures of the Medici circle depicted in those chambers. This headwear, together with his long-term friendship with Uccello, is the basis for suggesting the present attribution of Uccello's turban-wrapped 'Noah' as a commemorative portrait of the patrician architect and astronomer Toscanelli.