Leonardo’s Landscapes as Maps

Donato Pezzutto

London, Ontario, Canada

“There are three classes of people; those who see, those who see when they are shown and those who do not see.” Leonardo da Vinci.

Abstract: The nature of Leonardo’s landscapes, have been the subject of debate. The position that they are fictional—in other words, a synthesis of disparate elements—has been challenged by evidence that the Mona Lisa landscape is a realistic portrayal that matches a particular place. Evidence is reviewed, that the landscape is a topographic map, displaying a fly-over view of an actual location, as depicted by Leonardo in his Val di Chiana map. Methods used to support this hypothesis are applied to the analysis of the Annunciation, Madonna of the Yarnwinder and Virgin and Child with St Anne and Lamb. The landscapes of these three Leonardo paintings will also be matched to particular locations.

Résumé: On a longuement disputé le provenance des paysages de Léonard. De nouvelles preuves, issues d'une étude de La Gioconde, mettent en question la position
que ces paysages sont des synthèses d'éléments disparates—autrement dit, qu'ils sont des œuvres de fiction—et indiquent au contraire que le paysage de La Gioconde est une représentation fidèle qui correspond à un endroit particulier. Les preuves ici passées en revue indiquent que le paysage est une carte topographique qui illustre, en survol, un endroit représenté par Léonard dans sa carte, la Val di Chiana. Les méthodes qui ont révélé ces preuves sont aussi appliquées à l'analyse de L'Annunciation, de La Madone aux fuseaux, et La Vierge, l'Enfant Jésus et sainte Anne. Les paysages de ces tableaux de Léonard sont aussi identifiés avec des endroits particuliers.

Introduction

The nature of the landscapes painted by Leonardo da Vinci, (1452-1519) have long been debated. The dominant opinion of art historians is that they represent a synthesis of disparate elements. The opposing position would be that they represent particular locations. People of Arezzo, in the Val di Chiana, Tuscany, traditionally maintain that theirs is the landscape depicted in the Mona Lisa. Recent evidence supports their position. A previous article by this author, suggests the following; the Mona Lisa (fig. 1) contains as background, a landscape image divided in two parts; the two parts can be reconciled into one image by aligning the two lateral edges; the reconstituted image

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Figure 1. Leonardo da Vinci, *Mona Lisa / La Gioconda*, from 1503. Oil on poplar panel.

79.4 x 53.4 cm. Paris: Louvre. (Photo Credit: Réunion des Musées Nationaux / Art Resource, NY.)
Figure 2. Leonardo da Vinci, *Val di Chiana* (RL12278), 1502-3. Pen and ink, watercolour, bodycolour and chalk on paper, 33.8 x 48.8 cm. Windsor: Royal Collection.

(Photo Credit: Scala /Art Resource, NY.)

depicts an actual place, namely the Val di Chiana (fig. 2) as mapped by Leonardo, and that image consists of a sequence of vistas assembled in the form of a topographic map. (fig. 3) That article makes similar claims for three other Leonardo landscapes.²

To appreciate the above, Leonardo’s work as a cartographer will be reviewed. A general comparison of his maps and landscapes will be undertaken. Leonardo’s motivation in

Figure 3. 3a and 3b show the reconstituted landscape of the *Mona Lisa*. Compare the features along the seam of the juxtaposed halves with those along the line on the repositioned *Val di Chiana* map, 3c. This demonstrates the painting as a puzzle and reveals the solution.
exploring cartographic techniques and applying them to landscape depiction will be considered. The example of the *Mona Lisa*, providing the unique opportunity of a painted landscape matching a particular location that was mapped by that artist, will yield the method used to analyse the landscapes of three other paintings. Leonardo’s *Annunciation, Madonna of the Yarnwinder and Virgin and Child with St Anne and Lamb* will also be shown to feature landscapes that match particular locations.

**Cartography**

Leonardo proved to be a skilled and innovative cartographer. His cosmology included the knowledge of the earth as a sphere. Webster Smith, in “Observations on the Mona Lisa Landscape”, builds the case that this cosmologic awareness is evident in the *Mona Lisa* landscape. The curvature of the earth, demonstrated in the “curved surface of the waters”, is discussed in his *Notebooks*. That would make the landscape, as a portrayal of a section of the “sphere of the earth”, reminiscent of the many examples of this concept found in his notes and drawings.³

Leonardo’s formidable powers of visualization will be shown here with his abilities to manipulate vistas on the scale of entire mountainous watersheds, to create maps or landscapes. Yet he was able to do the same on an even grander scale. His *Notebooks* entry under “Astronomy”, which anticipates by decades the heliocentric universe of Copernicus, demonstrates the extent of his knowledge of cosmology:

> The earth is not in the centre of the Sun’s orbit nor at the centre of the universe, but in the centre of its companion elements, and united with them. And any one

standing on the moon, when it and the sun are both beneath us, would see this our earth and the element of water upon it just as we see the moon, and the earth would light it as it lights us.\(^4\)

Leonardo saw himself as a cartographer or land surveyor and advertised himself as such. When Leonardo left Florence for Milan, in 1480, he solicited a position from the duke of Milan, Ludovico Sforza; in a carefully composed letter to the Moor, he offered his services as a military and civil engineer.\(^5\) When he joined Cesare Borgia in Imola, in 1502, Leonardo created the *Town Plan of Imola*, based on his own accurate survey. This innovative map, believed to be the first zenith map and one of the earliest Renaissance geometric town views to have been made, impressed his cartographic skills upon his new employer.\(^6\) This was followed by the *Val di Chiana* map, in which Leonardo introduced the cartographic convention of using colour to indicate changes in elevation. Brian Blevins, in “Leonardo Da Vinci Land Surveyor and Cartographer”, claims that:

(Leonardo’s second Florentine period, 1500 to 1516, [age 48-64]), was perhaps the most productive period of his life. Leonardo’s maps from that period show geographical details with a degree of accuracy far beyond anything attempted by the cartographers of his time. He used washes of different intensities to follow the contours of mountain chains, different shades representing different elevations, and he pictured the rivers, valleys, and settlements in such a realistic

manner that one has the eerie feeling of looking at the landscape from an airplane.\textsuperscript{7}

His cartographic vision, lead to grandiose schemes of diverting the Arno. A proposal to divert the river through a shortened route to the sea through Serravalle, will be discussed later. In 1503, based on his reputation as a military engineer and surveyor, Leonardo was consulted on another plan to divert the Arno, with the intent of severing Pisa’s access to the sea, during its hostilities with Florence. This misadventure with Niccolò Machiavelli resulted in a spectacular failure\textsuperscript{8} but serves to demonstrate Leonardo’s confidence, even over-confidence, as a cartographer.

Characteristics of his maps are shared by his landscapes. Leonardo's earliest known dated work is a drawing in pen and ink, \textit{La Valle dell'Arno (The Arno Valley)}, drawn on August 5, 1473 (age 21). (fig. 4) This map-like drawing is an antecedent of the treatment Leonardo would display with landscapes in subsequent works. Eugen Oberhummer’s descriptions of Leonardo’s maps could well apply to his landscapes after 1500. Leonardo’s \textit{Map of Tuscany}, reveals that the:

- mountains, mostly crowned by towns, are drawn in perspective, with the light falling from the left (south). Rivers are indicated by double lines, towns and


villages by vignettes. The second [Val di Chiana] map is similarly executed and embraces eastern Tuscany between Arezzo, Siena, and Perugia. The scale is about the same, but the orientation is to the east, and the light falls from the right (south). Besides the blue expanse of the lake Trasimeno with its three rather exaggerated islands, we notice in the Valle di Chiana a large and long sheet of water, no longer existing, which drains both to the Arno and the Tiber.⁹ (fig. 2)

Oberhummer also offers his opinion on landscape formations favoured by Leonardo:

His preference for steep and rugged rocks and grottoes is seen in his treatment of the background of several of his most famous pictures. Among these are one of his greatest masterpieces, the portrait of *Mona Lisa* in the Louvre, and also the *Madonna of the Rocks* (“*La Vierge aux Rochers*”), which exists in two versions, one in the Louvre, the other in the National Gallery in London, of which the relationship has not been definitely explained; the *Madonna [and Child] with St. Anna [and Lamb]* and [*Madonna] with the scales* (“*La Vierge aux Balances*”) [now entitled *Madonna of the Yarnwinder*].

Both his maps and his landscapes feature topography that is drawn in perspective, with the vertical heights “exaggerated”. There is a paucity or complete absence of vegetation or human-made features. Trees, towns and bridges are rare. When they do appear, they may be indicated as vignettes.

Cartography, like many of his enquiries, was pursued by Leonardo as an extension of his studies to improve his art. Cartography, in particular, enabled him to expand the confines of linear perspective. Leonardo demonstrated command of linear perspective in the *Adoration of the Magi*, (1481)\(^{11}\) and he developed atmospheric perspective, well demonstrated in the *Madonna of the Rocks* (1483.)\(^{12}\) Yet he was reaching beyond these in depicting depth by incorporating cartographic techniques in his development of topographic perspective.

\(^{10}\) Oberhammer, “Leonardo Da Vinci and the Art of the Renaissance in Its Relations to Geography”, 561.


Maps, by their nature, being projections of a curved surface of the Earth onto a plane, amend the laws of linear perspective. Distortions are required. Straight lines become curved and surface areas are expanded or contracted. The vertical axis can be flattened or enhanced. The scale, or point of view, of any vignette may not match its surroundings. These statements also apply to Leonardo’s landscapes. Leonardo experimented with several methods of dealing with the cartographer’s problem of approximately mapping a sphere onto a plane.\(^\text{13}\) Thinking topologically, in terms of connectivity, spatial relationships, and continuous transformations, was almost second nature to Leonardo. His topological techniques can also be found in his geographical maps. In the Val di Chiana map he uses a topological approach to distort the scale while providing an accurate picture of the connectivity of the terrain and its intricate waterways.\(^\text{14}\) The same could be said of his landscapes in general.

**Mona Lisa Landscape**

The specific case of the *Mona Lisa* will be reviewed with the above in mind. Others, including Derek Bair, have made the observation that the image on one edge of the painting continues on the other edge. Juxtaposing two copies of the *Mona Lisa* allows the two images to be aligned and a reconstituted landscape to emerge.\(^\text{15}\) As mentioned,

\(^{13}\) Capra, *The Science of Leonardo*, 204.
that landscape corresponds to a particular place, namely the Val di Chiana, as mapped by Leonardo. (fig. 3) Leonardo assembled a series of imagined aerial vistas and sequenced them as he did with his maps to create the landscape. As described in his *Notebooks*, features closest to the viewer are treated with full colour and lighting. Beyond that, the bands of terrain are treated to ever more muted colour and diffused lighting until the distant lakes and mountains are depicted in a colour-drained haze.

Bruno Mottin, in *Mona Lisa; Inside the Painting*, stated that “[t]his skilful use of aerial perspective, in which the depth of field is rendered by a gradation of colours, prevents us from noticing that the landscape in the *Mona Lisa* does not obey the rules of traditional perspective, but is rendered in a manner suggesting a relief map,…”.

The reconstituted landscape has been matched, by Thierry Joliveau, to an aerial view of Tuscany, which includes the Val di Chiana, but from one vantage point. However, the *Mona Lisa* landscape is not simply a bird’s-eye view from a single vantage point. There is no one point that an observer can view the slope of Pratomagno, the Buriano bridge, the confluence of the rivers, the ridge of hills between Arezzo and Lake Chiana and the surface of the distant elevated Lake Trasimeno as depicted in the painting. A static view does not fit. A virtual fly-over on a program (such as Google Earth 3D), will re-create Leonardo’s technique of sequencing a series of aerial vistas to produce a map or a

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landscape. He enhanced the portrayal of depth in his landscapes by combining his cartographic technique of map making while treating the sequenced vistas to atmospheric perspective out to a vague horizon. This treatment can be called topographic perspective. (fig. 5 & 6) Leonardo used continuous transformation in taking multiple surface-based survey images and manipulating them into a seamless aerial fly-over rendition. Figure 5 takes the vistas from four vantage points, from Google Earth, along the fly-over glide-line, to present a crude display of his technique. (A more satisfying comparison would be experienced in an actual fly-over of the area. A virtual fly-over can be simulated by moving along the above sequence on Google Earth).

These four static views are a limited display of Leonardo’s talent, but the exercise provides a method to test the match of a landscape to a specific place.

This method will be used in three more paintings. The process is as follows; a painting with a map-like aerial perspective will be identified. Candidate locations (fig. 7) will be identified that Leonardo had documented as a map. Other documentation will be used when a map is lacking. The prospective location will be reproduced as a schematic map and as a sequence of fly-over vistas. A high degree of correspondence will support a match.

Three other landscapes

The next landscape-to-location match involves an earlier work, the *Annunciation* (from 1472) (fig. 8) and the *Map of Tuscany* (c.1503). In his Leonardo biography, (appropriately subtitled *Flights of the Mind*), Charles Nicholl seems to imply a match for the part of landscape visible under the wing in the *Annunciation* with a part of the *Map*
Figure 6. *Mona Lisa* landscape depicted as bands from four different vantage points along the Val di Chiana, from proximal view from above Castilion Fibocchi (positioned at the bottom) to the distal Lake Trasimeno (positioned at the top): 1. Castiglione del Lago. 2. Lake Trasimeno. 3. the Chiana (now a plain, then a lake.) 4. Ridge of hills. 5. Chiana river. 6. Confluence of rivers. 7. Arno river. 8. Ponte Buriano. 9. Via Setteponti. 10. Gap in ridge. 11. Cortona hills. (Photos: Google Earth, 2011).
Figure 7. Outline map of Italy with rivers showing locations for Leonardo’s landscapes: Arrows (→) indicate the direction of view through an area. 1. Sesia valley and Monte Rosa for the *Virgin and Child with St Anne and Lamb*. 2. Adda river valley to Lecco for the *Madonna of the Yarnwinder*. 3. The Arno river towards Serravalle and Florence for the *Annunciation*. 4. The Val di Chiana from the Arno towards Lake Trasimeno for the *Mona Lisa*. M. Milan. F. Florence. R. Rome.
of Tuscany. He precedes this by trying to identify the potential location for the previously mentioned Uffizi drawing, La Valle dell'Arno, (fig.4) Nicholl identifies:

a distant, conical, tower-topped hill rising suddenly from the haze of the plain. This feature also serves to identify the landscape: the conical hill is quite unmistakably that of Monsummano (or Monsomano, as Leonardo writes it on one of his maps). This lies north-west of Vinci, about 8 miles away as the crow flies, a couple of hours’ walk via the road that winds down through Lamporecchio and Larciano. We are, quite specifically, in the landscape of Leonardo's childhood.

If the tump is Monsummano other features of the landscape are deducible: the flatlands are the Padule di Fucecchio [wetlands] lying south-west of
Monsummano; the mountains beyond are those of the Val di Nievole; the lower rounded hills to their left suggest Montecarlo; and so on. These are ingredients in the landscape, but as soon as one tries to relate them to a map of the area – or to actual views from actual hills - the drawing promptly recedes back into mystery. The distinctive form of Monsummano is visible from many vantage-points in the Mont’ Albano, but no one has yet found the particular spot which provides this particular vista. My own belief, having tracked the area in search of it, is that no such spot exists. The castle or fortified village in the left foreground is a particular problem: none of the candidates suggested - Montevertolini, Larciano, Papiano - can be found in that sort of spatial relationship with Monsummano. Another difficulty is that to look across the *padule* [wetlands] to Monsummano you would have to be somewhere up in the Pisan hills, but if you were, Monsummano itself would not have the shape it has in the drawing. In short, the drawing is an imagined or idealized view of the landscape around Vinci. It incorporates real places, vividly and beautifully sketched, but is not a real view. What it shows cannot be found and photographed, though it could perhaps be re-created, loosely, by a cunning collage of photos.\(^{19}\)

The problem of matching the landscape of *La Valle dell’Arno* to a specific location, shares similarities to the problem of matching the landscape of the *Mona Lisa* to a specific location and Nicholl arrives at a solution similar to the one proposed here for the *Mona Lisa* landscape. After grappling with these same issues, he likewise concludes that:

perhaps it could be re-created by flying above the land in a hang-glider (I confess I have not tried this), for the viewpoint most powerfully suggested is an aerial one. It is a bird's-eye view: the imagination soars above the land, and this is what it sees. One recalls a phrase in the Turin Codex on the flight of birds: ‘The movement of the bird’ - in other words the ‘big bird’ or flying-machine – ‘must always be higher than the clouds, so that the wings don’t get wet, and so that one can see more of the land’. ‘Per iscoprire piu paese’: precisely what is achieved, thirty years earlier, in the high-gliding viewpoint of the Uffizi drawing.\textsuperscript{20}

Nicholl sees the parallels with the above and the \textit{Annunciation}, to which he:

\begin{quote}
note[s] that the iconic features of the Uffizi drawing are echoed in the landscape of Leonardo’s \textit{Annunciation}, a work from the early 1470s and thus broadly contemporary with the drawing. The same conical hill with nipple-like protuberance can be discerned (more clearly since the restoration of 1999). It is on the horizon immediately to the left of the announcing angel; on the picture surface it lies within the crook of the angel’s wing. Closer to us, again echoing the drawing, is a tall cluster of rocks whose sheer verticals counterpoint the feminine curves of the tump; and beyond stretch those long hazy expanses of comingled land and water suggestive of the marshy \textit{padule} [wetlands] below Vinci.\textsuperscript{21}
\end{quote}

This is an early example of Leonardo’s use of topographic perspective that corresponds to a particular place. The view is looking east from the mouth of the Arno River. On the left (below the angel wings), are the Pisan hills then the \textit{palude} (wetlands) with the gap

\textsuperscript{20} Nicholl, \textit{Leonardo da Vinci}, 50.
between Montecatini, to the north, and the Monte Albano range with distinctive “mnemonic icon” peak of Monsumano, to the south. On the right, is the view up-river, past a city that should be, but does not quite resemble Pisa, with high peaks on the south bank, to the distant and highest mountains, on to the horizon. It should be noted that the arrangement would place his hometown of Vinci, in the Mont’ Albano hills, hidden behind the angel’s head. Some years after painting this work, Leonardo would produce the *Map of Tuscany*, outlining his plan to divert the Arno through Serravalle. Thus the painting came to feature the Arno with its actual course on the right and the proposed course on the left. (fig. 9 & 10)


The next example of landscape-to-map match involves the *Madonna of the Yarnwinder* (c. 1501) (fig. 11) and the Adda river valley, just east of Milan. During his years working
for Ludovico Sforza, the Duke of Milan, Leonardo extensively studied the canals and waterway in that region, in his role as military engineer.\textsuperscript{22} The landscape in the \textit{Madonna of the Yarnwinder} corresponds to the Adda valley. The view is looking north, up the Adda River from Vaprio with Trezzo sull'Adda, then steep banks up river, then a valley towards the Lecco arm of Lake Como, on the left side of landscape. The high Alps along the horizon are seen on the right side. The area is featured in Leonardo's map of the Adda, \textit{Canal for Navigation between the Lake of Lecco and the Lambro} and

\textsuperscript{22} Capra, \textit{The Science of Leonardo}, 82.
in the drawing, *Ferry Crossing at Vaprio*. A problem arises, as the Madonna and Child are shown on high ground with a bridge below them. The physical features fit with a view from the hills above Villa d’Adda, looking north, up river, with a bridge at Brivio. But there is no record of such a bridge at that time. A possible solution is that the initial vista is positioned very far across the Po plain in the Apennine range above Piacenza. A better fit is that the bridge is at Trezzo sull’Adda, with the high ground near Vaprio (either imagined, or the exaggerated slope of a steep and rocky river bank). A bridge at Trezzo sull’Adda, did exist before Leonardo’s time but it was single arched (not the multi-arched bridge in the painting) and it had been destroyed in 1416, leaving only the abutments on either bank.\(^{23}\) Perhaps Leonardo took licence with this feature, in keeping with his tendency to do so with other human-made structures, like those of Pisa in the *Annunciation*. (fig. 12 & 13)

Evidence for the final example of landscape-to-map match is more tenuous. There are various potential candidate locations to correspond with the landscape for the *Virgin and Child with St. Anne and Lamb* (1510) (fig. 14) and no specific map is available. A good fit is one based on the *Storm over Valley* drawing and the Monte Rosa area discussed in his *Notebooks*. The view is looking north-west, from Monte Barone towards Monte Rosa (Dufour) across the Val di Sesia, with a valley to Rima San Giuseppe on the right and the main Sesia valley with Piode on the left. (fig. 15 & 16)

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Conclusion

All these landscapes, along with that in the *Mona Lisa*, demonstrate topographic perspective. They include sequences of mountainous terrain not appreciable from one vantage point, but assembled as a series of fly-over vistas, imagined above the highest peaks. It is the human-made features, of bridges and buildings, as scarce as they are, with which Leonardo takes the most licence. These do represent some difficulty with matching. But allowing for Leonardo’s tendency to exaggerate the vertical height of hills
Figure 13. *Madonna of the Yarnwinder* landscape depicted as bands from four different vantage points along the Adda river from proximal view from above the Po Valley (positioned at the bottom) to the distal Lecco arm of Lake Como (positioned at the top):

and mountains, the natural features provide the best match for the landscapes to particular places.

Other than the earliest example of the *Annunciation*, it is a testament to Leonardo’s discernment for beautiful landscapes that the other paintings feature locations that presently include protected parkland. The *Annunciation* was completed before Leonardo had travelled extensively but its landscape includes terrain well known to him including

his home region. The *Mona Lisa* location includes both the Riserva Naturale Regionale Ponte a Buriano e Penna and the Parco del Lago Trasimeno. The *Madonna of the Yarnwinder* location includes the extensive Parco Adda Nord while the *Virgin and Child with St Anne and Lamb* location includes Parco Naturale Alta Valsesia.\(^{24}\)

The polyglot genius, Leonardo, extended his inquiries to into numerous fields including optics, perception, perspective, anatomy, botany, geometry, astronomy, architecture,

\(^{24}\) Parks.it. 2011. Parchi nazionali e regionali, riserve naturali, parchi marini e altre aree. (Portal to national and regional parks and protected areas) available at [www.parks.it/](http://www.parks.it/) (accessed February, 2011)

Geology and others, all to augment his art. He did this to more completely capture the faces, postures, plants, animals, human-made structures and natural phenomena in his paintings. It would seem entirely reasonable that he would use his considerable talents in cartography to produce his landscapes as evocative topographic maps.
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