

Leonardo as a visual communication theorist

Principles of written/graphic/visual communication in Leonardo da Vinci's Notebooks

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Abstract

This article is devoted to outlining a theory of graphic/written communication in the frame of a visual communication paradigm in Leonardo da Vinci's notebooks. He practiced a continuous integration between different tools of expression and described a printing technique that was able to preserve this complexity. His notes on the relationship between words and images are few, especially when compared with the notes on differences between them. However, with a patient approach, systematizing previous works and thanks to new examples and lexical clarification, it is possible to outline a structured vision that allows us to put Leonardo in the conceptual equipment of any theorist of communication.

Keywords

Leonardo's notebooks; Leonardo's communication theory; Word/image integration; Printing techniques; *Paragone*

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Acknowledgments

The scholar Antonio Perri generously offered an attentive reading of and commentary on the text and provided suggestions; particularly in the area of the semiotics of writing.

Precious methodological remarks were provided also by the scholar Luciano Perondi.

This research has been conducted during 2019, in the period as Associate Professor at the Faculty of Communication, Media, and Design of RUDN University in Moscow.

Note on the use of reproduction of Leonardo's manuscripts

The number of Leonardo's pages I consider would make it very hard to obtain the authorization to publish all of them; furthermore, it is more effective for the reader to consult them in their context, close to the other pages of a certain manuscript. Luckily, thanks to the project "E-Leo" of the "Biblioteca Leonardiana",¹ all the manuscripts I consider are available freely online, together with the transcription in Italian. In this paper you will find that whenever there is a reference to a *folio* of a manuscript there is a link to the digital version.

1. Introduction

This research project began out of an interest in Leonardo's manner of writing/drawing his various notebooks. The heterogeneity of the forms of communications used in the different manuscripts immediately catches the eye and intrigues anyone interested in visual communication and writing. What is surprising in particular is the plurality of the articulations between letters, numbers and figures together with the different degrees of abstraction of the representations, the use of the space of the pages and the continuity of the passage/shift between characters and drawings.

These elements, seen from the perspective of information visualization, visual communication, and in general, in the frame of the reflections on different semiotic systems, are fascinating and challenging for many methodological and theoretical assumptions. The scholars of Leonardo's notebooks highlight the word/image or writing/drawings correlation, they explore it and document it systematically, but questions remain regarding to what extent they analyze the consequences of their work and what assumptions they approach Leonardo from.

This research aims to prove that it is possible to reformulate the word/image categorization in Leonardo's notebooks advantageously, at least in some respects, if we use a shared frame for them. The hypothesis proposed in this article is that, in Leonardo's notebooks, we can identify and recognize not two but one unique, complex, and original system of expression, that is the written/graphic dimension as opposed to orality. For the sake of this objective the method used will be the following:

- a selective choice, review, and correlation of previous research;
- the re-contextualization of previous research from a different theoretical perspective;
- the identification and analysis of examples taken from the notebooks.

The focus of this research is on the reformulation of Leonardo's concepts. Therefore, for reasons of space and consistency, we cannot dwell on the relationship with related semiotic concepts, except for some tangential remarks used solely for the purpose of a better understanding of Leonardo's work. This

¹ "The Biblioteca Leonardiana of Vinci holds the complete collection of the editions of Leonardo's works published since 1651"; <<https://www.leonardodigitale.com/en/>>.

systematic comparison requires further specific investigation, which is precisely the next step of this research.

2. The question of the word/image relationship in Leonardo's notebooks

The question of the interrelationship between words and drawings in Leonardo's notebooks, and the parallel issue of the theoretical comparison of painting and poetry, have fascinated many scholars. The whole debate is complex and articulated, and to summarize it would be beyond the scope of this paper. Fortunately, several scholars (Brizio 2007; Farago 1992; Keizer 2019; Montani 2022; Scarpati 1981; Vecce 2000b, 2003; Zwijnenberg 1999) have already offered a synthesis of Leonardo's theoretical positions and a selection of the most revealing examples of words/images combination in his manuscripts. One only needs to refer to their works to have a complete perspective; in this paragraph we focus on a specific point: the potential contradiction between the theoretical principles asserted by Leonardo concerning painting vs. poetry on the one hand, and the nature of his manuscripts on the other.

Scholars specialist in Leonardo's work highlight that he devoted a relevant part of his life to writing (and drawing) notebooks, more than the time he spent on painting (Zwijnenberg 1999: 7; Vecce 2003: 59): "He filled thousands of sheets with words, between 5000 and 10000 pages, depending on how you count" (Keizer 2019: 13); "Leonardo's early biographer Giorgio Vasari was right: Leonardo appears to have laboured more by his word—especially words accompanied by sketches—than anything else" (Wells 2008: XIII).

On the other hand, in his notes on painting, Leonardo claims that the latter is superior to poetry in many respects. As Claire Farago specifies, "Leonardo da Vinci argued for the supremacy of painting over the arts of poetry, music, and sculpture in writings that are known today as his *Paragone*" (Farago 1992: 3). *Paragone* is the common name for the first part of the *Libro di Pittura* ("Book on Painting"), a posthumous selection and arrangements of Leonardo's writing on the subject. These are writings that have come down to us only in a small part. However, even in his holograph documents in the France Manuscript A (99r²) (considered an important original nucleus of *Paragone*), Leonardo contrasts not only painting to poetry but, as noted by Claudio Scarpati, more in general painting to writing (Scarpati 1981: 206).

Given this situation many scholars have inevitably detected a margin of contradiction and, more broadly, a space for interpretation. However, seeing as a substantial proportion of the original manuscripts did not survive over the centuries it is not possible to generalize based on the existing notes. Joost Keizer, in a recent book almost entirely devoted to word/image in Leonardo, goes as far as to formulate it as a kind of paradox, of a contradiction between theory and practice (Keizer 2019: 13). In the next paragraphs we will propose a perspective to deal with this contradiction/paradox.

² <<https://www.leonardodigitale.com/en/browse/manuscript-a-in-the-Institut-de-France/0099-r/>>.

3. Different spatial arrangements of the manuscripts' pages and page layout

Ladislao Reti affirms that the inter-relationship between words and figures in Leonardo is univocal: “figures had been drawn first” (Reti 1971: 193). However, it is possible to find many examples where the integration is different and more variegated, as we will see further on. As Vecce (2003: 71) writes as part of his analysis of Leonardo pages: “Headings were often placed at the top center of a sheet, and texts were then handled, in both appearance and execution, as if they were part of a single, intellectual unity (as indeed they were)”.

Concerning these points, even considering only a small portion of Leonardo's notebooks (for instance the Anatomical Drawings at Windsor),³ it is possible to observe several typologies of pages. In particular, going from the more sequential/linear alphabetical pages to the more visual ones:⁴

1. pages completely sequential (48v,⁵ 49r⁶) interrupted only by headings;
2. pages completely sequential with keywords on the column (72r⁷);
3. lists, draft of a table of contents (63v⁸ - RCIN 919040v) (Fig. 1);
4. words enriched by drawings (157r⁹);
5. words and figures organized in such a way that we could read the page alternatively as led by figures or by sentences (29r¹⁰);
6. list of sentences led by figures (25r¹¹);
7. words organized “spatially” around a figure (51v¹²);
8. words that follow a “discourse” created by the succession of figures (137r¹³ - RCIN 919003r) (Fig. 2);
9. words that merely “comment” a figure (68r¹⁴);
10. pages entirely consisting of drawings (138v¹⁵).

Given these examples, it is not possible to state that Leonardo prefers to express himself with words or with drawings, or not even reasoning merely in terms of a sum of them: this dichotomy does not play out. What is interesting to note is that, even focusing on the more “wordy” pages (like the typologies 1, 2, 3), there are many differences: some pages are like the ones

³ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/>>.

⁴ It would be worth to expand this list, conducting a systematic research on this aspect, inspired by the one realized by Enzo Macagno on Fluid Mechanics (Macagno 1986) or on Flow Phenomena (Macagno 1987) and the consequent multichannel tabulations.

⁵ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0048-v/>>.

⁶ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0049-r/>>.

⁷ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0072-r/>>.

⁸ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0063-v/>>.

⁹ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0157-r/>>.

¹⁰ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0029-r/>>.

¹¹ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0025-r/>>.

¹² <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0051-v/>>.

¹³ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0137-r/>>.

¹⁴ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0068-r/>>.

¹⁵ <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0138-v/>>.

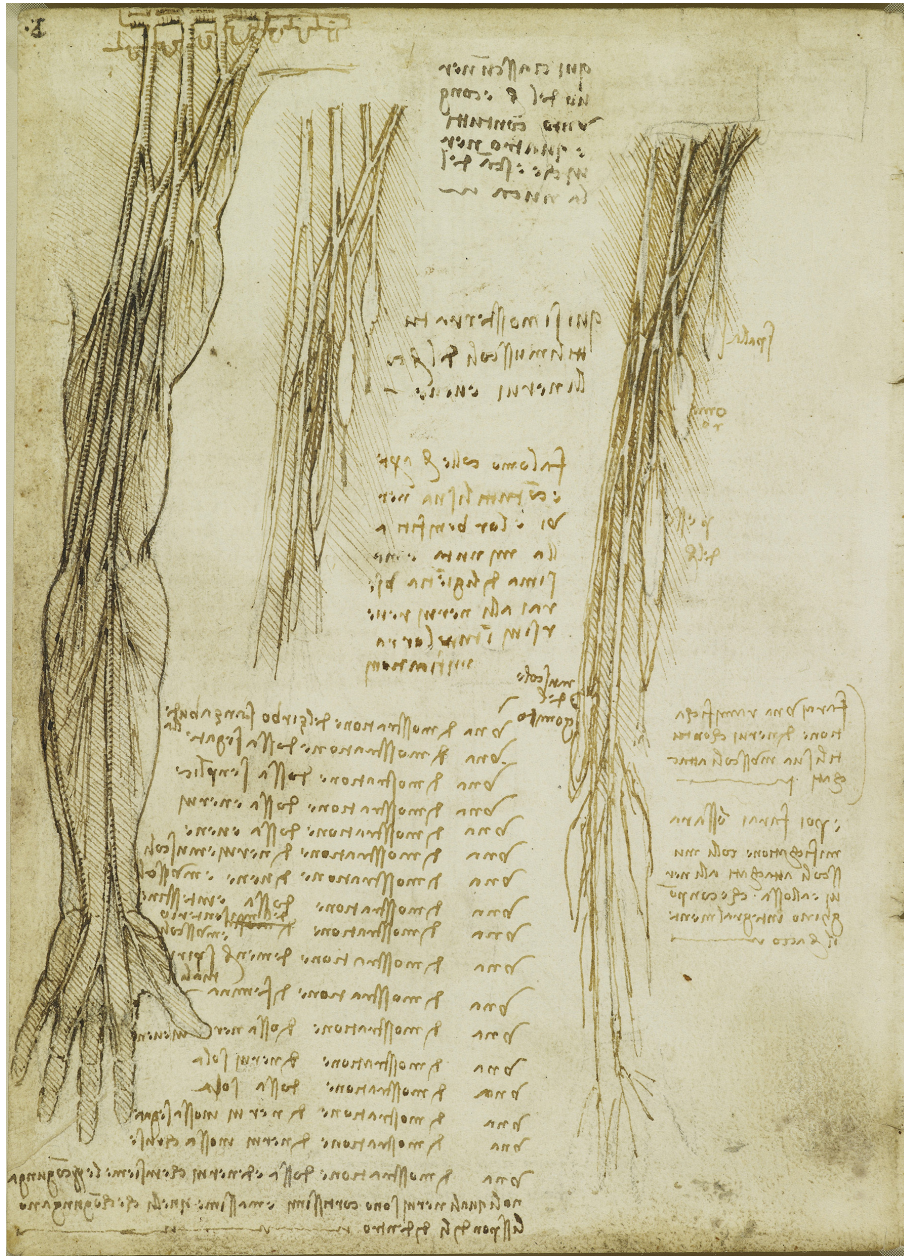


Figure 1. Anatomical Drawings, RCIN 919040 Verso: The brachial plexus and nerves of the arm.
Royal Collection Trust / © His Majesty King Charles III 2024



Figure 2. Anatomical Drawings, RCIN 919003 Recto: The superficial anatomy of the shoulder and neck. Royal Collection Trust / © His Majesty King Charles III 2024

described by Reti (just filled with words) others present a spatial articulation of words. In this respect, the expression “writing spaces” used by Vecce (2003: 68) is particularly appropriate and should be taken to its consequences.¹⁶

Quoting Leonardo:

Suppose that you, reader, were to glance rapidly at all this written page, and you will quickly perceive that it is full of various letters, but in this time you could not recognize what letters they are nor what they were meant to convey. Hence you need to proceed word by word, line by line, to be able to understand these letters.¹⁷ (Richter and Wells 2008)

This is precisely what does *not* happen in the pages like 137r (typology 8: discourse created by figures) thanks to the primacy of figures and to the system of notes and reference marks (letters and numbers), used by Leonardo to connect drawing with sentences, that help to have a first immediate perception of the content.

4. Printing techniques

As Claire Farago (2003: 31) points out “The practice of making each folio autonomous in a pre computer age turned Leonardo’s long-standing nonlinear methods of compilation into an advantage”. This non-linearity is reflected, at the micro-level, within the other practice previously highlighted: the heterogeneous spatial articulation of the words and drawings on the paper surface. Interestingly, however, this focus in the composition of the page is not reflected in any printed work: “... for it is indeed true that Leonardo never published a single line” writes Reti (1971: 189).

Different elements converge on the hypothesis that this expressive approach of Leonardo could be the main reason why he did not consider typographic printing as a viable technique.

In his paper on the relationship between Leonardo and the Graphics, Reti (1971) highlights three key points: Leonardo was interested in publishing;¹⁸

¹⁶ The concept could be compared with the notion of “synsemia” (Perondi 2007, 2012; Perri 2007; Lussu 2007, 2010; Perondi and Romei 2010, 2022; Bonora et al. 2020) as they share the focus on spatial articulation of a text. As noted by Emanuela Bonini Lessing (2010), summarized in Bonora (2017: 2), the word describes the visual organization of writing in the space of the text and it explains its visual syntax, but refusing to use the notion of *syntax* for its linguistic background. “Sinsemia means the deliberate and conscious disposition of elements of writing in the space, in order to communicate in a reasonably unambiguous way and in a regular manner, through the space articulation and the other visual variables. These regularities can be valid only for a specific text (but consistent, rigorous and interpreted without the aid of the author), or defined by specific patterns and consolidated habits of use” (Perondi, Romei 2010). Some of the pages of Leonardo could be interpreted as efforts to build a “synsemic text” beyond the limits of linear texts, without rejecting the efficacy of written words.

¹⁷ France Manuscript A – 108r “Poniamo caso. Tu, lettore, guarderai in una occhiata tutta questa carta scritta, e subito giudicherai questa essere piena di varie lettere, ma non conoscerai in questo tempo che lettere si sieno né che vo[g]llin dire, onde ti bisogna fare a parola a parola, verso per verso, a volere avere notizia d’esse lettere. Ancora se vorrai montare all’altezza d’uno edificio, ti converrà salire a grado a grado, altrimenti fia impossibile pervenire alla sua altezza”.

¹⁸ On this point see even Zwijnenberg (1999: 83-84).

however, he considered the existing printing techniques inappropriate and so invented more opportune and applicable printing techniques. The first two points are proved according to Reti by a note in which L. proposes teaching how to print one of his anatomical figures. This is the full quote: and it starts with the fact that Paolo Giovio stated that L. intended to publish his anatomical drawing in copper engravings:

But Giovio's statement finds a remarkable confirmation by Leonardo himself in a note accompanying beautiful drawings of the spinal column (Anat. Fogli A, fol 8 verso – W. 19007 verso¹⁹): "And as regarding this benefit which I give to posterity, I teach the method of printing it in order, and I beseech you who come after me not to let avarice constrain you to make the prints in...". The last word is missing, but I wholeheartedly agree with Clark and Pedretti that the only possible integration would be *legno*, i.e. wood-cut. Leonardo was thus convinced that wood-cuts were unfit for reproducing his drawings where the most delicate designs of form and texture would have had to be taken into account. (Reti 1971: 190²⁰)

Nevertheless, as we discover in the article, there is a passage which is even more revealing and explicit. In Codex Madrid II, in pages devoted to geometrical investigations and demonstration (119r), Leonardo proposes a specific technique that it is based on the point of scratching the surface directly with texts and drawings "written on it left-handedly, scratching the ground" (Reti 1971: 193).

Del gittare in istanpa questa opera. Metti la piastra di ferro di biaca a uovo e poi scrivi a mancina sgraffiando tal campo. Fatto questo e ttu metti di vernice ongni cosa, cioè vernice e giallolino o mmin[i]o. E sseco che è, metti i' molle, e 'l campo delle lettere fondato sulla biaca a uovo fia quello che ssi leverà insieme col minio, il quale, per essere frangibile, si ronperà e llascierà le lettere apicate al rame. E poi cava il campo col modo tuo e tti rimarà le letere di rilievo e 'l campo basso. E poi ancora mistare il minio con pece greca e così calda darla, come di sopra dissi, e sarà più frangibile. E perché meglio si veghino le lettere, tigni la piastra col fumo del zolfo che ss'incorpora col rame.²¹

Of how to cast this work in print. Coat the iron plate with white lead and eggs, and then write on it lefthanded, scratching the ground. This done, you shall cover everything with a coat of varnish, that is, a varnish containing giallolino or red lead. Once dry, leave the plate to soak; the ground of the letters, written on the white lead and eggs, will be removed together with the minium. As the minium is frangible, it will break away, leaving the letters adhering to the copper plate. After this, hollow out the ground in your own way, and the letters will stay in relief on a low ground.

¹⁹ Anatomical Drawings at Windsor 139v, bottom of the page: <<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0139-v/>>.

²⁰ "Ma per questo brevissimo modo del fugurarli per diversi aspetti, se ne darà piena e vera notizia e, acciò che tal beneficio ch'io dò all'omini, io insegno il modi di ristamparlo con ordine, e priego voi, o successorì, che l'avarizia non vi costringa a fare le stampe in..." (<<https://www.leonardodigitale.com/en/browse/anatomical-drawings/0139-v/>>).

²¹ <<https://www.leonardodigitale.com/en/browse/madrid-II/0119-r/>>.

You may also blend minium with hard resin and apply it warm, as mentioned before, and it will be more frangible. In order to see the letters more clearly, stain the plate with fumes of sulphur which will incorporate itself with the copper. (Reti 1971: 193; our italics)

Reti (1971: 195) explains that the problem with the existing techniques was that wood-cuts did not render “delicate details”, and engravings were slow and expensive. Joost Keizer (2019) explains the technical necessities of Leonardo in terms of high quality needed and esthetic characteristics: “...was against the way in which printing obscured the look of the handwritten page with its high-quality illustrations” (Keizer 2019: 1. The look of Script). While these explanations are convincing, it is possible to give a stronger role to the fact that the note written by L., as previously seen, is related to the reproduction of a geometrical demonstration and that in the description of the techniques, he focuses on how to render letters. This shows that Leonardo, in this case, is not interested in the level of details of an image or aesthetic characteristics, as geometrical demonstrations are generally not considered to have the same complexity and details of anatomical drawings.

Carlo Vecce (2003: 74) insists on a different aspect: “the reproducibility of prints diminishes the aura resulting from a unique artistic creation, while Leonardo wanted instead to preserve the distinctive character of his work, even of his writing and its textuality”.

Even without the consideration of the “aura” that is expressed by Leonardo but then partially controverted by his interest in printing machines, the “textuality” alone is a sufficient reason. What exactly is this textuality and what can be seen in the anatomical drawings or the geometrical demonstration? Total integration between alphabetical texts, numbers, graphical elements, and figures organized on the space of the page.

Robert Zwijnenberg (1999: 85) points out that we might consider that the printing method proposed by Leonardo “enabled him to write and draw the way he was accustomed to” and “as an indication of his awareness that a typographic reproduction would not do justice to the form and content of his manuscripts”.

Considering this point of view, we can see in Leonardo an example of the fact that the invention of the printing press with moveable types has two different aspects. On the one hand as the same Vecce (2001: 20) notes, it (*my translation*) “... had made written communication triumph over oral communication”, from another angle it establishes a technical separation between words (with moveable types) and images (wood-cut)²² that on the contrary were more integrated previously in the manuscripts; furthermore the use of colors and the organization of space change radically (Smith 1996).

In this regard Zwijnenberg (1999: 85) argues that Leonardo did not mean to improve the art of typography, on the contrary his method “is a proposal for a replacement of typography”.

²² On this perspective see Smith (1996), Lussu (2007), Perondi and Romei (2010), Tufte (2006: 83-85).

As David Lane wrote (Lane 2015: 48, 58): “Another technology that is responsible for increasing cognitive demands is the printing press. Before its invention, graphics and text were integrated in the great works of scientists as Da Vinci and Galileo”; “Following Gutenberg’s invention of moveable type, however, images and text are often separated to expedite the printing process”.

As noted, Leonardo’s writings, in many cases, are organized in the space of the page; thus, they go in the direction of global and immediate perception, the characteristics he praises in painting. Consequently, they need a technique able to render the unity of the page as Leonardo had designed it.

5. The implicit theory of written/graphic visual communication in Leonardo’s notebooks

5.1. Introduction

Leonardo formulated a theory of painting as a system of expression and explored the differences between painting and poetry; and, more generally, between the characteristics of verbal (both oral and written) language and images. However, his main concrete activity was not, as a matter of fact, opposing and contrasting different domains of expressions, but, on the contrary, integrating them.

He wrote and drew in the space of the page, not caring about the boundaries between letters, numbers and figures, articulating heterogeneous elements. Nevertheless, he did not explicitly elaborate, at least in the existing manuscripts, a theory related to this aspect. If he did not formulate this theory, he did manifest some intentions that allow us the faint possibility of defining some principles that were animating his practice. This paragraph is devoted to the emergence of these concepts.

5.2. The primacy of *disegno* and the visual dimension of writing

If we transform into practice the theoretical reflections of Leonardo on the connection of words to hearing (and picture to sight), the attention he paid to the rendering of the page would appear inexplicable, as he refused to leave the page visual layout to someone else. Therefore, there is a need to find in his manuscripts a trace of a different perspective; something that survived his dichotomous opposition.

In the *Libro di Pittura* – 12 v there is an excerpt,²³ highlighted by Vecce (2003) and Keizer (2019), that is illuminating in this respect.

²³ “Ma la Deità della scientia della pittura considera l’opere, così humane come divine, le quali sono terminate dalle loro superfitie, cioè linee de’ termini de’ corpi. Con le quali lui comanda a lo scultore la perfectione delle sue statue. Questa, col suo principio, cioè il disegno, insegna allo architetto fare ch’el suo edificio si renda grato a l’occhio, questa alli componitori de diversi vasi, questa alli orefici, tessitori, recamatori. Questa ha trovato li carateri con li quali s’esprime li diversi linguaggi; questa ha dato le caratte agli arismetici, questa ha insegnato la figuratione alla geometria, questa insegna alli prospettivi et astrologhi et alli maccinatori e ingegneri” (Farago 1992: 226). Original page: *Libro di Pittura* – 12 v, <<https://www.leonardodigitale.com/en/browse/book-on-painting/0012-v/>>.

Let us evaluate it in the translation by Claire Farago:

Yet the deity of the science of painting considers human works as well as divine, [both of] which are bounded by their surfaces, that is the lines at the boundaries of bodies. [The deity] directs the sculptor to perfect his statues by means of these lines. With his principle, that is *dissegno*, [the deity] teaches the architect to render his buildings agreeable to the eye; this is what teaches composers of different vases, goldsmiths, weavers, embroiderers. The characters by which different languages are expressed were discovered by this [principle] and this has given ciphers to the mathematicians, this teaches figurations to geometry, and this teaches perspectivists and astrologers and makers of machines and engineers. (Farago 1992: 227)

Disegno (*dissegno*), which Farago (in a footnote) considers equivalent to “Drawing, or possibly design”, and that in Italian keeps this double semantic framing,²⁴ is considered the principle from whose origins came characters (*caratteri*), ciphers (*caratte*), geometrical figures (and of course paintings and the drawings themselves). As Vecce stresses, L. considers writing as a “form of *disegno*, that is, design or drawing” (2003: 61).

Therefore, it is possible to come to a conclusion: everything that a reader can find in the manuscripts of Leonardo (from the more linear alphabetical texts to the anatomical figures) could go under the categories of forms of expression originated by *disegno*.

The notion of *disegno* expresses the visual dimension of Leonardo’s writing, or as previously specified text as visual object (Zwijnenberg 1999: 96), and provides a perspective consistent with his practice. There are strong similarities between this concept and the idea of *gramma* as formulated by James Elkins:

a word that means picture, written letter, and piece of writing. The verb *graphein* is even more open-ended: It means to write, draw, or scratch. Together, *gramma* and *graphein* preserve a memory of a time when the divisions we are so used to did not exist, and they help us remember, when we need to, that picture and writing are both kinds of “scratching” – that is, marking on and in surfaces. (Elkins 1999: 83)

Disegno and *gramma* both indicate a field that includes figures, writings, and scientific notation (even *caratte*, “ciphers”, derive from it).

The similarities are evident, even in relation to the common origin for writing and drawings. In case of *gramma*, the point of contact is “scratching”, in case of “*disegno*” the origin is the visual dimension, according to Libro di Pittura -12v and if we refer to France Manuscript A – 97v, it is the line; “Come la prima pittura fu sol d’una linia” (“As the first painting was only one line”, *my translation*); so according to Vecce (2003: 60) the common root is “the movement of the pen over the blank surface of the paper”.

Gramma could provide us a precious function: we could give a name to the complex pages of Leonardo that are not drawings and are not writings. L., in

²⁴ For instance: “disegno su un foglio” (drawing), “disegno di legge” (project).

the case of the anatomical drawings, calls the whole page “figure”, but “gramma” could include even geometrical demonstrations.

A further point of contact between *gramma*, *disegno*, and Leonardo’s principles emerges in Claire Farago’s commentaries on Leonardo’s *Paragone*. Although the word *gramma* is not present in the surviving Leonardo’s manuscripts, it was used by relevant humanist writers (Farago 1992: 293).

As a matter of fact, if *gramma* is a neologism in contemporary human sciences and art studies, it is not so if we go back to the era of Leonardo. Farago focusing on the interaction between artists and poets notes:

In the late fifteenth century, a similar unity of poetic and artistic imitation was posited by humanist writers like Poliziano, Giorgio Valla, and Pomponius Gauricus, all of whom named *graphie* or *gramma*, meaning letter or mark, as the foundation of imitation. In 1504, Pomponius Gauricus, writing on sculpture, even identified *graphie* with *disegno* as the “unity of art”. (Farago 1992: 293)

Leonardo, in the manuscripts, never refers to the notion of *gramma*, however, this concept helps us to identify a deep and rich root in his writing principles, an aspect that could be further investigated.

Keizer, when describing the previous excerpt from Leonardo about *disegno*, connects them to the question of the hieroglyphics, the Renaissance interest for a quest for a universal visual language, and the invention of “visual scripts” (Keizer 2019: § Hieroglyphs). However, it is legitimate to see the question from a different theoretical point of view: words for Leonardo are already visual, even without the effort of building a visual script, and *disegno* is the principle, and in other terms, even the “platform,” that allows the interaction between elements originating from different systems of expression.

5.3. Theory of reproduction/copy and theory of writing

In the previous paragraphs, the reader encountered several examples of Leonardo’s pages or portions of pages. In all of them, the specific organization of letters and numbers and their relation to figures are a fundamental component of the meaning of the text and of its effectiveness.

These pages are not equivalent to their words arranged linearly, or organized with a consistent justification, and are not comparable to the mere sum of words + drawings. The manuscripts, in other terms, contain unified elements of communication (pages or sections of pages) that need to be considered as a whole.

Unfortunately, if we consider the current examination and the researches consulted and described in the previous paragraphs, Leonardo never explicitly writes about this; he never affirms “the page is a whole,” or the contrary. Nevertheless, he focuses on two concepts that can be considered to be related.

Firstly, he praises painting for the immediacy of perception, in other terms, for the fact that one can grasp the meaning of a painting as a whole. Secondly, and more importantly, he establishes the conditions of technical reproduction of his pages. With regard to the first point, the preference for the visual “re-

ception” of the page as opposed to a reading reception or a hearing reception induces one to think that even for pages that were not painting Leonardo tried to introduce elements which concede some visual hints to the reader. Consequently, he values the page-layout and the letters/figures configurations and he defends the visual consistency of the page.

In relation to the second point, Leonardo elaborates an argument against the ease of technical reproduction of books, and he praises painting for not being replicable in the same way: characters (letters) can be copied (or even more: are replicable): books have infinite copies equivalent to the original.

[...] questa non si coppia, come si fa le lettere, che tanto vale la coppia quanto l’origgine; questa non si impronta, come si fa scultura della quale tal è l’impressa qual è l’origgine in quanto alla virtude l’opera. Questa no’ fa infiniti figlioli, come fa li libri stampati. Questa sola si resta nobile, questa sola onora il suo Autore e resta pretiosa e unica e non partorisce mai figlioli eguali a sè. E tal singularità la fa più eccellente che quelle che per tutto sono pubblicate.²⁵ (Farago 1992: 186, 188)

It cannot be copied, as happens with letters, where the copy is worth as much as the original. It cannot be cast, as happens with sculpture where the impression is like the original as far as the virtue of the work is concerned. It does not produce infinite children, as do printed books. Painting alone remains noble, it alone honors its author and remains precious and unique and never bears children equal to itself. This singularity makes painting more excellent than those [sciences] which are made public everywhere. (Farago 1992: 187, 189)

At the same time he developed new techniques for printing and even suggested ways to print. This corroborates the idea that Leonardo was not *tout-court* against the idea of reproduction, and not even against in general the printing press with moveable types (Pedretti 1957: 110), but he was against typologies of printing that do not keep the original form and structure of the manuscripts.²⁶

Indirectly, we could argue, he elaborates *in nuce* a semiotic of copies and replicas. He makes a distinction between: painting (not reproducible); linear writing as a sequence of discrete characters – not to be confounded with handwriting/ cursive chirography – (highly reproducible, with the current printing techniques); the writings (handwriting/chirography) of the notebooks where there is a margin for reproduction but under certain conditions (both semiotic and technical conditions).

Leonardo on his notes oscillates between two different questions: replicability as related to reproducing the same effect on the reader and as related to the question of “authenticity”.

²⁵ Libro di Pittura – 3r: <<https://www.leonardodigitale.com/en/browse/book-on-painting/0003-r/>>.

²⁶ In this regard we may notice that Leonardo witnessed the first transformations of the printed book, from a more or less faithful copy of the manuscript text to a product set up on the basis of an autonomous graphic design increasingly distinct from handwriting.

As it emerges from Umberto Eco's work and in particular his notes about "Replicability" in the frame of a "Theory of Sign Production" (Eco 1976: 179-183), the conditions of replicability are related to the awareness of the productive rules of an object (1976: 181), unless we consider the question of authenticity.

Following Eco's perspective, we could say that to replicate something we need to know exactly its pertinent features, and the relationship between expression and content. In the case of our manuscripts, it is difficult to establish which characteristics are pertinent and which are not, that is why Leonardo focuses on reproducing them as they are.

Luis Jorge Prieto's concept of "specific identity" (Prieto 1991) helps to clarify this further. This notion, as opposed to "numerical identity", includes all the characteristics of an "invention" (a work of art, an artifact, a document) that the "inventor" considers essential to achieve the intended purposes. It is clear that Leonardo perceived many visual and spatial characteristics of his texts to be part of their "specific identity".

Following Prieto's footsteps, this time with Paolo Fabbri's clarifications (Fabbri 2016), we can focus on the distinction between "copy", which requires an act of interpretation of the relevant features of the source, and "reproduction", which is free of interpretation and tends to include as many features of the source as possible, with the use of a "matrix". One might ask whether what Leonardo wants to realize are "copies" or "reproductions". In fact, Leonardo dissolves this theoretical distinction by proposing the creation of original manuscripts that are a "matrix" for further copies/reproductions, with the peculiarity that this "matrix" is an act of interpretation of the relevant characteristics of the original text. Moreover, by inventing a specific printing technique, L. aims to guarantee the effectiveness of the whole process: each copy/reproduction will contain all the elements of the "specific identity" of his texts.

Regarding the question of authenticity, a fundamental reference is Nelson Goodman's theory about the differences between *autographic* and *allographic* arts (Goodman 1968: 112-115). In the autographic arts, for instance painting, even an exact duplication is not considered genuine. On the other hand, there are the allographic arts, like music. Let's consider the case of different performances of the same symphony: if they are correct, they are all considered "genuine instances of the work". Goodman considers literature an allographic art because different copies of, let's say, the same novel, are all regarded as genuine versions of the same text if the copy is accurate. He then specifies that the fact of being autographic is not related to the fact of being a one-stage or a two-stage art. Music is a two-stage art, because the end-product of a score is the performance, and it is allographic; but the work of an etcher is autographic: any copy of the original plate is an imitation, even if the end-product is the print.

Goodman's reflections on literature are based on the fact that according to his perspective, what counts in a written text is the "sameness of spelling" (Goodman 1968: 115), or in other words sequence of letters, spaces, punctuation marks. As it would have become evident, we disagree with the idea that the "sameness of spelling" is a sufficient characteristic to state that one text is an accurate copy of the original, because we consider that in many cases the

spatial and visual characteristics of a text are themselves parts of the meaning. But still, even in a text considered for its visual characteristics, it would be theoretically possible to identify a notation, so following Goodman's paradigm we could talk about allographic arts even in this case.

Another fundamental reference on this topic, is the work of Charles S. Peirce who explained his distinction between *type* and *token*, with the example of the differences between words as occurrences and words as, we may say, abstractions. Interestingly, he mentions even the case of the copy of a book in relation with the book as an abstraction (Peirce 1931-1958: 4.537).

Clearly, from the point of view of authenticity, the first edition of a book in a certain year is not equivalent to a second edition, done in a different year, even if the two objects are materially and completely equivalent.

The focus is, on the contrary, on establishing how a certain text can be considered equivalent to another as a sign. And from this point of view, a theory of copy/reproduction/replicas is not separable from a theory of what we consider relevant features of a text or an object. If we think that written words are only vehicles of verbal language, then, as a consequence, every different reproduction or visual replica of the same word is equivalent, and the spatial layout does not matter. Following this perspective, two different editions of the same novel or its original manuscript are the same from the reader's point of view.

If we instead consider, or better if the strategy of the author and of the text itself (*intentio operis* in Eco 1979), considers that written words are part of graphic configurations, then those graphic configurations are relevant, and we need to reproduce them (in Prieto's terms they are included in the "specific identity"). And this is the vision that emerges from Leonardo's manuscripts.

6. Conclusion

Based on the points expressed in the previous pages we can argue that Leonardo elaborated in parts implicitly and in part explicitly, through his practice and some specific remarks, some theoretical and methodological principles of written/graphic communication, or graphic expression, which include writing and drawing and of its functions and role in relation to knowledge.

These are the main points we have identified:

- a written/graphic text is reproducible, but only under certain conditions; that is to say its visual configuration has to be taken into consideration;
- a written/graphic text is not reducible to words, and not even to words + images, if its visual configuration is different then the text is different;
- abstract articulation of thoughts is not confined to the linearity of words but is elaborated, autonomously, also through non-linearity, figures, the interaction between letters/numbers/figures;
- writing (of words) in Leonardo is *expanded*, including space, and it is frequently organized into *units of space*; on the other hand, "drawing" includes letters, ciphers, and other graphical signs.

These principles are part of a broader vision. Leonardo, *de facto*, refuses to stop the process through which all the elements of expression in graphic texts correlate in new ways to content; as pointed out by Zwijnenberg (1999: 83-86) he considers form and content as interrelated.

Leonardo, who described and figured a tremendous number of phenomena, did not care about categorizing his strategy of writing and drawing. We had to look for his notes, found tangential remarks, and only thanks to this and to the previous analysis some notes emerged, but not in a structured form. In fact, if it wasn't for the polemic against poetry, and written verbal language, which we find in the France Manuscript A or in the Libro di Pittura, we could even consider that L. does not *combine different domains*; more radically, it can be said that in practice he does not care about defining different domains. Leonardo is not correlating words and images in the examined page, he is just using different tools, graphic ingredients which in some cases are based on previously existing semiotic correlations (the meaning of words for instance) and in other cases establish new ones, in a continuous process of semiosis.

List of Leonardo's manuscripts consulted during the research

Note

The original manuscripts, except the Rebus page from Royal Library, were read through the authoritative digital archive e-Leo (Biblioteca Leonardiana). In order to have a perception of the original artefacts, one manuscript (Codice sul Volo degli Uccelli) was consulted in a facsimile reproduction by Giunti. The transcriptions in Italian are the ones adopted in e-Leo, except the ones for Libro di Pittura (Book on Painting) which are taken from Claire Farago (1992). In case of any doubts regarding the transcription please note that the author consulted Leonardo's manuscript directly. The English translations are plainly highlighted in the text, where no translation was found the author provided his own translation.

Anatomical Drawings at Windsor

<<https://www.leonardodigitale.com/en/browse/anatomical-drawings/>>

Codex Atlanticus

<<https://www.leonardodigitale.com/en/browse/codex-atlanticus/>>

Codex Leicester (Ex Hammer)

<<https://www.leonardodigitale.com/en/browse/codex-leicester/>>

Codex Madrid I

<<https://www.leonardodigitale.com/en/browse/madrid-I/>>

Codex Madrid II

<<https://www.leonardodigitale.com/en/browse/madrid-II/>>

Codex Trivulzianus

<<https://www.leonardodigitale.com/en/browse/codex-trivulzianus/>>

Codice sul Volo degli Uccelli (Codex on the Flight of Birds)

<<https://www.leonardodigitale.com/en/browse/codice-sul-volo-degli-uccelli/>>

France Manuscript A

<<https://www.leonardodigitale.com/en/browse/manuscript-a-in-the-Institut-de-France/>>

France Manuscript G

<<https://www.leonardodigitale.com/en/browse/manuscript-g-in-the-Institut-de-France/>>.

France Manuscript I

<<https://www.leonardodigitale.com/en/browse/manuscript-I-in-the-Institut-de-France/>>.

Libro di Pittura (Book on Painting)

<<https://www.leonardodigitale.com/en/browse/book-on-painting/>>.

Royal Library, Rebus, RL 12692

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