THE *VITRUVIAN MAN* BY LEONARDO: IMAGE AND TEXT

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Summary: This article analyses the nature and content of the so-called Vitruvian man by Leonardo, a study dealing with the proportions of the human body. The essay opens with an analysis of topics such as the image as the first element to be set out onto the page and its influence on the graphic arrangement of the text; the ambiguity between a private study and a study to be published; the dimension of the single page. It then proceeds towards an analysis of Leonardo's drawing as an attempt to visualize in a perfect way a text by Vitruvius and the conception of the visual language as a philological instrument.

In the so-called *Vitruvian man*, a drawing now in the Galleria dell'Accademia in Venice (n. 228), Leonardo da Vinci illustrates a well known theory by the ancient Roman architect Vitruvius (fig. 1).¹ In his treatise *On Architecture* (*De architectura*), Vitruvius linked the architecture of Roman temples to the imitation of the perfect proportions of the human body. He therefore went on also to describe the proportions for the perfect form of the human body. In particular, he described the link between the body as a whole and the two perfect geometrical forms: the circle and the square. Vitruvius then proceeded to discuss the proportions of the parts of the body in terms of fractions of the whole. For example: "the head from the chin to the crown is an eight part of the human body,"² and so on. In the drawing by Leonardo, we can see these very principles illustrated. There is the connection of the human figure to the circle and the square. Inside the human figure, there is even a pattern of lines which indicate measurements and connections between the different parts of the body. In particular, the

¹Among the more recent and significant studies see Zöllner "L'uomo vitruviano" and Sinisgalli "La sezione aurea." Zöllner emphasizes the practical meaning of Vitruvius's theory, Sinisgalli the theoretic and geometric construction of Leonardo's drawing. In my view, both studies underestimate the main subject of Leonardo's study: the human body and its proportions. See also the fundamental synthesis by Zöllner *Vitruvius Proportionsfigur*.

²Vitruvius, *De architectura*, III, 1, 1-3 (see *Appendix*).

Fig. 2 Albrecht Dürer, *Vitruvian Man*. London, British Library, ms. Sloane 5230, f. 2.
(By kind permission of the British Library)

human figure presents one single head and one single trunk, but contains multiple arms and legs in alternative positions. The position with joined legs and horizontal arms refers to the square. The position with open or outstretched legs and raised up arms refers to the circle. Before analyzing the meaning and the content of this study, let us first try to focus in on its nature.

The relationship between image and text and the primacy of the first.

One aspect to point out is that the drawing was the first element to be set out onto the page, and it was only later that the text was added. We can see this by the fact that the last two lines of the text, at the top of the page, are interrupted by the form of the circle and continue after it, seemingly following its contour. This is not an insignificant point. The first editions of Vitruvius's treatise published by some humanists were without images, and even when these editions included illustrations, they were set out at the end, or in the margins of the text, as if they were an appendix. The same thing happens in a sheet by the great German artist Albrecht Dürer datable to 1507 (London, British Library, ms. Sloane 5230, f. 2; fig. 2).³ Dürer does dedicate the whole sheet to the Vitruvian man theory just like Leonardo, but in the page by the German artist the text prevails: the two figures have been added last, in the remaining space at the bottom, as if they were part of an appendix. In Leonardo's version, on the contrary, the relation is just the opposite: the figure is the central piece, with the text serving it like a complimentary element.

Leonardo's text quotes a famous passage by Vitruvius, with some original variations (see the Appendix). Therefore, it develops a continuous and unitary discourse. Nevertheless, Leonardo has broken it up into three units (fig. 1). A first passage at the top ends with the beginning of the drawing, branching out symmetrically, to the right and left of it.⁴ The text then continues below, with a first line isolated and set out exactly at the centre;⁵ note that this line is not a title caption, as it may seem at first, but an integral part of the text. This isolated line is finally followed by a last and long passage at the bottom of the page.

This graphic arrangement is not accidental. At the top of the page, the lines of text broken up by the circle concern Vitruvius's concept that deals

³Reproduced in Strauss, *The Complete Drawings of Albrecht Dürer*, 5:2431.

⁴"Vetrivio architetto mette nella sua opera d'architettura che lle misure dell'omo sono dalla natura disstribuite in questo modo. Cioè, che 4 diti fa un palmo e 4 palmi fa un pié: 6 palmi fa un cubito, 4 cubiti fa un homo e 4 cubiti fa un passo e 24 palmi fa un homo; e cqueste misure son né sua edifizì. Se ttu apri tanto le gambe che ttu cali da capo 1/14 di tua alteza e apri e alza tanto le braccia che colle lunghe dita tu tochi la linia della sommità del capo, sappi che 'l cietro delle stremità delle aperte membra fia il bellico e llo spazio che ssi truova infra lle gambe fia triangolo equilatero" (see *Appendix* for the full text and translation in English).

⁵"Tanto apre l'omo ne' le braccia quanto è lla sua altezza."

Fig. 3 *De laudibus Sanctae Crucis*. Vienna, Oesterreichische Nationalbibliothek, ms. 652.
(By kind permission of the Austrian National Library)

with the relationship between the human figure and the circle. At the same time, the content of the isolated line of text, positioned immediately underneath the drawing, deals with the link between the human body and the square and, from a graphic point of view, is visually linked to the position of the closed legs related to the square. Therefore, the content of the text affects its graphic arrangement, a form of communication already put to use during the Middle Ages, for example in the so-called *carmina figurata*. In the *De laudibus Sanctae Crucis* by Rabano Mauro (fig. 3, Vienna, Oesterreichische Nationalbibliothek, ms. 652), the text deals with the theo-

logical meaning of the cross and is itself arranged in the form of a cross.⁶ In Leonardo's case this not only helps to emphasize the visual content of the text, but, above all, to link the text further to the figure.

A private study or a study to be published?

Apart from these subtle associations, by cutting and setting out the text into three units Leonardo has achieved an end result of text and figure that is graphically refined. Both for this reason, and for the minute attention given to the drawing itself, we could say that he was thinking about publishing his study. It has even been speculated that this sheet was originally an illustration, or even the frontispiece, for a treatise on architecture, or for his treatise on painting, and that it was subsequently destined to be printed.

There are some problems, however, with this hypothesis. The handwriting used by Leonardo is from right to left. It was not easy to read even for Leonardo's contemporaries (as attested by various ancient sources), and it does not seem to support this hypothesis. We know that Leonardo did write left to right when he was preparing studies to be shown to other people. For example this occurs in the maps of the river Arno done for the Florentine government, where there are notes written in the standard manner, from left to right.⁷ I would consequently say that, in spite of its polished and completed style, the *Vitruvian man*, at least in the version we have today, is a personal or private study. Even if Leonardo sometimes claimed that he wanted to publish some of his works, the main dimension and domain of his work remained that of private study. The tendency at that time to write diaries and to note the more or less significant events of private and public life is well known. Antonio da Vinci, heir to a family of notaries and Leonardo's grandfather, kept a diary of this kind. In a certain sense, we can add Leonardo's notes and drawings to this same domain. But instead of a simple chronicle of events that mark the times, and an ordinary private diary, Leonardo's are the noted observations and thoughts of a genial artist and scientist. Sometimes, as is the case in this drawing, these daily notes achieve forms of great power and beauty. One needs only read the notes that accompany his drawings to realize that Leonardo almost always regarded his magnificent portrayals as nothing more than temporary stages towards a final work to be achieved at a later time.

⁶See Pozzi, *La parola dipinta*.

⁷See Windsor Castle, Royal Library, n. 12678 and 12679.

The dimension of the single page

Concerning the supposed association of this work with a wider treatise, even if this is possible, I would nevertheless like to highlight the strong autonomy of this study: as a set of figures and text, skilfully articulated in relation to one another, this study constitutes a whole unto itself. The use of the single page is one of Leonardo's favourite expressive mediums. In every field of his scientific work it is very seldom that an argument is developed over more than one sheet. In science this form of communication has precise historical roots. During the sixteenth-century, the so called *fugitive sheets* were printed sheets of paper that were placed into circulation, each one independently of the other. These types of documents have been studied for their practical use: for example, there were *fugitive sheets* that dealt with medicine and illustrated simple notions of anatomy and medical procedure for untrained surgeons or amateurs. Learned scholars and scientists, however, also used this kind of communication for the publication of knowledge in academic contexts. In the medical manuscripts of medieval Scholastics tables and diagrams there were often completely self-sufficient units of figures and notes. Even if they summarized the content of a treatise or a manuscript, they often were of a different size from the other sheets of the manuscript, with different kinds of paper or parchment for example, almost as if they would have been intended to circulate independently from the manuscript. In the Renaissance, the famous *Tabulae sex* published in Venice in 1538 by the great anatomist Andreas Vesalius, and conceived for the academic world were conclusive sheets each unto itself and often circulated independently from one another. Leonardo's *Vitruvian man* can also be put into this type of scientific communication category based on the single sheet. Even if it was originally part of a wider treatise, this treatise was made up of other tables and diagrams, each with figures and notes, like an atlas of the human body.

Visualizing Vitruvius: philology and images

Until now I have tried to set out the more concrete dimension of this study by Leonardo, and I have pointed out the following elements: the primacy of the drawing to the text, the nature of private study, and the nature of the single sheet. Let us now consider its content, its actual intellectual importance, and its value.

The drawing illustrates, as I have already mentioned, a famous theory by the ancient Roman architect Vitruvius. In fact, the passage at the top of the drawing begins with: "Vitruvius the architect has it in his work on architecture that the measurements of man are arranged by nature in the

Fig. 4 *Giorgio Martini, Vitruvian Man. Florence, Biblioteca Laurenziana, ms. Ashburnham 361, f. 5r* (By kind permission of the Ministero per i Beni e le Attività Culturali, Florence. Any further reproduction by any means is strictly forbidden).

Fig. 5 *Giorgio Martini, Vitruvian Man. Turin, Biblioteca Reale, ms. Saluzziano 148, f. 6v.* (By kind permission of the Ministero per i Beni e le Attività Culturali, Turin)

following manner.”⁸

In Leonardo’s time,

Vitruvius’s treatise was at the centre of the humanist’s attention.⁹ It was not

⁸Venice, Galleria dell’Accademia, n. 228 (see *Appendix*).

⁹Galluzzi, “*Machinae Pictae*.”

an easily intelligible text and survived only in imperfect versions. As a consequence, the text needed exhausting philological work. Around 1450 Leon Battista Alberti had shaped his own treatise *On the Art of Building* (*De re aedificatoria*) on the Vitruvian text, which he frequently quoted. In 1486 Sulpicio de' Veroli published the first printed edition of the Vitruvian treatise, not without hinting at the difficulties of reconstruction and interpretation. Both Alberti and Sulpicio were humanists and their treatises were without figures. Their interpretation of Vitruvius was represented by a purely textual question: it regarded only Vitruvius's words and was achieved by means of words. Afterwards, however, something changed. At a certain point in time, several artists who were also engineers joined in the effort to clarify the Vitruvian text. The artist and engineer Francesco di Giorgio Martini (Siena, 1439-1501), in the second version of his treatise on architecture (c. 1487-89), discussed the meaning of this intervention very well. He basically said that for a lack of images, with the simple reading of the text, every reader imagines in his own way an architecture, a machine, or a theory by Vitruvius: "there are as many readers as interpreters,"¹⁰ he wrote. According to Francesco, only drawing—together with the archaeological inspection of ancient remains—can fix the actual sense of the ancient text and avoid the Babel of interpretation. In short, the image is presented as an instrument of humanistic philology and the artist presents himself as a protagonist in the rediscovery of the classical world, on the same level as the humanist. In his treatise Francesco quotes Vitruvius and often accompanies these quotations with images that clarify and compliment the sense of the quoted passages. Leonardo's drawing (c. 1490) belongs to this historical context, of which it is probably the main expression.

Among the various problems with the Vitruvian text facing Francesco di Giorgio Martini and Leonardo was the famous theory concerning the proportions of the human body. Francesco deals with this theory in the first version of his *Treatise* (c. 1478-81).¹¹ Vitruvius had written that *a homo bene figuratus* (that is: a human body of perfect beauty) if it holds out its arms and legs is closed-in by a circle: "a pair of compasses centred in his

¹⁰"[...] tanti lettori, tanti varii compositori"; Francesco di Giorgio Martini, *Trattati di architettura*, 2:489.

¹¹"In prima è da sapere steso in terra el corpo umano, posto un filo a l'imbelico, alle stremità d'esso tirata circolare forma sirà. Similmente quadrata ed angolata designazione sirà". (Francesco di Giorgio Martini, *Trattati di architettura*, 1:20). For the date see below.

navel, the fingers and toes of his two hands and feet will touch the circumference of a circle described there from.”¹² He then added that with outstretched arms the breadth of these arms will be found to be the same as its height; and this linked the body to a square. This prescription could be interpreted and represented in various ways. One possibility was to draw two separate images, one representing the connection between the human body and circle, the other to link the human body with the square. Dürer chose this possibility in the sheet already examined (fig. 2), and so did the architect Antonio da Sangallo as well (Uffizi A 1249). We also find two separate images in the printed edition of Vitruvius published by the architect and mathematician Fra Giocondo (1433-1515) in Venice in 1511 with the presses of Giovanni Tacuino da Tridino.

There was, however, another, more radical and more correct, possibility to express this double link: to represent in one single image both the bond with the circle and the one with the square, representing also the motives of this double association. It was this option that Leonardo chose for his drawing. As we have already seen, Leonardo represents two different positions within the same human figure, one related to the circle, the other to the square. These two different arrangements are strongly interwoven between themselves, and not merely because they coexist in the same figure. We can see, in fact, that in the square-related position the joined legs touch not only the square but also the circle; and vice versa, in the circle-related position with the limbs outstretched, the hands at the top touch not only the circle, but also the square.

This more complex illustration of the Vitruvian theory appears, even if in a poorer version, in two drawings inserted in two copies of the first version of the *Treatise* on architecture by Francesco di Giorgio Martini (figs. 4-5).¹³ The human figure, in-scripted at the same time by both the circle and the square, adopts positions of the limbs that try to explain this dual connection. In one case, head and feet touch the circle and square, the hands only the square. In the other case, with more respect for Vitruvius's text, one arm is lowered while the other is slightly raised in order to link both geometrical figures. In spite of this arrangement, both drawings distance themselves from the Vitruvius text on various points. For example, Vitruvius describes the head only in connection with the square, whereas in these two drawings the head touches both the square and the circle.

¹²Vitruvius, *De architectura*, l. III (see *Appendix*).

¹³Florence, Biblioteca Laurenziana, ms. Ashburnham 361, f. 5r and Turin, Biblioteca Reale, ms. Saluzziano 148, f. 6v.

Why did Francesco assume such a difficult task? It would have been sufficient, in a more customary way, to draw two separate representations of the human figure, one related to the circle, the other to the square. So why, on the contrary, did he try to embody a unitary representation, and in such a poor a way?

The composition of the first version of Francesco di Giorgio Martini's *Treatise* and the two copies with the quoted drawings are generally dated by scholars no later than 1486.¹⁴ These two copies were made in the workshop of Francesco di Giorgio and under his supervision.¹⁵ For different reasons, it has also been supposed that some drawings could have been added later on.¹⁶

We know that Francesco di Giorgio and Leonardo met in Pavia in 1490.¹⁷ It is therefore possible that in his meeting with Leonardo Francesco – even without knowing of Leonardo's drawing of the Vitruvian man – grasped something of this very new interpretation of the Vitruvian theory that Leonardo had been elaborating. Francesco remained fascinated by this new interpretation and tried to apply it to the drawings we have just examined. If Francesco's drawing was done, instead, before 1486, we can assume that Leonardo knew it or its idea in Pavia in 1490.¹⁸ He then developed it in his own drawing, going far more further than Francesco had.

We must therefore clarify what was so innovative about Leonardo's interpretation. First of all, there was a radical and drastic philological effort that, in going even further than the usual level of interpretation applied to an ancient source, proposed a new and powerful vision.

Harmony and simultaneity:

the Paragone among images, music and verbal language

Leonardo not only tried to respect the literal words of Vitruvius' prescriptions, but above all understood their deep and inner meaning, their essence: the conception of harmony. In fact, Vitruvius opens his text with passages concerning the concepts of symmetry and proportions amongst

¹⁴However, there are also elements against this early date: see Mussini, "La trattatistica di Francesco di Giorgio," 359. See also Scaglia, "Book review."

¹⁵Mussini, "La trattatistica di Francesco di Giorgio," 359.

¹⁶Marani, in Francesco di Giorgio, *Il Codice Ashburnham*, xv-xvi; Biffi, in Francesco di Giorgio, *La traduzione del De Architectura*, xli.

¹⁷Marani, *Francesco di Giorgio a Milano*.

¹⁸For drawings of machines by Francesco possibly influencing Leonardo see Marani, *Francesco di Giorgio a Milano*, 97.

the different parts of a whole; all of which implies the general concept of harmony.¹⁹ In the *Vitruvian man* Leonardo realized a harmonic representation. The geometric figures illustrated are two (circle and square), but they also coexist forming a unitary whole. And this is even more true for the human figure. This figure presents two different and alternate positions of arms and legs. Yet, this multiplicity of positions does not break the unity of the figure. Various and alternate configurations are coordinated in order to create a perfectly unitary whole; a whole that is various and unique at the same time. That is, a harmonic whole.

While describing the link of the human figure with the circle and the square Vitruvius emphasizes their coexistence. In fact, after having hinted at the link between the human body and the circle he writes: "And just as the human body yields a circular outline, so too a square figure may be found from it."²⁰ Vitruvius then goes on to describe this link between the human figure and the square. Even if not explicitly written, this double connection of the human body with two different geometric figures is yet another example of the application of harmony and proportion, concepts with which, as we have seen before, Vitruvius opens up the chapter.

However, Vitruvius explains this double link of the body with the circle and square by mentioning it in separate parts, in two linked but different passages. This could not be otherwise. A verbal text can proceed only in this way, by describing first one thing and then the other. However, in doing so the same essence of the concept is lost: the simultaneity of the double link, or the reason of its harmonic meaning. This is the reason why Leonardo undertook such an arduous task of radical philology. According to Leonardo, only an image could communicate the harmonic concept inherent in the Vitruvian text. Or, better still, the image by which Leonardo illustrates this concept was more appropriate than the Vitruvian text itself. Only the visual language of images is able to represent and to explain simultaneously the two different and co-existent connections with the circle and the square. Only visual language, contrary to verbal language, can illustrate, with impressive simultaneity, the variety and unity of this harmonic link.

In the so called *Paragone*, a theoretical text written around 1490 (that is, at the same time of the *Vitruvian man*), Leonardo stated the primacy of painting over the other arts. Speaking about the comparison between painting and poetry (that is among images and words), Leonardo under-

¹⁹See Laurenza, *La ricerca dell'armonia*.

²⁰Vitruvius, *De architectura*, l. III (see *Appendix*).

lines the fact that it is painting alone ("solo la pittura") that can achieve a harmonic proportion, even more so than music. By exemplifying the representation of a face, Leonardo writes: "Yet the beautiful proportions of an angelic face in a painting will do much 'more than a chord.' A harmonic concord [*concento*] results from this proportionality which serves the eye at one and the same time, just as music serves the ear." Poetry, a verbal language, is on the contrary incapable of accomplishing this simultaneous and harmonic description. In fact, Leonardo writes that:

Now a poem, which extends to the figuration of this designated beauty by the particular figuration of each part [...] does not result in any grace other than what is heard in music if each tone were to be heard only by itself at various times [...]. It is as if we would want to show a face part by part, always covering up the part which was shown before. [...] A similar thing happens with the beauties of anything feigned by the poet (that is, described by words): since their parts are said separately at separate times, the memory does not receive any harmony from them. (*Libro di pittura*, chapt. 21)²¹

This is precisely the limit that Leonardo sees in the Vitruvian text: by using only words, Vitruvius had described separately at separate times the two simultaneous connections of the human body with the circle and square. Vitruvius's words are therefore unable to express the harmony of this connection. Leonardo was able to grasp the deepest sense of the theory of Vitruvius and expressed it in the only suitable language: the visual language of the drawing. At the very moment when Leonardo tries to respect the essence of that text, he inevitably puts it under intense criticism: Vitruvius was wrong because he tried to illustrate concepts by words only, concepts that the image alone is capable of communicating. Only the image can, in fact, achieve a synchronous representation of multiple things or events. And it is this simultaneity that is at the basis of a harmonic whole.

²¹Vatican City, Vatican Library, Codex Urbinas Latinus 1270, f. 10. Leonardo da Vinci, *Leonardo da Vinci's Paragone* chapt. 21: "[...] Ma molto più farà [della poesia] le proporzionali bellezze d'un angelico viso posto in pittura, della quale proporzionalità ne risulta un armonico concento, il quale serve a l'occhio in un medesimo tempo che si faccia della musica a l'orecchio. [...] Ma della poesia la qual s'abbia a stendere alla figurazione d'una predetta bellezza con la figurazione particolare di ciascuna parte [...] non si componerebbe alcun concento, come se volessimo mostrare un volto a parte a parte, sempre ricoprendo quelle che prima si mostrano. [...] Il simile accade nelle bellezze di qualunque cosa finta dal poeta, le quali, per essere le sue parti dette separatamente in separati tempi, la memoria non ne riceve alcuna armonia." (Leonardo da Vinci, *Libro di Pittura*, pp. 145-146).

A classical example of relationship between visual and verbal language: the Polycletus's Canon.

Through this absolute trust in the image Leonardo carried out a radical act of philology. Vitruvius did not invent the harmonic and proportional theories of the human body, but passed on ideas born centuries earlier in Greece. According to the Roman anatomist Galen, the sculptor Polycletus had elaborated the *Canon*, a complex theory concerning the harmonic and proportional connections among the different parts of the body. The *Canon* was not just a written text, but also a statue that illustrated this text. According to the ancient sources, the two component parts of the *Canon*, the text and the statue, had the same name (the *Canon*) and were strictly linked to one another. In an age in which book illustrations did not yet exist, the statue was the illustration of the treatise.

Some scholars argue that the statue known as the Doryphoros—which has survived only in Roman copies—might correspond to this lost *Canon*. The *Canon* by Polycletus that, directly or indirectly, influenced Vitruvius, was therefore not only a written text, but a written text directly linked with a statue, with an image, with visual language. Even if shortly before the passage on the body's proportion Vitruvius generically mentions the existence of Polycletus and other Greek sculptors, almost certainly Leonardo was not aware of all of this. Nevertheless, by opposing his drawing to the text of Vitruvius, he shows that he has grasped the historical origin of the ancient Greek theory handed down by Vitruvius.

*Besides the classical sources:
qualitative conceptions, anatomy, scientific ambitions.*

The study of classical sources in Leonardo and other Italian artists from the same age is not limited to this radical elucidation, but also represents the starting point towards a new age of discovery. As we have seen, Leonardo succeeds in representing, in the same image, two different geometric links to the human figure by depicting two different positions for his limbs: the man has joined legs and horizontally spread arms in connection with the square, and open legs and raised-up arms in connection with the circle.

Besides expressing harmony and unity, this arrangement has a dynamic meaning as well. The figure seems to move from one position to the other with movement, almost cinematographically. In the art of ancient Greece, harmony was born together with realism and the representation of movement: harmony implies variety, and movement arouses, or generates, this variety. For example, in the Doryphoros by Polycletus, the slight putting forward of the left leg corresponds to the lowering of the right shoulder and

so on. This slight complimentary association, which gives harmony to the figure, arises from the movement of the body. Therefore, movement is not a concept opposite to harmony, but can become so if pushed to extreme measures. And this is just what Leonardo did.

Previously, Leonardo had tried to discover and to resolve, by means of geometry, the ways in which the proportions of the human body vary during the body's movements. By developing the dynamic arrangement of the Vitruvian man he made kinetic studies such as the ones known through sixteenth-century copies from lost originals by Leonardo (Codex Huygens, New York, Morgan Library). In these drawings we can see not only the harmonic arrangement of the Vitruvian man (the fact that different positions are linked to one single human figure), but above all the dynamic implications of that drawing.

Later, Leonardo would pay more and more attention to understanding how the proportions of the body vary not only during movement, but also from youth to old age,²² in health and in illness, and so on. This led Leonardo, in later periods of his life, to be fundamentally sceptical about the possibility of fixing and identifying exact and mathematical laws in nature. From an artistic point of view this vision will contribute to define the famous *sfumato* (smoke-screened) in Leonardo's painting and, thereafter, several fundamental aspects in the art and painting of the sixteenth-century. Likewise, from a scientific point of view, this same vision opens towards some important developments in modern scientific thought, such as the atomistic theories of the sixteenth-century and the cosmological conception by Giordano Bruno, all characterized by a physical and fluid vision, not by a mathematical approach.

Another example of how Leonardo goes beyond his ancient source is the fact that he applied the study of proportions to anatomy. To understand this aspect we need to return to the *Vitruvian man*. In this drawing Leonardo studies not only the link between the body in its entirety to the circle and the square, but also some inner measures and connections among different parts of the body. For example, the face is divided into three equal parts: the forehead, the nose and the space between the nose and chin. These three parts are assumed to be equal among themselves and each is assumed to be one third the length of the entire face. Leonardo writes: "the portions that are to be found between the chin and the nose, and between the start of the hair and the eyebrows, are both spaces similar in themselves

²²For example, Paris, Bibliothèque de l'Institut de France, 2172, f. 63r. (so-called Manuscript A).

to the ear and are each a third of the face.” He derives these measurements from Vitruvius and, in this case, seems to agree with his source. However, even in this case he goes far beyond what Vitruvius had written.

In the same years of the *Vitruvian man*, Leonardo did a series of studies on the human skull (Windsor Castle, Royal Library, 19057r). They do not deal with anatomy in the modern sense. Leonardo in fact did not study and represent merely the form of the skull. The main aim of this study was instead to find where the seat of the intellectual soul was located, what Leonardo called common sense, which is a mental faculty in which all sensory perceptions are collected and elaborated. The way in which Leonardo tried to discover the seat of the soul consisted in a search for proportional lines on the inside of the skull. The network of lines placed over these two skull drawings have just that aim. Under one of these drawings (RL 19058v) Leonardo writes:

The bone cavity hosting the eye, the maxillary cavity located below it, and the bone cavities of the nose and mouth, all have an equal depth; in correspondence with this depth, stands common sense; and the depth of the bone cavities is *one third of the face*.²³

In other drawings from the same series we see that the soul is at the crossing point between two lines and that this vertical line stands in relation to the back end of the bone cavities mentioned above. The depth of these cavities (and therefore the position of the soul) is neither casual nor accidental, but corresponds exactly to one third of the face, that is, to the same module, or unit, illustrated in the face of the *Vitruvian man*. In short, Leonardo has literally turned to the inside the body for a module that, according to the Vitruvian theory of proportions, dealt only with the surface of the body. In this way, Leonardo extends the study of proportions from outside the body to its inside, not only to measure inner anatomical connections, but also to solve philosophical problems such as the seat of the soul.

In general we do not have any evidence to claim that Greek classical artists extended the study of proportions (which also meant the study of beauty) to the inside of the body, to anatomy. In a passage from *De naturalibus facultatibus*, the ancient Roman anatomist Galen (c. 130-200 AD)

²³“Il vacuo della cassa dell’occhio e ’l vacuo dell’osso sostenitore della guancia e quello del naso e della bocca sono d’eguale profondità, e terminano sotto il senso comune per linia perpendicolare. E ciascuna d’essa vacuità ha tanto di profondità quant’è *la terza parte del volto dell’omo*, cioè dal mento ai capegli.”

made a comparison between the creations of a sculptor and those of nature, and claimed that nature was superior:

The sculptors Praxiteles and Phidias limited themselves to shaping the external matter, or that which could be touched (and seen from the outside.) While the deeper or inner parts they left without any ornaments, and rough [...], because they were unable to enter it, to go down to it and to touch all of its parts (Galen, *De naturalibus facultatibus*, ed. Kuhn, 2: 82)

According to Galen, the beauty of the artist's works is limited to the surface, while that of nature works on the interior as well. Leonardo broke apart this separation. He not only turned to the inside of the body in search of the proportions and the beauty that Vitruvius and other classical artists had restricted to the surface, but he also looked at this anatomical research as the first step toward his artistic creation.

Both the study of the surface proportions (exemplified by the *Vitruvian man*) and those of the inner ones (exemplified by the anatomical studies of the skull) have in fact a precise goal: to understand the inner reasons of the external form of the body. The external form was indeed for Leonardo, as an artist, the final destination, or the final synthesis. In his paintings he dealt with the external appearance of the human body.

Leonardo investigated nature as a scientist because he wanted radically to imitate nature with his art. This mimetic conception of art was at the basis of the Vitruvian theory as well: the aim of Vitruvius's study of the proportions of the human body was so as to create architecture that imitated those proportions. Francesco di Giorgio Martini widely developed the somatic implications of this conception. He made drawings in which the human figure literally determines the various parts of the architecture: the length and size of different parts of the head determine the proportional relationship in the different parts of the *capitello*. In other cases the human figure determines the plan of the church, the form and the number of the chapels, the connections among them, and with the nave and so on. Leonardo goes far beyond all this by conceiving, or devising, the artistic process as a journey starting from inside the body, from the anatomy. To imitate nature it is necessary to investigate its laws, its structure, not merely the external, but also the internal ones. Therefore, to imitate the natural world the artist must also become a scientist.

In Leonardo's work, the true final destination of his search for the perfect proportions in the *Vitruvian man* or in the skull studies are artistic figures. The anatomical search on the form of the skull affects many figures in the Last Supper and even the portrait of *Lady with an Ermine* (*Cecilia*

Gallerani).²⁴ He first investigated the beauty and proportions of the surface of the body (for example in the *Vitruvian man*); he then studied the proportions found on the inside of the body (for example, in the skull studies); then, he finally came back to the surface, applying to his artistic figures that sense of balance and beauty of the body stated in this research.

Drawing comparisons such as these between science and art from a historiographical perspective could be more or less appropriate. In the case of Leonardo and other Italian artists of the Renaissance it is an obligation, for without them scholars run the risk of not understanding the more original aspect of these artists' work.

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Appendix

Leonardo's text (Venice, Galleria dell'Accademia, n. 228)

Vetruvio architetto mette nella sua opera d'architettura che lle misure dell'omo sono dalla natura distribuite in questo modo. Cioè, che 4 diti fa un palmo e 4 palmi fa un piè: 6 palmi fa un cubito, 4 cubiti fa un homo e 4 cubiti fa un passo e 24 palmi fa un homo; e queste misure son né sua edifizii. Se ttu apri tanto le gambe che ttu cali da capo 1/14 di tua alteza e apri e alza tanto le braccia che colle lunghe dita tu tochi la linia della sommità del capo, sappi che 'l cietro delle stremità delle aperte membra fia il bellico e llo spazio che ssi truova infra lle gambe fia triangolo equilatero.

Tanto apre l'omo ne' le braccia quanto è lla sua altezza

Dal nasscimento de' capegli al fine disotto del mento è il decimo dell'alteza de l'uomo. Dal disotto del mento alla somità del capo è l'ottavo dell'alteza dell'omo. Dal di sopra del petto alla somità del capo fia il sexto dell'omo. Dal di sopra del petto al nasscimento de capegli fia la settima parte di tutto l'omo. Dalle tette al disopra del capo fia la quarta parte dell'omo. La maggiore largheza delle spalli contiene in sé [la oct] la quarta parte dell'omo. Dal gomito alla punta della mano fia la quarta parte dell'omo. Da esso gomito al termine della ispalla fia la ottava parte d'esso omo. Tutta la mano fia la decima parte dell'omo. Il membro virile nasce nel mezzo dell'omo. Il piè fia la settima parte dell'omo. Dal disotto del piè al disotto del ginocchio fia la quarta parte dell'omo. Dal disotto del ginocchio al nasscimento del membro fia la quarta parte dell'omo. Le parti che si truovano infra il mento e 'l naso e 'l nasscimento de' capegli e quel de' cigli ciasscuno spazio per sé è ssimile all'orecchio, è 'l terzo del volto.

English Translation of Leonardo's Text

Vitruvius the architect has it in his work on architecture that the measurements of man are arranged by nature in the following manner: four fingers make

²⁴See Laurenza, *De figura umana*.

one palm and four palm make one foot; six palms make a cubit; four cubits make a man and four cubits make one pace; and twenty-four palms make a man; and these measures are those of his buildings. If you open your legs so that you lower your head by one fourteenth of your height, and open and raise your arms so that with your longest fingers you touch the level of the top of your head, you should know that the central point between the extremities of the outstretched limbs will be the navel and the space that is described by the legs is an equilateral triangle.

The span to which the man opens his arms is equivalent to his height.

From the start of the hair to the margin of the bottom of the chin is a tenth of the height of the man; from the bottom of the chin to the top of the head is an eighth of the height of the man; from the top of the breast to the top of the head is a sixth of the man; from the top of the breast to the start of the hair is a seventh part of the whole man; from the nipples to the top of the head is a quarter part of the man; the widest distance across the shoulders contains in itself a quarter part of the man; from the elbow to the tip of the hand will be a fifth part of the man; from this elbow to the edge of the shoulder is an eighth part of this man; the whole hand is a tenth part of the man; the penis arises at the middle of the man; the foot is a seventh part of the man; from the sole of the foot to below the knee is a quarter part of the man; from below the knee to the start of the penis is a quarter part of the man; the portions that are to be found between the chin and the nose and between the start of the hair and to the yeybrows are both spaces similar in themselves to the ear and are a third of the face.

(Leonardo da Vinci, *The Literary Works*, ed. Jean Paul Richter. Oxford: Oxford University Press, 1939, vol. 1, par. 343.)

Vitruvius's text (*De architectura*, I. III)

Corpus enim hominis ita natura composuit uti os capitis a mento ad frontem summam et radices imas capilli esset decimae partis, item manus palma ab articulo ad extremum medium digitum tantundem, caput a mento ad summum verticem octavae, cum cervicibus imis ab summo pectore ad imas radices capillorum sextae, ad summum verticem quartae. Ipsius autem oris altitudinis tertia est pars ab imo mento ad imas nares, nasum ab imis naribus ad finem medium superciliorum tantundem. Ab ea fine ad imas radices capilli frons efficitur item tertiae partis. Pes vero altitudinis corporis sextae, cubitus quartae, pectus item quartae. Reliqua quoque membra suas habent commensus proportionem, quibus etiam antiqui pictores et statuarii nobiles uti magnas et infinitas laudes sunt adsecuti. Similiter vero sacrarum aedium membra ad universam totius magnitudinis summam ex partibus singulis convenientissimum debent habere commensus responsum.

Item corporis centrum medium naturaliter est umbilicus. Namque si homo conlocatus fuerit supinus manibus et pedibus pansis circinque conlocatum centrum in umbilico eius circumagendo rotundationem utrarumque manuum et pedum digiti linea tanguntur. Non minus quemadmodum schema rotundationis in corpore efficitur, item quadrata designatio in eo invenietur. Nam si a pedibus imis ad summum caput mensum erit eaque mensura relata fuerit ad manus pansas,

invenietur eadem latitudo uti altitudo, quemadmodum areae quae ad normam sunt quadratae.

(Vitruvius, *De architectura*, III, ed. P. Gros. Turin: Einaudi, 1997, vol. 3, p. 238)

English translation of Vitruvius's Text

For Nature has so planned the human body that the face from the chin to the top of the forehead and the roots of the hair is a tenth part; also the palm of the hand from the wrist to the top of the middle finger is as much; the head from the chin to the crown, an eighth part; from the top of the breast with the bottom of the neck to the roots of the hair, a sixth part; from the middle of the breasts to the crown, a fourth part; a third part of the height of the face is from the bottom of the chin to bottom of the nostrils; the nose from the bottom of the nostrils to the line between the brows, as much; from that line to the roots of the hair, the forehead is given as the third part. The foot is a sixth of the height of the body; the cubit a quarter, the breast also a quarter. The other limbs also have their own proportionate measurements. And by using these, ancient painters and famous sculptors have attained great and unbounded distinction. In like fashion the members of the temples ought to have dimensions of their several parts answering suitably to the general sum of their whole magnitude. Now the navel is naturally the exact centre of the body. For if a man lies on his back with hands and feet outspread, and the centre of a circle is placed on his navel, his figure and toes will be touched by the circumference. Also a square will be found described within the figure, in the same way as a round figure is produced. For if we measure from the sole of the foot to the top of the head, and apply the measure to the outstretched hands, the breadth will be found equal to the height, just like sites which are squared by rule. (Vitruvius, *De architectura*, III, I, 2-3, ed. and trans. F. Granger. London and Cambridge, MA: W. Heinemann/Harvard University Press, 1970, vol. 1, pp. 159-161.

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