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# LEONARDO DA VINCI ON NATURE

## *Knowledge and Representation*

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THE IMPETUS OF BATTLE:  
VISUALIZING ANTAGONISM IN LEONARDO

Comme si les variations des choses lui paraissaient dans le calme trop lentes, il adore les batailles, les tempêtes, le déluge. Il s'est élevé à les voir dans leur ensemble mécanique et à les sentir dans l'indépendance apparente ou la vie de leurs fragments, dans une poignée de sable envolée éperdue, dans l'idée égarée de chaque combattant où se tord une passion et une douleur intime<sup>1</sup>.

Paul Valéry

Conflict has often been described as a defining trait of Leonardo's understanding of the physical world and as a recurring element in his oeuvre. The depiction of relentless, dynamic encounters between the forces of nature, men, and animals – from volcanic eruptions and deluges to battles between men and horses – and the deep connections that he detected among them, are some of the most persistent themes of his investigations. In his works, both nature and man's experience of it, that is, both physical processes and sensory perception, seem to exist in a state of constant and violent strife.

In dealing with Leonardo's pervasive concern with such encounters, this essay aims to contribute to an understanding of how he defined and imagined conflict between antagonistic elements in different fields of knowledge, analyzing structural parallels that shed light on a common way to visualize contrasts between adverse forces. Studies of continuities and connections between Leonardo's artistic and scientific theories have traditionally focused on perspective and anatomy. The goal of this essay is to reach beyond these areas of investigation, exploring how Leonardo's thoughts on mechanics became intertwined with the formal qualities of his pictorial and graphic works, and

<sup>1</sup> P. Valéry, *Introduction à la méthode de Léonard de Vinci*, Paris 1919 (1894), p. 72.

of his battle scenes in particular, in a crucial and formative moment for this artistic genre<sup>2</sup>. In this way, this analysis is consistent with current trends in Leonardo studies as exemplified by other essays in this volume that emphasize how the language of physics and mechanics – previously overlooked in its connection to Cinquecento artistic theory – is indeed fundamental to comprehending Leonardo's approach to images.

While this essay will not address the moral and political implications of Leonardo's view of conflict<sup>3</sup> or its relation to antique sources<sup>4</sup>, two closely related mechanical notions, those of force and impetus, lie at the core of its argument. Contrary to the Aristotelian theory of motion – the so-called *antiperistasis*, with its emphasis on the role of the medium – impetus physics postulates the presence of a force transmitted by an active mover to a passive receiver, an inherited charge that survives in the latter even after loss of contact with the source of its motion. This impressed, incorporeal force, capable of moving a body contrary to its natural inclination, is conceived as a temporary and self-dissipating entity. Varying interpretations attribute its gradual extinction to the opposing action of gravity, to the resistance of the medium, or to the object's natural tendency to rest<sup>5</sup>.

<sup>2</sup> The preliminary thoughts presented in this essay form part of a larger research project focusing on the representation of battle scenes in Cinquecento artistic theory. I wish to express my sincere thanks to Frank Fehrenbach, Alessandro Nova, and Fabio Frosini for their suggestions and advice. During my research I relied heavily on *e-Leo*, the History of Science and Technology Digital Archive of the Biblioteca Leonardiana: my gratitude goes to Romano Nanni for making Leonardo's manuscripts accessible as they have never been before, profoundly shaping research practices in this field.

<sup>3</sup> Cf. M. Versiero, «Per un lessico politico di Leonardo da Vinci. II. Indizi di polemologia: "naturalità" del conflitto e "necessarietà" della guerra», in: *Bruniana & Campanelliana*, xv, 1, 2009, pp. 121-134; id., «"O per sanguinità, o per roba sanguinata": il pensiero politico di Leonardo», in: *Raccolta Vinciana*, xxxi, 2005, pp. 215-230.

<sup>4</sup> Cf. A. Brown's contribution to this volume; S. Toussaint, «Leonardo filosofo dei contrari. Appunti sul "chaos"», in: *Leonardo e Pico. Analogie, contatti, confronti*, ed. by F. Frosini, Firenze 2005, pp. 13-35; M. Beretta, «Leonardo and Lucretius», in: *Rinascimento*, xlix, 2009, pp. 341-372.

<sup>5</sup> On impetus physics cf. A. Maier, *Metaphysische Hintergründe der spätscholastischen Naturphilosophie*, Roma 1955; M. Clagett, *The Science of Mechanics in the Middle Ages*, Madison/WI 1959; S. Drake, «Impetus Theory Reappraised», in: *Journal of the History of Ideas*, xxxvi, 1, 1975, pp. 27-46; A. Franklin, «Stillman Drake's "Impetus Theory Reappraised"», in: *Journal of the History of Ideas*, xxxviii, 2, 1977, pp. 307-315; M. Wolff, *Geschichte der Impetustheorie*, Frankfurt am Main 1978. For the Aristotelian tradition, cf. G.A. Seeck, «Die Theorie des Wurfs. Gleichzeitigkeit und kontinuierliche Bewegung», in: *Die Naturphilosophie des Aristoteles*, ed. by G.A. Seeck, Darmstadt 1975, pp. 384-390.

First developed in late antiquity, impetus mechanics was further refined in the thirteenth and fourteenth centuries and in Leonardo's time became fully established as the common theory of physical motion. In its Scholastic formulation impetus was often defined as *vis impressa* or *derelicta* («impressed» or «residual» force) and connected to optical theories of visual emissions. Its non-corporeal propagation was assimilated to the emission of *species* («forms» or «images»), which, according to intromission theory, objects radiate through the surrounding transparent medium. The Franciscan theologian Peter John Olivi even concluded that projectile motion resulted from the action of *species* or *similitudines* impressed by the mover on the mobile object; in his view, these *species* were identical in nature to those responsible for the perception of the visible by the eye<sup>6</sup>. Force and impetus, therefore, are intimately linked to the physiology of vision: as force strikes its target and impresses its impetus upon it, so emanations of the visible world strike the sensory organs of living beings, impressing their impact – or impetus – on them.

Building on this tradition, Leonardo defined force as a spiritual power that, by exerting violence on inanimate bodies, imparts the impetus that keeps them mobile until its consumption<sup>7</sup>. As an invisible charge, impetus

<sup>6</sup> M. Wolff, «Mehrwert und Impetus bei Petrus Johannis Olivi. Wissenschaftlicher Paradigmenwechsel im Kontext gesellschaftlicher Veränderungen im späten Mittelalter», in: *Sozialer Wandel im Mittelalter. Wahrnehmungsformen, Erklärungsmuster, Regelungsmechanismen*, ed. by J. Miethke & K. Schreiner, Sigmaringen 1994, pp. 413-423.

<sup>7</sup> On impetus in Leonardo cf. D. Duhem, *Études sur Léonard de Vinci*, Paris 1906-1913, 3 Vols., Vol. III, pp. 54-112; C. Luporini, *La mente di Leonardo*, Roma 1953, pp. 33-79; V. Somenzi, «Leonardo e i principi della dinamica», in: *Leonardo. Saggi e ricerche*, ed. by A. Mazza, Roma 1954, pp. 147-157; I.B. Hart, *The Mechanical Investigations of Leonardo da Vinci* (1925), Berkeley/Los Angeles 1963; G. Castelfranco, «Il concetto di forza in Leonardo da Vinci», in: id., *Studi Vinciani*, Roma 1966, pp. 18-24; F. Fehrenbach, *Licht und Wasser. Zur Dynamik naturphilosophischer Leitbilder im Werk Leonardo da Vincis*, Tübingen 1997, pp. 239-244; A. Marinoni, «Bewegung und Kraft bei Leonardo», in: *Leonardo da Vinci. Natur im Übergang*, ed. by F. Fehrenbach, München 2002, pp. 81-95; M. Kemp, «Force and Motion», in: id., *Leonardo da Vinci. Experience, Experiment and Design*, Princeton/Oxford 2006, pp. 140-183; F. Frosini, «Pittura come filosofia: note su "spirito" e "spirituale" in Leonardo», in: *Accademia Leonardi Vinci*, x, 1997, pp. 35-59; id., «Il concetto di forza in Leonardo da Vinci», in: *Il codice Arundel di Leonardo: ricerche e prospettive*, ed. by A. Bernardoni & G. Fornari, Poggio a Caiano 2011, pp. 115-128.

is therefore conceived as an attribute that belongs to the body affected by it. Its transmission works according to the paradigm of optical emissions and reflects the same proportional laws that govern the propagation of other pyramidal powers: the fading of sound, light, and smell, and the effects of magnetism<sup>8</sup>. Indeed, all these entities emit *species* in every direction, impressing their effect on surrounding bodies.

As the only exception among pyramidal powers, however, impetus is invested with a unique enlivening potential. Leonardo asserts that motion impulses created by animated bodies (that is, bodies capable of self-initiated movement) endow inert objects with residual and apparently autonomous movement and thus with the semblance of life. Through the action of impetus, force animates the incorporeal world, generating admiration and wonder: «Force is an immaterial power, an invisible potency which is created and infused by animated bodies in inanimate ones through acquired violence, giving to these bodies the appearance of life; this life is of marvelous efficiency compelling and transmuting all created things from their places»<sup>9</sup>. This is not an isolated idea. In several related passages, the vivifying qualities of force are said to derive directly from its bond with the life that first produced it. Force is defined as a spiritual power because in it there is active life («vita attiva»); it is an animation of marvelous power that can be transmitted to inanimate objects («dando a questi vita attiva di maravigliosa potenza»)<sup>10</sup>.

<sup>8</sup> For a classic discussion of the universality of pyramidal laws in Leonardo cf. K.D. Keele, *Leonardo da Vinci's Elements of the Science of Men*, New York 1893, pp. 58-60; M. Kemp, *Leonardo da Vinci. The Marvellous Works of Nature and Man*, Cambridge 1981, revised edition, New York 2006, pp. 114-117; to be integrated with F. Frosini, «Appearance and Truth. The Function of 'Pyramidal Powers' in Leonardo's Research During the Last Decade of the xv Century», in: *Festschrift for Carlo Pedretti in Honor of his 70 Years of Leonardo Scholarship*, ed. by C. Moffatt, forthcoming.

<sup>9</sup> «Forza non è altro che una virtù spirituale, una potenza invisibile, la quale è creata e infusa per accidental violenza da' corpi sensibili nelli insensibili, dando a essi corpi similitudine di vita; la quale vita è di maravigliosa operazione. Costringendo e stramutando di sito e di forma tutte le cose, corre con furia a sua disfazione e vassi diversificando mediante le cagioni», in: *Il Codice Atlantico di Leonardo da Vinci nella Biblioteca Ambrosiana di Milano*, ed. by A. Marinoni, Firenze 1975-1980, 12 Vols., fol. 826, ca. 1492 [hereafter: Leonardo, *Codex Atlanticus*]. For an English translation of the passage cf. Kemp, 1981 (as in n. 8), p. 123.

<sup>10</sup> Leonardo, *Manuscript B*, fol. 63r: «Che cosa è forza. Forza dico essere una potenza spirituale [...]. Spirituale dissi, perché in essa forza è vita attiva»; Leonardo, *Manuscript A*, fol. 34v: «Forza dico essere una virtù spirituale [...] la quale per accidentale, esterna

Impetus, therefore, performs painting's most crucial task, that of apparent enlivenment and animation; painted images are expressive of living things without having life in themselves («la pittura in sé non è viva ma isprimitrice di cose vive senza vita»)<sup>11</sup>.

Since the lifeless artifact lacks natural animation («vivacità naturale»), Leonardo recommends equipping it with artificial animation («vivacità accidentale») in order to vivify its inert matter<sup>12</sup>. Being accidental and not natural, this fictive vivacity can only be achieved by means of violence, intended, in accordance with the Aristotelian tradition, as the application of a force that causes an object to move in an imposed way that counteracts its natural inclination. It follows that in forced, violent movements – when impetus is at its greatest – the painter finds an opportunity to convey great animation: for example in battle scenes, where motion is particularly dynamic («Ma li moti composti sono nelle battaglie di grand'artificio e di grande vivacità e movimento»)<sup>13</sup>.

Despite this enlivening power, force is an inherently destructive entity. It is characterized by an irreversible desire to extinguish itself, wasting its energies through movement. Ultimately, it leads to the object's rest: a motionless state that is conceived by Leonardo – again via Aristotle – as the absence of any sign of life, and thus as apparent death. Force's 'suicidal' desire is unequivocally described: «It [force] rushes with fury

violenza è causata dal moto e collocata e infusa ne' corpi, [...] dando a quelli vita attiva di maravigliosa potenza», in: Leonardo da Vinci, *I manoscritti dell'Institut de France*, ed. by A. Marinoni, Firenze 1986-1990, 12 Vols. (*Manoscritti A-M*) [hereafter: Leonardo, *Manuscript A-M*]. For an English translation cf. *The Manuscripts of Leonardo da Vinci in the Institut de France*, trans. by J. Venerella, Milano 1999-2007, 12 Vols.

<sup>11</sup> «[...] la pittura in sé non è viva ma isprimitrice di cose vive senza vita, e se non gli si aggiunge la vivacità dell'atto essa riman morta la seconda volta», in: Leonardo da Vinci, *Libro di pittura. Codice Urbinate lat. 1270 nella Biblioteca Apostolica Vaticana*, ed. by C. Pedretti & C. Vecce, Firenze 1995 [hereafter: Leonardo, *Libro di pittura*, 1995], chapter 376. On the topos of enlivenment cf. F.H. Jacobs, *The Living Image in Renaissance Art*, Cambridge 2005; on enlivenment as an aesthetic category cf. F. Fehrenbach, «Kohäsion und Transgression. Zur Dialektik lebendiger Bilder», in: *Animationen/Transgressionen. Das Kunstwerk als Lebewesen*, ed. by U. Pfisterer & A. Zimmermann, Berlin, 2005, pp. 1-40.

<sup>12</sup> «Dove manca la vivacità naturale, bisogna farne una accidentale», in: Leonardo, *Codex Atlanticus*, fol. 399r. For the meaning of the «accidentale» in Leonardo cf. Frosini, 2011 (as in n. 7).

<sup>13</sup> Cf. Leonardo, *Libro di pittura*, 1995, chapter 106. On art as violence, operating «against nature», cf. M. Cole's contribution to this volume.

to its destruction [...]. It lives by violence and dies at liberty [...]. Great power gives it great desire for death. [...] It always desires to weaken and extinguish itself»<sup>14</sup>. By translating force into motion, impetus prolongs the desire of the moving object to return to its natural state, that is, force's drive to die off, as Leonardo himself writes<sup>15</sup>. In doing so, impetus extends force's lifespan by temporarily suspending its flight towards consumption and death. It thereby creates a paradoxical oscillation between life (the vivifying potential of force) and its extinction (its suicidal desire)<sup>16</sup>.

The use of the term «impetus» in Leonardo's writings confirms this ambivalence between the generative and destructive potential of force: the word describes both the power of male semen and that of a charging army<sup>17</sup>. In addition to its mechanical meaning of *vis impressa*, the word is employed by Leonardo more broadly to characterize the forceful impact produced by impetuous movement. Impetus describes the flow of air and liquids – currents of water, but also blood. The heartbeat itself is «a impeti», a process rhythmically interrupted by pauses that occur when the force transmitted by one pulse dies off<sup>18</sup>. In an even more generic sense, the term might simply refer to violence or vehemence. As in Latin and vernacular texts, where the word is more often used in a military context, Leonardo's impetus is especially that of battle, referring to the destructive effects of artillery («l'impeto della bombardà»),

<sup>14</sup> Leonardo, *Codex Atlanticus*, fol. 826r: «[...] corre con furia a sua disfazione [...]. Vive per violenza, e more per libertà [...]. Gran potenza le dà gran desiderio di morte [...] volentieri consuma se stessi. [...] <Pote>nza è solo un desiderio di fuga. <Se>mpre desidera farsi debole e spegnersi».

<sup>15</sup> Leonardo, *Codex Atlanticus*, fol. 340r: «L'impeto è molte volte causa che 'l moto prolunga il desiderio della cosa mossa».

<sup>16</sup> Cf. Frosini, 2011 (as in n. 7).

<sup>17</sup> «L'impeto della premuta sperme», in: Leonardo da Vinci, *Corpus of the Anatomical Studies in the Collection of Her Majesty the Queen at Windsor Castle*, ed. by K.D. Keele & C. Pedretti, London 1978-1980, 3 Vols. [hereafter: K/P], 115r (Windsor, RL 19116).

<sup>18</sup> «Il battimento del core è a impeti», K/P 172v (Windsor, RL 19083v); other examples on K/P 116r (Windsor, RL 19118r), K/P 155r (Windsor, RL 19062r), K/P 156r (Windsor, RL 19063r), K/P 166r (Windsor, RL 19073r; for the impetus of blood cf. F. Fehrenbach, «Leonardo's Liquid Bodies», in: *Le corps transparent*, ed. by V. Stoichita et al., Roma 2013, pp. 147-172. For the impetus of water cf. especially the *Codex Leicester* [*The Codex Hammer of Leonardo da Vinci*, ed. by C. Pedretti, Firenze 1987]).

the attack of armies and horses, and the motion resulting from hostile actions<sup>19</sup>.

Among the writings of Leonardo's contemporaries, the term is exceptionally frequent in Machiavelli. As «impeto de' nemici», the word appears consistently in *Dell'arte della guerra* as well as in the *Discorsi sopra la prima deca di Tito Livio*. In the *Principe*, «impetuosity» features as a crucial quality, the decisive virtue that enables forceful and resolute men to triumph over Fortuna<sup>20</sup>.

Notes on impetus began to appear in Leonardo's manuscripts at the same time as his notes on painting, roughly between 1489 to 1492. They soon developed into an idea for a treatise, a «libro dell'impeto» that Leonardo mentioned around 1495 in *Codex Madrid*<sup>21</sup>. Nevertheless, the term occurred frequently both before and after he gave it the specific significance of *vis impressa*, possibly around 1495<sup>22</sup>. Often both meanings – the generic and the mechanical – coexist on the same page, even in the same passage<sup>23</sup>. The impression is that of a fluctuating terminology in which the word is used ambiguously in order to exploit the semantic proximity of its generic and specific meanings.

In 1503, with the *Battle of Anghiari*, Leonardo amplified to a monumental scale impetus's fundamental qualities. The composition's central group – the so-called *Fight for the Standard* (fig. 1) – has often been approached from the

<sup>19</sup> For some examples of the impetus of: 1) water in military operations, cf. Leonardo, *Manuscript B*, fols. 60v, 63r, 64r; *Manuscript I*, fol. 68v 2) hostile bodily movements, cf. *Codex Atlanticus*, fol. 957v; *Libro di pittura*, 1995, chapter 392; K/P 144v (Windsor, RL 19013v) 3) weapons: crossbows, cf. *Manuscript A*, fol. 32r; catapults, cf. *Manuscript I*, fols. 98r, 101v; *Manuscript E*, fol. 21r; artillery, cf. *Manuscript I*, fols. 133r, 100v, 122v; *Manuscript E*, fol. 27v; *Il Codice di Leonardo da Vinci nel Castello Sforzesco*, ed. by P.C. Marani & G.M. Piazza, Milano 2006 [*Codex Trivulzio*], fols. 18v, 19r.

<sup>20</sup> Niccolò Machiavelli. *Il Principe*, ed. by G. Inglese, Torino 1999, chapter xxv; cf. G.M. Anselmi, «Impeto della fortuna e virtù degli uomini tra Alberti e Machiavelli», in: *Alberti e la cultura del Quattrocento*, ed. by R. Cardini & M. Regoliosi, Firenze 2007, 2 Vols., Vol. II, pp. 827-842.

<sup>21</sup> *Codex Madrid I*, fol. 103r: «8<sup>a</sup>. Quess[t]a 8<sup>a</sup> è allegata nel libro dell'impeto. Adunque queste figure vanno in esso libro», in: *Codices Madrid*, ed. by L. Reti & A. Marinoni, Frankfurt a.M. 1974, 5 Vols. [hereafter: Leonardo, *Codex Madrid*].

<sup>22</sup> Cf. Fehrenbach, 1997 (as in n. 7), p. 243.

<sup>23</sup> For example Leonardo, *Codex Atlanticus*, fol. 266v: «Quando l'uccel si leva di terra in alto, esso salta e chiude con impeto le aperte alie, e fassi un'onda d'aria, che se le condensa e per<c>ote il petto di sotto in su, l'impeto della quale va seguitando alquanto».



standpoint of Leonardo's hydraulic studies and associated with the idea of a vortex. Ernst Gombrich, Martin Kemp, and Carlo Pedretti, for example, have described the composition as a whirlpool, a clash of colliding masses of water<sup>24</sup>. However, mechanics also provides a valid framework for approaching the composition<sup>25</sup>, as Leonardo likely conceived of these figures as bodies charged with fury and impetus. Even the account of the Anghiari battle written by the chancery official Agostino Vespucci in the *Codex Atlanticus* describes the impetus of the approaching Milanese troops and the opposing action of the Florentine cavalry. In this passage – often cited as the textual source that Leonardo was expected to follow but instead decided to disregard – Vespucci states that five hundred horses were sent to impede the impetus of the Milanese<sup>26</sup>. A translation and summary of Leonardo Dati's *Trophaeum Anglaricum* (1443), the text recounts how the two armies alternately controlled the bridge to Anghiari, which was lost to the Florentines, re-conquered, and then lost and re-conquered again<sup>27</sup>. The passage unfolds as a narrative of two opposing forces pushing each other back and forth in the battle for the bridge, a motif scholars have identified in a small sketch where Leonardo drew a series of compositional studies for the *Battle of Anghiari*<sup>28</sup>.

<sup>24</sup> The bibliography on the topic is too extensive to be listed here. For a recent and useful attempt to consolidate this material cf. C. Echinger-Maurach, «Virtute Vincere. Leonardos und Michelangelos "Schlachtenbilder" im Rahmen der Ausstattung der Florentiner Sala grande del Consiglio im Palazzo Vecchio», in: *Leitbild Tugend: die Virtus-Darstellung in italienischen Kommunalpalästen und Fürstenresidenzen des 14. bis 16. Jahrhunderts*, ed. by T. Weigel & J. Poeschke, Münster 2013, pp. 256-294, with previous bibliography.

<sup>25</sup> On Leonardo's mechanization of human movement and its aftermath see M. Cole's contribution to this volume.

<sup>26</sup> *Codex Atlanticus*, 202a r: «500 cavalli furon mandati dal Patriarcha per impedire o raffrenare lo impeto etc.». Agostino Vespucci, Macchiavelli's secretary in the Second Chancery, has recently been identified as the humanist that signed himself as Agostino Nettucci; a critical reassessment of this figure, including his connection with Leonardo, would then be in order. Cf. A. Schlechter, «Leonardo da Vinci's 'Mona Lisa' in a Marginal Note in a Cicero Incunable», in: *Early Printed Books as Material Objects*, ed. by B. Wagner & M. Reed, Berlin/New York, 2010, pp. 151-173. I thank Gerard González Germain for the reference.

<sup>27</sup> Cf. Leonardo Dati, «Trophaeum Anglaricum (1443; nach dem Codex Riccardianus 1207, fol. 47v-58r)», ed. by G. Maurach & C. Echinger-Maurach, in: *Fontes*, LXXIV, 2013 (online resource).

<sup>28</sup> Gallerie dell'Accademia, Venice, inv. 216 (pen and brown ink, 101x142 mm); cf. *I disegni di Leonardo da Vinci e della sua cerchia nel Gabinetto dei disegni e Stampe delle Gallerie dell'Accademia di Venezia*, ed. by C. Pedretti, G. Nepi Scirè & A. Perissa Torrini, Firenze 2003, p. 117, n. 17.

In the *Fight for the Standard*, Leonardo similarly draws two antagonistic forces close together, pressing combatants around the contested banner. The main concern of the composition seems to be the compression of bodies engaged in the struggle: the use of intertwined forms secures a tightly joined unit that appears, in the words of Kenneth Clark, «almost unbearably close-knit and dense»<sup>29</sup>. Cinquecento sources similarly referred to the group as a «knot of horses and men», or a «tangle of horses fighting for a standard»<sup>30</sup>.

The interlocking of opposing forces resulting from this compression prevents bodies from unleashing their impetus through movement. In this transitional and paradoxical stabilization, force is held in tension, its inexorable destiny – «living by violence and dying at liberty»<sup>31</sup> – temporarily suspended. Locked and impeded in its motion, this charge does not translate into movement: it represents action without motion.

The image embodies impetus's fundamental quality, creating a juncture where both stability and instability, the conservation of motion and its undoing, paradoxically coincide. The «knot» extends the decisive moment of oscillation between life and death, generation and destruction. By suspending the fugacity of force, the image reconciles time as both fleetingness and duration: the instant is prolonged into a lasting temporal extension. As the outcome of the event seemingly remains in the balance, the viewer is engaged and challenged to imagine the future course of the action<sup>32</sup>.

<sup>29</sup> K. Clark, *A Catalogue of the Drawings of Leonardo da Vinci in the Collection of this Majesty the King at Windsor Castle*, Cambridge 1935, p. XLIII.

<sup>30</sup> «[...] un gruppo di cavalli che combattevano una bandiera», in: Giorgio Vasari, *Vite de' più eccellenti architetti, pittori et scultori italiani*, ed. by S. Bettarini & P. Barocchi, Firenze 1966-1987, 6 Vols., Vol. IV, p. 32 (1976). The Anonimo Gaddiano (1540) describes Leonardo's battle as «il disegno del gruppo de cavalli» (cf. *Codice Magliabechiano*, ed. by C. Frey, Berlin, 1892, p. 111), while Anton Francesco Doni calls it «gruppo de cavalli e uomini» (in: id., *Tre libri di lettere del Doni*, Venezia, 1552, fols. 177-181). On the meaning of «gruppo» as knot see *Vocabolario degli Accademici della Crusca*, Firenze 1691, Vol. II, fol. 803, where the entry on «gruppo»/«grosso» refers to the Latin «nodus» for the meaning of the lemma. The early modern meaning of the term in relation to Leonardo's and Bramante's «gruppi» had been already pointed out by Luca Beltrami in 1902, cf. id., *Leonardo da Vinci e la Sala delle Asse nel Castello di Milano*, Milano 1902, pp. 35-36.

<sup>31</sup> Leonardo, *Codex Atlanticus*, fol. 826.

<sup>32</sup> Cf. the notion of amphibolia in Pomponius Gauricus, *De sculptura*, ed. by P. Cutolo, Napoli 1999, pp. 217-218; D. Summers, «Michelangelo's "battle of Cascina", Pomponius Gauricus, and the Invention of a "Gran Maniera" in Italian Painting», in: *Artibus et Historiae*, LVI, 2007, pp. 165-176: 172.

The idea of opposing forces mutually holding each other in place must have been a long-standing interest of Leonardo. The concept had already appeared in ca. 1498 in the *Sala della Asse*<sup>33</sup>, where the vigorous impetus of the trees' growth is visualized in the now fragmentary fresco in the northern corner of the hall. Here, a rocky basement is splintered by the force of the trees' massive roots, a motif that has no precedents in Quattrocento fresco decoration (fig. 2)<sup>34</sup>. On the ceiling, the trees' branches have been woven together into an elaborately knotted canopy, which binds them into a taut unit. Antagonistic movements deriving from the plants' growth, each branch exerting pressure on another, have been stabilized over time so that progressive increments of force generate ever greater solidity<sup>35</sup>.

What are the visual consequences and perceptual implications of impetus? As an incorporeal and spiritual entity, force neither adds weight to nor changes the form of the body it inhabits, as Leonardo states explicitly<sup>36</sup>. However, when considered *sub specie temporis*, force becomes empirically verifiable, as it can be observed, measured, and represented through its secondary effects<sup>37</sup>. When unfolding over time through movement, force manifests itself visibly by affecting resistant bodies placed within its path.

This observation surfaces in Leonardo's scientific inquiries, for instance, when he recommends looking at the dust raised by a running horse in order to visualize the derived motion of the air, or suggests using millet

<sup>33</sup> Beltrami, 1902 (as in n. 30); J.F. Moffitt, «Leonardo's "Sala delle Asse" and the Primordial Origins of Architecture», in: *Arte Lombarda*, n.s., 92/93, 1990, pp. 76-90; M.T. Fiorio & A. Lucchini, «Nella Sala delle Asse, sulle tracce di Leonardo», in: *Raccolta Vinciana*, xxxii, 2007, pp. 101-140; M. Collareta, «Gotik in der Renaissance. Divagazioni sulla Sala delle Asse», in: *Saggi di Letteratura Architettonica. Da Vitruvio a Winckelmann*, Vol. III, ed. by H. Burns, F.P. Di Teodoro & G. Bacci, Firenze 2010, pp. 133-138.

<sup>34</sup> Cf. Kemp, 1981 (as in n. 8), p. 175.

<sup>35</sup> Cf. Fehrenbach, 1997 (as in n. 7), p. 272.

<sup>36</sup> Leonardo, *Manuscript B*, fol. 63r: «Che cosa è forza. Forza dico essere una potenza spirituale, incorpor<e>a e invisibile [...]; incorporea e invisibile dico, perché il corpo, dove nasce, non cresce in peso né in forma».

<sup>37</sup> Writing about force and weight, Leonardo specifies: «L'un e l'altro è invisibile, ma ben misurabile i suoi effetti», in: *Il Codice Arundel 263 nella British Library*, ed. by C. Pedretti & C. Vecce, Firenze 1998, fol. 37v. Cf. Frosini, 2011 (as in n. 7), pp. 117-118.

grains or wine to track the movement of water currents<sup>38</sup>. However, such indexes of force also have the paradoxical result of obscuring the legibility of phenomena. This is a crucial point, for the stronger the impetus, the more intense its secondary effects, and the more confused man's experience of it: «when water becomes rapid», writes Leonardo, «its impetus does not allow us to recognize the cases of the various bottoms»<sup>39</sup>. Similarly, in many of Leonardo's military drawings, the impetus of the artillery is visualized through the turbulent wake of dust and smoke that it leaves behind and in the conspicuous tracks of gunshots (fig. 3). Leonardo himself, nonetheless, notes that too much smoke impedes vision and becomes a weapon in itself: well aware of smoke's obscuring potential, he recommends its use in battle to confuse the enemy (fig. 4)<sup>40</sup>.

This idea culminates in Leonardo's late years in a drawing now at Windsor (fig. 5)<sup>41</sup>, a view of a battlefield usually dated ca. 1511-1515. Here, forces are visualized through the depiction of the indexes of their actions. Figures are moved and carried away by mortar explosions while a veil of smoke and dust suggests the intensity of the turmoil. Little agreement has been reached on the drawing's subject: scholars have interpreted it as a battle between Phyrus and the Romans (Müntz, Von Seidlitz), a wild elephant hunt (Möller), a charge of «fantastically gigantic quadrupeds» (Berenson), and a battle between horses and men rendered with variations of scale (Lessing, Clark). Focusing on its indecipherable tangle of chalk lines, baffled critics have discovered in it a «running giant» (Pedretti) as well as

<sup>38</sup> «E nell'acqua bollente con tardi moto potrai mettere alquanti grani di panico, perché mediante il moto d'essi grani potrai speditamente cognoscere il moto dell'acqua, che con seco gli porta e di questa tale speranza potrai investigare molti belli moti, che accaggiano dell'uno elemento penetrato nell'altro», Leonardo, *Manuscript F*, fol. 34v; on wine cf. *Manuscript C*, fol. 25r; on the horse running along a dusty road cf. *Manuscript E*, fol. 8or.

<sup>39</sup> Leonardo, *Manuscript I*, fol. 70v: «Dove l'acqua si fa veloce, il suo impeto non lascia conoscere i casi de' vari fondi». Significantly, Leonardo first wrote «male» (poorly), as he probably meant to describe a condition of poor visibility; eventually, though, he crossed it out and ended the sentence with a statement on the phenomenon's complete illegibility.

<sup>40</sup> Leonardo, *Manuscript B*, fol. 63v: «Usano i Germani annegare i castellani con fumo di piuma, solfo e risalgallo, e fanno durare detti fumi 7 e 8 ore. Ancora la pula del frumento fa assai e durabil fumo e 'l letame secco ancor lui, ma fa sia mischiato colla sansa, cioè ulive, trattone l'olio, o voi morca d'olio». Cf. also *Codex Atlanticus*, fol. 950v for the preparation of a «fumo mortale» to be used in battle.

<sup>41</sup> Windsor, RL 12332 (red and black chalk on red prepared paper, 148×217 mm).

a headless lion, a kicking ram, a horse with a jester's cap, and an animal whose head is becoming human while its legs are transformed into fins, symbolizing courage, stubbornness, folly, and remorse respectively (Popp)<sup>42</sup>. In 1934, Maria Lessing pointed out that «there's not sufficient detail clearly visible to permit of a complete symbolical interpretation», an observation soon rebuffed by Emil Möller as a facile surrender to the sheet's «pretended indistinctness», though he admitted a few lines later that «the technique chosen obscures the drawing»<sup>43</sup>.

Indeed, objects and bodies are shown under conditions that obscure them. Even if Leonardo gives his chalk a very sharp and damped point to achieve a more defined, almost pen-like stroke, the tangle of lines becomes elusive on the equally reddish ground. This red-on-red drawing technique reduces the contrast between figure and ground: as a result, the vaguely sketched forms appear to sink into thick, hazy air. This necessitates a more attentive response on the part of the beholder: it is difficult to identify objects, isolate single figures, and relate them to one other; any attempt to distinguish between active movements and impressed motions (or, in other words, between active force and *vis impressa*) seems to be destined to fail. Possessed by the impetus infused by an apparently invisible agent, a «mêlée humaine lilliputienne»<sup>44</sup> swarms about the vast battlefield. A mani-

<sup>42</sup> Cf. in chronological order: E. Müntz, *Leonardo da Vinci, Artist, Thinker and Man of Science*, London 1989, 2 Vols., Vol. II, p. 267; W. von Seidlitz, «I disegni di Leonardo da Vinci a Windsor», in: *L'arte*, XIV, 4, 1911, pp. 269-289: 273, n. 74; E. Möller, «Leonardo da Vinci's Pazzia Bestialissima», in: *The Burlington Magazine for Connoisseurs*, LXV, 377, 1934, pp. 89-90; B. Berenson, *The Drawings of the Florentine Painters*, Chicago 1938, n. 1230; M. Lessing, «Leonardo da Vinci's Pazzia Bestialissima», in: *The Burlington Magazine for Connoisseurs*, LXIV, 374, May 1934, pp. 219-231; K. Clark, *A Catalogue of the Drawings of Leonardo da Vinci in the Collection of His Majesty the King at Windsor Castle*, Cambridge, 1935, pp. 25-26; Clark revises his reading in id., *A Catalogue of the Drawings of Leonardo da Vinci in the Collection of His Majesty the King at Windsor Castle*, second edition revised with the assistance of C. Pedretti, London 1968, p. 30, as well as in id., «Leonardo and the Antique», in: *Leonardo's Legacy*, ed. by C.D. O'Malley, Berkeley 1969, pp. 1-34: 15-17; *The Drawings and Miscellaneous Papers of Leonardo da Vinci in the Collection of Her Majesty the Queen at Windsor Castle. Volume II. Horses and Other Animals*, ed. by C. Pedretti, London 1987, p. 117, n. 148r; A.E. Popp, *Leonardo da Vinci. Zeichnungen*, München 1928, pp. 11-12, 52, pl. 70.

<sup>43</sup> Lessing, 1934 (as in n. 42), p. 89.

<sup>44</sup> D. Arasse, *Léonard de Vinci. Le rythme du monde*, Paris 1997, p. 442.

festation of the enlivening power of force, the figures' violent animation – now more than ever – also coincides with a flight towards death.

As the drawing is in a generally good state of conservation, its elusive qualities are hardly accidental: Leonardo must have been aware that many details of the scene would not be visible under the conditions he created. To be sure, he certainly intended to exploit the bewildering effects of disproportion conveyed by the shifting scale of the figures: a similar disparity of size can be found in the latest of his deluge drawings, an equally apocalyptic vision of uttermost destruction<sup>45</sup>. The visual experience conveyed is intentionally ambiguous: it is meant to trouble the eye, forcing it into a strained participation in the contrasting events represented. The drawing seems to be testing the very possibility of acquiring accurate visual information by establishing circumstances in which sight inevitably errs under conditions that obscure visibility.

In an effort to visualize impetus, images of battle challenge sight. They slow or defer what Panofsky would have called pre-iconographical apprehension, or, less anachronistically, what the optical tradition inherited by Leonardo would have defined as *intuitio*. As opposed to *aspectus* (the intuitive visual grasp by which forms are superficially perceived), *intuitio* refers to the active understanding of external objects. The distinction, which Leonardo derived from Alhazen, thrusts an enormous importance on this sense-producing act of seeing, one that is conscious and dynamic because it is based on the constant scanning movement of the eye's natural axis, the central visual line along which the faculty of sight operates most clearly and effectively<sup>46</sup>.

<sup>45</sup> Cf. RL 12388, ca. 1517-1518 (pen, ink and wash over traces of black chalk, 300x203 mm). Cf. *The Drawings and Miscellaneous Papers of Leonardo da Vinci in the Collection of Her Majesty the Queen at Windsor Castle. Volume 1. Landscapes, Plants and Water Studies*, ed. by C. Pedretti, London 1982, p. 141, n. 70r.

<sup>46</sup> On Alhazen see S.B. Imar, *Ibn al-Haytham's Optics: A Study of the Origins of Experimental Science*, Minneapolis/Chicago 1977; *The Optics of Ibn al-Haytham: Books I-III: On Direct Vision*, ed. by A.I. Sabra, London 1989; *Alhacen's Theory of Visual Perception: a Critical Edition, with English Translation and Commentary, of the First Three Books of Alhacen's «De Aspectibus», the Medieval Latin Version of Ibn al-Haytham's Kitāb al-Manāẓir*, ed. by A.M. Smith, Philadelphia 2001, 2 Vols.; H. Belting, *Florence and Baghdad: Renaissance Art and Arab Science*, Cambridge Ma 2011, pp. 90-99. On its reception in Italy cf. G. Federici-Vescovini, *Studi sulla prospettiva medievale*, Torino 1965; Blaise de Parme, *Questiones super perspectiva communi*, ed. by G. Federici Vescovini & J. Biard, Paris 2009; F. Fiorani, *Leonardo's Optics in the 1470s*, in *Leonardo da Vinci and Optics*, ed. by F. Fiorani & A. Nova, Firenze 2013, pp. 256-290.

The realization that the eye sees with clarity only within a certain segment of the visual field at any one time implies that the viewer can only observe the whole with multiple eye movements. Especially when troubled by difficult viewing conditions, perception extends over time: images of battle therefore require a slowing down of experience. They bring the beholder to a halt and hold him there as the wandering eye examines the battlefield in search of comprehensible, recognizable forms. Scenes of antagonism thus become, in the beholder's eyes, reenactments of violence.

This link between sight and conflict unfolds in different aspects of Leonardo's work. The famous passage titled «How to represent a battle», composed by Leonardo around in 1492 in the pages of *Manuscript A*, addresses similar issues. As is well known, the text belongs to a large group of notes on painting that Francesco Melzi later transcribed from the last section of this manuscript into the *Libro di Pittura*<sup>47</sup>. References to battle scenes within the *Libro* can mostly be traced back to the 1490s, and specifically to this manuscript<sup>48</sup>. It is here that Leonardo for the first time designates battles as *the* privileged test for proving the greater *enargeia* of painting versus poetry, an idea that, formulated again around 1500-1505, appears twice in his writings on the Paragone<sup>49</sup>. Battles also appear in *Manuscript A* as a result of the human mind's imaginative projections onto amorphous stains on walls<sup>50</sup>. Significantly, large sections of the manuscript deal at length with violent motions, the definition of force and percussion, and ballistics, or the trajectories of objects moved by fury and impetus<sup>51</sup>.

<sup>47</sup> «Modo di figurare un battaglia», in: Leonardo, *Manuscript A*, fols. IIIr-IIIV. ca. 1492; «Come si debba figurar una battaglia», in Codex Vat. Urb. lat. 1270, fols. 53r-v, 85r-v [now in Leonardo, *Libro di pittura*, 1995, chapter 148, pp. 207-208].

<sup>48</sup> This is easily confirmed by looking at the dating of relevant passages and their concordances between the *Book on Painting* and *Manuscript A* provided by Carlo Pedretti, in: id., *Leonardo da Vinci on Painting: a Lost Book (Libro A) Reassembled from the Codex Vaticanus Urbinas 1270 and from the Codex Leicester by Carlo Pedretti*, Berkeley 1964.

<sup>49</sup> Leonardo, *Manuscript A*, fol. 99v, ca. 1492, later *Vat. Urb. lat. 1270*, fols. 8v-9r [Leonardo, *Libro di pittura*, 1995, chapter 19, p. 143]. For the second, longer comparison between painted and written representations of battles see *Vat. Urb. lat. 1270*, fols. 5v-7 [Leonardo, *Libro di pittura*, 1995, chapter 15, pp. 139-140].

<sup>50</sup> Leonardo, *Manuscript A*, fol. 102v, ca. 1492, *Vat. Urb. lat. 1270*, fol. 35v [Leonardo, *Libro di pittura*, 1995, chapter 66, p. 177].

<sup>51</sup> For example Leonardo, *Manuscript A*, fol. 81v: «Ogni cosa mossa con furia seguirà per l'aria la linea del movimento del suo motore». Marinoni is wrong when he writes that

Leonardo's notes on battle representation open with a long passage describing how the sight of combat is impeded and confused by mud, dust, and smoke<sup>52</sup>. No battle is visible: it is the failure of sight that determines the beholder's experience. Leonardo foregrounds vision and its limits, seemingly turning the oscillation between the visible and the invisible into the subject of his representation. Describing how the view of battlefields is always confused by mud, dust, and smoke, he identifies the failure of sight as the defining experience of war for both spectators and participants. His account underscores acts of looking and responses to things seen; observations about the gestures of soldiers struggling to restore their impeded vision are often repeated and outlined in great detail. Leonardo emphasizes that the further soldiers are placed within the swirling mass of fighting bodies, the less visible they become, as clouds of smoke and dust screen the pictorial field from the eyes of the beholder<sup>53</sup>. Combatants are characterized by an even more dramatic inability or unwillingness to see. Leonardo recommends depicting victors emerging from the multitude after combat, rubbing their eyes with both hands to remove the dirt caked on their faces in a mixture of tears and dust<sup>54</sup>. Reserve troops, in turn, should be represented standing with watchful eyes as they gaze at the turmoil in search of orders from their commander, bringing their hands to their foreheads to shield their eyes from the sun<sup>55</sup>. Ultimately, vision becomes a hallmark of

the term «impetus» is significantly not yet used in *Manuscript A* (in his introduction to *Manuscript A*, p. XIII), as the word appears in both its generic and mechanical meanings, cf. *Manuscript A*, fols. 3v, 26r, 32r, 59r.

<sup>52</sup> C. Vecce, *Le Battaglie di Leonardo* (LI Lettura Vinciana – 2011), Firenze 2012, especially pp. 9-10.

<sup>53</sup> «I combattitori quanto più fieno in fra detta turbulenzia, meno si vederanno»; «[...] e le loro gambe quanto più s'appresseran alla terra, men fieno vedute, perché la polvere e li più grossa e più spessa», Leonardo, *Manuscript A*, fol. 111r. The idea is repeated in Leonardo, *Manuscript G*, fol. 15r: «Delli omini e cavagli in battaglia travaglianti le lor parte saran ta<n>to oscure, quanto esse fien più vicine alla terra che li sostiene»; also in Leonardo, *Libro di pittura*, 1995, chapter 789.

<sup>54</sup> «Vederai alcuni vincitori lasciare il combattere e uscire dalla moltitudine nettandosi colle 2 mani li occhi e le guance ricoperti di fango fatto dal lagrimare degli occhi per l'amor della polvere» *ivi*, fol. 110v.

<sup>55</sup> «Vederesti le squadre del soccorso stare pien di speranza e sospetto colle ciglia aguzze, facendo a quelle ombra colle mani e riguardare, in fra la folta e confusa caligine, dell'essere attenti al comandamento del capitano», *ivi*, fol. 110v.



victory: while the victors recover their sight, those hopelessly caught in the middle of the struggle, according to Leonardo, refuse to see. Wounded and vanquished, lying on the ground, they shield their terrified eyes with one hand raised, the palm turned outwards toward the enemy<sup>56</sup>.

A specific physiological affinity associates battles with the process of vision itself, described by Leonardo as an antagonistic confrontation between the visible and the eye. It is especially in *Manuscript D* that Leonardo investigates how the eye, when «offended» by excessive brightness («offesa dalla soverchia luce»), protects itself by contracting the pupil<sup>57</sup>. Thanks to this physical response to light, the *spetie* of luminous objects reach the curved surface of the eye with diminished brightness and magnitude (fig. 5)<sup>58</sup>. As a result, any change in brightness triggers a reaction in the eye, which is therefore physiologically involved in the antagonistic processes of nature. Incessantly vigilant, Leonardo's «mobile eye» is kept in constant and swift motion by these continuous adjustments to different light intensities<sup>59</sup>. Natural contrasts can sometimes exceed the organ's capacities: for example, the eye can experience momentary blindness when the pupil does not contract quickly enough<sup>60</sup>. Blindness, whether caused

<sup>56</sup> «l'una delle <ma>ni faccia scudo ai paurosi occhi, voltando il dentro in verso il nimico», ivi, fol. 110v.

<sup>57</sup> Leonardo, *Manuscript D*, fol. 5v. See also *Manuscript F*, fols. 35v, 39v. Cf. D.S. Strong, *Leonardo on the Eye. An English Translation and Critical Commentary of MS. D in the Bibliothèque Nationale, Paris, with Studies on Leonardo's Methodology and Theories on Optics*, London 1979, especially pp. 115-116, 343-345. Leonardo's study of pupil dilation is regarded as an original contribution to optical studies, cf. D.C. Lindberg, *Theories of Vision from Al-Kindi to Kepler*, Chicago 1976, p. 163.

<sup>58</sup> Cf. also Leonardo, *Codex Madrid II*, fol. 26v: «Quando il predetto obbietto sarà forte luminoso, la popilla, non la potendo soportare, si fa ttanto minore, che la similitudine di tale luminoso obbietto viene alla popilla non manco diminuita di ssple[n]dore che di magnitudine».

<sup>59</sup> Strong, 1979 (as in n. 57), p. 376.

<sup>60</sup> «[...] questa nostra popilla cresce e diminuisce secondo la chiarità o scurità del suo obietto, e perché con qualche tempo fa esso [occhio] crescere e discredere, esso non vede così presto uscendo <d>al lume andando all'oscuro, e similmente dallo scuro al luminoso», in: Leonardo da Vinci, *I Codici Forster del Victoria and Albert Museum di Londra*, ed. by A. Marinoni, Firenze 1992, 3 Vols., Vol. II, fol. 158v. Cf. also Leonardo, *Manuscript C*, fol. 16r: «L'occhio uso nelle tenebre che subito veda la luce, riceve detrimento, onde subito si richiude non potendo essa luce sopportare».

by overwhelming brightness or by the pupil's delayed adjustment to darkness, is a sign that the eye's natural defense mechanism can fail, leaving it temporarily defenseless and exposed to the impetus of light. When this happens, images can be retained on the eye even after actual exposure has ceased: «[...] l'occhio riserva per alquanto spazio la similitudine della cosa che splende»<sup>61</sup>. In this encounter with brightness, eyes react differently depending on their strength: the phenomenon of afterimages, for instance, affects only weak eyes («accade negli occhi più deboli che nelli potenti»)<sup>62</sup>.

Elsewhere, when investigating the best conditions for the perception of apparent color, Leonardo establishes how the light-sensitive mechanism of the eye seeks the maximum amount of brightness up to its pain threshold in performing its function. In *Manuscript E* and *Codex Madrid II*, addressing the conflict between the beauty of fully illuminated color and the pupil's limited ability to endure such brightness, Leonardo ultimately associates sight with pain<sup>63</sup>.

As mentioned above, the mechanical notion of impetus and its gradual extinction had already been linked to the process of optical perception by Scholastic thinkers. The connection is embraced and emphasized by Leonardo, who observes how «every impression desires its own permanence, as is shown by the simulacrum of the sun impressed in the eye, or the simulacrum of a moving object impressed in the moved one»<sup>64</sup>. The «impression» that the visible world leaves on the eye is just another instance of *vis impressa*: not only does it set the pupil in motion, but also, as an entity desiring its own permanence, it lingers in the pupil as an afterimage, just like the resonance of a bell in the ear or the propagation of waves in water.

<sup>61</sup> Leonardo, *Manuscript K*, fol. 12or «[...] l'occhio riserva per alquanto spazio la similitudine della cosa che splende, e perché tale impessione dello sp<l>endor della stella è più premanente nella pupilla che non fu il tempo del suo moto, che tale impessione dura insieme col moto in tutti i siti che passan a riscontro della stella».

<sup>62</sup> Leonardo, *Manuscript D*, fol. 5v.

<sup>63</sup> Cf. C. Farago, «Leonardo's Color and Chiaroscuro Reconsidered: The Visual Force of Painted Images», in: *The Art Bulletin*, LXXIII, 1, Mar. 1991, pp. 63-88, especially 75-77.

<sup>64</sup> Leonardo, *Manuscript G*, fol. 73r «Ogni impressione attende alla premanenzia, ovvero desidera premanenzia. Provasi nella impressione fatta dal sole nell'occhio d'esso risguardatore e nella impressione del sono fatto dal martello di tal campana percussore. Ogni impressione desidera premanenzia, come ci mostra il simulacro del sole impresso nell'occhio e 'l simulacro del motore impresso nel mobile, ecc.». Cf. also *Codex Leicester*, fol. 29v.

The force and intensity of images capable of impressing themselves upon the eye can be expressed in both physical and metaphorical terms. As intense brightness moves the beholder's pupils, so is his mind moved – whether inflamed, aroused, or frightened – by the picture's brilliance of style and invention. A sense of physiological continuity therefore links the impetus of battle with the process of vision itself: the encounter on the battlefield mirrors that in the visual field, in which the eyes of the beholder are exposed to the assault of light and darkness and to the picture's rhetorical force.

The relationship between the work of art and its spectator was modeled by Leonardo as a violent encounter, an overwhelming of the audience. Frank Fehrenbach in particular has argued how in Leonardo's oeuvre, the force of the representation is pushed as far as possible in order to make the viewer feel the desire to escape the image<sup>65</sup>. In Vasari's *Life of Leonardo*, the artist's inventions generate tales of erotic attraction towards images but more often result in episodes of violence and terror. From the late «Vatican lizard» back to Leonardo's first painting, a hybrid «animalaccio», these creations aim at terrifying their viewers. This terror is a validation of the work's effectiveness. In Vasari's narrative, when Leonardo's own father turns away in fear at the sight of the «animalaccio», the artist complacently remarks that the image served the end for which it was executed<sup>66</sup>.

Although the term *impetus* does not appear in this context, the structural connection between the mechanical model of *vis impressa* and human aesthetic response can hardly be overlooked. As a transfusion of physical force impresses itself in a body, moves it, and lingers in it, so the force of powerful visual *species* sets the eye in motion and persists in it as an afterimage. So too, the activated artwork discharges its visual energies on its beholders. It moves their minds and imprints itself on the first ventricle of the brain, the *impres-siva*. From there, it travels through the second ventricle, the *senso comune*; if forceful enough, it is ultimately stored in the third and last vessel, *memoria*<sup>67</sup>.

<sup>65</sup> Fehrenbach, 1997 (as in n. 7), pp. 239-244; cf. also H. Gründler, «Orrore, Terrore, Timore. Vasari und das Erhabene», in: *Translations of the Sublime. The Early Modern Reception and Dissemination of Longinus' «Peri Hupsous» in Rhetoric, the Visual Arts, Architecture and the Theatre*, ed. by C. van Eck, Leiden/Boston 2012, pp. 83-116.

<sup>66</sup> Cf. Giorgio Vasari, *Das Leben des Leonardo da Vinci*, trans. by V. Lorini, ed. by S. Feser, Berlin 2006, pp. 23-24.

<sup>67</sup> On the cycle of images cf. F. Fehrenbach's contribution to this volume.

This process is especially crucial when dealing with battle representation. From classical rhetoric to Cinquecento artistic theory, battle scenes were said to require a «terrible» style, a powerful «gran maniera» able to move and engage the spectator by virtue of force. As David Summers has observed, in the Florentine Great Council Hall, Michelangelo and Leonardo, given the task of composing epic subjects, «understood that these themes were to be treated brilliantly, with a high degree of evident difficulty, and therefore display of skills, and with a high degree of invention and fantasy, and therefore of *ingegno*»<sup>68</sup>. Commemorative implications were also key to the treatment of such scenes: battle paintings were required to aid memory, consigning wars to lasting fame<sup>69</sup>.

In yet another instance of *vis impressa*, the force of battle scenes is transmitted to the viewer as to a passive receiver. The impetus represented must, in other words, have an impetus on the beholder: form and content are inextricably interwoven, and their structural kinship is a prerequisite for the adequate representation of antagonistic scenes. As the impetus of the charging army that it represents, the image moves the beholder and in him – from his *impressiva*, to the *senso comune* and the *memoria* – it lingers and persists.

Scholarly discourse on «pazzia bestialissima» would benefit from a re-contextualization within this rhetorical framework. Described as a vivid manifestation of Leonardo's moral condemnation of war, the expression is rarely analyzed or quoted with reference to the paragraph in which it appears. The term is found at the very end of a passage from the *Book on Painting* titled «On Composing Narrative Paintings», where it serves as a powerful closing formula. The text, composed around 1505-1510, deals with the use and abuse of extreme foreshortenings and bent postures – «storciamenti e piegamenti» – in the representation of the *historia*<sup>70</sup>.

<sup>68</sup> Cf. Summers, 2007 (as in n. 32), p. 171.

<sup>69</sup> R. Starn & L. Partridge, «Representing War in the Renaissance: The Shield of Paolo Uccello», in: *Representations*, V, 1984, pp. 32-65.

<sup>70</sup> «Del comporre le istorie. Ricordati, fintore, quando fai una sola figura, di fuggire gli scorti di quella, sì delle parti come del tutto, perché tu aresti da combattere con la ignoranza delli indotti di tale arte; ma nelle istorie fanne in tutti li modi che ti accade, e massime nelle battaglie, dove per necessità accade infiniti storciamenti e piegamenti delli componitori di tale discordia, o vo' dire pazzia bestialissima», in: Leonardo, *Libro di pittura*, 1995, chapter 177, p. 218.

Within this context, and against the background of Leonardo's polemic with Alberti, who had warned artists to avoid the excessive display of *ornatus*, the expression acquires a new meaning. «Pazzia bestialissima» primarily identifies a subject matter that demands a suitable rhetorical register and is therefore employed in this passage to justify the recourse to powerful artistic means. Battles' exceptional brutality and intensity, in other words, require an equally exceptional treatment: it is only in battle scenes that exaggerated movements become accountable as actions, rather than as examples of artifice and license<sup>71</sup>. Alberti had famously insisted upon a Ciceronian middle style in the representation of the *historia*, condemning conspicuously artful inventions, which express nothing more than the overheated and furious *ingegno* of the artist<sup>72</sup>. In a related passage, again opposing Alberti's ideal of moderation, Leonardo returns to this point and explicitly prescribes the use of contorted postures in battle scenes, for these were the only instances where extreme artfulness could fall within the confines of decorum<sup>73</sup>.

As a conventional yet evocative indication of war's uncontrolled violence, Leonardo's «pazzia bestialissima» might well be a memory of Dante's «matta bestialitate» (*Inferno* XI, vv. 82-83)<sup>74</sup>. In Dante, the expression alludes to one of a triad of morally wrong dispositions derived from Aristotle's *Nichomachean Ethics*<sup>75</sup>. While the exact meaning of the term within the structure of Dante's lower hell is still debated, Cristoforo Landino's reading is a safe point of departure where Leonardo is concerned. His commentary, of which Leonardo was

<sup>71</sup> On extreme postures as a manifestation of license cf. M. Cole, «The *Figura Sforzata*: Modelling, Power and the Mannerist Body», in: *Art History*, xxiv, 2001, pp. 520-551.

<sup>72</sup> «[...] mostrano l'ingegno dell'artifice troppo fervente e furioso», in: L.B. Alberti, *Della pittura*, ed. by L. Mallè, Firenze 1950, pp. 97. On the importance of mean and moderation in Alberti cf. J. Bialostocki, «The Power of Beauty. A Utopian Idea of Leon Battista Alberti», in: *Studien zur toskanischen Kunst. Festschrift für L.H. Heydenreich zum 23. März 1963*, ed. by W. Lotz & L. Möller, München 1964, pp. 13-19.

<sup>73</sup> «Ma li moti composti sono nelle battaglie di grand'artificio e di grande vivacità e movimento», in: Leonardo, *Libro di pittura*, 1995, chapter 280, p. 258.

<sup>74</sup> «Non ti rimembra di quelle parole/ con le quali la tua Etica pertratta/ le tre dispositione che 'l ciel non vole,/ incontinenza, malizia e la matta/ bestialitate? e come incontinenza/ men Dio offende e men biasimo accatta?», in: Dante, *Inferno*, ed. by A.M. Chiavacci Leonardi, Milano 1991, pp. 287-288.

<sup>75</sup> Cf. Aristotle, *Ethics* 7.1.1145.

certainly aware, identifies «matta bestialitate» as a perversion of both reason and appetite, and therefore as the worst of the three Aristotelian dispositions. Devoting a long passage to defining how «mad bestiality» falls outside the confines of the human, Landino, following Aristotle, opposes it to heroic virtue, which he illustrates by quoting examples of ancient warriors<sup>76</sup>.

Scholars have demonstrated that Leonardo's notebooks are studded with echoes of the *Commedia* and the *Convivio*. Hinting at an intimate familiarity with these texts, this literary evidence consists of a series of close paraphrases of Dante's words, as in the example addressed here. Even more crucially, Carlo Vecce recently identified the presence of several images of the *Inferno* in Leonardo's battle description from *Manuscript A*; motifs taken from Dante's hellscape, including men's beastly nature, permeate the entire passage<sup>77</sup>.

«Pazzia bestialissima» identifies, first and foremost, a rhetorical register, one suited to the representation of uncontrolled violence and destruction. Seen in this context, Leonardo's recurrent suggestion that the painter and poet should be judged by their depictions of battles comes as little surprise, for only in these scenes can the force of *pictura* and the *ingegno* of the artist fully express itself<sup>78</sup>. The idea is not new: antique sources already stated that «no small part of the artistic faculty was shown in the painter's choosing at the outset a subject of some amplitude, instead of whittling down his art into small things, little birds (for example) or flowers». The suitable subjects for painters are instead battles and cavalry engagements, «which give many opportunities of representing horses charging or rearing high or crouching low, and their riders hurling javelins or being thrown»<sup>79</sup>.

<sup>76</sup> Cristoforo Landino, *Comento sopra la Comedia*, ed. by P. Procaccioli, Roma/Salerno 2001, 4 Vols., Vol. II, pp. 608-611. On the debate on the meaning of the expression in Dante cf. A.A. Triolo, A. Oldcorn & C. Ross, Berkeley/Los Angeles/London 1998, pp. 150-164; S. Vazzana, «Dov'è la "matta bestialitate" (Ancora sulla struttura aristotelica dell'*Inferno*)», in: *L'Alighieri*, IX, 1997, pp. 95-108, both with previous bibliography.

<sup>77</sup> C. Vecce, 2012 (as in n. 52), passim. On Dante as a source for Leonardo cf. id., «La parola del corpo. I testi anatomici di Leonardo», in: *Leonardo da Vinci's Anatomical World: Language, Context and «Disegno»*, ed. by A. Nova & D. Laurenza, Venice 2011, pp. 22-26 (with previous bibliography).

<sup>78</sup> Cf. n. 49 above.

<sup>79</sup> Demetrius, *On Style*, II, 74-76, trans. by W.R. Roberts, in: *The Loeb Classical Library*, ed. by E.H. Warmington, Cambridge/London 1973, p. 351; the same idea permeates discussions on the epic genre and appears in Hermogenes's *On Types of Style* and Quintilian's *De institutio oratoria*; for a Renaissance formulation cf. Gauricus's *De sculptura* (1504).

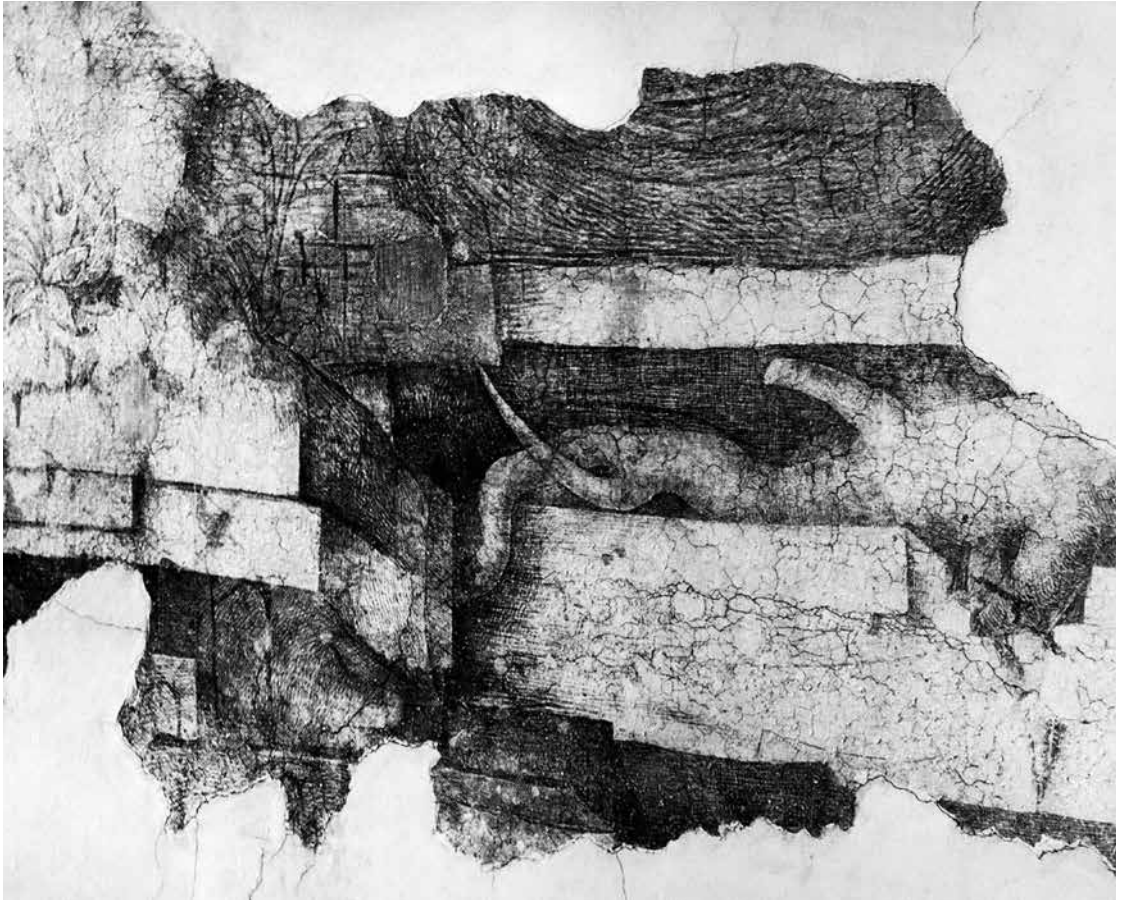
Battle painting allows the artist to animate the artifact with the force of his *impetus ingenii*, a force of skill and invention that, pace Alberti, is required by the narrative and corresponds to that inhabiting the bodies engaged in the fight. In a scene of uttermost destruction, the representation of violent motion testifies to the animating power of painting. Fighting figures are enlivened by the most extreme «vivacità accidentale»; only on the verge of death do bodies come fully to life.



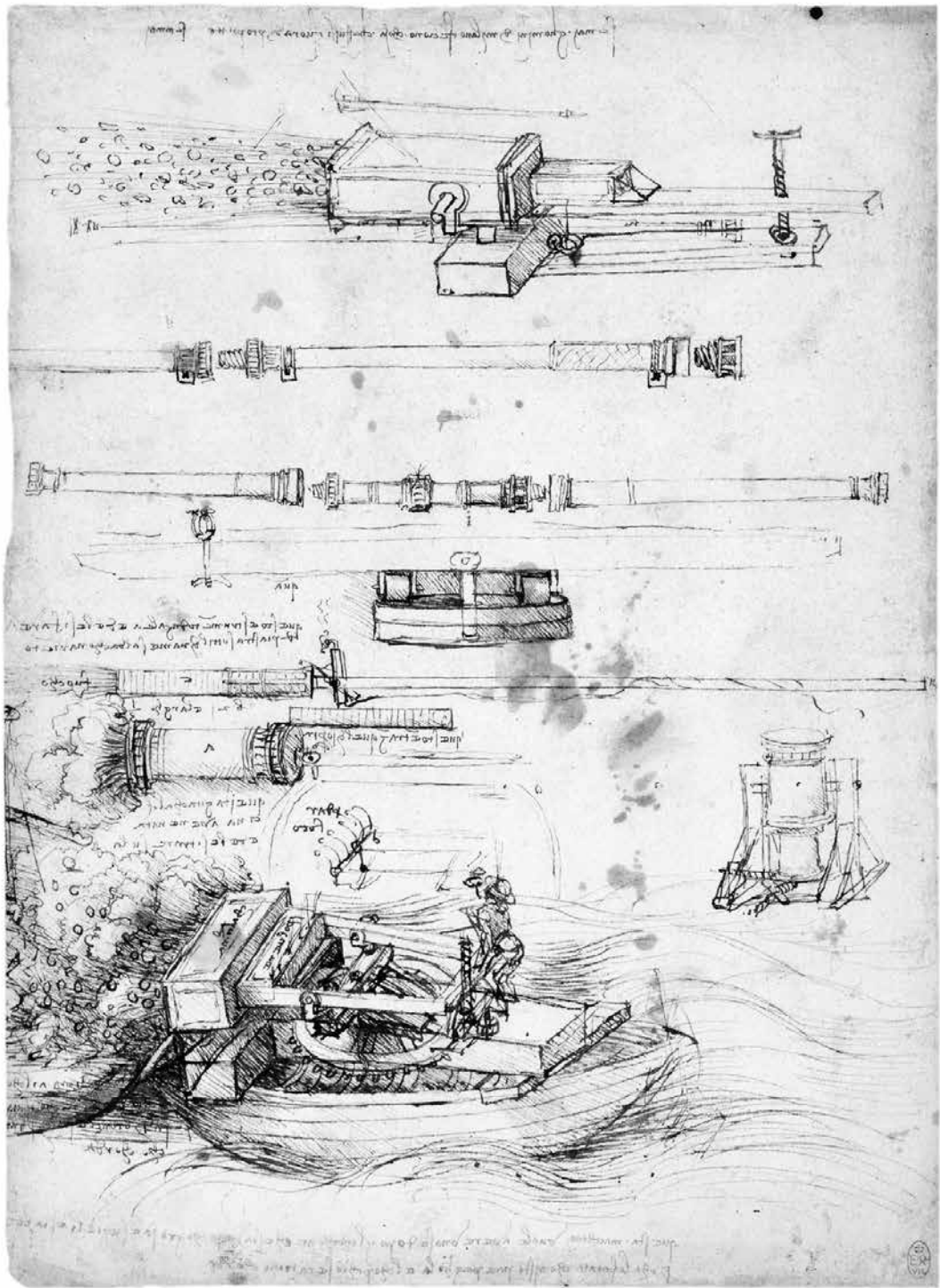
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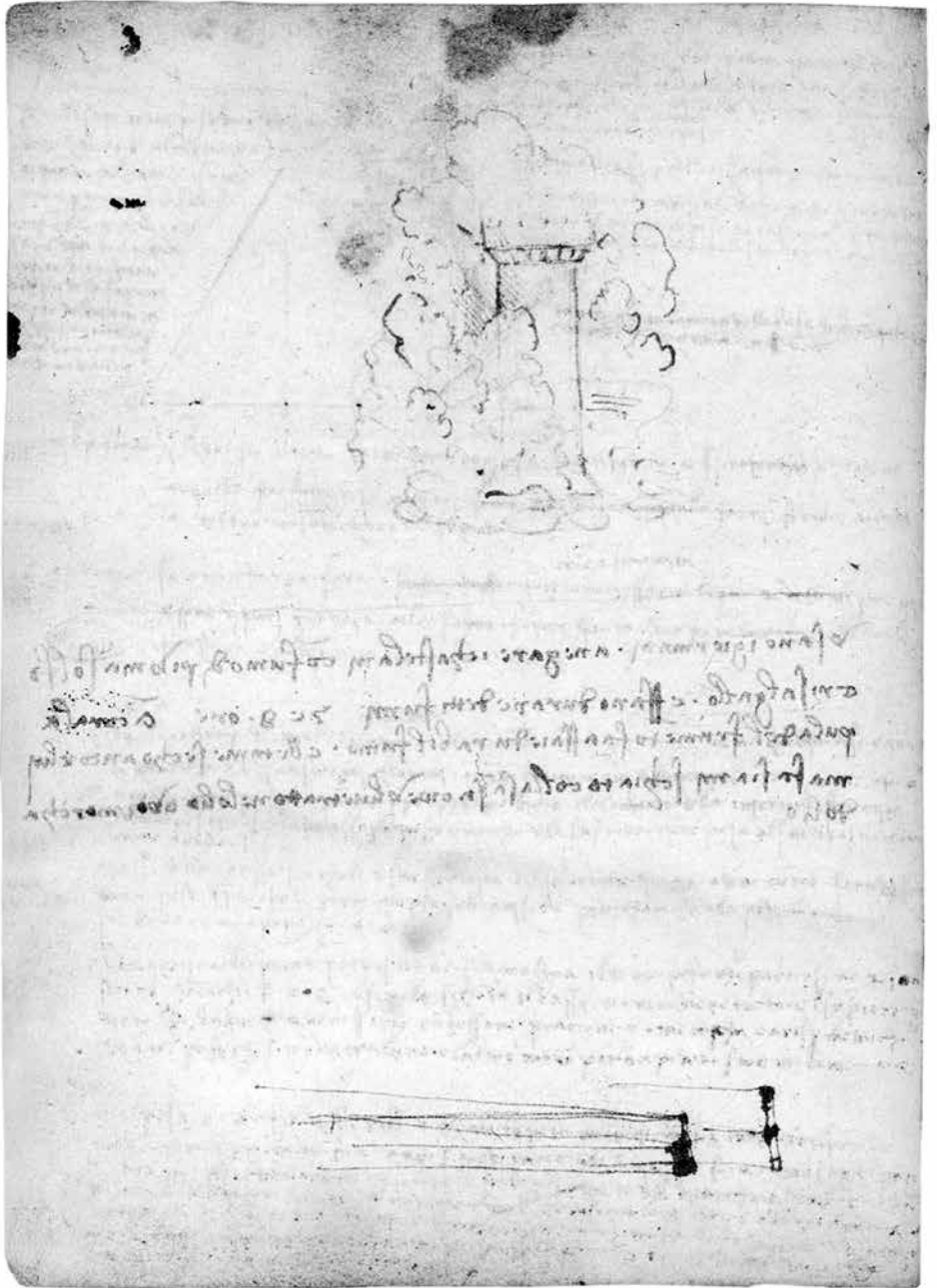
1. Lorenzo Zacchia after  
Leonardo da Vinci's *Fight for the  
Standard*, 1558, Wien, Albertina,  
Graphische Sammlung,  
inv. 40.312C





2. Leonardo da Vinci, *Roots and Rocky Stratifications*, c. 1498, Milano, Castello Sforzesco, north wall of the Sala delle Asse, detail





3. Leonardo da Vinci, *Studies of Gun-Barrels and Mortars*, c. 1485-1490, Windsor, RL 12652r

4. Leonardo da Vinci, *Tower Surrounded by Smoke*, 1487-1490, *Manuscript B*, Paris, Institut de France, fol. 63v



5. Leonardo da Vinci, *View of a Battlefield*, c. 1511-1515, Windsor, RL I2332r

6. Leonardo da Vinci, *Eye Diagram*, *Manuscript D*, Paris, Institut de France, fol. 4r, detail

