

# Dante's Visions

Crossing Sights on Natural Philosophy, Theory of Vision, and Medicine in the Divine Comedy and Beyond

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**Visual Perception in Dante's *Commedia*  
According to the Early Commentaries  
(1320–1400)**

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# 7 Visual Perception in Dante's *Commedia* According to the Early Commentaries (1320–1400)

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As Patrick Boyde stated in the preface of Simon Gilson's monograph *Medieval Optics and Theories of Light in the Works of Dante*, "the words 'vedere' and 'luce' (and their cognates) are among the most frequent and distinctive items" in the poet's imagery and writings.<sup>2</sup> Furthermore, in Dante's time notions and theories about the functioning of sight and the behaviour of light rays were not only of interest to physicists and anatomists, but occupied a prominent place in the broader culture: they were also discussed by theologians, philosophers, and artists.<sup>3</sup> It is, therefore, unsurprising that much has been written about Dante's knowledge of and ideas on optics (understood as the science of light and vision), about his sources and reference models, and about the wonderful images and metaphors found in the *Commedia*.<sup>4</sup> On the other hand, with the exception of a recent contribution by Gilson, there are, to my knowledge, no systematic insights into the way optical contents are approached and employed by Dante's early commentators.<sup>5</sup> While rather neglected, this is not an irrelevant point. Indeed, it tells us something about the domain of expertise of medieval readers and about the reception and interpretation of certain images and theories in years close to the composition of the poem.<sup>6</sup> The present contribution addresses this research question, already sketched out in a previous article that, however, focused on the presence and use of analogies and concepts related to optics in preaching, particularly in Tuscany around the year 1300.<sup>7</sup> My aim is to conduct a preliminary survey and lay the foundations for subsequent in-depth investigations.

## 1 The *Perspectiva* in the Early Commentaries

Since the range of topics is vast, it is essential to circumscribe the field of inquiry. First, I chose to define a time frame and thus to consider those commentaries that date from the period between Dante's death and the beginning of the following century (1400).<sup>8</sup> The definition of the *terminus ante quem* is certainly arbitrary, but for the moment I have deemed it preferable to stop at the threshold of the century in which pictorial perspective was 'invented' and a significant paradigm shift took place. I then checked whether any author within this chronological time span explicitly mentions the science of

light and vision (*perspectiva*) and in what terms. Research carried out on the commentaries included in the DDP database and subsequent spot checks on the recent national editions, published by Salerno, and on texts not included in the database (e.g. Andrea Lancia's commentary) have revealed that at least six of Dante's first readers – namely Iacomo della Lana, the author of the *Ottimo Commento*, the so-called Amico dell'Ottimo, Benvenuto da Imola, Francesco da Buti, and the commentator known as the Anonimo Fiorentino – refer to *perspectiva*.<sup>9</sup> Table 7.1 provides an overview of the occurrences of the term in the above commentaries.<sup>10</sup>

Of course, the references we find in a commentary may derive from an earlier text, e.g. the *Ottimo* and the Anonimo Fiorentino often depend on Lana. Nevertheless, further scrutiny of key words and particularly significant passages (e.g. some similes dealing with light and vision) suggests that all these commentators had a non-superficial interest in optics and related topics. In the selected excerpts, the terms “perspettiva”/“prospettiva” may designate the science itself or a specific treatise, in which case the term is capitalised in modern editions – incidentally, the most popular optics handbook in the 14<sup>th</sup> century was Peckham's *Perspectiva communis*. It should also be borne in mind that this science is applied in different contexts and to a variety of subjects. In medieval culture, as already remarked, it was a multi-faceted field of knowledge, at the crossroads between various disciplines, including geometry, physics, medicine, and astronomy. In the *Convivio* (II, xiii, 25) Dante says that geometry has optics as its handmaiden (“la sua ancella, che si chiama Perspectiva”), and Benvenuto da Imola specifies that it concerns both geometry and philosophy.<sup>11</sup>

Similarly and consequently, in Dante's verses and related commentaries optical science is called into question with regard to multiple issues: the (mal-)functioning of sight (*Inf.* X), the properties of mirrors (*Inf.* XXIII and *Purg.* XXV), and the optical effects and illusions whereby something appears to be bigger or smaller than it actually is or is mistaken for something else (*Inf.* XXXI: towers/giants; *Purg.* XXVII: the dimension of stars; *Purg.* XXIX: trees/candelabra). In *Purg.* XV, 21, the poet himself mentions the “arte” (i.e. the discipline), when in a rather technical manner he dwells on the movements of light rays and the equality of the angles of incidence and reflection. Furthermore, in *Purg.* XXXIII and *Par.* II optical knowledge is evoked with respect to astronomical matters. At the end of the second *cantica* and with regard to how the sun appears to move more slowly when it is close to the zenith, Iacomo della Lana (as well as the Anonimo Fiorentino) mentions a *Perspetiva*, along with the *Canons to the Toledan Tables*.<sup>12</sup> Finally, the second canto of *Paradiso*, where the author lingers on moon spots and describes the three-mirror experiment, is very rich in optical content, as is also evidenced by the splendid miniature by Giovanni di Paolo (ca. 1450) in ms London, British Library, Yates Thompson 36, fol. 132.

Given the main purpose of this volume, I will focus on those passages where image transmission and visual perception are discussed and leave for

Table 7.1 Occurrences of the term *perspectiva* (in Latin and the vernacular) in Dante Early Commentators

<i>Iacomo della Lana</i> (1323–1328)	<i>Ottimo Commento</i> (c1330–1334)	<i>Amico dell’Ottimo</i> (c1341–1343)	<i>Benvenuto da Imola</i> (c1379–1383)	<i>Francesco da Buti</i> (c1390–1396)	<i>Anonimo Fiorentino</i> (14th ex.–15th in.)
<i>Inf. X</i> , 100–105: Prospettiva / Perspectiva	<i>Inf. X</i> , 100–105: Prospettiva	<i>Inf. X</i> , 100–105: Perspectiva	<i>Inf. X</i> , 100–105: perspectiva	<i>Inf. X</i> , 61–62: Prospettiva	
<i>Inf. XXIII</i> , 25–33: Perspettiva / Perspectiva			<i>Inf. XXIII</i> , 25–27: Perspectiva		<i>Inf. XXIII</i> , 25–27: Arte prospettiva
				<i>Inf. XXXI</i> , 19–27: Prospettiva	
<i>Purg. XV</i> , 1–6 and 16–23: Prospettiva / prospettiva			<i>Purg. XV</i> , 21–24: Prospettiva	<i>Purg. XV</i> , 16–33: Perspettiva	<i>Purg. XV</i> , 1–6: Prospettiva
				<i>Purg. XXV</i> , 16–30: Perspettiva	
<i>Purg. XXVII</i> , 89–90: Perspettiva / prospettiva					<i>Purg. XXVII</i> , 89–90: Prospettiva
<i>Purg. XXIX</i> , 46–50: Prospettiva / prospettiva					<i>Purg. XXIX</i> , 46–48: Prospettiva
<i>Purg. XXXIII</i> , 103–105: Perspettiva / Perspectiva		<i>Purg. XXXIII</i> , Perspectiva			<i>Purg. XXXIII</i> , 103–105: Prospettiva
				<i>Par. II</i> , 112–126 and 139–148 Prospettiva	

future studies the commentators' arguments about light propagation, the luminosity of celestial bodies, and mirrors. The definition of the object of research will lead me to turn my attention mainly, albeit not exclusively, to verses and episodes set in hell (particularly from *Inf.* IX, X, XV, and XXXI). This is the realm where the eye is not dazzled, but rather tries to grasp something in the darkness. It is a place of mist and gloom ("nebioso e scuro"), unlike paradise, which is all light ("per contrario dovei è tutta la luxe, ch'è 'l paradiso"), as Iacomo della Lana points out.<sup>13</sup> As will be seen, various cues already included in the poem and others inserted quite independently in the commentaries will lead Dante's readers to deal with the anatomy of the eye and the physiological causes that alter visual perception, with the theories of vision (extramission *vs* intromission), and with geometric optics and the spatial conditions required for the correct reception of images (clear air, an adequate distance).

## 2 The Faulty of Eyesight and Its Causes

The first passage which practically compels commentators to engage with the science of vision is in *Inferno* X<sup>14</sup>:

'Noi veggiam, come quei c'ha mala luce,  
le cose', disse, 'che ne son lontano;  
cotanto ancor ne splende il sommo duce.

Quando s'appressano o son, tutto è vano  
nostro intelletto; e s'altri non ci apporta,  
nulla sapem di vostro stato umano'.

(*Inf.* X, 100–105)

[‘We see, like those with faulty vision, / things at a distance’, he replied. ‘That much, / for us, the mighty Ruler’s light still shines. / When things draw near or happen now, / our minds are useless. Without the words of others / we can know nothing of your human state’].

Shortly before (vv. 67–72), Dante, puzzled by the question about Cavalcante's son (i.e. whether Guido was still alive or not), had hesitated to answer it. Cavalcante, distraught, had fallen down supine and then disappeared. Dante now voices his doubt as to what the damned see – that is, what they know. He guesses they have some awareness of the future but wonders what they glimpse of the present and asks Farinata to shed some light on this conundrum: “pray untie for me this knot” (*Inf.* X, 95: “solvetemi quel nodo”). Farinata replies by formulating the famous comparison with those who have “mala luce”. He points out that the damned are precluded from learning about events close in time, unless they receive news from others and conclude that they will no longer know anything with the arrival of the last day: “all

our knowledge / will perish at the very moment / the portals of the future close" (vv. 106–108: "tutta morta fia nostra conoscenza da quel punto che del futuro fia chiusa la porta").

The parallel with those who have poor eyesight is variously explained by ancient and contemporary commentators. Among the latter, most (e.g. Anna Maria Chiavacci Leonardi) explain that the damned are similar to presbyopes, in the sense that they see well from afar and poorly up close.<sup>15</sup> Some, however, e.g. Singleton, propose a slightly different interpretation and claim that the meaning of Farinata's words is that the inhabitants of hell see "dimly" at a distance (and nothing of things near them): "their light, which is said to come from God, is 'poor' only in the sense of being insufficient".<sup>16</sup> Early commentators are essentially divided between two explanations for Farinata and his companions' defective eyesight, one referring to the principles of geometrical optics and the other focusing on physiological causes. Iacomo della Lana is a spokesman for the former view. He makes it clear, also by referring to the commentaries on Aristotle's *Physics*, that Farinata uses the example of the sense of sight to speak of intellectual knowledge. He then quotes Aristotle's *Metaphysics* ("sensibile super sensum conrumpit sensum") and considers the question in spatial terms, emphasising that there must be an adequate distance ("proportionevele distancia") between the eye and the object in order for the latter to be seen. To prove his point, he mentions a second *auctoritas*, Euclid's *Optics* ("come ne dimostra Euclide in la *Prospectiva*") and explains that the visual process takes place according to a triangular pattern ("ell'è neccesse che ongni cosa che sende se veça per triangollo"); it can be conceived of (and represented) as a cone or a triangle with the eye as its apex. Unlike the future, which is yet to come, the present time for the damned is like an object placed directly on the eye ("è come fusse in su l'ochio"), so close that the visual triangle cannot be formed ("quando la cosa è sovra lo ochio, ella non pò costituire triangolo"); hence, knowledge is precluded to them ("non se vede").<sup>17</sup> The *Ottimo* and thus also the Amico dell'Ottimo take up Lana's exposition almost literally, although the Latin quotations from Aristotelian works are in the vernacular here. This is the only passage in these two commentaries in which the term *Prospectiva/Prospectiva* is explicitly used.<sup>18</sup>

Many readers, on the other hand, overlook the geometric-spatial aspects of visual perception and dwell instead on the gradual loss of the faculties of the human eye with age. Pietro Alighieri compares the damned to ageing men ("senescentes homines"), whose visual power ("visus, idest virtus visiva") thickens and weakens ("ingrosatur et incipit debilitari"), becoming less effective.<sup>19</sup> Roughly the same remark can be found in the *Chiose cagliaritane*: "those with bad eyesight are obviously old people, who see better from a distance than up close".<sup>20</sup> Immediately afterwards the anonymous commentator – like Dante in *Conv.* III, ix, 14 – describes the gesture of an old man who cannot see what is near him and moves the object away from himself in order to see it better ("quando l'omo vecchio vole vedere una

cosa sì la se delunga dal viso et allora la vede et apresandolase nol la vede”). Boccaccio also offers a physiological explanation. He speaks of a defect due to ageing (“questo vizio avvenire agli uomini quando vengono invecchiando”), when bodily fluids coming from the brain (“omori li quali vengono dal cerebro”) block the visual power and prevent one from seeing things nearby (“l’occupano intorno alla vista delle cose propinque”). Only when the *virtus visiva* extends farther (“la virtù visiva si stende più avanti”), the dimness (“adombration dell’omore”) is lessened and the quality of perception improves (“men mal vede e con più sincerità”).<sup>21</sup>

A similar reference to the visual rays gradually brightening as the distance from the eye increases occurs in Benvenuto’s commentary. The master from Imola clarifies that the damned see the future as those with weak sight see things (“damnati vident futura eo modo, quo ille qui habet debilem visum videt rem aliquam”). Then, explicitly referring to the teachings of optical science (“cuius ratio assignatur in perspectiva”), he says that eyesight can be defective in two ways, as there are those who see well from afar but poorly at close range and those who are in the opposite condition (“aliqui vident rem melius de longinquo, alii de propinquo”). The latter have limpid but limited vision (“habent visum clarum, sed non multum”), while the visual rays of the former become clear only after travelling a long way (“radii visuales egrediendo serenantur”).<sup>22</sup> The damned belong to the former category (“autor hic loquitur de illis qui vident rem a longe, sed non de prope”), and can therefore know the future but not the present.<sup>23</sup>

Both the master of Imola and Boccaccio would later return to the subject of weakened and blurred vision in relation to *Inf.* XV, 20–21, when commenting on those souls who “peered with knitted brows” (“aguzzavan le ciglia”) at Dante and Virgil like an elderly tailor threading a needle. Boccaccio explains that when eyesight does not work properly (“difetto degli spiriti visivi”), for example owing to a certain “thickness” (“grosseza”), the act of peering with knitted brows (“aguzar le ciglia”) condenses visual power into a narrower space (“ristrignamo in minor luogo”), thereby making it sharper and more effective (“più acuta e più forte al suo ufficio”). An identical explanation of the tailor’s gesture is given by the Amico dell’Ottimo (“strigne<ndo> le ciglia, per la vista degl’occhi più ragunati insieme, più adoperi”).<sup>24</sup> Benvenuto expounds the same concepts and recalls that the issue in question is addressed in the (pseudo)Aristotelian *Problemata* (“Aristotiles libro Problematum quaerit rationem huius”), taking the example of archers ‘squinting’ (“balistarii hoc faciunt”) to direct arrows at their target.<sup>25</sup>

Finally, if we return to Farinata’s words in *Inf.* X, we can observe that the Anonimo Fiorentino, who often refers to Lana, opts instead for some anatomical-physiological clarifications in this passage. A few details are added to what had already been written by his predecessors. The commentator notes that there are two natural reasons (“per difetto naturale”) as to why eyesight may prove faulty, especially as humans age (“attempati”). The visual spirit may be too thick (“ingrossato”) or, on the contrary, too thin

("troppo assottigliato"). In the latter case, it is too weak ("debole et fragile") to reach objects in the distance, whereas it allows the perception of near things. Conversely, in the former case, it benefits from moving away from the eye. Indeed, as the *virtus visiva* stretches ("dilungandosi"), it becomes sharper, thinner, and more united ("s'appunta et assottigliasi et è più unita"); in addition, the amount of air, and thus of light, between the sensory organ and the object increases ("v'ha più aere et per seguente più lume"). As a consequence, the Anonimo concludes, some people tend to hold reading material farther away to make the letters clearer.<sup>26</sup>

### 3 Echoes of the Debate about the Visual Process (Intromission or Extramission?)

Unlike the other commentators we have considered, Francesco da Buti quickly moves beyond the comparison developed by Farinata, and instead finds a cue to delve into optical matters in the dialogue between Dante and Cavalcante (*Inf.* X, 52–72).<sup>27</sup> Indeed, Guido's father is troubled by the past tense of the verb 'to have' used by Dante: "What? / Did you say 'he held'?" (vv. 67–68: "Come? / Dicasti 'elli ebbe?"). He wonders whether his son is still alive: "Lives he not still?" ("Non viv'elli ancora?"). The question is rephrased a second time in v. 69: "Does not the sweet light strike upon his eyes?" ("non fiere li occhi suoi lo dolce lume?"). Alongside this first version (and interpretation) of the text, the commentator presents an alternative reading, based on the *varia lectio*: "Altro testo dice: *Non fieron li occhi etc*".<sup>28</sup> The eyes thus become the subject, and the plural verb ("fieron") would indicate an action of the visual organ ("li occhi veggono mettendo fuori li raggi visuali"). In this case – and the author seems to have a specific treatise in mind ("come dice nella Prospettiva") – the visual rays, actively emitted by the eye, reach the object and are then reflected through the mediation of light ("percossi nella cosa veduta, si riflettono alli occhi mediante la luce"), bringing the image back to the visual organ ("rapportano all'occhio").<sup>29</sup>

New thoughts on this point are offered by Francesco when commenting on *Purg.* XXIX.<sup>30</sup> The reason why candelabra appear to be golden trees is distance ("distanzia"), for if the space between the object and the eye exceeds the visual organ's ability to perceive ("per lunghezza del mezzo che eccede tanto la virtù visiva"), the sense is deceived ("l'vedere s'inganna"). Going into more detail, the commentator explains that the rays emitted by the eye shrink back before they have reached the object ("ch'e' raggi visuali si ristringeno innanti che vegnino a l'obietto"). This clarification implies a further elucidation of the mechanism of visual perception. Francesco states that the visual rays, which are responsible for conveying images to the organ of perception ("avendo virtù di rappresentare all'occhio la cosa veduta"), are emitted by the eye ("l'occhio mette fuori raggi") and stretch out ("si dilatano") to grasp the object in its entirety, albeit within the limits of the subject's sensory powers ("tanto che vegnano al mezzo corrispondente a la virtù



visuale”). In this way, the eye, which is itself small (“picculino”), can see an object of considerable size, such as a tower, from top to bottom (“apprende dil sommo a la fine”). However, if the distance exceeds the capacity of vision, the visual cone, which has the eye as its apex, shrinks back (“incominciano a chiudere”, “ritorna in acuto”) before perception is complete and things grow smaller (“le cose che si veggiono incominciano ad apparire minori più l’una che l’altra”) until they disappear (“e così non vede poi più nulla”). Without any references to geometry and Euclid, the phenomenon is graphically represented as a kind of double triangle or rhombus (“sì come appare in questa figura < >”).<sup>31</sup>

In the continuation of his argument Francesco notes that, once Dante gets closer to the candelabra, the deception vanishes. These verses lead the commentator to consider a different theory of vision. Having reduced the distance, the object to be perceived – “commune” because it initially concerns all the senses (“la cosa da esser appresa per li sentimenti è comune a tutti e cinque li sentimenti”) – does not fail in its operation and can thus be grasped properly.<sup>32</sup> Here it is the object, and not the eye, that plays an active role and imprints its own image (“ombra” and “imagine”), which is then received by the sensory organ (“’l vedere adoperi, ricevendo impressione da l’obietto, e non operi mettendo fuori li suoi raggi”). Francesco reports this opinion without taking any stance on it (“e questo dice secondo l’opinione di coloro che tignano che ’l vedere etc.”).

The master from Pisa is not the only reader of Dante grappling with the different attitudes towards visual perception developed in the Middle Ages, that is ‘intromissionist’ and ‘extramissionist’ theories.<sup>33</sup> While commenting on the term “postille” in *Par.* III, 13–15, that is reflections in a transparent body such as water or glass (“quella imagine nostra, che ci si rapresenta in acqua o in ispecchio, o altro corpo trapassante”), the *Ottimo* points out that there are two models of how vision works. The question of what moves towards what – whether the image from the object (“Della cosa che noi vedemo, cioè la sua forma viene agli occhi nostri”) or rays from the eye (“o li raggi visivi vanno alla cosa veduta”) – remains open, since the author claims to have dealt with it elsewhere (“è trattato altrove”), although I have been unable to identify any other passages in which the topic is further explored.<sup>34</sup> Nevertheless, hints about the theories of vision are made here and there. For example, in the extensive introduction to *Par.* XXXIII, the commentator, repeating Iacomo della Lana’s words almost verbatim, says that the perceiver gets to know the object by the image that reaches the pupil (“quando noi veggiamo una cosa, la spezia visibile di quella cosa ne viene alla pupilla e per quella la conosciamo”).<sup>35</sup> Like the *Ottimo*, the Anonimo Fiorentino also explicitly refers to the contemporary debate about how visual perception works. In commenting on *Inf.* VIII, 3, he observes that there are conflicting opinions among natural scientists (“Egli è gran quistione fra’ fisici”) as to whether sight goes towards the thing or the other way around (“se ’l nostro vedere va alla cosa, o se la cosa veduta viene agli occhi”). Yet,

despite multiple opinions (“et come che molte oppenioni ne sieno”), there seems to be common agreement about the image being transmitted to the eye (“comunemente s’accordono che l’oggetto viene agli occhi”).<sup>36</sup>

#### 4 The Anatomy of the Eye: Speaking of “nerbo” and “gonna”

After mentioning the dispute between intromission and extramission theories, the Anonimo Fiorentino introduces a lengthy anatomical description of the visual system.<sup>37</sup> He says that the eye is a spherical, watery body (“corpo sperico et acquoso”) with membranes or sheaths (“panniculo”) that contain the fluids or humours and prevent them from falling out and dispersing (“questo licore caderebbe et disfarebbesi”). He enumerates various parts of the visual organ, providing summary information for each of them. Three membranes separate the cornea (“cornea”), the crystalline lens (“parte [...] cristallina”), and the vitreous humour (“parte [...] vitrea”). The cornea is the “white outer [part] of the eye” (“bianco di fuori dell’occhio”); it is named after the horn (“corno”), which is a bone (“osso”) and is also used as a writing implement.<sup>38</sup> Besides these parts (“fuori di queste parti”), there is the pupil, also called “Luce”. This is the black part of the eye (“nero dell’occhio”) where images multiply (“ove si moltiplicano le spezie visive”). Below the pupil (“sotto questa Luce”) is the uvea (“Uva”), which is shaped like a grape (“come un acino d’uva”) and has a hole that is adjacent to the pupil (“quello foro viene al lato alla Luce”).<sup>39</sup> The commentator also distinguishes between those nerves responsible for sensation (“dà il sentimento della cosa”) and those responsible for motion (“dà il movimento alla virtù viva”): the former originate from the front of the brain, the latter from the back (“nucrea”). Finally, he deals with the optic nerves, which are part of a single nerve that comes from the brain and then splits into two (“procede dal cerabro uno nerbo [...], si divide in due”). As the right nerve extends to the left eye (“l nerbo destro va all’occhio sinistro”) and the left one to the right, these nerves cross (“incrocicchiasi”) in the shape of an X before branching out and reaching the aperture of the uvea (“vengono infino a quel forato dell’Uva”). The optic chiasm is the site where judgments are made (“giudica”) about the thing seen, for example by assessing whether it is “tall or short” (“se la cosa è alta o bassa”) or “an ox or a horse” (“bue o cavallo”).

The Anonimo then refers back to this thorough exposition a little later, when commenting on Virgil’s words in *Inf.* IX, 73–74.<sup>40</sup> The Latin poet invites Dante to look in a certain direction by saying “drizza il nerbo del viso” (literally “direct the nerve of vision”), and the commentator recalls what has already been illustrated (“Come detto è poco avanti”) about the nerve that moves from the brain and enables the visual process (“il vedere procede da uno nerbo che si muove dal cerabro”). Virgil’s exhortation also prompts Benvenuto to provide some details about the optic nerve (“in oculo est quidam nervus [...], vocatur opticus”). The master from Imola reiterates that the “nerbo” means intellectual acumen (“robur intellectualis oculi” and

“acumen intellectus, qui est oculus animae”).<sup>41</sup> Furthermore, he points out that, according to natural scientists (“ut physici tradunt”), this nerve acts as a channel conveying images from the pupil to the brain (“transmittit species rerum visarum ad intellectum, et respondet pupillae”). It is wider than any other nerve (“grossior nervus quam sit in toto corpore”), as can be seen from the head of a kid or other animal (“sicut tu potes videre in capite unius capretti vel alterius animalis”).<sup>42</sup> A slight different view of the “nerbo” is expressed by Guglielmo di Maramauro, who specifies that the optic nerve (“se chiama ‘otiquo’”) has the task of turning the eye in the direction of that which one wishes to look at (“el qual ne fa gitar l’ochio da ogni lato donde l’omo vol riguardare”).<sup>43</sup>

Another passage that requires Dante’s readers to consider the anatomy of the eye is the elaborate simile that occurs in *Par.* XXVI, 70–79:

E come a lume acuto si disonna  
per lo spirto visivo che ricorre  
a lo splendor che va di gonna in gonna,

e lo svegliato ciò che vede aborre,  
sì nescia è la sùbita vigilia  
fin che la stimativa non soccorre;

così de li occhi miei ogni quisquilia  
fugò Beatrice col raggio d’i suoi,  
che rifulgea da più di mille milia:

onde mei che dinanzi vidi poi<sup>44</sup>  
(*Par.* XXVI, 70–79)

[As sleep is broken by a piercing light / when the spirit of sight runs to meet the brightness / that passes through its filmy membranes, / and the awakened man recoils from what he sees, / his senses stunned in that abrupt awakening / until his judgment rushes to his aid / exactly thus did Beatrice drive away each mote / from my eyes with the radiance of her own, / which could be seen a thousand miles away, / so that I then saw better than I had before].

The poet compares his hazy vision, later healed by the rays coming from Beatrice, to the bewilderment of someone who is suddenly awakened by a bright light. In this parallel, Dante depicts the movement of the visual spirit as it approaches the splendour that penetrates through the various membranes of the eye. To comment on these verses, Iacomo della Lana dwells on the anatomy of the eye (“la notomia de i ochi”), explaining that the visual organ is composed of multiple sheaths (“l’ochio ha cumposto de pluxur tongehe”), called “gonna” by the poet.<sup>45</sup> These membranes are one on top of

each (“l’una sovra l’altra”) and their centre is that point in the pupil where visual power properly lies (“nel centro hano solo quel punto in la pupilla dove è lo numero, c’ha la vertù visiva, sì termena”).<sup>46</sup> After passing through the air and the various sheaths, starting from outermost one (“primo apar nella extrinseca, che termena cum l’aire”), the image (“spetia visibelle”) reaches the centre of the eye (“fino al centro dell’occhio”). There it multiplies (“si multiplica”), as Aristotle says in the second book of *De anima* (“sí come apare in secundo *De anima* dal Philosopho”), and is then mirrored by being ‘delivered’ to the *sensus communis* (“s’aspieca nel senso comune”).

The Anonimo Fiorentino repeats almost verbatim what he reads in Lana. Benvenuto merely refers to the teaching of experts in the field (“est notandum quod sicut tradunt physici oculus habet tunicas etc.”), while the *Ottimo* offers a rather detailed description.<sup>47</sup> While noting that it would be long and unfruitful to cover the topic (“ed a tractare [...] sarebbe lungo ordino e con poco frutto”), he mentions the names of the seven sheaths (“sette tuniche” and “tunica viene a dire gonnella”) of the eye, except for the *coniunctiva*. First comes the “retina”, which “arises from veins and arteries and is woven like a web” (“nasce dalle vene e da l’arterie e in modo di rete è contessuta”). Then come the “secondina”, the “sclerotica”, and the “tunica aranea”, which lies between the “cristallino” and the “albugineo umore” (i.e. aqueous humour); it is through this last sheath the visual spirit penetrates (“per la quale passa lo spirito della veduta”). Last come the “uvea” and the “cornea”. In his conclusion, the *Ottimo* also makes his source explicit, namely Bartholomew the Englishman’s encyclopedia: “In libro quinto *De proprietatibus rerum* habetur, capitolo iiii”.

Galen’s name (“ait sic Galienus”) is instead recalled by Pietro Alighieri, who says that “our seeing is in the crystalline humour” (“nostrum videre est in humore cristallino”), which is separated from the cornea by another membrane (“inter quem et tunicam corneam interponitur unica tunica”).<sup>48</sup> Behind this “tunica” (the uvea) there is the aqueous humour (“humor albugineus”), whereas between it and the “cristellinum” there lies the “tela aranea”, which has a hole, the pupil, through which the visual spirit passes (“cuius foramen est pupilla”).<sup>49</sup> Finally, Francesco da Buti more generically mentions natural philosophers (“diceno li Naturali”) and compares the *tunicae* to various layers of leaves (“l’occhio è composto di più sode toniche come foglie”), in the middle of which (“in mezzo di quelle, sì come nel centro”) is a liquid where the visual power lies (“è un umore in che sta la virtù visiva tra foglia e foglia”).<sup>50</sup>

In sum, the anatomical descriptions examined here provide no original insights (nor should we expect them to). However, they may be of interest in understanding what sources Dante’s commentators used and what notions they deemed fit to share with a wider readership. Moreover, these texts, particularly those in the vernacular, deserve attention from a lexical point of view, as they allow us to verify how certain technical terms and theories were circulated and translated in a context where Latin was not the prevailing language.<sup>51</sup>

## 5 Eye-Deceiving Conditions and Circumstances

As we have already seen, for example with regard to Farinata's answer, Dante and his commentators are well aware that the distance and the characteristics of the *medium* or "mezzo" – that is, the element that lies between the eye and the object and may be more or less terse and bright – significantly influence visual perception. As Andrea Lancia puts it, "the author observes that the sense of the eye is deceived by distance in space or darkness in the air".<sup>52</sup> Not unexpectedly, this remark is made with reference to *Inf.* XXXI, 19. Almost at the end of the first *cantica*, much of this canto builds on the difficulties due to the gloom and misunderstandings, which gradually melt away, giving way to fear, as the poet and Virgil approach the towers/giants.

Right from the start (vv. 10–11) Dante creates a twilight atmosphere, with little chance to catch a glimpse of what lies ahead:

Quiv'era men che notte e men che giorno,  
sì che 'l viso m'andava innanzi poco;  
ma io senti' sonare un alto corno,

tanto ch'avrebbe ogne tuon fatto fioco,  
che, contra sé la sua via seguitando,  
dirizzò li occhi miei tutti ad un loco.

(*Inf.* XXXI, 10–15)

[Here it was less than night and less than day – / I could not see too far ahead. / But I heard a horn-blast that would have made / the loudest thunderclap seem faint. / To find its source I turned my eyes / back to the place from which the din had come].

It is then the sound of a horn, more terrible than that of Roland's olifant, that directs the poet's gaze (v. 15) towards the supposed towers, and makes him ask Virgil for enlightenment as to their whereabouts. The guide replies:

Ed elli a me: "Però che tu trascorri  
per le tenebre troppo da la lungi,  
avvien che poi nel maginare abborri.

Tu vedrai ben, se tu là ti congiungi,  
quanto 'l senso s'inganna di lontano;  
però alquanto più te stesso pungi".

(*Inf.* XXXI, 22–27)

[And he to me: "Because you try to pierce / the darkness from too far away, / it follows that you err in your perception. / When you are

nearer, you will understand / how much your eyesight is deceived by distance. / Therefore, push yourself a little harder”].

Since he looks too far into the distance and almost in the absence of light, Dante is confused and cannot form a mental image that matches the truth. Getting closer he will instead be able to peer through the thick, dark blanket (v. 37: “forando l’aura grossa e scura”) and realise that he is facing frightening giants. A beautiful comparison with fog, which, as it dissipates, allows what was previously concealed to emerge, completes the description of this gradual unveiling:

Come quando la nebbia si dissipa,  
lo sguardo a poco a poco raffigura  
ciò che cela ’l vapor che l’aere stipa.  
(*Inf.* XXXI, 34–36)

[As, when the mist is lifting, little by little we discern things hidden in the air made thick by fog].

Another contribution in this volume focuses on the optical illusion the poet sketches at the end of the canto (vv. 136–141), when he compares Antaeus, in the act of stooping, to the Garisenda tower in Bologna, which gives the impression of falling on the observer if the clouds move in the opposite direction to its inclination.<sup>53</sup> The optical phenomenon on which the simile is based is rather neglected by early commentators, who were more interested in providing details about the building, its history, Dante’s stay in Bologna, etc. Only Iacomo says that the tower seems to be falling (“el par puro ch’ella caça”) because of the visual ray that penetrates deep into the air (“sì se interna lo raggio visuale in l’aere”).<sup>54</sup>

More attention is paid to the atmosphere in which the scene is set and to the problem of the distance between the eye and the thing to be seen. The *Ottimo* remarks that the gloomy air between Dante’s pupil and the giants (“l’aere tenebroso, ch’era mezzo tra le pupilla de li occhi e l’obietto, ch’erano li giganti”) does not make things look the way they are (“non lasciava fare vera aprensiva”) and therefore induces misjudgment (“faceva falso iuditio”).<sup>55</sup> Benvenuto also takes into account darkness and the position of the object in space (“propter distantiam medii et maxime in tenebra”) and provides a second example of deception that frequently occurs, namely mistaking a man for a tree (“saepe capit hominem pro arbore”).<sup>56</sup> It is, however, Francesco da Buti who offers a more comprehensive explanation.<sup>57</sup> The commentator makes it clear that Dante cannot recognise what is in front of him because he is in a dimly lit place and looking from too far away (“Perchè t’è troppo di lungi la vista, conviene correre più che non può nel luogo tenebroso”). Then he wonders what sight might perceive if the place were not dark but bright (“imperò che cosa potrebbe la vista nel luogo chiaro,

che non può nel luogo tenebroso?”), and this question is followed by some specifications. Francesco points out that in the science of vision (“nella prospettiva”), as in other circumstances (“come nell’altre cose”), there must be a proportion (“si richeggono proporzioni”) among the elements involved. Visual power (“virtù visiva”) can be more or less effective depending on its capacity (“la sua potenza”), distance (“la distanza del luogo”), the object’s size (“la quantità dell’oggetto”), and brightness (“la chiarezza della luce”). Consequently, the same thing at a certain distance is seen differently by different eyes, depending on how powerful they are (“secondo che la virtù visiva è maggiore in uno che in un altro”); furthermore, the same eye sees different by day and by night (“altrimenti si comprende la cosa di dì, altrimenti di notte”), as well as from a distance and up close (“altrimenti da presso, altrimenti da lungi”).

The Anonimo Fiorentino repeats roughly the same content, but includes a noteworthy detail about the density of the *medium*.<sup>58</sup> The human eye, he explains, may not see well and take one thing for another because the distance is either too small or too great (“secondo la distanza o picciola o grande”), and because of the qualities of the “mezzo”. After saying that one can see better from afar if the air is bright (“per l’aria chiara si vede più da lungi che per la oscura”), he dwells on an optical phenomenon that is not strictly related to Dante’s verses and concerns the density of the “mezzo”, which can be either thick or thin (“grosso o sottile”). Indeed, the Anonimo clarifies that a thing surrounded by air or another ‘thin’ substance (“per l’aria sottile et per la materia sottile”) appears smaller in size and, conversely, appears larger if it is in something dense (“nella materia grossa appare maggiore”). As a consequence, since water is denser than air (“l’acqua è di più grossa materia che non è l’aere”), a coin in a glass of water looks bigger than outside it (“mettendo uno danaro nell’acqua, il danaro parrà maggiore che di fuori dell’acqua”).<sup>59</sup>

The note about the quality of the *medium* seems to be unprecedented among commentators, while on several occasions, besides those already recalled, Dante’s readers stress the fact that proportion plays an important role in visual perception (and, therefore, in scientific reasoning about it). Iacomo della Lana, for example, explicitly mentions optical science (“como apare in perspetiva”) in relation to those verses in which Dante, almost at the top of Purgatory, admires the stars, which seem brighter and larger than usual, that is, on earth (*Purg.* XXVII, 89–90: “vedea io le stelle / di lor solere e più chiare e maggiori”). In this respect, Iacomo notes that “the closer man comes to a shiny, luminous body, the greater that body appears in size and luminous intensity”.<sup>60</sup> Similarly, with regard to Dante’s failure to recognise the candelabra in *Purg.* XXIX, the commentator reiterates – once again referring to the *scientia perspectiva* (“sí come chiaro appare nella prospettiva”) – that distance alters perception and can mislead the sense of sight (“lo senso del viso s’inganna”), insofar as “the space should be proportionate to the visual power and to the thing to be seen”.<sup>61</sup> Iacomo thus stresses proportions,



while Francesco da Buti, as seen above, makes a more complex argument and compares two different theories of vision. When commenting on this passage, the *Ottimo* and Benvenuto add nothing relevant from the point of view of optics, but the latter inserts a clarification about the phrasing and the grammatical subject (“Et vide quod in constructu debes incipere a longo tractu etc.”).<sup>62</sup>

Also with regard to the poet’s gaze in *Par.* XXVII, which follows the luminous spirits upward as long as it can during the extraordinary snowfall, Iacomo emphasises the need for proportion between the size of the object and the space separating it from the eye (“lo meço convene esser proportionado tra la cosa che se vede e ’l vixo”).<sup>63</sup> He begins there by quoting Aristotle’s *De anima* (“sí cum’ dise ’l Philosopho nel secundo *De anima*”) and notes that a small thing slips out of sight (“se perde ad ochio”) more easily than a large one, particularly if the distance between it and the observer is beyond proportion (“quando lo meço è sí grande che ceda la proportione della cosa”). This, he concludes, is the reason why the saints, having strayed beyond measure (“cedea lo meço a la proportione”) into the bright air (“l’aire luminoso”), can no longer be followed by the poet’s eye (“lli perdé ello ad ochio”).

Although it is not possible to develop the discussion any further here, to the excerpts examined we could add others in which Dante’s commentators underline that distance also changes the perception of the shapes of objects. Concerning the river of light that becomes a lake, and then the white rose at the end of Paradise, Iacomo della Lana proposes an accurate geometric demonstration (“Sia linea AB lo extremo della riva de’ fiuri da l’una delle parti de fora, etc.”).<sup>64</sup> Francesco da Buti in turn explains that one realises the actual shape of a round thing of ample size (“una cosa tonda [...] molto ampia”) only when approaching it (“come l’uomo s’appressa ad essa”) or looking at it from above (“o se l’omo sallie in alto”), whereas before that it appears to be a kind of line (“parrà lunga”).<sup>65</sup>

## 6 Conclusions: First Results and Next Steps

The review of passages presented here clearly shows that early commentators grasp the centrality of light and vision in the *Commedia*. At the same time, these readers of Dante prove that they know the basics of optics and, albeit to varying degrees, are aware of contemporary debates about the functioning of sight, light propagation, etc. A few developments in this research are on the horizon. First, there are other verses from the three *cantica* and excerpts from the commentaries to consider, particularly those dealing with the movement of light rays and mirrors – a couple of examples will be given shortly. In addition, it would be worthwhile to investigate the sources explicitly cited or employed without naming names, and to draw a comparison with what Dante says about optical matters in the *Convivio*. Finally, the vernacular commentaries might be a valuable field of inquiry to gain insights into the lexicon, by studying how the technical terms of a discipline that originated



in Latin are rendered in the Italian of the time. Advancement along this path will, on the one hand, enable an increasingly accurate contextualisation of Dante's work with reference to one of its fundamental themes. On the other hand, a substantial pool of texts – hitherto almost unexplored from this perspective – is being brought to the attention of scholars of the history of optics, and they may prove valuable resources for the study of the popularisation of this discipline outside the proper scientific context. Indeed, Dante's commentators surely drew on those “popular conduits” through which the “visual paradigm filtered down from scholastic circles to a broader, less formally educated community”. At the same time, they contributed to spreading “optical literacy”, that is, to the dissemination (and vernacularisation) of the science of light and vision.<sup>66</sup>

The discussion developed so far can, therefore, be brought to a close with a final example that can also be regarded as an opening to future ‘explorations’. In *Inf.* XXIII, 25–27 Virgil invokes a comparison with mirrors to say that Dante's thoughts and feelings are immediately reflected in his mind:

E quei: “S'i' fossi di piombato vetro,  
l'immagine di fuor tua non trarrei  
più tosto a me, che quella dentro 'mpetro”.  
(*Inf.* XXIII, 25–27)

[And he: “If I were made of leaded glass / I could not reflect your outward likeness / in less time than I grasp the one inside you”].

The image used by the poet prompts Andrea Lancia to provide some clarifications on mirrors and their properties (“*Speculum et eius proprietates*”).<sup>67</sup> He explains that a mirror is a leaded glass (“*vetro impiombato*”) that, in the poet's words, draws the image to itself, as a magnet does with iron (“*traela a sé, come calamita ferro*”). Thus, the commentator points out, Dante settles here a specific issue (“*qui solve una questione*”) regarding the way in which a mirror works, namely whether it is the image that reaches the reflecting surface (“*se l'immagine dello specchiante va allo specchio*”) or the surface that draws the image towards itself (“*o lo specchio trae a sé l'immagine dello specchiante*”), arguing in favour of the latter explanation (“*e dice che 'l trae, non va a llui*”).

The Anonimo Fiorentino also dwells on this matter at length.<sup>68</sup> First he emphasises that the technical knowledge involved, that is, optical science (“*quest'arte prospettiva*”), is uncommon and complex (“*è poco in uso, et forte è malagevole*”). As for the specific question of how images reach mirrors, there would not appear to be any solution at hand, since no philosopher makes a clear statement on this (“*chiaramente per veruno filosofo si disfinisce*”). At least it can be taken for granted (“*se non che dicono etc.*”) that the image of each thing arrives in a straight line at the mirror placed in front of the object (“*per retta linea ferisce all'opposito suo nello specchio*”).

Therefore, images cross thin and transparent surfaces – and they could do the same with a clear liquid (“et in qualunche altra materia che sia rara et lucida, ovvero liquida”) – and stop where they find something thick and dark (“passa infino alla cosa densa et oscura”), for example the leaded part of a mirror; they are then reflected backward and return to the eye (“ritorna addirietro, et manifestasi agli occhi nostri”).

The commentator also wants to show what can be achieved through the skilful use of mirrors. He maintains that, by making use of a few reflective surfaces, one can instantaneously see what is happening in a place many miles away (“di specchio in specchio in uno stante si possono vedere le cose che universalmente si fanno di lungi molte miglia”). He also seems to report an experiment that was actually carried out (“dicesi che fare si potrebbe, e fatto è stato”). He explains that through a system of three mirrors correctly arranged (“per quello modo che ’l maestro saprebbe acconciare”) on top of as many mountains, from Monte Morello, the highest peak in the Florentine plain, one could see in real time what is happening in Bologna (“si vedrebbe dallo specchio di Monte Morello ciò che fatto fosse in Bologna in uno stanti”). Finally, the Anonimo reiterates that those who have experienced this know how such a result can be achieved (“come questo possa essere chi ha fatta la sperienza il sa”).<sup>69</sup> Once again, then, Dante’s ingenious similes – built on optical phenomena frequently encountered in everyday life, but whose explanation was unknown to most people – led contemporary interpreters to investigate certain matters, to gather and convey information, and to digress about topics close to – and sometimes distant from – the starting idea. And along with them we also discover something new about the poet’s world and words, and about the notions and uses of optical science and tools in 13<sup>th</sup>- and 14<sup>th</sup>-century Italy.

## Notes

- 1 This contribution is part of a research project that is funded by the Swiss National Science Foundation and is currently being conducted at the University of Zurich (Ambizione grant, PZ00P1\_201935).
- 2 See Patrick Boyde’s preface to Gilson, *Medieval Optics*, XIII. See also Piccolino, “The Visions of Dante”, in this volume.
- 3 The bibliography on this subject is huge. See Smith, *From Sight to Light*, where many other references (including the pioneering studies by David C. Lindberg and Graziella Federici Vescovini) can be found.
- 4 Much has been published on the topic. Among other publications (and in addition to Gilson’s monograph), see Akbari, *Seeing through the Veil*; Ariani, *Lux inaccessibilis*; Panti, “Il visibile ‘per retta linea’”.
- 5 See Gilson, “Optics in and through Dante”; the author briefly deals with Trecento commentators at 505.
- 6 Needless to say, the commentators’ level of education is higher than that of the general public. Albeit in relation to a later period, notable general considerations on the study of Dante’s reception can be found in Gilson, *Leggere Dante*, 19–44.
- 7 See Galli, “e però puote anche la stella parere turbata”. See also Ledda, “Filosofia e ottica”.

- 8 For a general introduction (date, authorship, etc.) to commentaries transmitted in manuscripts and dated to before 1480, see Malato and Mazzucchi (eds.), *Censimento dei commenti*.
- 9 Initial surveys were conducted through the DDP: “Dartmouth Dante Project”, <https://dante.dartmouth.edu/> (accessed on 3 May 2023). Whenever feasible, commentaries have been read and quoted on the basis of their respective critical editions. When no critical editions are available, the texts have been quoted from 19<sup>th</sup>-century editions, even though these publications are not always reliable (especially that of the Anonimo Fiorentino’s commentary). As for Benvenuto da Imola’s commentary, comparisons have been made with the editions of his *Lectura Bononiensis* (1375) and the *Lectura Ferrariensis* (1375–1376). I would like to thank Luca Azzetta for his suggestions on the editions of early commentaries and the valuable materials he shared with me. Of course, any errors or inaccuracies are my responsibility.
- 10 Iacomo’s commentary has been published by Volpi as a synoptic edition of two different versions, in the Bolognese vernacular and in the Tuscan vernacular respectively. In the table I have quoted both, while in what follows I will refer to the Bolognese version of Iacomo’s text, and I thank the editor for his suggestions in this regard.
- 11 See Dante, *Convivio*, 234. Benvenuto da Imola, *Comentum*, vol. 3, 406: “prospectiva, quae partim spectat ad philosophiam, partim ad geometriam”. The commentator explains the term “arte” in *Purg.* XV, 21.
- 12 Iacomo della Lana, *Commento*, vol. 2, 1652 (*Purg.* XXXIII, 103): “sí cum’ chiaro apare nella *Perspetiva* in lo capitolo della diversità de l’aspetto in li canoni sovra le Tavole Tolletane”.
- 13 Iacomo della Lana, *Commento*, vol. 1, 852 (*Inf.* XXXI, 10).
- 14 The *Commedia* is always quoted from the edition by Chiavacci Leonardi. The English translation is the one by Hollander, available on the “Princeton Dante Project” website, <https://dante.princeton.edu/pdp/> (accessed on 28 April 2023).
- 15 Dante Alighieri, *La Divina Commedia*, vol. 1, 324. Moreover, Nicola Fosca wonders whether Farinata’s “noi” refers to all the damned or just to the Epicureans: see Fosca’s commentary (2003–2015) in the DDP (*Inf.* X, 100–105).
- 16 Singleton, “Commentary”, quoted from the DDP (*Inf.* X, 100).
- 17 Iacomo della Lana, *Commento*, vol. 1, 344 (*Inf.* X, 100).
- 18 *Ottimo commento*, vol. 1, 252 (*Inf.* X, 100–108); Amico dell’Ottimo, *Chiose*, 102 (*Inf.* X, 100); see also 754.
- 19 The quotation is from the second redaction of Pietro’s commentary (1342–1355): Pietro Alighieri, *Comentum*, 297 (*Inf.* X, 94–114). The ‘thickening’ of the *virtus visiva*, which makes one unable to see farther than a span, is also mentioned by Iacomo della Lana and the *Ottimo* when commenting on *Par.* XIX, 79. This canto is replete with references to vision, but there is not much optical material in the commentaries.
- 20 Comment on *Inf.* X, 100: “coloro c’anno la mala luce sono naturalmente i vecchi che vegono le cose da lungi meglio che da presso.” The commentary, known as *Chiose cagliaritan*e and dated to the late 14<sup>th</sup> century, is quoted from the DDP (ed. by Carrara).
- 21 Boccaccio’s commentary is always quoted from the DDP (ed. by Padoan).
- 22 Part of the quoted passage is transmitted by manuscripts E (Estense) and S (Strozzi) and is only included by the 19<sup>th</sup>-century editor in the critical apparatus. The integration in E and S (or a similar one) seems essential, however, to complete the meaning of the sentence: “nam quidam habent visum multum sed non clarum, et tales vident melius a longe <quia radii visuales egrediendo serenantur: alii autem habent visum clarum, sed non multum>, et tales non vident nisi a propinquo. Modo autor hic loquitur de illis qui vident rem a longe, sed non de

- prope". See Benvenuto da Imola, *Comentum*, vol. 1, 352. What we read in Benvenuto's two *Lecturae* is not helpful in this regard.
- 23 Here the author pays much attention to the theological question of the foreknowledge of the damned and reports various opinions. According to some, the inhabitants of hell do not see anything ("illi qui habent malam lucem non vident aliqua perfecte") unless there is an external intervention ("nisi secundum quod ostenditur sibi ab aliis qui ostendunt sibi rem"); therefore, they know neither the present nor the future, but can only be aware of something if they receive news from others (e.g. a demon or other spirit who has entered the infernal realm). This explanation is orthodox ("pulchra et catholica") but does not respect the text ("litera tamen non patitur eam"). Even less acceptable ("ista expositio est quaedam fuga ignorantiae") is the hypothesis that the damned can only foresee death, since it contradicts the preceding verses.
- 24 Amico dell'Ottimo, *Chiose*, 146 (*Inf.* XV, 13–16).
- 25 Before referring to the (pseudo)Aristotelian *Problemata*, Benvenuto describes how the elderly tailor narrows his eyes when threading a needle ("contrahit cilia, ut virtus visiva fiat fortior quando vult ponere filum in parvum foramen acus"). This act concentrates visual power into a smaller space, enhancing sharpness and effectiveness. ("quia virtus tunc magis unita exit per minorem viam"). The same source is mentioned by the commentator from Imola in relation to another gesture related to sight. In *Purg.* XV, 13–15, Dante shields his eyes with his hand in order to protect them from excessive light. Benvenuto again points out that the aforementioned Aristotelian work accounts for the phenomenon: "Unde Aristoteles libro Problematum circa principium quaerit propter quid versus solem opposcentes manum ante lumen magis videmus. Et dicit quia superabundantia prohibita a manu visum non laedit." Francesco da Buti also dwells on these verses, provides the etymology of "solecchio" (it is a diminutive meaning "small sun": "è a dire piccolo Sole"), and emphasises that the thing to be seen must be commensurate with one's visual capabilities ("contemperata a la vista"). Conversely, if it exceeds them ("avansa la potenza visuale"), it must be scaled down ("per parificazione e riduzione del superfluo a parità et equalità de la porta visiva") by closing the eye or shielding it with the hand. See *Commento di Francesco da Buti*, vol. 2, 349 (*Purg.* XV, 1–15). Similar to Benvenuto, Giovan Battista Gelli, in his commentary (1559), makes reference to the *Problemata* (albeit addressing different questions from those recalled earlier) while discussing optical topics in relation to *Inf.* X, 100–108. This passage is cited by Gilson: Gilson, "Optics in and through Dante", 515–516.
- 26 *Commento alla Divina Commedia d'Anonimo Fiorentino*, vol. 1, 241–242 and 256–257.
- 27 *Commento di Francesco da Buti*, vol. 1, 285 (*Inf.* X, 61–72). Concerning Farinata's words, Francesco merely observes: "Et a questo risponde, che li passati veggono come colui ch' a mala luce, che vede le cose da lungi; ma non da presso: e così ellino veggono il futuro; ma non il presente"; 286 (*Inf.* X, 73–84).
- 28 The textual variant is reported in the apparatus and the name of Francesco da Buti is mentioned in the footnotes in Petrocchi's edition: *La Commedia secondo l'antica vulgata*, vol. 2, 166 (*Inf.* X, 69).
- 29 Francesco's mention of "prospettiva" would actually be a reference to a specific treatise on optics, if it is correct to capitalise the P as in the 19<sup>th</sup>-century edition; if not, it must be a more generic reference to the science of vision.
- 30 *Commento di Francesco da Buti*, vol. 2, 702–703 (*Purg.* XXIX, 43–57).
- 31 The illustration is given here as in the 19<sup>th</sup>-century edition (at 703), since I have not yet examined the manuscripts.
- 32 In other passages some commentators, following Aristotle, define colour as the proper object of the sense of sight. See, by way of example, Iacomo della Lana on

- Purg.* XVI: “lo color ch'è sempre oietto della vertù visiva”; Iacomo della Lana, *Commento*, vol. 2, 1250.
- 33 These theories conflicted less sharply than we tend to believe today; see the recent Lička, “The Visual Process”.
- 34 *Ottimo commento*, vol. 3, 1364 (*Par.* III, 13–15).
- 35 *Ottimo commento*, vol. 3, 1906 (*Par.* XXXIII). On the multiplication of visual *species* in the pupil, see also 1695–1696 (*Par.* XXI, 16–18), where the commentator refers to Aristotle's *De anima* and *De sensu et sensatu*, and 1773 (*Par.* XXVI, 103–114).
- 36 *Commento alla Divina Commedia d'Anonimo Fiorentino*, vol. 1, 204. See also Dante's *Convivio*, III, ix, 6–16.
- 37 *Commento alla Divina Commedia d'Anonimo Fiorentino*, vol. 1, 204–206. The description by the Anonimo Fiorentino bears some similarities to Bacon's account of the anatomy of the eye in his *Perspectiva*: Lindberg, *Roger Bacon and the Origins*, 26–33 (p. I, dist. 2, ch. 2–3). Concerning the anatomy of the eye, its representations, and the specific terms used to describe it from antiquity to the late Middle Ages, see Raynaud, *Eye Representation*, 3–70, 477–486. See also Smith, *From Sight to Light*, 36–43, 184–188.
- 38 To be more precise, the cornea is the membrane, while the ‘white’ is the aqueous humour or *humor albugineus*. The Anonimo also adds something about the uses of horn in writing practices: “et è detta cornea da quello corno, cioè da quello osso che si pone alcuna volta inanzi a certe lettere di tavola o d'altro, acciò che le lettere si conservino molto et possansi leggere”. As the editor points out, the commentator is probably thinking of ‘horn windows’, of thin, transparent horn plates applied to the covers of ancient codices to protect the title of the work. I once again wish to thank Marco Cursi for his valuable help with palaeographic and codicological issues.
- 39 As Smith explains, when commenting on Alhacen's description of the eye, “the uveal tunic continues beyond the circle created by the intersection of the sclera and the cornea, but it falls short of completion by the amount occupied by the circular opening of the pupil”: Smith, *Alhacen's Theory of Visual Perception*, vol. 1, LVII–LVIII.
- 40 *Commento alla Divina Commedia d'Anonimo Fiorentino*, vol. 1, 230.
- 41 Benvenuto already includes some information about the optical nerve in the *Lectura Ferrarensis*: “nerbo, idest acumen: idest, respondet nervus qui ministrat visum. Iste est grosior nervus corpore, qui ministrat virtutem visivam, et respondet <in> medio oculo, in pupilla; atrahit res vivas exteriores et mittit in mentem; vocatur ‘nervus oticus’ penes phisicos.” (and note the use of the verb ‘to attract’, “atrahit”, which could imply an active role). See Benvenuto da Imola, *Lectura Dantis Ferrarensis*, 216 (*Inf.* IX, 73–75).
- 42 Benvenuto da Imola, *Comentum*, vol. 1, 319.
- 43 Guglielmo Maramauro's commentary is quoted from the DDP (ed. by Pisoni and Bellomo).
- 44 Concerning the meaning of “aborre” (v. 73) and two alternative interpretations of it, see Dante Alighieri, *La Divina Commedia*, vol. 3, 724.
- 45 Iacomo della Lana, *Commento*, vol. 4, 2444 (*Par.* XXVI, 72).
- 46 The meaning of the last part of the sentence quoted (“dov'è [...] termina”) is unclear. The 19<sup>th</sup>-century edition, which can be consulted in the DDP, reads: “più toniche [...]. le quali nel centro hanno solo quello punto in la pupilla dove lo numero, che ha la virtù visiva, si termina,” which could be taken to mean “where the number (of tunics) that has visual power ends”. I wish to thank Mirko Volpi for the time he has spent discussing this passage with me, providing valuable suggestions.
- 47 *Commento alla Divina Commedia d'Anonimo Fiorentino*, vol. 3, 470; Benvenuto da Imola, *Comentum*, vol. 5, 378–379; *Ottimo commento*, vol. 3, 1772 (*Par.* XXVI, 70–78).

- 48 Pietro Alighieri, *Comentum*, vol. 2, 1156.
- 49 Usually, the pupil is considered to be a hole in the uvea. In the *Chiose Cassinesi* (ca. 1365) we find an identical explanation, while the one in the *Chiose Ambrosiane* (1355) is more detailed.
- 50 *Commento di Francesco da Buti*, vol. 3, 696 (Par. XXVI, 67–78).
- 51 Although Margherita Quaglino has mostly dealt with later authors (including Leonardo), I will here refer to her studies, including Quaglino, “Leonardo”.
- 52 Andrea Lancia, *Chiose*, vol. 1, 453 (*Inf.* XXXI, 19): “nota l’autore come il senso de l’occhio per distantia di luogo o per tenebrositate d’aere s’inganna”.
- 53 See Piccolino, “Moving Clouds”, in this volume.
- 54 Iacomo della Lana, *Commento*, vol. 1, 860 (*Inf.* XXXI, 136).
- 55 *Ottimo commento*, vol. 1, 642 (*Inf.* XXXI, 22–27).
- 56 Benvenuto da Imola, *Comentum*, vol. 2, 458.
- 57 *Commento di Francesco da Buti*, vol. 1, 787 (*Inf.* XXXI, 19–27).
- 58 *Commento alla Divina Commedia d’Anonimo Fiorentino*, vol. 1, 653–654.
- 59 A number of optical illusions and phenomena, including the appearance of a coin in a glass of water, will be revisited a century later in Varchi’s exposition on Dante’s poem. See Gilson, “Optics in and through Dante”, 514.
- 60 Iacomo della Lana, *Commento*, vol. 2, 1510 (*Purg.* XXVII, 89): “quanto l’omo s’avisina più al corpo lucido e luminoso, tanto apare ello maore sí in quantitate come in qualitate”.
- 61 Iacomo della Lana, *Commento*, vol. 2, 1560 (*Purg.* XXIX, 46): “l’spatio convene essere proportionado secundo la vertú visiva de quel che vede e secondo la cosa ch’è veçuda.”
- 62 Benvenuto da Imola, *Comentum*, vol. 4, 458.
- 63 Iacomo della Lana, *Commento*, vol. 4, 2478 (*Par.* XXVII, 74).
- 64 Iacomo della Lana, *Commento*, vol. 4, 2598 (*Par.* XXXI).
- 65 *Commento di Francesco da Buti*, vol. 3, 795 (*Par.* XXXI, 82–96).
- 66 Smith, *From Sight to Light*, 280 and 287.
- 67 Andrea Lancia, *Chiose*, vol. 1, 363–364 (*Inf.* XXIII, 25).
- 68 *Commento alla Divina Commedia d’Anonimo Fiorentino*, vol. 1, 492–493.
- 69 Further questions and observations about reflecting surfaces can be found in the comments on *Purg.* XXV, 25–27, where Virgil gives the example of movements being reflected in a mirror with the aim of explaining the relationship between souls and aerial bodies to Dante. See, for example, the *Ottimo: Ottimo commento*, vol. 2, 1203 (*Purg.* XXV, 25–27).

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