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The Optics of St. Francis's Stigmatization

Iconography and Theories of Seeing

▼ **RESEARCH ARTICLE**

▼ **ABSTRACT** This article examines the changing iconographical conventions representing St. Francis's stigmatization and explores how they might be understood in the context of contemporary intellectual trends within the Franciscan order. The evolving ray imagery in visual representations of the stigmatization can be productively interpreted through theories of the visual process, especially *perspectiva*, which was based on Arabic optical theory and initially adopted in the Latin West by English Franciscans. Latin articulations of *perspectiva* were compatible with hagiographical accounts of Francis's stigmatization, especially Bonaventure's, and therefore provided the Franciscan order with a more precise language and set of theories to explore how to visually represent the stigmata being impressed on Francis's body. Both visual processes and Francis's stigmatization can be understood as specific examples of the "multiplication of species" model. The stigmatization was therefore depicted as comprehensible through its consistency with natural processes of causation. This article explicitly connects the history of optical science with the history of Franciscan iconography and hagiography to demonstrate the richness and complexity of the interactions between different areas of Franciscan knowledge production and dissemination.

▼ **KEYWORDS** stigmata; *perspectiva*; Franciscan; iconography; hagiography; knowledge transfer

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This article investigates one way in which theories of visual perception might help us to understand the changing iconographical conventions representing St. Francis's stigmatization in thirteenth- and fourteenth-century Italian frescoes and panel paintings. My core argument is that, alongside hagiographical accounts, contemporary theories of visual perception provide a useful framework for reading visual representations of the stigmatization. These novel theories of visual perception are known in modern scholarship as *perspectiva*, based on the Latin titles of the earliest treatises that assimilated Arabic optical theory.[1] The major contributors to Latin *perspectiva* were the English Franciscans Roger Bacon (d. 1292) and John Pecham (d. 1292), as well as the Polish friar Witelo (fl. 1270s).

Here, I explore the possibility that Italian Franciscan iconography may have drawn on ideas from contemporary theories of visual processes, first articulated in the Latin West by English scholars who taught at the University of Paris, to construct a visual argument about the miraculous process by which Francis received the stigmata. My argument is based on the changing uses of ray imagery in frescoes and panel paintings between the mid-thirteenth and early fourteenth centuries: The earliest images of Francis's stigmatization seem to present the seraph's gaze as the primary agent of the encounter, while later depictions represent Francis seeing the Christ-seraph's wounds as the cause of his receiving their likenesses on his own body. I argue that this evolution can be understood in the context of changing theories of visual processes.

As André Vauchez has demonstrated, the divine authenticity, or at least uniqueness, of Francis's stigmatization was by no means universally accepted, well into the fourteenth century.[2] More recently, Carolyn Muessig has convincingly shown that Francis's miraculous reception of all five of Christ's wounds was unheard of, even in the context of the long tradition of Christian stigmatics.[3] Therefore, the problem of proving that Francis's vision, and resultant five wounds, were truly divine in origin was an important issue for those who sought to establish his status as a recipient of dominical stigmata. Constructing a visual argument around Francis's stigmatization in iconographical representations of the event was thus a major concern for the Franciscan order.

I will suggest that this visual argument drew from *perspectiva*, showing the continuity between natural and supernatural causation. *Perspectiva* was concerned with a broad range of topics related to light and vision, from the formation of the rainbow to the storage of visual information in the brain.[4] The specific aspect from which Franciscan iconography might have taken inspiration was *perspectiva*'s widely disseminated application of the broader "multiplication of species" framework, in which species, or forms of objects,

1 Bacon, *Perspectiva*; Pecham, *Perspectiva communis*; Witelo, *Perspectiva*. Witelo's extensive textbook will not be discussed here at length.

2 Vauchez, "Stigmates de saint François."

3 Muessig, *Stigmata*, 60.

4 Smith, *From Sight to Light*, 275–77.

emanate from every point of the surface of visible objects. In this context, species are temporarily impressed on the observer's eye, allowing them to see the object. This model of natural causation provided a visual language for representing the process of Francis's stigmatization, even as the *super*natural, miraculous nature of Francis's stigmatization was confirmed by the fact that his wounds were permanent.

During the century following his death in 1226, artistic representations of Francis's reception of Christ's wounds increasingly associated that moment with his vision on mount La Verna of a seraph/Christ-seraph figure. This association was already implicit in the first official *Life* of Francis, Thomas of Celano's (d. c.1265) *Vita Prima* (1228–1229).[5] Nevertheless, iconographical conventions representing Francis's stigmatization, first appearing in Italian panel paintings (e.g., Figure 1), made this connection much more explicit.[6] Furthermore, different visual representations of the encounter seem to engage deliberately with seeing, and how it can be an effective vehicle for the transfer of grace, in significant ways. I thus argue that wider theories of visual processes, not least the perspectivist understanding of visual perception as articulated by Bacon and Pecham, provide one framework that can help us to understand the evolving use of ray imagery in frescoes and panel paintings commissioned by the Franciscan order.

In this argument, I follow the example set by Michael Baxandall's famous claim that Giotto di Bondone (d. 1337) found rhetorical texts to be useful for his art.[7] This argument implies in principle that some late medieval artists, and those who commissioned their work, could (and did) draw inspiration from a wide variety of intellectual and textual sources. As I will demonstrate, *perspectiva* is already recognized as a significant philosophical framework for the development of linear perspective in late medieval Italian art, not least through the work of Giotto himself.[8] Going beyond this primarily art-historical tradition, I argue here that reading images of Francis's stigmatization through the development of perspectivist theory suggests the construction of an increasingly sophisticated visual argument about the stigmata as both naturally and supernaturally produced.[9]

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5 Thomas of Celano, *Vita Prima*, 2.3, 101–2.

6 Köpf, "Stigmata des Franziskus," 54–55. Note that this panel, and many early representations of Francis's stigmatization, show only four wounds, excluding the side wound.

7 Baxandall, *Giotto and the Orators*.

8 See Hills, *Light of Early Italian Painting*; Raynaud, *Optics and the Rise*, 6–8; and Raynaud, *L'hypothèse d'Oxford*, 239. The bibliography on Giotto is immense and ever-expanding. Although nearly two decades old, Derbes and Sandona, *Cambridge Companion to Giotto*, is still a useful introduction. In this article, I cite only the literature on Giotto that is most pertinent to the present argument.

9 Mordechay Lewy has recently suggested a different connection: Lewy, "Burning Mirrors," 116. See below for discussion.

Early Iconography

Even before the adoption of *perspectiva* in the Latin West in the second half of the thirteenth century, some of the earliest pictorial depictions of Francis's stigmatization deployed light imagery, which was absent from early hagiography, to represent the transfer of grace between the Christ-seraph and Francis.[10] In the 1240s and 1250s, Francis was often depicted with three golden rays directed at his head from the seraph, a standard symbol of divine illumination, borrowed from Byzantine iconography.[11] In a panel now held at the Uffizi [**Fig. 1**], the seraph and Francis are looking directly at each other's faces. This is consistent with the earliest hagiographical accounts, in which the seraph's "kind and gracious look" (*benigno et gratioso respectu*) was presented as an important part of Francis's visionary experience.[12]

The Uffizi panel, read in conjunction with Thomas of Celano's hagiography, appears to make the implicit argument that the seraph's active, visual interaction with Francis produced his stigmatization: The key agent of Francis receiving the wounds was thus the seraph, and, perhaps, specifically the seraph's gaze upon him. This makes the point that Francis's wounds were not self-inflicted but were instead received as the result of a miraculous encounter. Nevertheless, precisely *how* the seraph caused Francis's stigmatization is not made explicit in this image, or others like it. Was it the seraph's "kind and gracious look?" Or a more general transfer of divine grace, depicted as rays of light emitted from the seraph's body and touching Francis's halo?

It is worth stressing here that it is not necessary to choose a single interpretation: The representation can permit both. It is sufficient to point out that, owing to the awkward angles at which both the seraph and Francis's heads are tilted, clearly toward each other, one possible reading of this image is that it implied a causal relationship between the seraph's active gaze and Francis's stigmatization. It is therefore worth considering the possibility that changing understandings of the gaze and vision in general might have impacted on later visual representations of the miraculous event.

10 Cooper and Robson, *Making of Assisi*, 202.

11 For the relations between Byzantine and Franciscan art, see Chatterjee, *Living Icon in Byzantium*, 163–206.

12 Thomas of Celano, *Vita Prima*, 2.3.

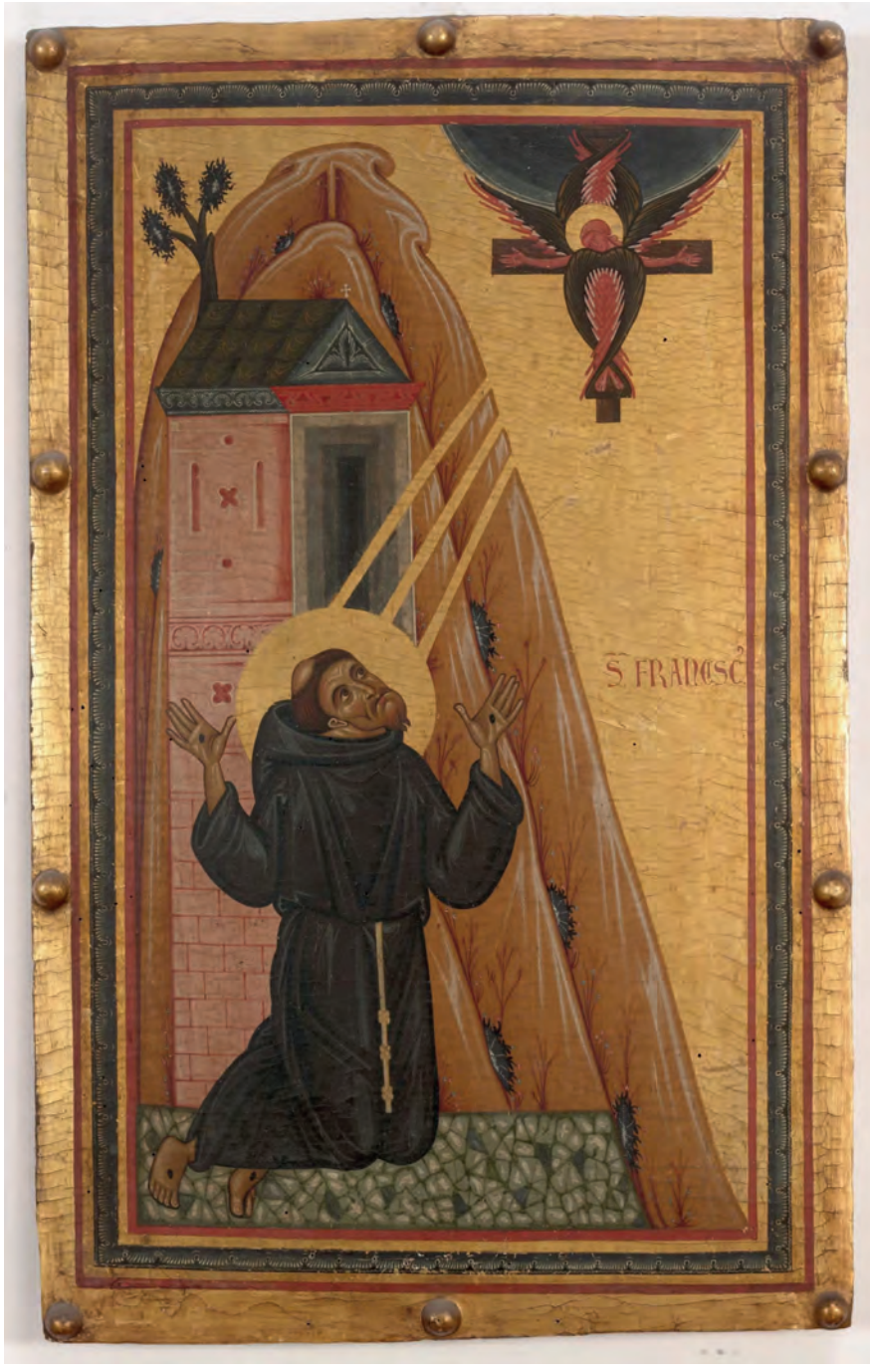

Figure 1. Master of San Francesco Bardi. St Francis Receiving the Stigmata (c. 1240–1250). Tempera on wood. Galleria degli Uffizi, Florence. Courtesy of the Ministero della cultura – Le Gallerie degli Uffizi.

Certain Seeing in Latin *Perspectiva* and Hagiography

Not long after the likely composition date of the Uffizi panel, two English Franciscans, Bacon and Pecham, began to assimilate Arabic optical thought into their understanding of visual processes. The main source of both Bacon's *Perspectiva* (c. 1260–1263) and Pecham's *Perspectiva communis* (c. 1277–1279) was the anonymously translated *De aspectibus* (original title *Kitāb al-Manāẓir*) by Ibn al-Haytham (d. after 1040), known in Latin as Alhacen.[13] Two major distinctive characteristics of Latin *perspectiva*, as it appears in both Bacon's and Pecham's texts, are useful concepts for reading later representations of Francis's stigmatization.

The first characteristic is that thirteenth-century *perspectiva* was a primarily, though not always exclusively, "intromissionist" model.[14] Simply put, *perspectiva* claimed that sight occurs through the eyes receiving visual rays that emanate from visible objects. These visual rays are made up of species, or representations, multiplying along straight lines from every point on the surface of a visible object. When the visual rays enter the eyes, they impress a representation of the visible object on the glacial humor of the eye.[15] The representations then continue to multiply along a straight line through the optic nerve, and from there into the common nerve and the brain, where judgments can be made.[16]

This is the opposite of the extramissionist theory that was common at the time.[17] According to extramissionism, visual rays, known as a visual "spirit" or "fire" (*spiritus vel ignis*), were emitted from the eyes toward the visible object.[18] The intromissionist model of visual perception was a specific instance of Bacon's wider principle of physical causation, the multiplication of species. This principle argued that all objects acted on surrounding objects by emitting power into a medium (for example, air) that then multiplied through the medium along straight lines to impress itself on other objects.[19]

The second distinctive characteristic of *perspectiva* is that it was fixated on the problem of "certifying" visual experiences (*certificare*). *Perspectiva* was concerned with explaining how an observer can trust that their visual perceptions are reasonably truthful representations of visible objects. The most certain representations of visible objects are those that are transmitted along "direct rays"—that is, the visual rays that are received perpendicular to the eye so

13 Lindberg, "Science of Optics," 350–51.

14 Bacon argued for cooperation between intromitted rays and rays emitted from the eyes. Bacon, *Perspectiva*, 1.7.2: 101. For the "purely philosophical reasons" for Bacon's inclusion of extramissionist elements, see Lièka, "Visual Process," 91–95.

15 Bacon, *Perspectiva*, 1.4.2: 53.

16 *Ibid.*, 1.5.2: 62–65.

17 Bacon used his inclusion of an element of extramissionist theory to claim a precise analogy between physical and spiritual vision. Bacon, *Perspectiva*, 3.3.1: 324.

18 Lindberg, "Science of Optics," 349; Adelard of Bath, *Conversations*, 148.

19 Lindberg, "Roger Bacon on Light," 243–75; Denery, "Vision and Visual Error," 206.

travel into the eye and brain without being refracted by the glacial humor. An essential underlying aspect of this concern with certification is the conviction that we cannot *absolutely* trust that our visual impressions truly represent visible objects. This means that visual certification is about finding the "best available" visual impression, which is not necessarily one that represents reality with absolute certainty.[20]

Bacon aimed in his treatise to show how his audience can train themselves to acquire reliable, if not absolutely certain, knowledge through seeing.[21] This "training" took two main forms. The first of these lay in providing a comprehensive account of every stage of the visual process, so that readers could understand the many ways in which visual perceptions could be distorted, and therefore identify when their own perception may be less than accurate.[22] The second and, for present purposes, more significant form of "training" that Bacon offered in *Perspectiva* was to educate his audience to be actively concerned with more careful seeing in order that they may not be deceived by false appearances. This is most obvious in his descriptions of various illusions originating from refraction, such as the familiar case of a straight stick partially submerged in water appearing to be bent.[23]

Part of the blame for confusion in vision in such instances is attributed to viewers who might look at the visible object "carelessly and indifferently" (*negligentibus ac languide conspicientibus rem visam*).[24] This emphasis on the viewer as an agent whose attention and effort is required to see truthfully reveals Bacon's conviction that we can only trust our visual perceptions if we are constantly aware of and vigilant for sources of visual error. The purpose of his *Perspectiva* was therefore to train people in the science of the entire visual process so that they might become careful observers who recognize instances of visual deception and thus approach more certain sight.

Writing a decade or so later, the other major Franciscan scholar of the visual process in the Latin West in the thirteenth century, John Pecham, was less explicitly concerned with the moral cultivation of active perceivers.[25] Nevertheless, Pecham was strongly influenced by Bacon, crucially placing the problem of establishing certainty in vision as an important thread throughout his optical textbook for university students.[26] Pecham implied that, often, one or more of the requirements for certain vision would be either present in an immoderate degree (either deficiency or excess) or completely absent, leading

20 *Pace* Denery, *Seeing and Being Seen*; Denery, "Vision and Visual Error"; and Smith, *From Sight to Light*. Cf. Tachau, *Vision and Certitude*.

21 Cf. Mantovani, "First of All."

22 See, for example, Bacon, *Perspectiva*, 1.3.3: 45.

23 *Ibid.*, 3.2.4: 309–13.

24 *Ibid.*, 3.2.4: 321.

25 The Polish friar Witelo was similarly more interested in illuminating the mathematical *minutiae* of Alhacen's model. Witelo, *Perspectiva*, 1.

26 Pecham, *Perspectiva communis*, 18, 20.

to flawed visual experiences. For example, of the eight propositions that dealt individually with the necessary conditions for certain vision, he expressed five in negative terms.[27] Pecham therefore stressed that the lack of just one of several conditions will render vision impossible. Thus, for example, *without* light, *nothing* is seen (*sine luce nichil videri*).[28] Taken together with the other four statements, it seems that vision is significantly vulnerable to failure, reliant as it is on multiple external factors.

In this passage, and throughout his *Perspectiva communis*, Pecham emphasized the fragility of vision to an even greater extent than Bacon. While Bacon offered the glimmer of hope that an informed and careful viewer might avoid many sources of visual error, Pecham here presented vision in general as inherently fallible. He made no comment about certitude, implying that seeing of *any* type is a fraught endeavor. Thus, even when all the conditions for vision are present in appropriate moderation, there is still no guarantee that our visual experiences can be said to represent visible objects with certainty. For the major Latin perspectivist scholars, then, fully certified vision was an ideal for which one could (indeed, must) strive but that would most likely prove ultimately unattainable in this life.

This concern with the disconnect between visible appearances and authentic reality was shared not only by Bacon's *Perspectiva* and Pecham's later *Perspectiva communis* but also with Bonaventure's *Legenda Maior* (c. 1260–1263), which was precisely contemporary with Bacon's treatise.[29] Bonaventure's account strengthened the connection between certain seeing and Francis's stigmatization by implying that Francis's exceptional virtue allowed him to see the truth of the vision. Bonaventure modified Thomas's description of the figure that Francis saw from just a seraph to be Christ "under the appearance of a Seraph" (*Christo sub specie Seraph*).[30]

This modification of the content of the vision makes an implicit assertion about Francis's special powers of visual perception: He can perceive that he is exchanging gazes with Christ Himself beyond His superficial appearance (*specie*) as a seraph. It is worth emphasizing that the term "species" is also used by the perspectivists to denote the form of the visible object conveying visual information about the object to the eye. Its implicit meaning as a potentially misleading appearance fits with the perspectivists' argument that ordinary visual perceptions cannot be absolutely certified to accurately represent external reality.

The distinction that Bonaventure set out between the appearance of a seraph and the reality that Christ Himself appeared to Francis matched the perspectivist concern with carefully judging the appearances of visible objects

27 *Ibid.*, 1.47–54: 130–35.
28 *Ibid.*, 1.47: 130.
29 Bonaventure of Bagnoregio (d. 1274) was Minister General of the Franciscan Order (1257–1274).
30 Bonaventure, *Legenda Maior*, 13: 139.

to acquire certainty about the reality of those objects. Francis's vision preceding his stigmatization was a miraculous example of the everyday issue of establishing certitude in physical perception that *perspectiva* was devoted to addressing. As Francis's outstanding holiness allowed him to see past the appearance of a seraph (*specie Seraph*) to the real presence of Christ Himself, so did the perspectivists counsel that the gap between the appearances of visible objects and the objects themselves could at least partially be overcome by diligence and effort. For example, Bacon counseled that careful stewardship of the gaze was necessary to avoid the error of seeing double: "unless the position of the eyes is diligently guarded and corrected, the species of the eyes will converge at different places in the common nerve; consequently, one thing will often appear double."[31]

Bacon's aim to train careful perceivers reveals a similar attitude to seeing that Bonaventure implied. Like Bacon's trained perceiver, who carefully judges the truth of his or her visual perceptions, Bonaventure suggested that Francis's virtuous and diligent consideration allowed him to understand the true meaning of his divinely revealed vision of the Christ-seraph: "He gazed with exceeding admiration at the sight of so unfathomable a vision … Eventually he understood from this, through the Lord revealing it, that Divine Providence had shown him a vision of this sort so that the friend of Christ might learn that he was to be totally transformed into the likeness of Christ crucified."[32] In this case, "the Lord revealing it" (*Domino revelante*) was the main reason why Francis was able to understand what he saw, rather than any of Francis's own qualities. Nevertheless, Bonaventure highlighted how Francis "gazed with admiration" (*admirabatur*) and contemplated the implications of his "unfathomable" vision (*inscrutabilis visionis*). This idea, that understanding of an uncertain visual experience came through careful consideration, is consistent with Bacon's critique of careless observers, [33] and Pecham's slightly later insistence on the need for "reasoning" (*ratiocinatione*) to recognize visible objects adequately.[34]

Therefore, the concept of active effort on the part of the recipient of visionary experiences was a component of hagiographical accounts of Francis's stigmatization, as well as being a significant aspect of the perspectivist model of everyday seeing. Bonaventure presented the very fact that Francis was deemed worthy of divine revelation because of his status as a "friend of Christ"

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31 Bacon, *Perspectiva*, 1.5.2: 64–65: "suorum oculorum species nisi diligenter caveat et rectificet situm eorum venient ad loca diversa in nervo communi; et ideo ei sepius apparet unum duo."

32 Bonaventure, *Legenda Maior*, 13: 139. Translation based on *Francis of Assisi: Early Documents*, 2: 632. Hereafter *FAED*: "Admirabatur quam plurimum in tam inscrutabilis visionis aspectu … Intellexit tandem ex hoc, Domino revelante, quod ideo huiusmodi visio sic divina providentia suis fuerat praesentata conspectibus, ut amicus Christi praenosceret … totum in Christi crucifixi similitudinem transformandum."

33 Bacon, *Perspectiva*, 3.2.4: 321.

34 Pecham, *Perspectiva communis*, 1.57: 136.

(*amicus Christi*). Francis's love for Christ moved him to "compassionate sorrow" (*compassivi doloris*) at the sight of Christ's wounds.[35] In this way, Francis was not merely the passive recipient of a divine vision, but he also participated in it, by making a kind of emotional judgment about what he saw. Francis's emotional reaction, to feel ardent affection (*ardorem*) toward Christ, in turn contributed to the fulfilment of the vision and its meaning: that Francis's flesh would be imprinted with "marvellous signs" (*mirabilem signorum impressit*)—i.e., the stigmata.[36] Francis's careful attentiveness to, and emotional interpretation of, what he saw was required for him to receive the truth of the vision. This evocation of attention and interpretation is reminiscent of the perspectivist emphasis on considering visual perceptions "diligently" (*diligenter*) and making informed judgments on them.[37]

Connecting *Perspectiva* and Visual Art

The concerns of Franciscan hagiographers asserting Francis's most extreme claim to sanctity thus correspond strongly with the concerns of perspectivist theorists, who were also Franciscan. My further argument is that this can help us to understand novel elements of later thirteenth- and early fourteenth-century Italian visual representations of Francis's stigmatization. This is not an entirely unprecedented claim.[38] For instance, Mordechay Lewy has recently made a different connection between optical knowledge and the development of ray imagery. Lewy suggested that artists used Bacon's notion of burning mirrors, or concave mirrors that reflect rays of light into a point of ignition, in the context of combating contemporary doubts regarding Francis's stigmatization.[39] Lewy argued that the Christ-seraph acted as a concave mirror that inflicted the stigmata on Francis's body.[40] While Lewy's instinct to interpret developments in ray imagery as a persuasive device based on widely disseminated contemporary optical knowledge is astute, his selection of burning mirrors as the core analogy is less convincing than reading the encounter between Francis and the Christ-seraph as a version of vision by direct rays.

The perspectivists consistently emphasized that reflected rays produced substantially less certain visual perception than direct rays. That is, seeing objects in a mirror was always less reliable than seeing them directly. Bacon clearly stated that "such [i.e., reflected] vision is not as perfect as when the eye

35 Bonaventure, *Legenda Maior*, 13: 139.
36 *Ibid.*, 13: 139.
37 See, for example, Bacon, *Perspectiva*, 1.10.1: 146; 2.2.1: 179.
38 Belting, "Saint Francis and the Body"; Flanigan, "Likeness and Compassion," esp. 77–82; Lewy, "Burning Mirrors."
39 Lewy, "Burning Mirrors," 99.
40 *Ibid.*, 116.

sees by a straight line, since reflection weakens a species."[41] Likewise, Pecham's primary focus in his book on reflection was the many errors (*errores*) that occur in differently shaped mirrors.[42] Connecting Francis's stigmatization with reflected rays would not necessarily make the miracle more convincing—the aim of both hagiographers and artists. In what follows, I will show that the rays connecting the Christ-seraph's and Francis's wounds are more productively read as analogous to direct visual rays than reflected rays.

The circumstantial evidence for some perspectivist influence on depictions of Francis's stigmatization is certainly suggestive. One of the key commissioners of the Saint Francis cycle at the Basilica of Saint Francis of Assisi,[43] the Franciscan Minister General, Matthew of Acquasparta (d. 1302), had been taught at the University of Paris by Pecham, while Bacon was also in Paris, around the time that they were elaborating their visual theories.[44] It is therefore possible that Matthew's earlier optical education might have informed his commission of the cycle. Moreover, Klaus Bergdolt has repeatedly argued that Giotto's work at the Basilica, specifically in terms of developing representations of three-dimensional space, was influenced by his contacts with the scientific circle around the papal court at Viterbo, which included a great deal of interest in *perspectiva*.[45] Finally, Dominique Raynaud has provided convincing additional evidence for the role of thirteenth-century optics in the development of linear perspective. By mapping the diffusion of perspectivist manuscripts from Oxford to Assisi, via Paris and Rome, Raynaud has demonstrated that commissioners and artists in Italy were familiar with *perspectiva*.[46]

This rich tradition of historical scholarship persuasively demonstrates not only the significance of perspectivist theory to artistic naturalism, especially in the development of linear perspective in late medieval Italian art, but also the accessibility of these theories to some of those responsible for producing artworks. Here, I do not seek to displace these valuable analyses: Rather, I suggest that there may be multiple ways in which *perspectiva* can help us to understand these frescoes. As a cutting-edge (Franciscan) theory that dealt seriously with

41 Bacon, *Perspectiva*, 3.1.1: 252–53: "non ita perfecta sicut quando oculus videt per lineam rectam, quia reflexio debilitat speciem."

42 See, for instance, Pecham, *Perspectiva communis*, 2.35: 188.

43 On the debate over the authorship of the cycle, see Smart, *The Assisi Problem*. I follow Cooper and Robson's argument that the involvement (or not) of Giotto in the cycle is far from the most interesting aspect of these frescoes. Cooper and Robson instead suggest that the cycle was authored collaboratively by several painters who were guided by educated Franciscan patrons: Cooper and Robson, *Making of Assisi*, 12; 230.

44 Raynaud, *Optics and the Rise*, 7–8; 30–31; Raynaud, *L'hypothèse d'Oxford*, 243.

45 Bergdolt, "Bacon und Giotto," 40–41; Bergdolt, *Auge und die Theologie*, 43. This has a long-standing foundation in art-historical scholarship: Belting, *Florence & Baghdad*; Edgerton, *Heritage of Giotto's Geometry*; Edgerton, *The Mirror, the Window*; Ganz, *Medien der Offenbarung*, esp. 297–307; Vescovini, "Pyramide visuelle"; White, *Birth and Rebirth*.

46 Raynaud, *Optics and the Rise*, 6–8. See also Raynaud, *L'hypothèse d'Oxford*.

the problem of certifying visual experiences, *perspectiva* is a useful model for making sense of how artists sought to convince their audiences of the truly miraculous nature of Francis's own extraordinary visionary experience.

Changing Ray Imagery

When we explore the potential influences of textual sources on visual artists and those who commissioned their work, it is, of course, important to remain open to how contemporaries might have understood the value of those texts. In this case, perspectivist texts might have been valued not just for convincingly constructing three-dimensional space on a two-dimensional surface but also for making an argument about the consistency between natural and supernatural causation. *Perspectiva* was a widely disseminated application of the broader multiplication of species framework, in which species emanate from every point of the surface of visible objects. In *perspectiva*, these species primarily affect the eyes and the brain, while in other applications, notably celestial bodies, multiplied species also influence the bodies of observers over great distances.[47] This model of causation is useful to think with when reading painted representations of Francis's stigmatization, because they depict Francis's body being affected by the distant figure of Christ.

The *Stigmatization* [**Fig. 2**] in the Upper Church of the Basilica is given pride of place in the St. Francis cycle, in the south wall of the fourth bay of the nave, directly beneath a fresco depicting the lamentation of Christ. Donal Cooper and Janet Robson perceptively highlight the compositional symmetry of this bay, and the entire cycle. They stress that the decision to place major scenes of Christ's life in relation to Francis's was intended to highlight forcefully Francis's status as an *alter Christus*, based on Bonaventure's assertions of the same in his *Legendae*.[48]

This version of the stigmatization includes several novel elements compared to the tradition represented by the Uffizi panel. First, the figure who appears to Francis is more clearly Christ under the appearance of a seraph, following the specification in Bonaventure's *Legenda Maior*.[49] Second, Francis clearly bears the side wound. Third, Brother Leo (d. c.1270) is included as an ambiguous "witness" to the event, although he is never mentioned in hagiographical accounts.[50]

Fourth, and most importantly for present purposes, the rays connecting the Christ-seraph figure and Francis are substantially different. The five wounds of Christ emit thin golden rays that travel to Francis's wounds. Two points about the appearance of these rays are significant here. First, the rays connecting

47 For the relation between *perspectiva* and astrology, see Tachau, "*Perspectiva* and *Astrologia*."
48 Cooper and Robson, *Making of Assisi*, 138.
49 Bonaventure, *Legenda Maior*, 13: 139: "Christo sub specie Seraph."
50 Dalarun, "Great Secret," 24.

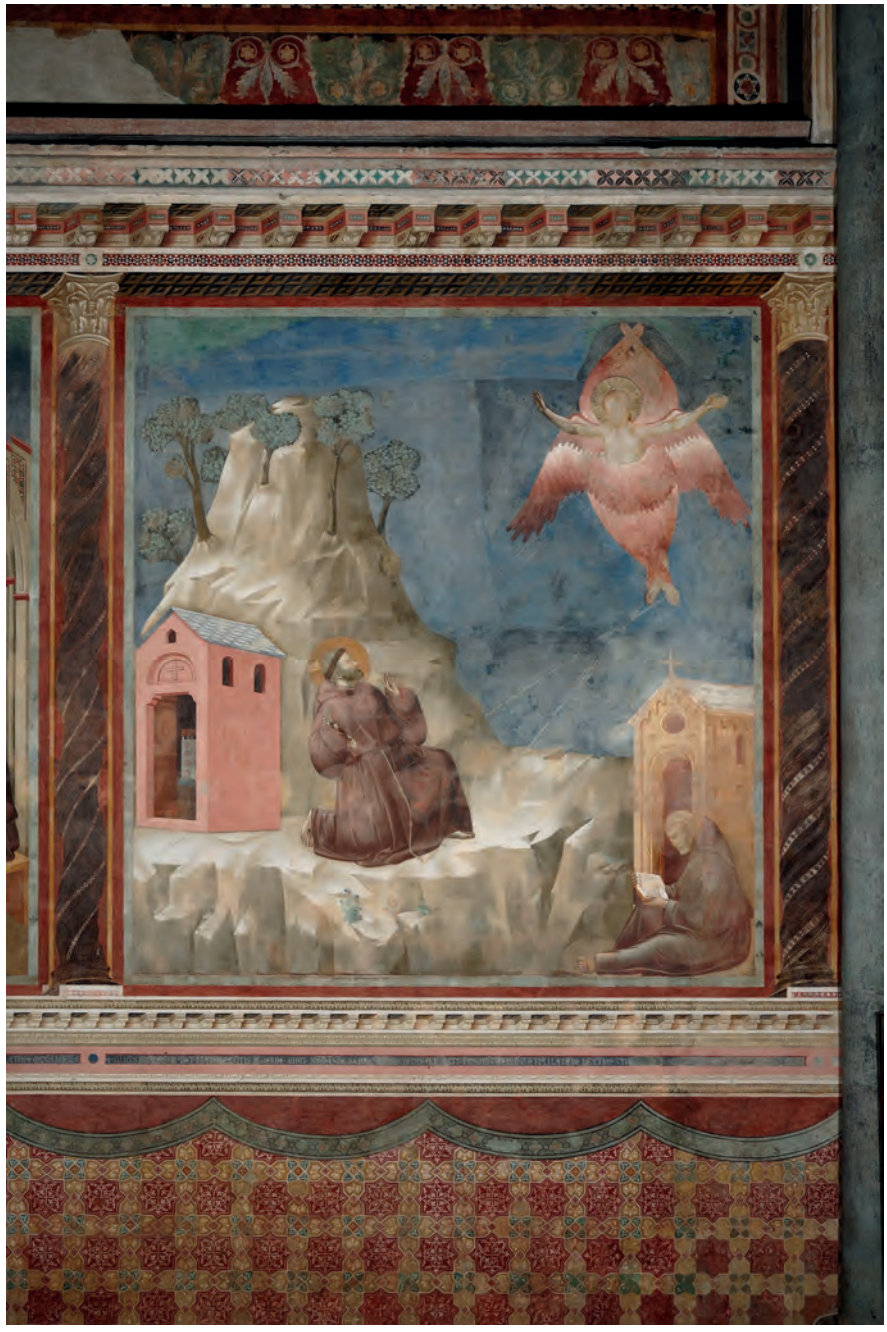

Figure 2. Legend of St Francis, 19. Stigmatization of St. Francis (c. 1288–1300). Fresco. Upper Church, San Francesco, Assisi. © Archivio fotografico del Sacro Convento di S. Francesco in Assisi, Italy.

the two figures' wounds link Christ's right hand with Francis's left and so on. Francis's wounds are thus a mirror image of Christ's, except for the side wound, which is on the right side of both figures. Second, at the origins (Christ's wounds), two other faint rays are emitted at either side of these central rays. Francis's pose is therefore also slightly more turned toward the Christ-seraph than in earlier images, in order to make the rays connect the two figures more clearly. This is a clear statement by the artists and commissioners of this fresco that likenesses of Christ's wounds were directly and immediately impressed onto Francis's body as a result of divine action and were certainly not self-inflicted, as some critics suggested.[51]

Cooper and Robson correctly associate this iconography with not only Bonaventure's hagiographical aim to associate Francis with Christ, but also the significance of divine illumination, or the need for divine intervention for humans to acquire knowledge, to Franciscan thinkers. They specifically cite the *Tractatus de luce*, written in the last quarter of the thirteenth century by friar Bartholomew of Bologna (d. c.1294).[52] Bartholomew's most recent editor, Francesca Galli, has argued that Bartholomew was decisively influenced by his contact with the circle of perspectivists at the University of Paris, which included Bacon, Pecham, and Bacon's non-Franciscan assistant, Peter of Limoges (d. c.1306).[53] Peter was the author of an immensely popular preachers' manual, the *De oculo morali*, that allegorized Bacon's model of physical visual processes to elucidate spiritual vision and survives in over 200 manuscript copies across Europe.[54] This testifies not only to the wide dissemination of the perspectivist model (and, by extension, the principle of the multiplication of species) well beyond the walls of the universities,[55] but also to the strong parallels that could be drawn between physical and spiritual visual experiences. Thus, while Cooper and Robson's emphasis on divine illumination is persuasive, we can also argue that the rays may be seen as a vivid illustration of how Christ's favor for Francis operated analogously to species multiplying along direct rays. The fact that the rays emanating from the Christ-seraph figure did not merely illuminate but also physically influenced Francis's body fits with Bacon's model of causation through universal radiation.[56]

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51 Brooke, *Image of St Francis*, 404; Frugoni, *Francis of Assisi*, 145.

52 Cooper and Robson, *Making of Assisi*, 203–204. Brooke also traces a significant thread in Franciscan thought associating Francis with light: Brooke, *Image of St Francis*, *passim*.

53 Galli, *De luce*, 31–34.

54 Newhauser, "Peter of Limoges," 31. No critical edition of Peter's treatise has yet been published.

55 For some of the many ways Peter's text could have impacted different spheres of visual art, see Kessler, Newhauser, and Russell, *Optics, Ethics, and Art*.

56 In contemporary Italian and later French manuscript images, the Christ-seraph was depicted as an illuminated object or source of light, with rays emanating from all points and directly impressing Francis with the stigmata. See, for instance, Paris, Bibliothèque nationale de France, MS Lat. 757, f. 360v (1300s); and Paris, Bibliothèque Mazarine, MS 506, f. 131 (c. 1450).

Visual and Spiritual Impressions

This analogy is also clear in the idea of "impression," both as a technical optical term and with respect to what Christ did to Francis. Bacon and Bonaventure shared a similar understanding of impression as a physical action that can occur between two spatially separated objects by means of a natural (e.g., species) or supernatural power (e.g., Christ's favor for Francis) traveling through the medium of air. As Bonaventure stressed the active role of the Christ-seraph in impressing Francis with the likenesses of His wounds, so too did Bacon claim that a visible object necessarily had a tangible effect on the seer through its species impressing itself on the eye, and the brain beyond.

By the 1260s, when Bonaventure was writing his hagiographies of St. Francis, the use of the verb *imprimere*, without much technical meaning, had become standard when referring to the stigmatization.[57] However, Bonaventure specifically justified the use of this term in the *Legenda Minor* by substantially increasing the precise detail of his description of Francis's reception of the stigmata: "The vision … inflamed him within with a seraphic ardor and marked his flesh externally with a likeness similar to the Crucified; it was as if the liquefying power of fire preceded the impression of the seal."[58] This vivid analogy of molten wax being impressed with a seal underlines the corporeality of Francis's reception of the stigmata, reinforcing Bonaventure's argument that the event was miraculous.[59]

In the mid-thirteenth century, the Franciscans were still facing opposition from their rival mendicant Dominicans, who objected to claims that Francis's stigmatization was a unique miracle.[60] Dominicans did this by arguing that it was Francis's "ardent imagination" (*vehemens imaginatio*), rather than direct divine action, that caused the wounds to be impressed on his flesh.[61] According to the Dominican position, it was perfectly possible for other holy people who contemplated Christ's passion with enough fervor to receive the stigmata.[62] It is that sort of criticism that Bonaventure is combating in this passage. While acknowledging that Francis's ardor had the power to make his material body more spiritually receptive, Bonaventure nevertheless made it clear that direct action by a physically present Christ was required to impress the wounds onto the thus prepared flesh.

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57 Bonaventure, *Legenda Maior*, 13: 139.

58 Bonaventure, *Legenda Minor*, 6: 258; *FAED* 2, 710: "visio … interius inflammavit ardore, carnem vero Crucifixo conformi exterius insignivit effigie, tanquam si ad ignis liquefactivam virtutem preambulam sigillativa quaedam esset impressio subsecuta."

59 Davidson, "Miracles of Bodily Transformation," 474. This analogy recalled Pope Honorius III's approval of the Rule by a sealed papal bull: Cook, "Giotto and the Figure," 141–142. See also Gardner, *Giotto and His Publics*, 41–42.

60 Vauchez, "Stigmates de saint François," 608.

61 Muessig, "Stigmata Debate," 485.

62 There were several claims of Dominican stigmatics after Francis died: Muessig, *Stigmata*, 151.

Crucially, although Bonaventure is clear about the physical presence of Christ during the stigmatization, he did not explain Francis's reception of the stigmata as the result of Christ directly touching Francis to impress the wounds. Bonaventure also contracted the time between Francis seeing the vision and receiving the stigmata, stating that "*immediately* the marks of nails began to appear in his hands and feet."[63] By making Francis's stigmatization the immediate (*statim*) effect of his visual experience, Bonaventure reduced the number of possible technical explanations for the mechanism by which it occurred.[64] While Bonaventure did not precisely elaborate on whether Christ caused Francis's stigmatization as a subject transferring grace through His gaze, or as a visible object transferring grace from His whole body onto Francis, what is important here is that the Dominican suggestion—that the stigmatization occurred internally without needing an external miraculous cause—was emphatically excluded.

The specific technical understanding of impression that Bonaventure articulated was also emphasized by Latin perspectivists.[65] According to Bacon, the structure of the eye is specifically designed to allow impressions of species: "The anterior glacial humor is moist, in order to be affected more readily by the species of light and color, for very dry substances do not easily receive impressions."[66] Furthermore, in his later textbook, Pecham echoed Bonaventure's seal analogy when he stated that "unless the species of the visible object were to make a distinct impression on the eye, the eye could not apprehend the parts of the object distinctly."[67] The physical imprint of species on the eye, and from there, in the common nerve (*nervo communi*), is therefore essential to seeing visible objects.[68]

The verbs *imprimere* and *sigillare* appear in both Bonaventure's account of Francis's stigmatization and in perspectivist treatises, suggesting a similarity between the ways in which both the miraculous event and everyday physical perception were thought to occur, even as the miracle unsurprisingly goes further than ordinary seeing. Both phenomena can be understood as specific applications of the multiplication of species model: Both take place through the transfer of some power between an object and an observer through a medium, resulting in an apparently instant physical effect on the observer.

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63 Bonaventure, *Legenda Maior*, 13: 139, *FAED* 2, 633: "*Statim* namque in manibus eius et pedibus apparere coeperunt signa clavorum."

64 Rona Goffen argued that the ray imagery in Giotto's fresco at the Bardi Chapel was a way of visualizing—and emphasizing the corporeality of—Bonaventure's more vague description of Francis's stigmatization: Goffen, *Spirituality in Conflict*, 62.

65 The language of impression was, when used in a generic sense, not novel to either Bonaventure or *perspectiva*: see Adelard of Bath, *Conversations*, 138; 142–43.

66 Bacon, *Perspectiva*, 1.4.2: 53: "anterior glacialis est humidus, ut citius patiatur a specie lucis et coloris, nam bene sicca non de facili recipiunt impressiones."

67 Pecham, *Perspectiva communis*, 1.28: 108–110: "nisi species rei visibilis distincte oculum sigillaret oculus partes rei distincte non apprehenderet."

68 Bacon, *Perspectiva*, 1.5.2: 63.

The perspectivist account of visual processes was thus consistent with the details of Bonaventure's narrative, even though the "Christ-as-visible-object" interpretation may not have been the only technical framework that might fit.

It is within the context of this shared hagiographical and perspectivist understanding of impression that the golden rays on the Upper Church fresco can be understood. Christ, who can be read here as a visible object as well as a gazing subject, is transmitting miraculous power from his wounds to impress their likenesses upon Francis's body, in a similar way to how *perspectiva* understood visible objects to transmit species from every point on their surface.

The fact that it is the middle of the three rays emitted from each wound that is impressed on Francis's body is arguably significant. Not only does this imagery preserve the symbolism of divine illumination from the iconographical tradition represented by the Uffizi panel, but it also conforms to the perspectivist claim that direct rays lead to more certain perception. The rays can be read as a persuasive statement that Francis's wounds had a direct, divine cause, without reflection or refraction through an intermediary that is denser than air.[69] A contemporary panel, more firmly attributed to Giotto, originally displayed at the San Francesco church in Pisa, now held at the Musée du Louvre [**Fig. 3**], seems to evoke this even more vividly. Each of Christ's wounds emits three or five rays [**Fig. 3a**]. In all five cases, it is the central ray that extends to each of Francis's wounds.

My argument thus complements and extends Cooper and Robson's central proposition, that the Saint Francis cycle should be understood within the broader context of late thirteenth-century Franciscan intellectual life.[70] I have argued that there are specific affinities between the representation of a foundational Franciscan claim for their founder and a contemporary theory of physical causation and perception, which was disseminated first by English Franciscan scholars teaching at the University of Paris, and subsequently through Peter of Limoges's widely used preachers' manual.[71]

During the first quarter of the fourteenth century, another slightly different model of rays began to appear, which depicted direct one-to-one correspondence between the wounds.[72] That is, rays from Christ's right hand joined with Francis's right hand, and so on. This followed the precedent that had already been set in earlier depictions of the side wound, which was consistently shown on the right side of both the Christ-seraph and Francis.

This modified use of rays is clear in the fresco in the Lower Church of the Basilica, [**Fig. 4**], by Pietro Lorenzetti (d. 1348), which dates from around 1320. The change seems to bring the iconography of Francis's stigmatization even more into line with perspectivist theory. In order for us to know a

69 *Pace* Lewy, "Burning Mirrors."

70 Cooper and Robson, *Making of Assisi*, 229–231.

71 Raynaud, *Optics and the Rise*, 3.

72 Chiara Frugoni noted this transition, although she did not relate the shift to contemporary optical thought: Frugoni, *Francesco e l'invenzione*, 213.

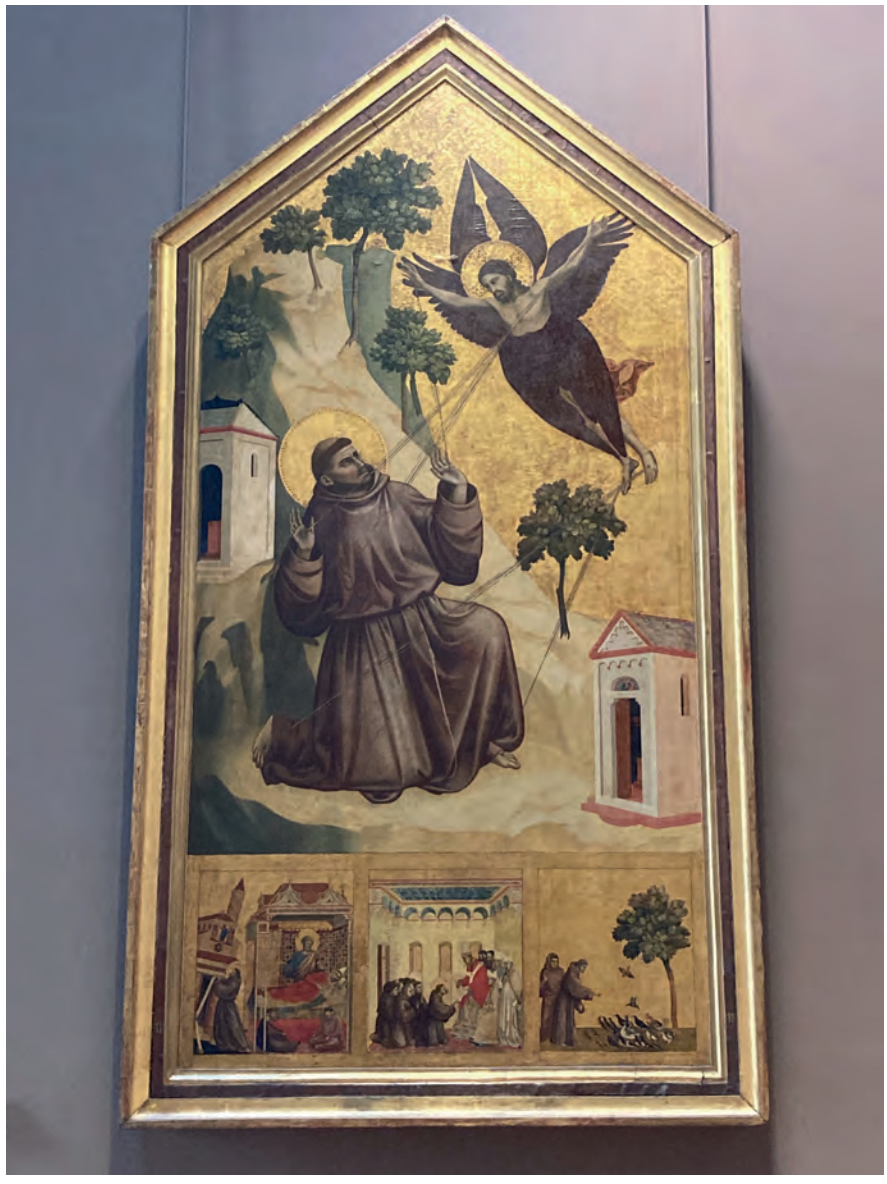

Figure 3. Giotto di Bondone. Stigmatization of St. Francis (1300). Tempera on wood. Musée du Louvre, Paris. Photo by author.

visible object with any degree of certainty, Pecham tells us, its species must be arranged on the glacial humor of the eye in the same order as they exist in the visible object.[73] The trust that we can have in our visual perceptions of the external world thus depends on the arrangement of species remaining constant

73 Pecham, *Perspectiva communis*, 1.41: 124.

Figure 3a. Detail of Figure 3. Photo by author.

throughout their journey along a direct ray from visible object to viewer. In this way, the later fresco is even more legible using the perspectivist understanding of species' role in visual processes than the earlier mirror-image model. This fresco shows Christ's wounds emitting rays that not only directly strike Francis's body on a perpendicular but also arrange themselves in the same positions.

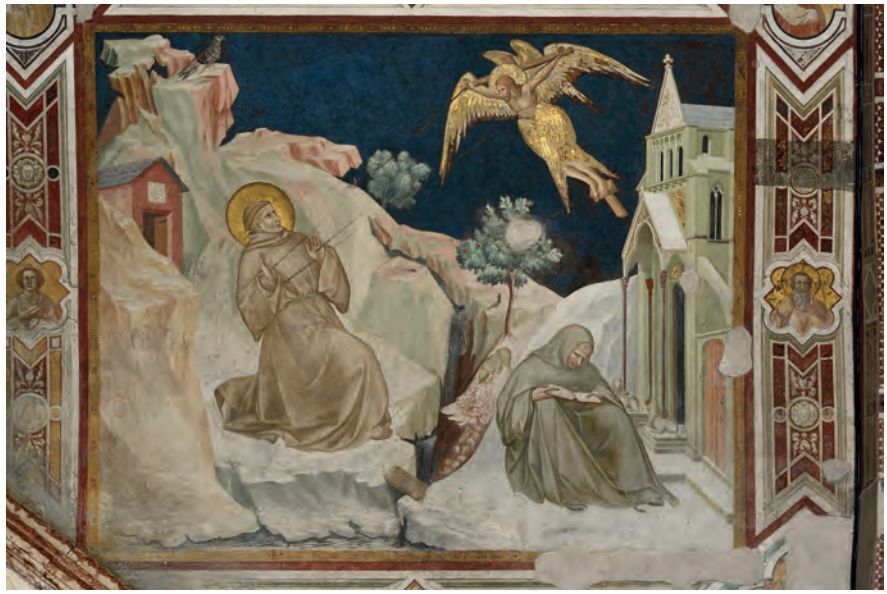

Figure 4. Pietro Lorenzetti. Stigmatization of St. Francis (c. 1320). Fresco. Lower Church, San Francesco, Assisi. © Archivio fotografico del Sacro Convento di S. Francesco in Assisi, Italy.

This correspondence model, as seen in Lorenzetti's fresco at Assisi, preserved the relationship between object and viewer that supports the certitude of visual impressions. Such a final iconographical shift was part of a process of persuasion that was reinforced by its similarity to developments in Franciscan visual theory. Just as the perspectivists argued that stable arrangement of species gives us greater trust in the reliability of our visual perceptions, so too does the consistent positioning of wounds on both the Christ-seraph and Francis strengthen the idea that the latter received them miraculously from the former.

Conclusion: Knowledge Transfers Between Text and Image

In sum, the selection of key Italian frescoes and panels depicting Francis's stigmatization that I have examined here can be productively interpreted through contemporary developments in Latin optical theory. There are multiple ways in which these panels and frescoes can be read. This article has explored one significant framework for interpreting the evolving uses of ray imagery.

It is certainly in the nature of this material that it is difficult to establish direct connections between written texts and visual art. As I have shown, however, there is suggestive circumstantial evidence to support a multifaceted relationship between English perspectivist theory, taught at the University

of Paris, and Italian visual representations of Francis's stigmatization. Furthermore, there is considerable correspondence between the concerns, terms, and agendas of hagiographical texts, perspectivist treatises, and visual representations. As such, one might even argue that it takes greater effort to avoid interpreting such images in the light of perspectivist concerns than is required to do so.

This investigation of late medieval Franciscan hagiography, iconography, and optical science further serves as an informative case study for the benefits of remaining open to reading both written and visual sources in terms of multidirectional knowledge transfer. Reading Italian panel paintings and frescoes of Francis's stigmatization through the principle of the multiplication of species allows us better to understand how artists and commissioners explored how to represent the miraculous event. This model of natural causation, on which Latin *perspectiva* depended, provided a more precise language and set of theories for persuasively depicting Francis's stigmatization as authentically miraculous but nevertheless comprehensible through (Franciscan) natural knowledge. Within the Franciscan order, there was a growing emphasis on using natural learning for spiritual and devotional ends during the thirteenth century.[74] Reading the changing imagery of Francis's stigmatization through a perspectivist lens—from representing the transfer of grace through the seraph's gaze, to depicting the Christ-seraph as a visible object affecting Francis through direct rays—provides further texture to our understanding of this trend. More broadly, this approach of connecting histories of science with histories of art and theology allows us to approach a more rounded understanding of medieval knowledge, unencumbered by disciplinary divisions that would seem artificial to the writers (and artists) we study.

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Genevieve E. Caulfield has recently completed an LAHP-funded PhD in the Department of History at University College London. During her PhD, in Autumn 2022, Genevieve undertook a doctoral research internship at l'École Pratique des Hautes Études in Paris, and from April to September 2023, she was a Thornley fellow at the Institute of Historical Research in London.

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74 Şenocak, *Poor and the Perfect*, 246.

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