The Visual Process: Immediate or Successive? Approaches to the Extramission Postulate in 13th Century Theories of Vision

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Introduction

Is vision merely a *state* of the beholder's sensory organ which can be explained as an immediate effect caused by external sensible objects? Or is it rather a successive *process* in which the observer actively scanning the surrounding environment plays a major part? These two general attitudes towards visual perception were both developed already by ancient thinkers. The former is embraced by natural philosophers (e.g., atomists and Aristotelians) and is often labelled "intromissionist", based on their assumption that vision is an outcome of the causal influence exerted by an external object upon a sensory organ receiving an entity from the object. The latter attitude to vision as a successive process is rather linked to the "extramissionist" theories of the proponents of geometrical optics (such as Euclid or Ptolemy) who suggest that an entity – a visual ray – is sent forth from the eyes to the object.[1]

The present paper focuses on the contributions to this ancient controversy proposed by some 13th-century Latin thinkers. In contemporary historiography of medieval Latin philosophy, the general narrative is that whereas thinkers in the 12th century held various (mostly Platonic) versions of the extramission theory, the situation changes during the first half of the 13th century when texts by Avicenna, Aristotle (with the commentaries by Averroes), and especially Alhacen, who all favour the intromissionist paradigm, were gradually assimilated.[2] It is assumed that, as a result,

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[1] For an account of the ancient theories of vision based on this line of conflict see especially D. C. Lindberg, *Theories of Vision from al-Kindi to Kepler*, Chicago, University of Chicago Press, 1976, pp. 1-17 and A. M. Smith, *From Sight to Light: The Passage from Ancient to Modern Optics*, Chicago – London, The University of Chicago Press, 2015, pp. 23-75.

[2] For these authors' criticism of extramission see e.g. Lindberg, *Theories of Vision*, pp. 44–49 (Avicenna), pp. 53–54 (Averroes), pp. 61–67 (Alhacen).

since ca. 1250 the intromissionist account was universally accepted by most Latin thinkers while extramission came to be regarded as a strange, eccentric, and antiquated theory – and the whole controversy became outdated.[3]

The present paper aims to somewhat amend this narrative. It argues that the extramissionist theory was taken quite seriously by many 13th-century thinkers (at least as a more or less sophisticated theory one should deal with and argue against) and even may have some merits in explaining the visual process. The attitudes towards extramission held by the 13th-century Latin thinkers investigated in the paper can broadly be divided into three categories: refutation, where the best example is Albert the Great (especially his works written in the 1240s and 1250s); syncretic tendencies to incorporate some extramissionist tenets into a broader intromissionist framework obvious especially in Roger Bacon (in his works written in the 1260s); and, finally, an open-minded rethinking and reformulation of the theory which, as I will argue, may be found in Peter Olivi (especially in various questions he wrote in the 1270s and early 1280s). As I will argue, while the traditional narrative is without doubt true in the general contour, these three figures do not fit into it. It is not true without qualification that the controversy between intromission and extramission had become antiquated already in the mid-13th century due to the "Alhacenian turn" – Bacon and Olivi still take the extramission postulate very seriously later in that century.

1. Extramission, Its Varieties, and Merits

Before these three medieval thinkers' accounts of vision can be considered, it ought to be elucidated 1) what an extramissionist theory amounts to, 2) what kinds of extramissionist involvement are present in theories of vision contemporary to the three thinkers investigated here, and 3) why an extramissionist theory may be challenging and interesting.

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[3] For a concise but broadly conceived instance of such a traditional narrative see D. N. Hasse, "Pietro d'Abano's Conciliator and the Theory of the Soul in Paris," in A. Aertsen, K. Emory, and A. Speer (eds), *Nach der Verurteilung von 1277. Philosophie und Theologie an der Universität von Paris im letzten Viertel des 13. Jahrhunderts. Studien und Texte*, Berlin, Walter de Gruyter, 2001, pp. 645-647. For more details, see Lindberg, *Theories of Vision*, pp. 87-121; Smith, *From Sight to Light*, pp. 228-277.

What are the distinctive features of extramissionist theories of vision? At least four general tenets can be pointed out:[4]

1) *The extramission postulate*. These theories share the assumption that visual perception consists in (or at least includes) the perceiver "extending" outwards to the visible object in a special way. This extension is often articulated by postulating an entity that issues from the eyes and reaches the object. In most authors, what is emitted is something material, albeit very subtle – e.g. the inner light of the Platonists, the visual ray of the Euclidians, or the visual spirit or *pneuma* of the Galenists.

2) *The primacy of visual activity*. As implied in the extramission postulate, the visual organ is active and plays a primary role in the visual process, which begins not because an external object affects the eye (which processes the affection in response), but because the eye itself acts first and reaches the object by means of something emitted. The primacy of the eye's activity is sometimes stressed by advocating the eye movements and the consequent focusing of attention.[5]

3) *Reducing vision to establishing a cognitive contact*. Vision is explained as establishing a contact between the observer and the object and often interpreted in haptic terms. The contact is ensured by the entity emitted from the eyes and hence vision is very much like a kind of touch: as the famous Stoic metaphor says, we see a thing by means of a *pneuma* just like a blind man "sees" by means of a cane.[6]

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[4] For a clear depiction of the grades of extramissive involvement in a visual theory see M. E. Kalderon, "Perception and Extramission in *De quantitate animae*," O*xford Studies in Ancient Philosophy* (forthcoming).

[5] E.g. Chalcidius, *Timaeus a Calcidio translatus commentarioque instructus*, J. H. Waszink (ed), London – Leiden, Brill, 1975, (hereafter *In Tim.*), 10, § 238, p. 251.

[6] This feature of extramissionist theories is stressed, e.g., by Nemesius of Emesa, *De natura hominis*, *Nemesii episcopi Premnon physicon sive Peri physeōs anthrōpoy liber a N. Alfano archiepiscopo Salerni in Latinum translatus*, C. Burkhard (ed), Leipzig, Teubner, 1917, 7, 75 (who mentions Hipparchus's comparison of the eye with its rays to a hand grasping a thing); Albertus Magnus, *De homine*, H. Anzulewicz and J. R. Söder (eds), *Alberti Magni Opera Omnia* XXVII.2, Münster, Aschendorff, 2008, 187b, 194b, 195b. Cf. Kalderon, "Perception and Extramission in *De quantitate animae*" who stresses that this condition in particular must be fulfilled for a theory to be called "extramissionist".

4) *Use of geometry.* Extramissionist theories often (but not exclusively) describe vision in geometrical terms – a visual cone is postulated with the base on the object seen and the apex in the eye.[7]

It is worth noting that several degrees of commitment to the extramission postulate are present in the visual theories commonly known or elaborated in Latin philosophy of the 12th and 13th century. First, there is (A) a genuine extramissionist explanation of vision – visual ray theories. These theories postulate visual rays emanating from the eyes towards the objects. The most prominent examples are (A1) the works on geometrical optics translated into Latin during the 12th and 13th century – Euclid's *De visu* and *De speculis* with a compilation *De speculis* falsely ascribed to Euclid, Ptolemy's *Optics* and Al-Kindí's *De aspectibus*. The visual theories expounded in these works display all of the aforementioned features.

Medieval scholars extrapolated a slightly different version of the visual ray theory also (A2) from Platonic philosophy, especially Plato's *Timaeus*, where a fiery nature is ascribed to the eyes with the consequence that they emit a special kind of light which coalesces with daylight to form a continuous body between the observer and the seen object. Such a ray theory is also ascribed to Augustine, at least by some Latin thinkers.[8] This Platonic version of the visual ray theory includes tenets 1)-3) but does not make use of geometry. As Albert the Great points out, this is the main difference between Euclidians and Platonists: whereas Euclidians explain the fact that distant things are seen poorly by the small angle included between the lateral rays of the visual cone, Platonists

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[7] There is no single understanding of the properties of such a visual cone. For a general survey of the issue among late ancient geometricians see H. Siebert, "Transformation of Euclid's Optics in Late Antiquity," *Nuncius*, vol 29, no. 1, 2014, especially pp. 90-94, 106-123.

[8] Augustine is commended as a proponent of extramission by Roger Bacon, *Perspectiva*, in *Roger Bacon and the Origins of Perspectiva in the Middle Ages*, D. C. Lindberg (ed and trans.), Oxford, Oxford University Press, 1996, (hereafter *Persp.*), I.7.2, 100 and criticized for the same reason by Petrus Iohannis Olivi, *Quaestiones in secundum librum Sententiarum*, B. Jansen (ed), Quaracchi, Collegium S. Bonaventurae, 1922–26, (hereafter *Summa* II), 58, 482–484; 73, 55–58. Roger Marston, *Quodlibeta quatuor*, Etzkorn, G. and Brady, I. (eds), Grottaferrata, Collegium S. Bonaventurae, 1994, I.19, 57-58 believes that Augustine proposed an intromission theory of vision; Petrus Sutton (?), *Quodlibeta*, F. Etzkorn (ed), *Franciscan Studies*, vol. 23, 1963, I.24, 111 asserts that extramission was a position upheld by the young Augustine when he was first instructed (*imbutus*) in a Platonic doctrine, but he corrected his view later. The ascription of a full-fledged extramissionist theory to Augustine is convincingly refuted by Kalderon, "Perception and Extramission in *De quantitate animae*".

propose that when the visual ray is obliged to stretch to a distant object, it is weakened and, hence, the vision is poor.[9]

However, the Platonic visual theory can also be interpreted differently – as including not only extramission of visual rays but also an emission from the visible object. (After all, a pure extramissionist theory may lead to the consequence that the visual act is not in the eyes but on the object where the visual ray touches the object.)[10] Such (B) a *syncretic* account is suggested already by Galen who stresses that Platonic theory includes not only an emission of internal light but also a reverse motion from the object to the eyes. In his view, the emitted entity is a visual *pneuma* that renders the intervening air an instrument of vision and enables the colours of the object to enter the eye.[11]

Latin scholars elaborated further on such syncretic accounts involving both extramission and intrommision. Two versions may be discerned – a syncretic account with (B1) a primacy of extramission and another one with (B2) a primacy of intromission. The primacy of extramission was stressed by some 12th-century Platonists: first, a visual ray of a fiery nature is sent forth from the eyes, then it encounters the object, disperses over its surface, grasps its form and brings the form back to the eye.[12] In the 13th century, the same view was held by the anonymous author of the *Lectura in librum De anima* (Paris, ca. 1246-47)[13] and later attributed to certain *Platonici* and dismissed by Roger Bacon, John Peckham (between 1277 and 79) and Peter Olivi.[14] This kind of

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[9] Albert, *De homine*, 192b-193a.

[10] A point ascribed to Augustine and criticized by Olivi, *Summa* II.73, 61-63.

[11] An outline of the Galenic account of vision is in Lindberg, *Theories of Vision*, pp. 10-11 and Smith, *From Sight to Light*, pp. 36-43. Hunajn / Constantine the African also point out that the Galenic account is in the middle between extra- and intromission – Constantinus Africanus, *De oculis*, *Collectio ophthalmologica veterum auctorum* VII, P. Pansier (ed), Paris, 1933, IV.2, 177-180.

[12] Such a position is defended by Bernard of Chartres, William of Conches, and Adelard of Bath – see Bernard of Chartres, *Glosae super Platonem*, P. E. Dutton (ed), Toronto, PIMS, 1991, II.7, p. 207; Guillelmus de Conchis, *Glosae super Platonem*, E. A. Jeauneau (ed), Turnhout, Brepols, 2006, II.137, pp. 248–249; idem, *Dragmaticon Philosophiae*, I. Ronca and A. Badia (eds), Turnhout, Brepols, 1997, VI.19.3–5, pp. 244–245; Adelard of Bath, *Quaestiones naturales*, *Conversations with his Nephew: On the Same and the Different, Questions on Natural Science, and On Birds*, Ch. Burnett (ed and trans.), Cambridge, Cambridge University Press, 1998, 23, pp. 140–142. See also Lindberg, *Theories of Vision*, pp. 90–94 and Smith, *From Sight to Light*, pp. 237–241.

[13] Anonymus, *Lectura in librum De anima a quodam discipulo reportata*, R. A. Gauthier (ed), Grottaferrata, Collegium S. Bonaventurae, 1985, (hereafter *Lectura*), II.14.1, 324.

[14] Bacon, *Persp.* I.7.3, 102-104; John Peckham, *Perspectiva communis*, *John Pecham and the Science of Optics*, D. C. Lindberg (ed and trans.), University of Wisconsin Press, 1970, I.46(49), p. 128; Olivi, *Summa* II.73, 55, 59-61.

syncretic theory includes the extramission postulate and the primary activity of the eye (tenets 1)-2)), but does not reduce vision to establishing a contact by means of a visual ray; the form of the object must be transported to the eye. None of its proponents mentioned above elaborates on the geometry of vision (tenet 4)); although a visual cone formed by the rays is sometimes mentioned by them.

Another kind of syncretic theory was quite prominent in the 13th century, especially among Franciscan thinkers. According to this theory, vision is basically established by intromission – but the postulate of visual rays emitted from the eyes is preserved (for details see Bacon below). Such a (B2) syncretic theory of vision with a primacy of intromission is suggested by Grosseteste (1220s), in an eclectic manner by Bartholomeus Anglicus (ca. 1240),[15] and also by an anonymous master whose questions on *De anima* are preserved in MS Assisi, Biblioteca del Sacro Convento 138 (ca. 1240s).[16] Visual rays are also advocated in the anonymous *Summa philosophiae* once ascribed to Grosseteste (1265–1275).[17] As I argue below, an elaborate version of this account is proposed by Roger Bacon (in early 1260s). Bacon's version is adopted by John Peckham and apparently also by Roger Marston (Oxford, between 1282 and 1284).[18] This syncretism is mocked as a peculiar novelty by Albert the Great in the 1240s and 1250s[19] and later in a *quodlibet* attributed to Peter Sutton.[20] The position cannot be called

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[15] Robert Grosseteste, *De iride seu De iride et speculo, Die Philosophischen Werke des Robert Grosseteste, Bischofs von Lincoln*, L. Baur (ed), Münster, Aschendorff, 1912, pp. 72-73; Bartholomeus Anglicus, *De proprietatibus rerum*, Frankfurt, Wolfgang Richter, 1601 (hereafter *DPR*), III.17, 64.

[16] Anonymus, *Quaestiones in De anima*, MS Assisi, Bibl. Sacr. Conv. 138, fol. 253vb. On the text see Long, R. J., "The anonymous De Anima of Assisi, biblioteca comunale cod. 138," in Musco, A. et al. (eds), *Universalità della ragione. Pluralità delle filosofie nel Medioevo*, vol. 2, Palermo, Officina di studi medievali, 2012, pp. 271-280.

[17] Pseudo-Robert Grosseteste, *Summa philosophiae*, in L. Baur (ed), *Die Philosophischen Werke des Robert Grosseteste, Bischofs von Lincoln*, Münster, Aschendorff, 1912, XII.15-18, pp. 502-508.

[18] Peckham, *Perspectiva communis* I.46(49), 128-130; Roger Marston, *Quodlibeta* I.19, 58-59.

[19] Albert, *De homine*, 198a; idem, *De sensu et sensato*, in S. Donati (ed), *Alberti Magni Opera Omnia VII.2A*, Münster, Aschendorff, 2017 (hereafter *De sensu*), I.5, 28b ("*novella et fatua … non opinio, sed insania*"). Albert may have had some of his contemporaries in mind (Grosseteste and Bartholomeus Anglicus being the most probable options). However, it is possible that Albert actually meant a syncretism with the primacy of extramission – then his target would be, e.g., William of Conches. For further surmises on the issue cf. H. Anzulewicz, "Perspektive und Raumvorstellung in den Frühwerken des Albertus Magnus," in J. A. Aertsen and A. Speer (eds), *Raum und Raumvorstellungen im Mittelalter*, Berlin – New York, Walter de Gruyter, 1998, pp. 263-264 and Hasse, "Pietro d'Abano's Conciliator," p. 649.

[20] Peter Sutton (?), *Quodlibeta* I.24, 110. While the traditional dating of the quodlibet was 1309-1311, recently it was suggested that it might be from the late 1280s (see M. Pickavé, "The Controversy over the Principle of Individuation in Medieval Quodlibeta (1277–ca. 1320): A Forest Map," in Ch. Schabel (ed),

"extramissionist" except in a broad sense. Its general setting is intromissionist and with its stress on the primary activity of the visible object it is against tenets 2) and 3). However, it preserves 1) the extramission postulate and 4) the use of geometry (albeit in an intromissionist rendering).

It is obvious that the extramission postulate was not a rare and eccentric feature of 13th-century visual theories – rather on the contrary. This list of visual theories more or less committed to the extramission postulate constitutes a framework for investigating the attitudes of Albert the Great, Roger Bacon and Peter Olivi to extramission. The most important question for such an investigation is their stance towards tenet 3, namely, whether they agree with extramission as an instrument for establishing a cognitive contact between the perceiver and the object seen. Hence, in examining their theories, a special emphasis is placed on the following two issues regarding the cognitive contact: First, how is the cognitive contact with the external object established? Is it by means of something received in the sight, or rather by something emitted from the eye? And when the cognitive contact is established, is it sufficient for vision to occur, or must a further operation be performed? Second, is there an ontological gap between the material world and the more or less immaterial sensory soul? If so, how is the gap bridged in the visual process?

Besides these questions, the paper is guided by the query whether an extramissionist theory actually has any merits. Why might it be challenging? Why did so many medieval thinkers deal with extramission, if it is empirically doubtful? Several arguments in favour of the theory are often repeated by medieval authors, who seem to have regarded at least some of them as sound and convincing. Besides some anecdotes from the ancient literature (cats seeing in the dark, basilisks killing with their glance, or menstruating women staining the mirror with their gaze), there was also the authority of some ancient thinkers defending (or apparently defending) extramission: besides geometrical optics and Platonists, even Aristotle is sometimes referred to as a proponent

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Theological Quodlibeta in the Middle Ages: The Fourteenth Century, Leiden, Brill, 2007, p. 56; in such case its author cannot be Peter Sutton.

of visual rays (especially his *De animalibus* and *Meteorologica*).[21] Theological arguments for extramission can also be brought up.[22]

Further, the extramission postulate was traditionally connected with geometrical description of the visual experience. Hence, the extramissionist approach – with the visual cone demarcating the visual field whose size depends on the angle included between the rays issuing from the eye – was believed to be better equipped to explain how the distance, location and size of an object is perceived. However, the notion of a visual cone can very easily be incorporated into the intromissionist framework, as we will see below – hence, it does not force a thinker to uphold extramission.

Nevertheless, the best argument for extramission is that it may describe some aspects of the visual process more adequately. It seems to be better equipped (than the intromissionist account) to explain some psychological features of the visual experience, e.g., attention focusing, active searching for a thing in the visual field, successive apprehension of a thing exceeding the boundaries of the visual field, etc. In all of these cases, the perceiver's active involvement is needed, as physiologically manifested in the eye-movements, which the extramissionist can easily explain with reference to the movements of the axis of the visual cone.

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[21] See, e.g., Pseudo-Petrus Hispanus, *Expositio libri de anima*, in Pedro Hispano, *Obras Filosóficas* III, M. Alonso (ed), Madrid, Instituto de filosofía "Luis Vives", 1952, III.10, pp. 393-394 (without justification); Bartholomeus Anglicus, *DPR* III.17, 64; Anonymus, *Quaestiones in De anima*, MS Assisi, Bibl. Sacr. Conv. 138, f. 253vb; Bacon, *Persp.* I.7.2, 100; Roger Marston, *Quodlibeta* I.19, 58. The Aristotelian passage often referred to is *De generatione animalium* V, 1, 781a1-2; however, the belief of medieval scholars that this passage is a statement of extramission seems to be based on a mistranslation – see D. C. Lindberg, *Roger Bacon and the Origins of Perspectiva in the Middle Ages*, Oxford, Oxford University Press, 1996, p. 359, note 223. Nevertheless, Aristotle's adherence to an intromissionist approach is not uncontested. The elements of a visual ray theory in Aristotle's writings are briefly listed by S. Berryman, "Euclid and the Sceptic: A Paper on Vision, Doubt, Geometry, Light and Drunkenness," *Phronesis*, vol. 43, no. 2, 1998, pp. 183-184. It is possible that such an attitude to visual theory prevailed in the early Peripatetic school – note that Chalcidius attributes the view that visual rays are emitted by the eye to both geometricians *and Peripatetics* (*In Tim.*, 10, § 238, 250-251).

[22] For medieval thinkers, incorporeal beings such as angels or separated souls cannot be affected by any corporeal impulses from the outside; hence, it is possible that they see by means of extramission. Such a position is mentioned and refuted by Bonaventure, Aquinas, and Peckham – see Bonaventura, *Commentaria in quatuor libros Sententiarum, Opera omnia* I-IV, Quaracchi, Collegium S. Bonaventurae, 1882-89, IV.49.2.1.3.2, 1020b; Thomas Aquinas, *Commentum in quartum librum Sententiarum*, Parma, 1858, IV.44.2.1, 315b-316a; and John Peckham, *Quaestiones tractantes de anima*, H. Spettmann (ed), Münster, Aschendorff, 1918, II.20.6, 164. The position seems to have been preferred to the theory of *species* by Olivi, *Summa* II.58, 489.

Take an example of a little penny on the floor, attributed by Nemesius of Emesa to "geometricians". The perceiver may see the whole floor without noticing the penny, until he focuses his attention directly towards it.[23] A conundrum for intromission: if the perceiver sees by virtue of effects caused in his sensory organs by the outside objects, he should see the floor *and* the penny at the same moment. An extramissionist has an advantage here: he may point out that the visual capacity is not distributed homogeneously in the visual cone (and hence, unlike the floor, the penny is not seen in the first moment) and refer to the movement of the axis (which enables the perceiver to see the penny as soon as the axis falls upon it).

Therefore, an extramissionist theory raises questions concerning the temporal and spatial aspects of the visual process. Is vision immediate or successive? And do we apprehend a single entity or a number of things at once? The extramissionist stance is that only one thing is seen at one moment – strictly speaking, only the point touched by the axis of the visual cone. The visual apprehension of a thing is completed by a quick transportation of the axis of the visual cone, i.e., successively.[24] On the contrary, Aristotelians insist on the view that vision is immediate – the reception of the object's form is not a result of a local motion but an alteration, and hence instantaneous. Based on the intuition that vision is immediate, some Aristotelians point out that the successive propagation of the visual ray and the consequence that the vision would occur in time is in fact an argument against extramission, because it renders a counterintuitive conception of vision.[25]

Therefore, the third issue considered in the following accounts of Albert, Bacon, and Olivi is their stance towards the temporal and spatial aspects of the visual process.

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[23] Nemesius, *De natura hominis*, 7, 75. The same example is also in Pseudo-Euclid, *De speculis*, in *Alkindi, Tideus und Pseudo-Euklid. Drei optische Werke*, A. A. Björnbo and S. Vogl (eds), Leipzig – Berlin, Teubner, 1912, 15, 106.

[24] This is how the medieval interpreted the Euclidian proposition that "nothing is seen as a whole simultaneously" (Euclid, *De visu*, W. R. Theisen (ed), "*Liber de visu*: The Greco-Latin Translation of Euclid's Optics," *Mediaeval Studies*, vol. 41, no. 1, 1979, 1, 62).

[25] See John Blund, *Tractatus de anima*, in *Treatise on the Soul*, D. A. Callus and R. W. Hunt (eds), trans. M. W. Dunne, Oxford, Oxford University Press, 2013, IX.101, 54; and Peter Sutton (?), *Quodlibeta* I.24, 110. The argument originates from Averroes, *De sensu et sensato*, *Compendia librorum Aristotelis qui Parva naturalia vocantur*, H. A. Wolfson, D. Baneth, and F. H. Fobes (eds), Cambridge, Mass., The Mediaeval Academy of America, 1949, p. 34.

2. Refutation: Albert the Great

The first theory under consideration here is the Aristotelian approach developed by Albert the Great, which is generally dismissive towards extramission of any kind.[26]

It is worth noting that Albert evidently inclined to extramission in his earliest theological works written in the 1230s and early 1240s. Having a foundation in Plato's *Timaeus* and Chalcidius's commentary on it, he assumes that vision is performed by rays emitted from the eyes coalescing with the external light and that the visual concentration depends on the close connection of the visual rays.[27] Albert's attitude towards extramission changed in the course of his work on the anthropological compendium *De homine* (finished in Paris around 1242) under the strong influence of Aristotle, Avicenna's *De anima* and Averroes's *De sensu* who all argued against extramission. Here Albert dismisses extramissionist theories for the first time and embraces an Aristotelian one.[28] Criticism of extramission is present also in his later *De sensu et sensato* (written in Italy in 1256).[29]

The reason why Albert devoted such a considerable amount of text to arguing against extramission may have been that – in his view – the theory was defended by not a few of the contemporary Latin scholars (*a multis hodie defenditur*).[30] Thus, in his early

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[26] On Albert's visual theory see e.g. N. H. Steneck, "Albert on the Psychology of Sense Perception," in J. A. Weisheipl (ed), *Albertus Magnus and the Sciences. Commemorative Essays 1980*, Toronto, PIMS, 1980; L. Dewan, "St. Albert, the Sensibles, and Spiritual Being," *ibid.*; on the optical issues in his works see Lindberg, *Theories of Vision*, pp. 104-107; C. Akdogan, *Optics in Albert the Great's De sensu et sensato: An Edition, English Translation, and Analysis*, PhD Dissertation, University of Wisconsin-Madison, 1978; and especially Anzulewicz, "Perspektive und Raumvorstellung". On the dating of Albert's writings see H. Anzulewicz, *De forma resultante in speculo*, 2 vols., Münster, Aschendorff, 1999, I, 6-17.

[27] A Platonic theory of vision is evident in Albert's *De natura boni* (Germany, ca. 1233/34) and *De resurrectione* (Paris, before 1242). This seminal change in Albert's visual theory is analysed in Anzulewicz, "Perspektive und Raumvorstellung," pp. 252-267.

[28] *De homine*, 185a-189b and especially the appendix to that question on pp. 189b-202b. Note that the appendix is a later addition to the text, written sometimes before 1246 (see *ibid.*, XIV). As a consequence of assimilating the Aristotelian framework in *De homine*, Albert abandoned extramission also in his theological works – see Albertus Magnus, *Commentarii in II Sententiarum*, A. Borgnet (ed), *Alberti Magni Opera Omnia* XXVII, Paris, Vivès, 1894, II.13.2, 246b (Paris, around 1246) and idem, *Quaestio de sensibus corporis gloriosi*, in *Alberti Magni Opera Omnia* XXV.2, A. Fries, W. Kübel, and H. Anzulewicz (eds), Münster, Aschendorff, 1993, 2.1, 116b-118a (after 1246 or 1249).

[29] *De sensu* I.7-8, 31a-39a. Albert denies extramission also in his *De anima* (Germany, between 1254-57) – Albertus Magnus, *De anima*, C. Stroick (ed), *Alberti Magni Opera Omnia* VII.1, Münster, Aschendorff, 1968, II.3.14, 119b.

[30] Albert, *De sensu* I.5, 27a; I.8, 35a.

De homine he argues against Plato, Euclid and Al-Kindí (he calls the latter two *aspectivi*, perhaps on the account of the title of Al-Kindí's *De aspectibus*); later in his *De sensu* he uses similar arguments against Empedocles (whom he considers to be a predecessor of Euclid) and again Plato. His reasoning is quite extensive, albeit not particularly original. He heavily relies on Avicenna and Averroes.[31]

From among the extramissionist tenets outlined in the introduction, Albert's main target was the postulate of a material emission itself. If vision was performed by the emission of a material body that touches the object, a little eye must have the capacity to create an enormously long body reaching up to the stars, which is impossible. Further, since two objects cannot be in the same place, two opposite observers could not see each other, because their visual rays would obstruct one another. For the same reason, every medium such as air or water would have to be porous – filled with vacuous places for visual rays to penetrate them.[32] Albert also assails the extramissionist assumption of the causal primacy of the eye. If the sensory organ were a primary active element in the visual process, the movements of the visual rays would fall under the commands of the will – the beholder would be able to emit the ray and retract it on demand. However, we experience that we are *forced* to see what is in front of us.[33]

All the deficiencies of the extramission theories lead Albert to embrace an intromissionist theory of the Aristotelian kind. Hence, he models the visual process in direct opposition to the extramissionists. The entity endowed with the primary causal activity is not the eye, but the visible object – a colour. The object alters first the medium between itself and the observer and then the eye of the observer, creating its similitude or *species* in the observer's visual power.[34] As a consequence, the cognitive contact

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[31] Albert's borrowings from Avicenna's *De anima* are well documented – see D. N. Hasse, *Avicenna's De Anima in the Latin West: The Formation of a Peripatetic Philosophy of the Soul, 1160–1300*, London, The Warburg Institute, 2000, pp. 60-69; on vision pp. 124-126 and especially the analytical index on pp. 270-279 (Albert's borrowings from Avicenna's *De anima* III). Note that Albert did not use Alhacen's *Perspectiva* in his reasoning against extramission (he mentions him only in passing in *De sensu* – see Lindberg, *Theories of Vision*, pp. 106, 252) – in the 1240s and 1250s the assimilation of Alhacen was still in its early stages and was taking place in Oxford, rather than in Paris (see note 62 below).

[32] *De homine*, 194b, 195a.

[33] *De homine*, 197b.

[34] See, e.g., *De homine*, 146a-b; 185b, 189a (recognition of the Aristotelian position); *De anima* II.3.7, 108; *De sensu* I.5, 28b; and N. Winkler, "Zur Erkenntnislehre Alberts des Großen in seinem De anima-Kommentar als systematische Einheit von sensus, abstractio, phantasmata, intentiones, species, universalia und intellectus," *Bochumer Philosophisches Jahrbuch für Antike und Mittelalter*, vol. 19, 2016, pp. 84-92.

between an observer and a visible object is established by the causal activity of the object and the *species* in the visual power is a principle of cognizing the thing seen.[35]

The question yet to be answered is how the ontological gap between the corporeal object and the visual power is bridged. Although Albert is not committed to the view that the visual power is a part of the soul as a spiritual substance, he nonetheless take it to be a potency seated in the material organ[36] and hence a more noble thing than the external object. As a consequence, there arises the problem of the so-called ascendant causality, i.e., how the less noble object can act upon a more noble one, if the agent is assumed to be more noble than the patient.

Albert deals with the problem in his *De anima*[37] and introduces two possible strategies, both assuming that the *species* (as a causal effect of the object) must be "elevated" and refined by an external agent in order to be able to affect the visual power. In the first account, the external agent is light; in the second it is a power of the soul that proceeds from the observer spiritually (*egreditur spiritualiter*), applies itself to the sensible object (*supponit se sensibili*), and confers being of an incorporeal and spiritual kind on it (*confert ei esse quasi incorporeum et spirituale*).[38]

The former account (held, e.g., by pseudo-Peter of Spain and later by pseudo-Grosseteste)[39] seems ridiculous to Albert; light has a role only in vision, thus it cannot interfere in the perceptual process of other senses. Besides, the form taken in itself is an immaterial essence – it can act immaterially.[40] The latter account, which Albert attributes

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For passivity of the senses in general, see e.g. *De homine*, 257b; *De anima* II.3.5, 102b-103b, and Steneck, "Albert on the Psychology of Sense Perception," pp. 270-272.

[35] *De homine*, 185a.

[36] *De homine*, 256a.

[37] *De anima* II.3.6, 104a-107b; see also Dewan, "St. Albert, the Sensibles, and Spiritual Being," pp. 305-307. As A. Pattin, *Pour l'histoire du sens agent: la controverse entre Barthélemy de Bruges et Jean de Jandun ses antécédents et son evolution*, Leuven, Leuven University Press, 1988, 1-3 points out this passage pertains to the early discussions about the so-called agent sense. Albert even refers to the famous passage by Averroes (Averroes, *Commentarium magnum in Aristotelis de anima libros*, F. S. Crawford (ed), Cambridge, Mass., The Mediaeval Academy of America, 1953 (hereafter *De an.*), II.60, 220f) from which these discussions originate.

[38] *De anima* II.3.6, 104b-105a.

[39] Pseudo-Hispanus, *Expositio libri de anima* II.11, 238-239; II.14, 277-279; pseudo-Grosseteste, *Summa philosophiae* XII.12, 496-498.

[40] *De anima* II.3.6, 106b.

to Plato, Augustine, and a few of his contemporaries (*pauci modernorum*),[41] seems a little more probable to him – but he still finds it unintelligible. He confesses that he just cannot imagine how sensory powers could be emitted towards the sensibles.[42]

Thus, Albert dismisses both solutions and declares the question itself to be foolish: in his view, every active potency is (*ex definitione*) perfectly suited to act *without* any external mover. Hence, the sensible form is able to cause its similitude in the medium in spiritual or intentional being, i.e. without its matter. Consequently, the ontological gap between the material object and the ontologically more noble visual power is bridged by the simple fact that the form of the object can create a spiritual or intentional *species* which, having such a refined mode of existence, is able to act on the visual power.[43]

However, the intromissionist account of vision still has some problems to be dealt with. A proponent of Euclidian extramission still has the advantages of the geometrical description of vision on his side and can argue against the Aristotelian theory from this background. Albert is aware of this strategy and presents several arguments against his own position.[44]

For example, if an observer sees a colour by means of an alteration caused by the colour first in the medium and then in his eye, why does the observer not see what is behind him? After all, the colours of objects behind his back alter the medium as well.[45] Albert's general strategy is to preserve optics, but on an Aristotelian foundation: as he notes, although some of the assumptions of geometrical optics are false, it can be modified in a way that both saves the conclusions of the optical science and does not contradict Aristotle.[46] Thus, he makes a concession to the Euclidian: he concedes that there *are* rays involved in vision that in turn make a geometrical description possible. However, these

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[41] It is not obvious who actually held such a view. Pattin, *Pour l'histoire du sens agent*, p. 3 suggests John Blund (*Tractatus de anima* VI.59, 34) and the anonymous *Lectura in librum de anima* (*Lectura* II.10.3, 277); however, Blund only mentions a *visus agens* and the *Lectura* assumes that the power acts upon the object – but neither uses the terminology employed by Albert. (Moreover, the author of the *Lectura* holds the same position as Albert: he ascribes a role in the spiritualization of the form solely to the medium – *Lectura* II.22.5, 404.) As I argue below, this account is similar to the role attributed to extramission later by Roger Bacon in his visual theory.

[42] *De anima* II.3.6, 106b-107a.

[43] *De anima*, 106a; 107a-b.

[44] *De homine*, 187b-189b.

[45] *De homine*, 187b.

[46] *Commentarii in II Sententiarum* 13.2, 246b.

rays are not visual rays emitted from the eyes, but the rays of external light. Light has the power to actualize the colours and these alter the medium in the rectilinear direction. These very rays constitute the visual cone and determine the paths of the *species* the observer receives. The obvious consequence is that the observer can see only what is in front of him.[47] Such a reinterpretation of the nature of the visual cone also enables Albert to preserve the validity of Euclidian geometrical demonstrations and include them in the Aristotelian framework.[48]

Another objection to Albert's position pertains to the issue whether the visible object is apprehended whole at once, or one part after another (and hence in time). The former option is challenged by the example of a coin on a floor (presented above).[49] The way Albert deals with this objection also reveals his opinion regarding the temporal and spatial aspects of the visual process. I consider, first, his criticism of Euclid's position, and second, his explanation of the example with the coin.

In Albert's reading, Euclid's theory is based on the conviction that what is seen at one moment is only one point of the surface of the object – the very point touched by the axis of the visual cone. The vision of the whole object is completed because the axis runs over all the points of the object.[50] However, this "scanning" of the object is so quick that it only takes a portion of time which is insensible to the perceiver. Therefore, the entire object is seen *as if* it were apprehended whole at once.[51]

However, Albert holds that such a view implies an implausible account of vision. All the visual acts would be only *illusory* – every time an object is seen in its entirety, the sight would be *deceived* and the visual representation of the object would be only something fabricated by the perceiver from the infinite partial visions.[52] In such a case, the whole would never be seen – the ray would not be able to run over all the points and grasp the visible object in its entirety.[53]

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[47] *De homine*, 189a.

[48] *Ibid.*, 198b. See also *ibid.*, 201a and *De sensu* I.8, 39a; I.14, 52b. Such a reinterpretation was popular among the proponents of intromission – one may find it in Avicenna or Alhacen (Lindberg, *Theories of Vision*, pp. 49-50; 71-74); before Albert also in Blund, *Tractatus de anima* IX.93, 50.

[49] *De homine*, 188a. Albert also ponders the problem in detail later in his *De sensu* III.

[50] *De sensu*, III.4, 106a.

[51] *De sensu,* III.7, 110b-111a.

[52] *De sensu,* III.4, 105b.

[53] *De sensu,* III.4, 106b-107a; III.7, 111a.

Albert, on the contrary, is committed to the Aristotelian view that vision is instantaneous (since the change caused by the colour actualized by light is not a local motion but an alteration),[54] the visual power is always altered by one visible object at a time,[55] and hence the entire object is seen at once.[56]

However, the example of the coin on the floor, tailored to Euclidian needs, still calls for an explanation in the Aristotelian framework. Apparently, the only way for Albert is to compromise his Aristotelian tenets a little. He distinguishes between two aspects of the visual process: apprehending the form impressed in the eye (*virtus visiva … apprehendit formam impressam in oculo*) and "directing" the form to the thing apprehended or focusing on the thing (*dirigit formam illam ad rem, quam apprehendit per ipsam*). Whereas the first phase of the visual process accords with the Aristotelian understanding of vision as passive and receptive, the second phase includes a kind of activity on the part of the visual power. Applied to the example, once the form of the floor is impressed in the eye, the visual power can "direct" (*dirigit*) the form to the floor in order to apprehend it – either to the whole floor, or only to a part of it. In the latter case, it apprehends one part of the floor after another and sees the coin as soon as it encounters it.[57]

Hence, Albert is willing to introduce a role for attention in his Aristotelian account of vision. The attention is not a presupposition of the vision; it is rather a mechanism for ordering the impressions already received. Surprisingly, the impressions are not understood here as causal vehicles providing the vision, but rather as representations by virtue of which the perceiver apprehends the external things. Whether this does or does not lead to a form of representationalism is a question for another investigation.[58]

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[54] *De homine*, 180b; 187a.

[55] *De homine,* 176b.

[56] *De sensu*, III.4, 106b; III.7, 111b.

[57] *De homine*, 189a-b.

[58] For other representationalist implications arguably present in Albert's visual theory see L. Lička, "What is in the Mirror? The Metaphysics of Mirror Images in Albert the Great and Peter Auriol," in B. Glenney and J. F. Silva (eds), *The Senses and the History of Philosophy*, London, Routledge, 2019, pp. 136-137.

3. Syncretism: Roger Bacon

Another attitude to the extramissionist theory is a less dismissive one. Such an attitude may be found in the works of Roger Bacon and other perspectivists. Bacon developed his theory of vision in his early *De sensu*[59] and especially in his mature works based on the optical tradition – *De multiplicatione specierum* and *Perspectiva* (both written in the 1260s).[60] Later, Bacon included the latter work as Part V in his *Opus maius* and also summarized its contents in *Opus tertium*.[61]

At the time of Bacon's life the Latin scholarship witnessed a vast -dissemination and assimilation of Alhacen's *De aspectibus* and its intromissionist account of vision – a movement of which Bacon himself was a cutting-edge initiator.[62] At first sight, Bacon's

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[59] While attributing *De sensu* to Bacon is not based on firm evidence, there are no decisive arguments *against* Bacon's authorship. Although S. Donati, "Pseudoepigrapha in the *Opera hactenus inedita Rogeri Baconi*? The Commentaries on the Physics and on the Metaphysics," in J. Verger and O. Weijers (eds), *Les débuts de l'enseignement universitaire à Paris (1200-1245 environ)*, Turnhout, Brepols, 2013, recently convincingly contested the authenticity of some of Bacon's early Aristotelian commentaries, it does *not* concern the case of *De sensu* (see *ibid.*, 156). The arguments for attributing it to Bacon are gathered in S. C. Easton, *Roger Bacon and his Search for a Universal Science*, New York, Russell & Russell, 1952, pp. 232-235 who inclines (with some hesitation) to a preliminary ascription of the work to Bacon. Since the work bears profound doctrinal similarities to Bacon's mature works, I treat it here as authentic. See also Y. Raizman-Kedar, "Questioning Aristotle: Roger Bacon on the True Essence of Colour," *The Journal of Medieval Latin*, vol. 17, 2007, pp. 372-383 on the colour theory presented in this work. For the dating of *De sensu* see note 62 below.

[60] For Bacon's intellectual biography see Easton, *Roger Bacon* and the more recent A. Power, *Roger Bacon and the Defence of Christendom*, Cambridge, Cambridge University Press, 2013; cf. also an up-to-date chronology by J. Hackett, "From *Sapientes antiqui* at Lincoln to the New *Sapientes moderni* at Paris c. 1260–1280: Roger Bacon's Two Circles of Scholars," in J. P. Cunningham and M. Hocknull (eds), *Robert Grosseteste and the Pursuit of Religious and Scientific Learning in the Middle Ages*, Dordrecht, Springer International Publishing, 2016. On Bacon's visual theory see H. Hoffmans, "La genèse des sensations d'après Roger Bacon," *Revue néo-scolastique*, vol. 15, 1908, pp. 474-498; Lindberg, *Theories of Vision*, 107-116; Lindberg, *Roger Bacon*, lxviii-lxxxvii; P. K. Loose, *Roger Bacon on Perception: A Reconstruction and Critical Analysis of the Theory of Visual Perception Expounded in the Opus Majus*, PhD Dissertation, Ohio State University, 1979, pp. 179-282; Y. Raizman-Kedar, *Species as Signs: Roger Bacon (1220–1292) on Perspectiva and Grammatica,* PhD Dissertation, University of Haifa, 2009, pp. 69-101; Smith, *From Sight to Light*, pp. 260-271; cf. also K. H. Tachau, *Vision and Certitude in the Age of Ockham. Optics, Epistemology and the Foundations of Semantics, 1250 – 1345*, Leiden, Brill, 1988, ch. 1.

[61] Roger Bacon, *Opus tertium*, *Un fragment inédit de l'Opus tertium de Roger Bacon*, P. Duhem (ed), Florence, Quaracchi, 1909, (hereafter *OT*(Duhem)), pp. 75-97.

[62] The earliest references to Alhacen in the context of psychological literature (known to me) are made by Adam Buckfield in his *De sensu* commentary (late 1230s) and the so-called Oxford gloss on *De sensu* influenced by him (see G. Galle, "Edition and Discussion of the Oxford Gloss on *De sensu* 1," *Archives d'histoire doctrinale et littéraire du Moyen-âge*, vol. 75, 2008, pp. 211; 271-272); there are also several excerpts made by Bartholomeus Anglicus in early 1240s (see his *DPR* III.17, 62-64 and Lindberg, *Theories of Vision*, p. 253). Note also Richard Fishacre referring to Alhacen in his *Questio de luce* written in Oxford between 1245 and 1248 (see J. R. Long and T. B. Noone, "Fishacre and Rufus on the Metaphysics of Light:

own account of vision seems to have been heavily influenced by Alhacen. After a careful exposition of the anatomy and physiology of the eyes and the psychology of the internal senses in the opening distinctions of his *Perspectiva*, Bacon introduces the mechanism of vision: the objects issue *species* in all directions and once the *species* are received in the eye, the object is seen. For vision, the *species* of colour and light are required, which is proved by Alhacenian arguments: when exposed to intensive colour or light, the observer experiences afterimages or even pain.[63] The *species* are not forms of the whole object (as in Aristotle or Albert), but rather forms emitted from every point of the surface of the object in all directions along direct lines. In the eye, only the relevant forms are selected – the ones entering the eye along the lines perpendicular to its surface – and a veridical representation of the object is reconstructed. These lines of propagation of the intromitted *species* constitute a visual cone – a notion enabling the use of geometry for explaining vision.[64]

However, Bacon's account should not be labelled "intromissionist" too hastily. Bacon is not a blind imitator of Alhacen – after all, in his own words, although Alhacen is used by some wise Latins, his compendium is nothing other than an exposition of Ptolemy's *Optics*, which is in turn "the true source of the optical science". Further, Bacon

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Two Unedited Texts," in J. Hamesse (ed), *Roma, magistra mundi. Itineraria culturae medievalis*, Turhnout, Brepols, 1998, pp. 520, 532). Nevertheless, a full-fledged assimilation of Alhacen is to be situated not earlier than to the early 1260s – putting Bacon's *Perspectiva* aside, Alhacen is often advocated by the Oxford master Geoffrey of Aspall in his *De sensu* commentary – see e.g. Galfridus de Aspale, *Quaestiones super librum de sensu et sensato*, MS Todi, Biblioteca Comunale 23, q. 35, fol. 108r; q. 69, ff. 117r-v. (On this work, see S. Ebbesen, Ch. T. Thörnqvist and V. Decaix, "Questions on *De sensu et sensato*, *De memoria* and *De somno et vigilia*. A Catalogue," *Bulletin de philosophie médiévale*, vol. 57, 2015, pp. 66-70; I am indebted to S. Ebbesen for sharing with me some images of the Todi manuscript and some portions of his preliminary transcription of the work.) Note that all the references are in works written in Oxford (or – in the case of Bartholomaeus – by an Englishman), which is consonant with Bacon's claim, made in the 1260s that *perspectiva* had not been taught in Paris so far and only twice in Oxford (Roger Bacon, *Opus tertium*, in *Fr. Rogeri Bacon Opera quaedam hactenus inedita*, J. S. Brewer (ed), London, 1859, 11, 37) and suggests that Bacon received training in this science in Oxford, probably in the early 1250s (see Hackett, "From *Sapientes antiqui*", p. 125) and under the influence of Grosseteste's writings. Furthermore, with respect to numerous references to Alhacen in Bacon's *De sensu*, the work should be dated as being written after that training in the (early) 1250s – rather than in the 1240s, as Easton, *Roger Bacon*, pp. 59-61; 232-235 suggests.

[63] *Persp.* I.5.1, 60-62. For the argument from pain, see also Roger Bacon, *Liber de sensu et sensato*, R. Steele (ed), *Opera hactenus inedita* XIV, Oxford, Clarendon, 1937, (hereafter *De sensu*), 1, 3.

[64] *Persp.* I.6.1-2, 68-78.

stresses that he has also borrowed from another extramissionist authors, such as Euclid, Tideus, or Al-Kindí.[65]

Hence, one need not be surprised when later in part I of the *Perspectiva* one encounters an explicit *defence* of extramission. Bacon points out that extramission was proposed by many respectable authorities – optical scientists, Christian saints such as Augustine, and even (allegedly) Aristotle.[66] Further, authors such as Avicenna, Averroes and Alhacen who are famous for their criticism of extramissionist theories, should be read as arguing only against a robust version of extramission – against the postulation of a body issuing forth from the eyes that would seize the *species* of the object and bring it back to the eye.[67]

Against such an exaggerated stress on the primacy of extramission, Bacon takes a modest position of syncretism with a primacy of intromission. According to this view, approved also by "experts in Aristotle's philosophy and *perspectiva*", vision consists in both receiving the *species* of the object in the eye and in propagating something from the eye.[68] In contrast to its many earlier proponents, Bacon presents a different understanding of the extramission postulate. What is emitted from the eyes is not a body of a subtle nature, but a *species* of the eye or of the sight (*species oculi* or *visus*). Such a postulate can be easily justified in the context of his philosophy: if every entity in the universe is constantly multiplying its *species* in the surrounding medium, that is also what the sensory organs should do. And just as the *species* of an object somehow resembles that object as its source, the *species* of the sense of sight somehow resembles the sight and participates in the nature of the visual power to some extent.[69]

Hence, Bacon proposes a syncretic account of vision, in which intromission has a primary role. The emission is not responsible for the multiplication of the *species* of the objects; they are propagated independently of the observer. The cognitive contact between perceiver and object is established by the causal influence of the latter on the

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[65] *OT* (Duhem), 75-76; cf. also *Persp.* I.7.2, 100; *Persp.*, app. 1, 336; and Roger Bacon, *De multiplicatione specierum*, *Roger Bacon's Philosophy of Nature*, D. C. Lindberg (ed and trans.), Oxford, Clarendon Press, 1983, (hereafter *DMS*), pp. 347. The differences between Alhacen and Bacon are summarized by Smith, *From Sight to Light*, p. 271.

[66] *Persp.* I.7.2, 100.

[67] *Persp.* I.7.3, 102.

[68] *Persp.* I.7.3, 104.

[69] *Persp.* I.7.2, 100; *DMS* I.2, 30-32.

former. But Bacon evidently wants to preserve extramission as well. In this strategy, his sources may be Robert Grosseteste or Bartholomeus Anglicus.[70] But does extramission have any role in the visual process, or is its presence in Bacon's theory a residue of an inorganic harmonization of different sources (as seems to be the case in Bartholomeus)?

Scholars have taken various strategies in answering this question. Some emphasize the intromissionist framework of Bacon's account and infer that Bacon's references to extramission are nothing more than *ad hoc* additions incoherent with the rest of his theory, or an unimportant relic of earlier authors, included by Bacon due to his efforts to harmonize all the available sources.[71] Postulating the *species* of the eye would thus be merely a Bacon's way of paying homage to authors such as Ptolemy, but would not have any significant role in his theory.[72]

However, Bacon's references to extramission are systematic, not merely occasional. A strong affirmation of extramission is found in the *Opus tertium* – Bacon asserts that although the intromissionist account is so "deeply rooted in the hearts of the common scholars that they do not want to hear anything contrary", extramission is the truest (*veracissimum*) position.[73] The work was intended as a brief summary of everything important in the *Opus maius* – would Bacon put so much stress on extramission here, if it was just an *ad hoc* addition to his theory? Besides that, there are numerous places in his optical works where extramission is taken for granted or argued for.[74]

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[70] See note 15 above. Bacon's acquaintance with Grosseteste's works is evident (see e.g. D C. Lindberg, *Roger Bacon's Philosophy of Nature*, Oxford, Clarendon Press, 1983, pp. xviii-xx; xlix-lvi and Bacon's eulogies of Grosseteste, e.g. in *Compendium studii philosophiae*, in J. S. Brewer (ed), *Fr. Rogeri Bacon Opera quaedam hactenus inedita*, London, 1859, 8, 469); Bartholomeus's encyclopaedia was known in Oxford in the late 1240s (see Long, Noone, "Fishacre and Rufus," p. 519) and Bacon refers to it in a passage on magnet in his *Opus minus*, *Fr. Rogeri Bacon Opera quaedam hactenus inedita*, J. S. Brewer (ed), London, 1859, p. 384.

[71] Bacon himself stresses that, when writing on *perspectiva*, he does not want to imitate just one author, but chooses the best parts of every account – *OT* (Duhem), 75.

[72] Lindberg, *Theories of Vision*, pp. 114–116; G. B. Matthews, "A Medieval Theory of Vision," in P. K. Machamer and R. G. Turnbull (eds), *Studies in Perception: Interrelations in the History of Philosophy and Science*, Columbus, Ohio State University Press, 1978, p. 196; Raizman-Kedar, *Species as Signs*, pp. 91-92. Lindberg, *Roger Bacon*, pp. lxxxiii–lxxxvi suggest that it may also be a result of the fact that Bacon wrote his works "in haste, or in multiple drafts" and left them unrevised.

[73] *OT* (Duhem), 78-79.

[74] See *DMS* I.2, 30-32; I.5, 74; *Persp.* I.7.2-4, 100-106; II.1.1, 160-162; II.1.3, 174-176; II.2.1, 176-178; III.1.2, 260-262. The *species visus* is also employed in *DMS* II.5, 128; II.10, 176; *Persp.* I.9.1, 126. Loose, *Roger Bacon on Perception*, pp. 205-207, argues that the first two thirds of *Perspectiva* I present a *preliminary*

Recently, some scholars have also proposed that Bacon's syncretism may have been motivated by theological concerns. Bacon states that the eye, which not only receives the *species* but also actively cooperates, may serve as a model for spiritual vision, which requires not only the reception of divine grace, but also the cooperation of the recipient's soul and free will.[75] However, I believe that Bacon also had purely philosophical reasons to endorse extramission, which are internal to his visual theory.[76] In my opinion, extramission is not a source of confusion in Bacon's theory, but on the contrary perfectly coherent with Bacon's account. What does Bacon himself say about the role of the *species* of the eye in the visual process? He asserts that the *species* of an inanimate object are ontologically inferior to the eye (as a part of an animated body) and are not suited to act upon the eye just on their own account (*non sunt nate statim de se agere plenam actionem in visum propter eius nobilitatem*); therefore, they must be refined in some way. The *species* of the eye are emitted in the medium, alter and ennoble it and make it commensurate to the visual power. As a consequence, the entrance of the *species* of the object is prepared, because the visual power emitted in the medium ennobles the *species* of the object and renders them commensurate to the eye (*eam nobilitat, ut omnino sit conformis et proportionalis nobilitati corporis animati, quod est oculus*) and consequently able to act upon it.[77]

It is obvious from this passage that extramission (of the sensory power) is Bacon's answer to the issue of the ontological gap between the material world and the cognizer. The conviction that sensory organs are ontologically superior and more noble

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intromissionist account of the visual process, which is later in part I and especially in part II specified and modified by the extramission postulate.

[75] *Persp.* III.3.1, 324; the passage was pointed out by Loose, *Roger Bacon on Perception*, pp. 271-272 and Raizman-Kedar, *Species as Signs*, p. 90; the theological interpretation is embraced by J. Hackett, "Roger Bacon and the Moralization of Science: From *Perspectiva* through *Scientia Experimentalis* to *Moralis Philosophia*," *I francescani e le scienze*, Spoleto, Centro Italiano di Studi sull'Alto Medioevo, 2012, pp. 384-385; idem, "From *Sapientes antiqui*", pp. 133-134.

[76] The active component of Bacon's visual theory was stressed already by Hoffmans, "La genèse des sensations", pp. 479-486, but only in order to reprehend the theory for an implicit tendency to subjectivism. A rare acknowledgement of Bacon's syncretism may be found in Loose, *Roger Bacon on Perception*, especially pp. 205-225, 244-253.

[77] *Persp.* I.7.4, 104; also I.8.1, 108-110. Another way the sensory power acts on the received *species* is that it forces it to abandon the "laws of nature" and the rectilinear path of multiplication. Once in the animated medium, especially in the nerves, the *species* is not propagated along a direct line anymore but along a "twisted line" (*linea tortuosa*) – see *DMS* II.2, 102; idem, *The Opus maius of Roger Bacon*, 3 vols., J. H. Bridges (ed), Oxford – Edinburgh, 1897–1900, IV.2.2, 117; *OT* (Duhem), 78.

than material things is asserted already in his *De sensu*. There Bacon expounds the Aristotelian statement that organs are receptive of a certain kind of qualities, because their nature is constituted by the middle between the extremes of these qualities.[78] Bacon explains that it should not be taken that, e.g., the eye is constituted from a colour in the middle of the scale between white and black, but that the elements of organs are elevated above the common status of inanimate objects and have the most noble being possible in nature. Such being is called "spiritual", although not in a sense implying something incorporeal; they are highly refined and subtle, while still material.[79]

Hence, there is a salient gap between the sensory organs and material objects. How can such a gap be bridged? It is worth noting that there is no mention of extramission in *De sensu*.[80] It seems that when Bacon was writing this work, he was still advocating an Aristotelian theory of abstraction. According to this traditional Aristotelian explanation of how the *species* of a material object can enter the soul's power, the *species* of the object can act upon the senses because they are refined already in the medium and they undergo a continuing abstraction. Indeed, early Bacon remarks several times that the *species* are endowed with spiritual being in the medium and in the organ.[81]

But later in the 1260s, he abandoned the notion of the *species* having spiritual being in the medium.[82] He asserts that it is foolish to deny the material nature of the *species*. They obtain their existence from their causes and since these causes (i.e., the things that generate the *species* on the one hand and the matter from whose potency the *species* are educed on the other) are material, the *species* are material as well.[83]

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[78] Aristotle, *De anima* II.11, 424a4-5; Averroes, *De an.* II.118, 313-314.

[79] *De sensu* 1, 4. Bacon ascribed such an elevation to the powers of the soul and the heavens.

[80] *Species* of the eye are mentioned in *De sensu* 1, 10-11, but no role in the completion of the visual act is attributed to them. Vision occurs when the sight receives the form of the seen objects and renders them to the ultimate sentient seated at the intersection of the optical nerves – *De sensu* 3, 7-8. (The same assertion is also in *Persp.* I.5.2, 62-64; however, as we have seen, later it is problematized *how exactly* the forms are received in the sense.)

[81] *De sensu* 8, 28; 23, 117-118; 24, 124-125. Such a claim is perhaps influenced by Grosseteste – see Robert Grosseteste, *De lineis angulis et figuris*, *Die Philosophischen Werke des Robert Grosseteste, Bischofs von Lincoln*, L. Baur (ed), Münster, Aschendorff, 1912, p. 60.

[82] And apparently also the whole notion of abstraction, as argued by Y. Raizman-Kedar, "The Intellect Naturalized: Roger Bacon on the Existence of Corporeal Species within the Intellect," *Early science and medicine*, vol. 14, no. 1, 2009, pp. 140-145.

[83] *DMS* III.2, 190. Note that materiality does not imply corporeality here – the *species* are material but they are not bodies *sui generis* – see *DMS* III.1, 178-186. For an interpretation of Bacon stressing that the sensory organs are not only affected materially by *species* but also actually coloured by them, see M. Mantovani,

Consequently, Bacon needs another mechanism for bridging the ontological gap. It seems that extramission of the visual power (or "*species visus*") can serve as such a mechanism in the case of vision. Hence, Bacon's concession to extramission is not cognitive, but *metaphysical*: it is proposed in order to deal with the problem of ascendant causality and the need of *species* of material objects for refinement.[84] Bacon seems to endorse the position that *species* are ennobled by the soul's power proceeding towards them – a position refuted in Albert's *De anima* – which can perhaps be understood as an early anticipation of the later notion of *sensus agens*.[85]

In Bacon's middle account between intromission and extramission, what is his stance regarding temporal and spatial aspects of vision? Does he prefer an Aristotelian solution or a Euclidian one? Following Alhacen's lead, he dismisses the Aristotelian position, advocates the Euclidian one and gives a reasonable solution to the objections to it that had earlier been raised by Albert.

First, Bacon doubts even the basic Aristotelian claim that alteration occurs immediately – the very multiplication of *species* takes a moment, albeit an imperceptible one for the observer's sensory powers. Hence, it *appears* to him as if the light were propagated in no time.[86] Consequently, sensation also takes place in time.[87] However, the time necessary for completing the visual act is sometimes even perceptible to the

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"*Visio per sillogismum*: Sensation and Cognition in 13th-Century Theories of Vision," in E. Băltuță (ed), *Medieval Perceptual Puzzles. Theories of Perception in the 13th and 14th Centuries*, Leiden, Brill, 2020, pp. 117–129.

[84] Cf. also Loose, *Roger Bacon on Perception*, pp. 249-250 who mentions a "vertical causality" and Augustinian influences on Bacon's theory of vision. Another corroboration for such interpretation of Bacon's visual theory may be that it accords with the way some later medieval thinkers understood him. In anonymous questions on optics I found in a 14th-century Prague manuscript, Bacon is listed among proponents of extramission along with Euclid and Ptolemy and his metaphysical justification of extramission from *Persp.* I.7 is analysed there – see Anonymus, *Quaestiones de perspectiva*, MS Praha, Knihovna metropolitní kapituly M.100, ff. 69rb, 69va-b. I am preparing an edition of the treatise.

[85] The understanding of *sensus agens* as a kind of extramission is mentioned (and refuted) by John of Jandun, *Questio de sensu agente*, A. Pattin (ed), *Pour l'histoire du sens agent: la controverse entre Barthélemy de Bruges et Jean de Jandun ses antécédents et son evolution*, Leuven, Leuven University Press, 1988, p. 225. The activity of the sensory power is connected with extramission also in Anonymus, *Lectura* II.14.1, 323-324.

[86] *De sensu* 23, 114-118; *DMS* IV.3, 220-226; *Persp.* I.9.3-4, 134-144 (note that he explicitly associates the multiplication in time also with the *species visus*); *OT* (Duhem), 81. See also Tachau, *Vision and Certitude*, pp. 20-21.

[87] *De sensu* 23, 120-121.

observer – Bacon explains this experience by highlighting that the visual act includes not only a reception of the multiplied *species* but also a visual "judgement".[88]

This "judgment", which takes time to be made, is a certification of the vision performed by the movement of the axis of the visual cone travelling over the object. Bacon advocates the Euclidian view that there is a different sensitivity in different regions of the base of the visual cone.[89] However, it should not be understood in the way criticized by Albert, as if some parts of the base were seen and others completely unseen. Euclid's proposition that nothing is seen whole at once should be understood – according to Bacon – with regard to different grades of certainty: the central parts are seen clearly and with certainty and the peripheral ones are unclear and confused.[90] Unlike Aristotelians (and Euclid in Albert's reading), Bacon advocates the view that we see a number of things at once – but only one thing (or a part of it) is seen with certainty. The vision is completed by the passing of the visual axis (which follows the movements of the eye), by means of which the parts of the thing are certified successively, one after another.[91]

Hence, vision is not a state of being affected, but rather a process in which visual acuity is accomplished by an active scanning of the visual field. A number of things are seen at once, but with a different grade of certainty.

4. Reinterpretation: Peter Olivi

Finally, there is a strategy developed by Peter Olivi in some of his questions (written in the late 1270s and early 1280s) later included in his *Summa*.[92] His attitude towards

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[88] *Persp.* I.9.4, 144. "Time" is also included among the conditions of (veridical) vision – an object must not move too quickly in order to be seen properly – *Persp.* I.9.2, 132; *OT* (Duhem), p. 81.

[89] Note that according to Bacon, there are two visual cones: one constituted by the *species* propagating from the object and the other consisting of the *species* of the sight. However, these two cones are identical regarding their location – *Persp.* I.7.4, 106; II.2.1, 178.

[90] *Persp.* I.7.4, 106; II.2.1, 178; also I.6.2, 78.

[91] *Persp.* II.2.1, 178; also I.7.4, 106.

[92] On Olivi's visual theory, see e.g. Tachau, *Vision and Certitude*, pp. 39–54; R. Pasnau, *Theories of Cognition in the Later Middle Ages*, Cambridge, Cambridge University Press, 1997, pp. 130-134; 168-181; J. F. Silva and J. Toivanen, "The Active Nature of the Soul in Sense Perception: Robert Kilwardby and Peter Olivi," *Vivarium*, vol 48, no. 3, 2010, pp. 260-277; H. T. Adriaenssen, "Peter John Olivi on Perceptual Representation," *Vivarium*, vol. 49, no. 4, 2011, pp. 324-352; J. Toivanen, *Perception and the Internal Senses: Peter of John Olivi on the Cognitive Functions of the Sensitive Soul*, Leiden, Brill, 2013, pp. 115-222; and M. E. Kalderon, *Sympathy in Perception*, Cambridge, Cambridge University Press, 2017, ch. 5. Olivi's interest in the optical issues was uncovered by Tachau, *Vision and Certitude*, pp. 40-49 and recently

extramission is an instance of the way he deals with philosophical theories generally – ignoring what is and what is not conceived as plausible by his contemporaries, he often devotes a careful investigation to every theory and uncovers its (often unspoken) foundations and merits, while being determined not to be too dogmatic in philosophical matters.[93]

Although optics and theory of vision witnessed an increasing prevalence of Alhacenian intromission in the 1270s and 1280s (John Peckham and Witelo were composing their works on optics at that time), Peter Olivi does not hesitate to doubt the "Alhacenian turn" and reproaches those who identify a book by "one Saracen" with the whole of optical science for idolatry. Besides, Olivi notes, indicating his own efforts, that what is explained by "rays coming from things" can be reframed using "virtual rays of the sight itself" – just as Augustine and many others used "corporeal rays of the eye" for the same purpose.[94] Olivi's optical project in its totality cannot be introduced here, thus the focus will be on some aspects of his visual theory in relation to his rethinking of extramission.

Before his visual theory can be outlined, two basic tenets of Olivi's anthropology important for his philosophy of perception need to be recalled. The first one is dualism: the sphere of material objects and the sphere of spiritual souls are radically different. Whereas material objects are extended and inanimate, spiritual souls are unextended and endowed with life and consciousness. Thus, the issue of the ontological gap is of special importance to Olivi. The second tenet is the activity of the soul in its operations: the soul (or its power) is always the first active principle of its operations; otherwise the operations would be necessitated by something external and, as a result, the soul would

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partially investigated by D. Demange, "Olivi et les Perspectivi," *Oliviana*, vol. 5, 2016, http://oliviana.revues.org/850 and L. Lička, "Attention, Perceptual Content, and Mirrors: Two Medieval Models of Active Perception in Peter Olivi and Peter Auriol," *Filosofický časopis*, vol. 65, Special Issue 2, 2017, pp. 103–110, but a complete account is still missing. The dating of Olivi's questions is borrowed from a preliminary chronology of Olivi's works by S. Piron (to whom I express my gratitude for sharing it) – see also S. Piron, "La chronologie des écrits d'Olivi," *Oliviana*, vol. 6 (forthcoming).

[93] For Olivi's "sceptical" approach to philosophical theories see the classical D. Burr, "Peter John Olivi and the Philosophers," *Franciscan Studies*, vol. 31, 1971, especially pp. 69-70.

[94] *Summa* II.58, 499.

be passive and not free. Both tenets also presuppose that the soul and its powers are noble and superior to material objects.[95]

The early Olivi perhaps hesitated concerning the intromissionist theory of *species*[96] and later he mentions having taught the common opinion regarding the *species* in schools, or presenting various opinions while asserting none of them.[97] However, the two tenets outlined above make it impossible for Olivi to accept the intromissionist account of vision. If vision occurred by the received *species*, the visual power would not be free but subjected to the objects whose affections it suffers. Further, it is not clear how the *species* of a material and extended object could even enter the sensory power of the spiritual soul.[98]

The extramissionist theory seems to be more suitable for Olivi's demands. In q. 58 (ca. 1277-1278), where he argues for activity of the sensory powers in a digression included in a more extensive reasoning for activity of the will, he presents a set of counter-arguments based on the tacit assumption that activity of perception implies extramission.[99] He rejects such an assumption and criticizes the emission theory of Augustine, but gradually develops a theory based on some of the less problematic features of Augustine's theory. Later in q. 73 (ca. 1281-1282) focused on extramission, Olivi presents and criticizes the traditional materialistic notion of extramission in a syncretic account with a primacy of extramission, which he ascribes to some Platonists and Augustine, and elaborates his own theory of *aspectus* modelled as a "virtual ray".[100]

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[95] Pasnau, *Theories of Cognition*, pp. 176–181; Toivanen, *Perception and the Internal Senses*, pp. 25–42; J. F. Silva, "Medieval Theories of Active Perception: An Overview," in J. F. Silva and M. Yrjönsuuri (eds), *Active Perception in the History of Philosophy: From Plato to Modern Philosophy*, Dordrecht, Springer, 2014, pp. 132–135.

[96] See *Summa* II.26, 454-455 (before 1275) where it is taken for granted that vision occurs by means of receiving the *species* (note that the passage is preserved in only one manuscript).

[97] Petrus Iohannis Olivi, "Tria scripta sui ipsius apologetica annorum 1283 et 1285," D. Laberge (ed), *Archivum Franciscanum Historicum*, vol. 28, 1935, pp. 128; 404-405.

[98] For a detailed account of Olivi's criticism of the theory of *species* see e.g. Toivanen, *Perception and the Internal Senses*, pp. 125-135.

[99] *Summa* II.58, 405-407 (counter-arguments) and 486-499 (Olivi's response to them). This kind of assumption seems to have been common among his contemporaries (see the anonymous *Lectura* as in note 85), but, of course, not the sole understanding of the activity of perception (for the others, see Silva, "Medieval Theories of Active Perception").

[100] *Summa* II.73, 52-106. As it argued in Lička, "Attention, Perceptual Content, and Mirrors", pp. 105–106, the *Platonici* Olivi criticized are possibly the 12th century proponents of syncretic accounts with a primacy of extramission, such as William of Conches. The role of a Platonic emission theory in developing Olivi's own view was implied already by B. Jansen, *Die Erkenntnislehre Olivis*, Berlin, Dümmlers, 1921, p. 22 (in

Olivi's arguments are targeted especially against the postulate of *corporeal* visual rays. Just as in the case of Albert the Great, Olivi's arguments against extramission seem to have been at least partially influenced by Avicenna. If what is emitted were a corporeal body, it would have to travel extremely fast and reach the stars immediately. Further, the sense of touch would have to be somehow present in the corporeal visual ray – with the absurd consequence that we would *feel* all the changes of the medium, such as hot or cold air or winds, while seeing through it. Also, the changes in the ray and vision cannot be explained with reference to the will since we often see against our will. Finally, Olivi presents an Alhacenian argument against syncretism with a primacy of extramission: if the sole role of the emitted visual ray is to catch the *species* of the object and bring it back to the sight, then – in view of the fact that the *species* of the objects can propagate through the medium by themselves – the visual rays are superfluous.[101] Thus, the extramission postulate is impossible and futile for explaining perception and, as Olivi points out, nobody actually upholds it today (*nullus hodie sequitur*).[102]

However, there is a grain of truth in the extramissionist theories – the claim (ascribed by Olivi to Augustine) that the sensory powers "touch" (*attingerent*) their objects by a *virtual aspectus* and thus they are at their objects in a metaphorical way.[103] The notion of *aspectus* is at the very core of Olivi's visual theory. In Olivi's view, an *aspectus* is a constituent of every causal action, no matter whether physical or psychological, and manifests its orientation and directedness towards a target (*terminus*). For example, when throwing a stone, the thrower gives an *aspectus* to the stone, an inclination towards an aim. Similarly, when a perceiver is about to see, his sight has an *aspectus* to an object and it is oriented to it.[104]

The first two tenets of extramissionist theories (the extramission postulate and the primacy of the sight) provide inspiration for Olivi's visual theory. The extramissionist

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his summary of q. 73); later mentioned by Tachau, *Vision and Certitude*, p. 41; Pasnau, *Theories of Cognition*, pp. 169-170, Silva and Toivanen, "The Active Nature of the Soul," pp. 272-275; Adriaenssen, "Peter John Olivi on Perceptual Representation," pp. 329-330; and elaborated by Demange, "Olivi et les Perspectivi," and Lička, "Attention, Perceptual Content, and Mirrors". Olivi's early thoughts on *aspectus* are present already in his *Summa* II.23, 424-432 (before 1275).

[101] *Summa* II.73, 59-61.

[102] *Summa* II.58, 482.

[103] *Summa* II.73, 62-63.

[104] *Summa* II.23, 424.

emphasis on the activity and primacy of the visual power in the visual process is consonant with his metaphysical principles. The visual process cannot be initiated by the effects of external objects received in the visual power – since the visual power is ontologically superior, objects cannot act upon it.[105] Thus, the primary impulse for vision originates from the observer – Olivi identifies it with the *aspectus*, directedness or focus of the visual power. The visual *aspectus* is understood by him as *attention* – a psychological mechanism enabling the observer to scan the environment and actively grasp perceptual information.[106] It is worth noting that Olivi's notion of attention is completely different from the one proposed by Albert. Whereas for Albert attention is a secondary process of sorting impressions already received, in Olivi's view it is a necessary *preceding* condition of every visual act.[107] The primacy of paying attention is manifested by Olivi's claims that *aspectus* is not necessarily always determined to a specific object.[108] Such an undetermined *aspectus* would occur even in an imaginary scenario where there would be no external object to be seen at all.[109]

Olivi also exploits a hidden potential of extramissionist theory – the ability to assign a role in the visual process to eye movements, which cannot be explained in the intromissionist framework. According to Olivi, the eye is made round and capable of quick movements on purpose. If it were flat, it would not be able to look around from left to right, but would see only what is in front of it. The roundness of the eye thus contributes to the greater range of visual attention.[110] The eye movements performed on the physiological level manifest attention shifting and focusing on the psychological level.[111]

Besides the primacy of the visual activity, Olivi even holds a version of the extramission postulate – he describes the *aspectus* or attention focusing and shifting as a

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[105] *Summa* II.72, 18–27.

[106] Interpretation of *aspectus* as attention is quite usual in the literature – see Tachau, *Vision and Certitude*, pp. 41-42; Pasnau, *Theories of Cognition*, pp. 130–134, 168–181; Toivanen, *Perception and the Internal Senses*, pp. 151–161.

[107] *Summa* II.72, 9.

[108] *Summa* II.36, 634.

[109] On Olivi's thought experiment of a "man before creation", see J. Toivanen, "The Fate of the Flying Man: Medieval Reception of Avicenna's Thought Experiment," *Oxford Studies in Medieval Philosophy*, vol. 3, R. Pasnau (ed), Oxford, Oxford University Press, 2015, pp. 86–94.

[110] *Summa* II.73, 95-96.

[111] Petrus Iohannis Olivi, *Quodlibeta quinque*, S. Defraia (ed), Grottaferrata, Collegium S. Bonaventurae, 2002, I.4, 17: "[...] *ad uarium motum oculi sequitur uarius aspectus in eius potentia uisiua* [...]"; see also *Summa* II.73, 105; II.111, 274.

kind of "virtual ray" (*radius virtualis*).[112] Visual attention is modelled as a ray directed from the eye to the environment. Olivi's description even implies a basic concept of the visual cone: there are imaginary straight lines directed from every point of the pupil to the whole hemisphere demarcating the scope of visual attention.[113] These lines constitute a visual cone – the visual attention stretches forth in the form of a cone (*aciem visivi aspectus … oportet pyramidaliter acui et protendi*), with the apex in the centre of the eye and the base attached to the quantity of the visible object.[114] Olivi's description of the visual ray and cone reveals that his sources were rather Platonists than Euclidians.[115] Although he once mentions that the apparent size of the object is a function of the size of the angle in the apex of the visual cone,[116] he proposes no geometrical demonstration and focuses more on the dynamic and oscillating nature of the visual ray – attention has an "effort" (*conatus*), a "tendency" (*inclinatio*) and an "onset" (*impetus*) and these dynamic features bring about attentional switching.[117] The shifting of attention (*variatio* or *mutatio aspectus*) serves as a foundation for Olivi's explanation of optical phenomena such as reflection or refraction.[118]

The most important difference between Olivi's theory of *aspectus* and the visual rays postulated by Augustine and Platonists is Olivi's accentuation of *virtual* and *spiritual* nature of the rays of attention. He explicitly asserts his notion of *aspectus* is a version of Augustinian notion of a visual ray, although the latter is corporeal, whereas the former is "virtual".[119] Olivi also speaks about a "virtual extramission of the visual power"

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[112] *Summa* II.58, 490: "[…] *virtus visiva* […] *potest dici habere radium virtualem. Qui radius non est aliud quam ipse aspectus sic virtualiter protensus* […]."

[113] *Summa* II.73, 65; also II.58, 490.

[114] *Summa* II.73, 96, also *ibid.*, 91 and II.58, 497.

[115] *Summa* II.73, 55–61; on Olivi's sources cf. Demange, "Olivi et les Perspectivi," § 5-10 and Lička, "Attention, Perceptual Content, and Mirrors", pp. 105–106. As far as I know he never mentions Euclid or another proponent of geometrical optics. Note that Demange suggests Al-Kindí as Olivi's source; however, there is no direct evidence for such a claim.

[116] *Summa* II.73, 91.

[117] *Summa* II.58, 466, 490.

[118] See *Summa* II.58, 498-499; II.73, 69-71; 93 and Lička, "Attention, Perceptual Content, and Mirrors", pp. 108–110 (reflection and mirrors) and *Summa* II.23, 431-432; II.58, 490-3; II.73, 73-74; 92-93 (refraction).

[119] *Summa* II.58, 494; *radii virtuales* are mentioned also *ibid.*, 490, 494 and 499.

(*extramissio virtualis virtutis visivae*).[120] Nothing is actually emitted (no body, subtle matter, or even a *species* of the power) – the shifting of attention exists really (*tamquam in subiecto*) in the visual power and its organ.[121] However, the dynamics of the visual power has an outward direction and can be metaphorically described as an emission towards the object.[122] The virtual rays are merely imaginary representations of the paths of the attentional switching.[123] Although there is no real emission of the power, no rarefaction or local motion through the medium to the object, the workings of attention are somehow proportionate and analogous to these real properties and can be described as a virtual stretching out, a movement and virtual contact with the object.[124] Also, when attention "touches" the object and is fixed upon it, it is not a material contact but rather a stabilization and "quieting" of the dynamics of attention.[125]

But the movement of *aspectus* or attentional shifting is not vision yet. Against the traditional visual ray theory, Olivi strictly demarcates two phases of the visual process: (1) the visual ray or attention and (2) the visual act itself. The movements of the virtual ray and its fixation upon an object precede the actual vision but are not identical with it.[126] The (1) attention is an outwards-directed orientation and dynamic oscillation, while the (2) vision is something created in the visual power of the observer. Once the *aspectus* is fixed upon its object which is "sucked" (*imbibitum*) into the *aspectus*, the visual power

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[120] *Summa* II.58, 488. Note that interpreting the visual rays as spiritual entities was also proposed as a way of preserving the postulate against its criticism by pseudo-Grosseteste, *Summa philosophiae* XII.18, 507-508.

[121] *Summa* II.73, 66.

[122] On the nature of the virtual *aspectus* see also Pasnau, *Theories of Cognition*, pp. 172-175.

[123] *Summa* II.73, 67.

[124] *Summa* II.73, 104.

[125] *Summa* II.73, 105.

[126] Hence, I do not think that the problem implied in D. Perler, *Theorien der Intentionalität im Mittelalter*, Frankfurt, Vittorio Klostermann, 2004, pp. 136-137, and conceptualized in Adriaenssen, "Peter John Olivi on Perceptual Representation," pp. 331-332 exists: viz., that in order for attention to be fixed upon *x*, *x* must already be cognized in a preliminary way; but the cognition of *x* presupposes a determination of attention to *x* and, hence, an infinite regress occurs. On the contrary, in the first moment, the observer just opens his eyes, directs an undetermined *aspectus* outwards and scans the environment, waiting for what will be offered to his *aspectus*. When an object occurs, the *aspectus* is fixed upon it (the virtual ray "touches" the object, which is in the middle of the base of the visual cone) and the second phase of the visual process begins when the visual act is created. For the difference between the undetermined and determined *aspectus* see Silva and Toivanen, "The Active Nature of the Soul," pp. 275-277; Toivanen, *Perception and the Internal Senses*, pp. 183-187; see also Adriaenssen, "Peter John Olivi on Perceptual Representation," pp. 335-336.

efficiently causes its own visual act, which is in turn "conformed and configured" to the object (*conformatur et configuratur obiecto*).[127]

Hence, there are *two* kinds of contact here. The (1) "attentional" contact is outwards-directed and presents a quasi-extramissionist way of reaching out to the visible object. But the visual cognition itself does not occur until the (2) *cognitive* contact is established, which is an inwards-directed determination of the content of the visual act performed by the object once the visual power has created the act.[128]

It is important to note that – since Olivi takes the ontological gap between the object and the soul's power seriously – both contacts are explained without advocating any kind of physical realization or receiving a real entity. As for part (1) of the visual process, having attention fixed upon an object does not mean that the beholder touches it by means of a material extension of himself, but merely that the dynamic efforts of his visual power come to a rest. What is the cause of such a quieting? Olivi stresses that the efficient cause of attentional switching is the cognitive power, or ultimately the will.[129] But the virtual ray of attention must also somehow be affected by the external things. Thus, Olivi introduces a second kind of causation cooperating with the efficient cause – "terminative" or "objective" causality.[130] For example, when attention "bounces back" upon encountering a mirror, the efficient cause of such a change of direction is supposed to be the power and the mirror plays the role of a terminative cause. Having the ontological gap in mind (the mirror is a material object and the ray of attention is a spiritual extension of the soul's power), Olivi stresses that the action exerted by the mirror is not a full-fledged ontologically committing efficient causation.[131] Similarly, establishing a (2) cognitive contact between the object seen and the visual act is also not described as an efficient causal influence exerted by the object upon the visual power, but again as merely "terminative causality".[132]

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[127] *Summa* II.72, 35-36.

[128] *Summa* II.72, 38-39; see also Adriaenssen, "Peter John Olivi on Perceptual Representation," pp. 339-346 who distinguished between the object as a *terminus* of the *aspectus* and as a *terminus* of the act.

[129] *Summa* II.73, 66; 68; 74.

[130] On this notion in Olivi see Pasnau, *Theories of Cognition*, pp. 119–121; Adriaenssen, "Peter John Olivi on Perceptual Representation," pp. 339-346; Toivanen, *Perception and the Internal Senses*, pp. 145–150.

[131] *Summa* II.73, 68; see also *ibid.*, 66; 89; 103-104.

[132] Recently, the problem of whether the determination of the act by the object is to be interpreted in an externalist way (as a special kind of causality of the object) or in an internalist way (as a special kind of "configuration" the power performs itself) was raised by Adriaenssen, "Peter John Olivi on Perceptual

Hence, Olivi's account appears to be a rethinking of the Platonist conception of extramission, or rather a syncretic account with a primacy of extramission. He reinterprets the postulate of a physical extramission in a psychological way as attentional switching and fixation, described as a virtual ray. He reinterprets the "backwards motion" of grasping the form of the object and announcing it to the visual power as establishing cognitive contact, where the visual power efficiently causes the visual act and the object terminatively causes its content.

Finally, the distinction between the two phases of the visual process gives Olivi a good position to deal with the issue of whether vision is immediate or successive. Generally speaking, Olivi seems to be just as suspicious of the successive account of vision as Albert was. If we apprehended just one part of the visible object at one moment, we would never reach a determinate and certain apprehension of the whole thing. Hence, apprehension must be immediate (*in instanti*).[133] If vision is immediate, do we apprehend just one thing or a number of things in one moment? Olivi ponders the question and he presents an argument for the latter solution: if what is seen were solely the place to which the axis of the visual cone is attached, the perceiver would see just one point. However, such a conclusion is implausible: either he sees nothing, or he sees a divisible continuum that has a quantity and hence a plurality of parts.[134] Later he specifies his position:

Representation," who favours the latter option against the traditional externalist interpretation (e.g. Pasnau and Toivanen as quoted above). I tend to understand Olivi as proposing a special kind of causality here – one that is not ontologically committing (note that Olivi admits that terminative causality can be counted among the efficient causes in the broad sense – *Summa* II.72, 10). Thus, a comparison with the modern Lewisian interpretation of causality as a counterfactual dependence seems useful here. In this view, A causes B, if it holds that (1) if A occurs, B occurs, and (2) if A did not occur, B would not occur. (See D. Lewis, "Veridical Hallucination and Prosthetic Vision," *Australasian Journal of Philosophy*, vol. 58, 1980, pp. 239–249; W. Fish, *Philosophy of Perception: A Contemporary Introduction*, New York – London, Routledge, 2010, pp. 113-118.) Applied to the Olivi's case: the visual act is "caused" by the object in the sense that (1) if the object *x* occurs then the vision of *x* occurs and (2) if the object *x* did not occur, then the vision of *x* would not occur. Note that Olivi's makes a similar explanation in *Summa* II.72, 10: "[*Vis activa*] *absque tali termino et terminatione non posse agere suum actum et posse hoc cum ipso* […]." Hence, Olivi's claim that the determination of the visual act is *caused* by the object, although not efficiently but terminatively should be understood as asserting that the visual act counterfactually depends on the object without receiving any actual entity from it (which would compromise the ontological superiority of the visual power). Further, Adriaenssen's internalist reading of the "termination" fits only the second phase of the visual process (determination of the visual content). But Olivi uses the notion of termination also in the first phase (the attention switching and fixation), where the causal interpretation seems to be a better choice.

[133] *Summa* II.26, 452.

[134] *Summa* II.37, 660.

evidently, we see more than just one point, but on the other side, what is seen has to evince some kind of unity. The source of such a unity is the *aspectus* – hence, we see a number of things at once but always under one *aspectus*.[135]

On the other hand, we often experience that we are performing a *successive* scanning of the environment. Is it against Olivi's general conviction that vision is immediate? Not necessarily: he emphasises two phases of the visual process. The first (attention focusing) can be either immediate or successive (*simul vel successive dirigitur aspectus ab oculo*).[136] The simple "propagation" of the *aspectus* is understood as immediate, since it is not a local motion that takes place in time.[137] However, attention focusing can also be successive when it is applied to an excesively large object. In such a case, the observing eye has to oscillate to scan all the parts of the object, which takes some time. The second phase of the visual process (the visual act) is always instantaneous. Hence, Olivi understands vision as immediate or successive, depending on what stage of the process is emphasized.[138]

Conclusion

As I have shown, extramissionist theories did not appear as antiquated and obscure to 13th century thinkers as they may appear to us. Although Aristotelians, such as Albert the Great, refuted the theory, it still appeared considerably credible for Roger Bacon and was originally reformulated by Peter Olivi. Neither of them upheld the most problematic feature of the theory, viz., the emission of a material entity from the eyes. Both, while open-minded to the extramission postulate, manifest a tendency to "dematerialize" extramission: according to Bacon, what is emitted is the visual power or the "*species* of the sight"; in Olivi's view, there is only a virtual extension of the visual power, best to be described as attention.

Albert the Great refuted extramission, but incorporated the notion of a visual cone into an intromissionist framework; once the observer has received the *species* of the object, vision immediately occurs. However, he also attempts to include a selective

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[135] *Summa* II.37, 664.

[136] *Summa* II.73, 65.

[137] *Summa* II.26, 451-452; II.89, 209; also Tachau, *Vision and Certitude*, p. 48.

[138] Olivi, *Quodlibeta* I.4, 17.

attention as "directing" the received *species* to the thing or its part. Roger Bacon presented a syncretic account with a primacy of intromission; extramission has a *metaphysical* function in his account, since it refines the *species* of the material object and helps to bridge the ontological gap between them and the visual organ. Vision is a thoroughly successive process for him – not only the multiplication of the *species* takes time (albeit an imperceptible amount of it), but also the certification of vision performed by passing the axis of the visual cone over the parts of the object seen. Finally, Peter Olivi developed an original rethinking of an extramissionist (predominantly Platonic) visual theory. Extramission has a *psychological* role in his account and the traditional optical conceptual equipment (such as the notion of a visual ray) is used to describe attentional switching. However, the visual process is not completed by the fixation of attention, but by the creation of a visual act (by the power as an efficient cause) and determination of its content (by the object as a terminative cause). Whereas the first phase of the visual process, viz. attentional switching, can be successive, the second phase, viz. the causation of the visual act, is always instantaneous. With a grain of salt, Olivi's account can be described as a Platonic syncretic account with a primacy of extramission.[139]

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