



Albert the Great's Refutation against the Extramission Theory of Vision through the Extramission Theory of Reflection

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Abstract

Albert the Great (d.1280 CE), i.e., Albertus Magnus was the founder of Christian Aristotelianism, the medieval scholastic venture which reached its culmination in the teachings of his student, Thomas Aquinas (d.1274 CE). His writings reflect his effort in synthesizing Aristotelian philosophy with Christian teachings, and for this paper we would focus on chapter eighth of his work of *De sensu et sensato* (Sense and Sensibilia), which is entitled "A Digression to Destroy this Error by Considering the Consequences of Their Statements." The whole treatise of *De sensu* delineates Albert's refutation against extramission theory of vision in his task of introducing and establishing Aristotelian intromission theory in the medieval scholastic scholarship. Thus the chapter eighth focuses on Albert's claim on the absurdities of the extramission theory by refuting on the extramission theory of reflection. We will delineate further what does this theory mean, and the arguments brought forward by Albert against this theory in this particular chapter. Our methodology is a literature review of which we would review also the extramission theory of vision of Plato and Empedocles, the most important proponents of this theory in Greek philosophy, and the intromission theory of Ibn Haytham (d.1040 CE), who was the first scholar to establish scientific evidence of intromission theory. We would later discover that Albert has five major objections against the extramission theory of reflection, and most of his arguments are in the form of *reductio ad absurdum*, on which he tried to show that all the premises of the extramission theory of reflection, either explicitly derived or implicitly deduced from the theory would only lead to an absurdity or a contradiction of the conclusion.

Keyword: *Albert the Great, Christian Aristotelianism, Extramission Theory of Vision, Intromission Theory of Vision.*

Abstrak

Albert the Great (d.1280 CE), iaitu Albertus Magnus adalah pengasas Kristian *Aristotelianisme*, pengusaha skolastik abad pertengahan yang mencapai kemuncaknya dalam mengajar muridnya, Thomas Aquinas (d.1274 CE). Karyanya mencerminkan usaha beliau dalam mensintesis falsafah Aristoteles dengan ajaran Kristian, dan untuk penyelidikan ini, penumpuan pada bab kelapan karya *De sensu et sensato* (Sense dan Sensibilia), yang bertajuk "*A Digression to Destroy this Error by Considering the Consequences of Their Statements*". Seluruh risalah *De sensu* menggambarkan penolakan Albert terhadap teori penglihatan *extramission* dalam tugasnya memperkenalkan dan menubuhkan teori intromisi Aristotelian dalam biasiswa skolastik zaman pertengahan. Oleh itu bab kelapan memberi tumpuan kepada tuntutan Albert atas ketidaksuburan teori *extramission* dengan menafikan teori reflasi refleksi. Penerangan sejauh mana makna teori ini, dan argumen yang dibawa oleh

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Albert terhadap teori ini ditrangkan dalam bab ini. Metodologi merupakan kajian kesusasteraan yang akan dibentangkan juga teori penglihatan *extramission* Plato dan Empedocles, pendukung paling penting dalam teori ini dalam falsafah Yunani, dan teori intromisi Ibn Haytham (d.1040 CE), yang merupakan sarjana pertama untuk menubuhkan bukti saintifik teori intromisi.

Penemuan kajian ini mendapati bahawa Albert mempunyai lima bantahan utama terhadap teori refleksi *extramission*, dan kebanyakan hujahnya adalah dalam bentuk *reductio ad absurdum*, di mana beliau cuba untuk menunjukkan bahawa semua premis teori refleksi *extramission*, sama ada secara diperolehi secara tersurat atau secara tersirat dari teori hanya akan membawa kepada kenyataan yang tidak munasabah atau percanggahan pada kesimpulan.

Kata Kunci: *Albert the Great, Christian Aristotelianism, Teori Penglihatan Extramission Teori Visi Intromisi.*

Introduction

Albert the Great (Albertus Magnus or Albert of Bollstädt, d.1280 CE) was one of the first and greatest exponents of Aristotelian philosophy in the medieval Western Christendom. He wrote and taught as a scholastic scholar in the Dominican Order, and thus many of his writings and ideas reflect his effort in synthesizing Aristotelian philosophy with Christian teachings. He in fact earned the title as the effective founder of Christian Aristotelianism,¹ the medieval scholastic venture which reached its culmination in the teachings of his student, Thomas Aquinas. This deep entrenchment in Aristotelian ideas is reflected in many of Albert's writings including in his discussion on optics which appeared in several treatises including *De homine*, *De animalibus*, *Meteora*, *De anima* and *De sensu et sensato*. The last treatise, *De sensu et sensato*,² will be our main source here for delineating Albert's refutation against extramission theory of vision in his task of introducing and establishing Aristotelian intromission theory in the medieval scholastic scholarship.

For the purpose of this paper, however, we will only be concerned with the eighth chapter of *De sensu*, entitled "A Digression to Destroy this Error by Considering the Consequences of Their Statements."³ The main objective of the chapter is to refute the extramission theory of Empedocles and Plato by showing all the absurdities either inherently found in the theory or can be deduced implicitly from the theory's main propositions: "we wish right now not only to argue against what they say, but also to see what follows from their very statements."⁴ In other words, the chapter is not concerned with giving evidences on behalf of the intromission theory, but the main argument of the chapter is to refute extramission theory through Albert's claim on the falsity and absurdity of the extramission theory of reflection. We will delineate further what does this theory mean, and the arguments brought forward by Albert against this theory in this particular chapter.

Extramission Theory Of Reflection

Albert began his argument by introducing the reader to the version of the extramission theory of reflection which he attributed to Empedocles and Plato. He

wrote: "These two (philosophers) say that rays issue from the eyes, extend and spread more and more as they proceed from the eyes, and are then reflected from one body into another; and perception of visible objects occurs at their extremities, which touch the visible objects. When they are reflected from one thing into another, then one thing appears as two, because the thing the ray strikes last appears not as it is of itself, but in the thing from which the ray is reflected."⁵ There are several propositions that can be deduced from the above statement. First, it states one of the main characteristics of an extramission theory of vision, which is an emanation of visual rays coming out from the eyes, spreading away from the observer and eventually made a contact with the sensible objects. Once the visual rays touch the objects, perception occurs. In other words, the ability to perceive has been endowed to the visual rays, as mentioned above by Albert, "perception of visible objects occurs at their (the visual rays) extremities." In a way the visual rays here can be considered as something sentient, i.e., both the visual rays and the observer here are doing the perceiving of the objects seen.

Now the problem comes when Albert claimed that the extramissionists were also proposing that the visual rays when they touch one object are then reflected to another object. For example, Albert said, a visual ray that comes out from a person eye who is looking at a mirror, will then touch the mirror, before it is reflected back to the face of that person.⁶ But if the extramissionists were also saying that perception occurs at the extremities of the visual ray, then in the example above, what would be the final vision of that person if his visual ray has been reflected from the mirror to his face? If according to the statement of the extramissionists above that "the thing the ray strikes last appears not as it is of itself, but in the thing from which the ray is reflected," then the observer, awkwardly, will see the image of the mirror being imposed on his face.⁷ This illusion, according to the argument above, occurs because there are two things that the visual ray touches successively. First when it touches the mirror, it perceives the mirror, but when it is reflected to the face of the person who is looking at the mirror, it will then perceive the face of that

person. But how can the visual ray perceives two things at once? Thus, the image of the mirror has to be carried onto the face of the man, and thus “one thing will appear as two.”

This short and concise introduction reflects the whole argument that Albert was going to bring forward in this particular chapter. As we have seen from the argument above, Albert was trying to prove that the extramission theory of reflection is full of contradiction and absurdities. His main contention is that if the extramission theory of reflection itself is full of contradiction, then the whole theory of extramission can be considered as invalid. We will see how far this argument holds true for the extramission theory of vision in general.

Albert the Great's Five Major Objections against the Extramission Theory of Reflection

Albert gave about five major objections against the extramission theory of reflection. The basic form of his arguments are in the form of *reduction ad absurdum*, on which he tried to show that all the premises of the extramission theory of reflection, either explicitly derived or implicitly deduced from the theory would only lead to an absurdity or a contradiction of the conclusion.

His first objection of the theory of reflection centered on an argument that the proposition of the opponents on their theory would eventually lead them to conclude that reflection is possible on a rough surface, which according to Albert, is absurd. The argument is quite long and can be divided into several parts. First, Albert said that if we accept the extramissionists' theory of reflection, then we have to consider what kind of surfaces that this reflection can occur. He gave two possibilities, either the surface must be both hard and smooth, or the surface must be smooth but not necessarily hard, for example water.⁸ But does this mean that reflection could occur on any smooth surface? Albert here gave two possibilities, either the smooth surface must be continuous or not necessarily continuous.⁹ But since according to the opponent, water is not continuous since it is porous, then according to them reflection does not necessarily has to occur on a continuous smooth surface, but could occur on any smooth surface, either it is continuous or not.¹⁰

But can reflection occur on very small non-continuous smooth surfaces that existed among rough surfaces, since implicitly for Albert a rough surface could also have very small non-continuous smooth surfaces existed among its rough ones? Here, Albert said that since for the opponents, the extremities of the visual rays which emanate from the eyes is

indivisible and thus will always be smaller than any of the small surfaces existed on the rough body, then reflection could occur on these small smooth surfaces.¹¹ Thus it follows, from the premises of the opponents above, that reflection could occur on a rough surface, which for Albert is absurd.

Moreover, according to Albert, smoothness has no justification to be the universal cause for reflection. He said that if we took the principle of physics, “nothing repels a thing of different nature except as contraries repel each other,” then there is nothing in the characteristic of the visual ray which is opposite to smoothness.¹² Thus, what is the reason for reflection to occur on a smooth surface? This question, according to Albert, has not been answered satisfactorily by the opponents.

The second part of this first objection, on the other hand, centered on two principles of reflection which Albert attributed to the extramissionists. The first principle is the lack of penetration of the reflected body and the second is the impetus of violent motion resulted when visual rays made a contact with the reflected body, not unlike of what happened to a ball when it is thrown onto a wall.¹³ Both of these two principles, according to the extramissionists, must exist for reflection to occur. But according to Albert, these two principles are not the only ones, and are not the universal or necessary causes for reflection, since we know that reflection could occur on a transparent medium like water.¹⁴ Water, though it is porous and thus can be penetrated by the visual rays, is a good example as a medium of reflection.

Moreover, if these two principles are the causes for reflection, then it follows that reflection is possible on a rough surface, since a rough surface is impenetrable and can generate the impetus of violent motion.¹⁵ But, as Albert had mentioned before, reflection on a rough surface is absurd.

The opponents, however, maintained that it is not impossible for reflection to occur on the small smooth surfaces of a rough surface, since it might be possible that these reflected visual rays remain insensible to our eyes. Since on a rough surface there is a mixture between the rough ones and the smooth ones, thus it is possible that “the light and the image falling on a smooth place are obscured by the projecting rough areas, so that they are confused and darkened and rendered insensible.”¹⁶ Moreover, the rays are scattered in multiple directions from the rough surface, and does not gather again to one point, and thus making it insensible. This theory of reflection is also found in the *Optics* or *Kitāb al-Manāẓir* of Ibn al-Haytham, on which he wrote that when light is reflected on a rough surface, some of the rays will be dissipated within the gaps of the rough areas, while

the rest of the rays will be dispersed in different directions.¹⁷

Albert, on the other hand, objected to the opinion above by saying that there is no justification to say that reflection does occur on a rough surface but remain insensible since there are cases on which the dispersal of lights does occur, not unlike the dispersal of light that occurs on a rough surface, but the rays remain sensible.¹⁸ Thus, according to Albert, if reflection does occur on a rough surface, we should be able to detect it. If not, then we should remain to his main contention that it is absurd to say that reflection occurs on a rough surface.

In short, for Albert, whichever way the extramissionists tried to argue, their argument would only lead to an absurdity. Neither can their theory avoid the absurd conclusion of a reflection on a rough surface, nor can they say that reflection can occur on a rough surface but remain insensible, since it is known that there are cases which contradict this last proposition.

The second objection which Albert raised against the extramission theory of reflection centers on the refraction and reflection of visual ray when it hits the surface of water.¹⁹ Albert said that according to the extramissionists' theory, when a visual ray touches the surface of water, one part of the ray is refracted into the water, and touches an object, let us call it here as X, while the other part of the ray is reflected away from the surface of the water, and touches another object, let us call it here as Y (see Figure 1).

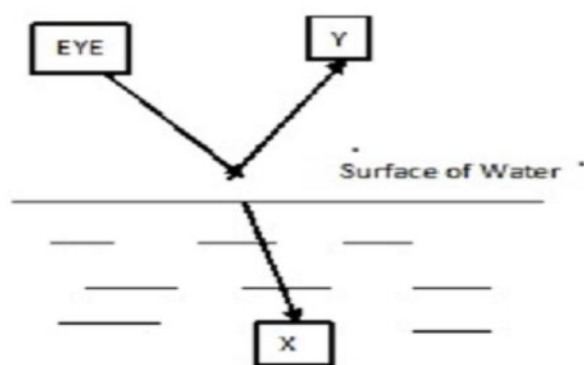


Figure 1

Since the extramission theory of reflection assumes that the perception of the visible object occurs at the extremity of the visual ray and since the perception of the visual ray is indivisible, then accordingly, both X and Y will be seen at the same time, since both are being touched by that one visual ray.²⁰ Thus, according to the opponents' theory, both will be seen

“successively as points mixed together,”²¹ and with the same degree of clarity which as we know it does not happen in reality. Moreover, according to our normal perception, it is only appropriate that the refracted or the incident ray will see X clearer than the reflected ray in seeing Y, since “what is seen by an incident ray is seen more distinctly than what is seen by a reflected ray.”²² This objection, according to Albert, is one of the strongest objections against the extramission theory of reflection.

The third objection brought forward by Albert is another complication when the extramissionists assumed that perception occurs at the end of the visual ray. The example he gave here is quite similar to the one that he gave in the introduction except that the reflection of the visual ray is extended further from the face of the observer back to the mirror. He said that if a person looks into a mirror, then a visual ray that comes out from his eyes, will be reflected from the mirror to his face, and then from his face the visual ray will be reflected back to the mirror.²³ Thus first the visual ray will perceive the mirror, and from here the image of the mirror will be carried forward to the face of the observer, and here, the visual ray will perceive both the image of the mirror and the face of the observer himself. Then when the visual ray is reflected back to the mirror, two images then will be carried forward back to the mirror, the image of the mirror and the image of the face of the observer. Thus at the end, both the image of the mirror and the image of the face of the observer will be seen at the same time in the mirror, which as we know it, is absurd.²⁴

The fourth objection is similar to the third objection above, which is the problem in extramission theory of assuming perception at the end of the visual ray. For example, Albert said, if our visual ray proceeds from our eyes and touches a person, let us say Socrates, and then it is reflected from Socrates to another person, let us say Plato, then accordingly, as the image of Socrates is reflected to Plato, Socrates then would be seen in Plato.²⁵ But this as we know it is contradictory to our normal human experience. The opponents, however, might respond by saying that it is not one ray that comes out from the eye, touching Socrates and then is reflected to Plato. But it is two separate rays that touched Socrates and Plato, and thus both will be seen distinctively from each other.²⁶ But, according to Albert, this is not possible, since according to him their first proposition which states that perception occurs at the end of the visual ray is already false. Thus even if they said that there are two distinctive rays touching Socrates and Plato separately, perception still would not occur since

perception after all does not occur at the end of the visual rays.²⁷

However, there were some proponents of the extramission theory of vision who agreed with Albert that indeed perception of the visible objects does not occur at the end of the rays but “the emanating rays return the sensible (form) to the visual power which is in the eyes.”²⁸ But this version of the extramission theory still could not avoid another objection brought by Albert. He said that if the forms of Socrates and Plato need to be returned to the eyes, then the eyes have to perceive two forms at the same time, and thus would cause confusion in the manner of perception: “Since no diversity is introduced by the diversity of rays, all diversity is relinquished in order that one (ray) may be returned, because all rays are terminated at one point in the eye.....Therefore, whatever things are seen must be seen in such a way that one thing appears in another, as a form appears in a mirror. And it is obvious that sight of visible objects does not occur in this way.”²⁹

However, this version of the extramission theory that has been put forth by Albert above, is indeed closer in form to the extramission theory that has been propounded by Plato than the one which Albert has attributed to Plato in the first few paragraphs of this chapter. In Plato’s extramission theory of vision, he stated that the process of vision begins when visual fire emanates from the eye, coalesces with the surrounding medium, i.e. daylight, to form a single homogenous body that extends from the visible object to the eye.³⁰ This single homogenous body then becomes the medium from which any emanation from the visible object is carried back to the eye: “So the whole, because of its homogeneity, is similarly affected and passes on the motions of anything it comes in contact with or that comes in contact with it, throughout the whole body, to the soul, and thus causes the sensation we call seeing.”³¹

Thus, the extramission theory of vision that has been propounded by Plato does not simply say that the visual rays coming out from the eyes, and touch an object in order for perception to occur, but according to his theory, vision occurs when the “single homogenous body,” which formed between the visual ray and the intervening medium, i.e. daylight, made a contact with the emanation from the visible objects, and thus inducing “motions” which is carried back to the eye. Emanation from visible objects, furthermore, is clearly represented in Plato’s theory of color: “They are known by the general name of color, a flame which streams off from bodies of every sort and has its particles so proportioned to the visual ray as to yield sensation.”³²

This extramission theory of Plato, as we shall see, has been the focus of Albert’s attack against the extramission theory in general in his fifth objection in the chapter. In his own words Albert said: “But let us not suppose that sight occurs when visual power issues from the eye to the visible object, but through rays, as through a medium that returns the forms of the things seen to the visual power in the eye. Therefore, if a ray returns (the forms) in this way, everything that is touched by all the rays intersecting the visual ray is returned by the visual ray; and therefore all of these things are returned to the eye.”³³

The extramission theory of vision that has been mentioned by Albert above, as we see is almost similar to what had been propounded by Plato. Although Albert did not mention specifically of “a single homogenous body” as a medium, he did mention of visual rays that act as “a medium that returns the forms of the things seen to the visual power in the eye.” Albert, however, believed that there are still weaknesses that can be found through the theory above. To refute it, he gave an example. He said let us draw a figure (see Figure 2), with an object C having an image inside the mirror, while an object D, since it is outside the range of the mirror, necessarily would not appear in the mirror.³⁴

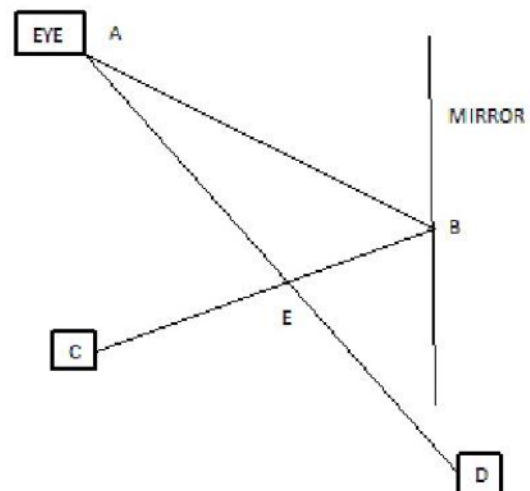


Figure 2

But Albert said, if we accept the version of the extramission theory above, then the image of D could also be seen in the mirror.³⁵ The reasoning is as follows. He said, since the visual ray AD intersects the reflected visual ray BC, then the image of D, which is returning back to the eye through the visual ray AD, will meet the visual ray BC at point E. And since the visual ray BC is also returning back the

image of C to point B, and then later back to the eye, then consequently by the above theory which states that “everything that is touched by all the rays intersecting the visual ray is returned by the visual ray,” then the image of D when it get in contact with visual ray BC at point E, will also be carried along with C to point B (i.e. the mirror).³⁶ Thus, the image of D will also be imprinted in the mirror, although commonsensically this does not happen. Thus, according to Albert, this proves that this theory of extramission is false.

The extramission theory of the above version, moreover, came with two propositions:

1. When an agent touches a recipient, the recipient is affected by it.
2. The visual ray must return the form of the object from the point it touches the object back to the eyes.³⁷

For example, when the reflected visual ray touches the object C, the object will be “affected” by the visual ray, and its forms then will be carried from the object C to B and is then reflected back to the eye at A. But Albert said that this transmission of the form C going back to the eye could only occur in one of two ways.³⁸

The first option is that the form C proceeds continuously through the visual ray BC, and then it is carried along the visual ray AB back to the eye. But if the transmission is occurring through this manner, then this would not be much difference then what we have mentioned before where the form of the object is transmitted back through the visual ray. Thus the form D, when it touches the visual ray CB at point E, will somehow “change the ray CB,” and its form, along with C, will arrive at B. Thus, three things, B, C and D, will appear simultaneously in the mirror, one inside the other, which however, as we know it does not occur in reality.³⁹

The second option, however, might be possible with a change that could occur from one point to another instantaneously, without needing to pass through the intermediate points.⁴⁰ For example, the form of object C is transfer to point B without needing to go through the intermediate point E. And so does the form of object D is transfer immediately to A, without needing to intersect the visual ray CB, and thus can avoid the problem of affecting the ray CB, along with the consequence of being transmitted to point B (i.e. the mirror). But all of these, said Albert, are impossible since there is nothing that could pass from one point to another without going through the intermediate points.⁴¹

Thus, on the whole, according to Albert, whichever way the extramissionists tried to uphold and argue on behalf of their theory, there will always be weaknesses and absurdities underlying somewhere in their theory. All their premises in the extramission theory of reflection, in one way or another, will only lead them to absurd conclusion that contradict our normal human perception. Thus, with a final stroke, Albert concluded that “all of these absurdities, then show that sight cannot occur by means of rays issuing from the eyes.”⁴²

Analysis of Albert the Great's Objections against the Extramission Theory of Vision

But how far does this whole argument hold true for the extramission theory of vision in general? Is it justifiable to refute the extramission theory of vision by refuting its theory of reflection? Does the absurdity of the latter necessarily lead to an absurdity of the former? Does any weaknesses that inherently can be found in the theory of reflection of the extramissionists necessarily means that the whole theory of extramission is false? In our opinion, Albert in fact did not give any strong justification for relating the falsity of the theory of reflection with the credibility of the extramission optical tradition in general. For example, if it is true that the premises of the extramission theory of reflection will lead to an absurd conclusion of reflection occurring on a rough surface, does this necessarily mean that the extramission theory of vision is false? What is the connection between reflection on a rough surface and visual rays emanating out from the eyes? Refuting the former and concluding it as false does not necessarily mean that the latter is also false. Moreover, what is the justification for Albert to assume that reflection on a rough surface is impossible? There were in fact some of the great ancient and medieval opticians like Ibn al-Haytham who believed that reflection does indeed occur on a rough surface.

The second, third and fourth objections are all related to the extramissionists' proposition that perception occurs at the end of the visual rays. This proposition, it seems according to our opinion, has been taken for granted by Albert. Not all the extramissionists, and certainly not Empedocles and Plato, proposed that perception of the visible objects occurs at the end of the visual rays. As we have seen before, Plato's extramission theory of vision is more complicated than simply assuming that visual rays emanating out from the eyes and touch the visible objects. Empedocles, moreover, although he made it clear of mentioning on visual fire emanating out from the eyes in one of his poems, was said to have been

reported by Aristotle to state that he also believed that there are emanation coming out of visible objects transmitted back to the eyes.⁴³ Thus, it is not a clear cut case to assume that both of these extramissionists proposed that perception occurs at the end of the visual rays.

Albert, however, relented in the last few sections of the chapter where he let the extramissionists to propound their other versions of the extramission theory of vision. Thus, if it is not acceptable to assume that perception occurs at the end of the visual rays, then it might as well be possible that the visual rays return the form of the visible objects back to the eyes. Even within this scheme of the extramission theory of vision, there are still weaknesses that Albert believed could be found lurking within the theory. Most of his arguments, however, are mainly focusing on the weaknesses in the manner of the transmission of the forms of the visible objects back to the eyes. But what is the relation between this manner of transmission with the main feature of the extramission theory of vision, which is the emanation of visual rays coming out from the eyes? Do any weaknesses or absurdities found in the former necessarily mean that the latter is also false?

Moreover, not much is given to the extramissionists for themselves to argue on behalf of their own extramission theory of vision. For example, not much is given to the extramissionists for them to explain what do they mean by their theory of reflection, and how does the reflection occur. Do they just simply mean that reflection occurs on smooth surfaces like mirror, or reflection could also occur between one object to the next, regardless if it is smooth or not? Also how does their theory of reflection relate to the act of perception? Unfortunately, not much was told to us by Albert on how the opponents themselves would explain their own version of the extramission theory of reflection.

Moreover, if the versions of the extramission theory that have been mentioned by Albert above failed in their manner of perceiving objects, this does not necessarily mean that the other versions of the extramission theory of vision would come to the same fate as their counterparts above. For example, the extramission theory of vision that has been propounded by the mathematicians like Euclid would escape the criticisms brought forward by Albert above. Since for Albert, it is not possible for perception to occur at the end of the visual rays, and also for him it is absurd to assume that forms of visible objects is transmitted through the visual rays back to the eyes, then the mathematicians might have their own respond in this particular matter. For the mathematicians, perception occurs within the visual

cone which has its base on the visible object, while its apex is inside the eye.⁴⁴ Thus, for them the visual power neither needs to reside at the end of the visual rays nor the forms of the objects have to travel back to the eyes, since they already have the visual cone which can act as their instrument of perception.

However, it is true that Albert himself has refuted the mathematicians' extramission theory in other chapters of *De sensu*. Thus it seems to us that his intention in this part of the particular chapter is clear that by indicating all the absurdities that could be found in the extramission theory of reflection he assumed that the whole theory of extramission is false.

Albert's argument, however, cannot be totally dismissed as irrelevant. Writing and teaching within the intromission optical tradition, which has been chiefly physical in its characteristics, it is understood that within a physical framework it is inconceivable to assume a visual body emanating out from the eyes and touch a visible object.⁴⁵ However, within the perspective of the extramission theory of vision, vision would not occur unless there is a physical contact between the eye and the visible object. Thus, it is understood that if we accept the extramission theory then perception could occur only in one of two ways, either perception occur at the end of the visual rays when the visual rays touch the visible objects, or the forms of the visible objects has to be returned back to the eyes. Both of these manners of perception as we have seen in this chapter have been used by Albert in his argument against the extramissionists.

Conclusion

On the whole, although some of Albert's argument against the extramissionists seem to be quite questionable and might not reflect the right opinion of the opponents themselves, Albert in fact had tried his best in presenting a logical and coherent manner of argument against the extramissionists' theory. To a certain extent, he in fact had succeeded in showing some of the absurdities and inconsistencies inherent within the theory itself. But most of these absurdities and inconsistencies do not strike at the root of the problem on which Albert is trying to argue. If in fact he had succeeded in portraying some of the weaknesses and deficiencies in the theory itself, these weaknesses are only a part or an elaboration of the extramission theory of vision, and not its main character, which is the emanation of visual rays from the eyes. Moreover, the background of many of Albert's theoretical assumptions rested on the physical characteristics of the intromission optical tradition, which he took them to his advantage in refuting against the extramissionists, though not all

the extramissionists would have agreed with these assumptions attributed to them by Albert.

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¹ David C. Lindberg, *The Beginnings of Western Science* (Chicago: The University of Chicago Press, 1992), 229.

² Cemil Akdogan, "Optics in Albert the Great's *De sensu et sensate*: An Edition, English Translation, and Analysis" (Ph.D. diss., University of Wisconsin, 1978), hereafter abbreviated as "*De sensu*."

³ Ibid., 136-148.

⁴ Ibid., 136.

⁵ Ibid.

⁶ Ibid.

⁷ Ibid.

⁸ Ibid., 136-137

⁹ Ibid., 137.

¹⁰ Ibid.

¹¹ Ibid., 138.

¹² Ibid.

¹³ Ibid., 138-139.

¹⁴ Ibid., 139.

¹⁵ Ibid., 139-140.

¹⁶ Ibid., 140.

¹⁷ A. I. Sabra, "The Physical and the Mathematical in Ibn al-Haytham's Theory of Light and Vision," pt.VII of A. I. Sabra, *Optics, Astronomy and Logic* (Hampshire: VARIORUM, 1994), 12.

¹⁸ Akdogan, "*De sensu*," 140-141.

¹⁹ Ibid., 141.

²⁰ Ibid.

²¹ Ibid.

²² Ibid.

²³ Ibid. 142.

²⁴ Ibid.

²⁵ Ibid., 143.

²⁶ Ibid.

²⁷ Ibid.

²⁸ Ibid., 143-144.

²⁹ Ibid., 144.

³⁰ David C. Lindberg, *Theories of Vision from al-Kindi to Kepler* (Chicago: The University of Chicago Press, 1976), 5, hereafter abbreviated as *Theories*.

³¹ *Timaeus*45b-d, trans. Francis M. Cornford, *Plato's Cosmology*, 152-53. Quoted from Lindberg, *Theories*, 5.

³² *Timaeus*67c-d, trans. Cornford, *ibid.*, 276. Quoted from Lindberg, *Theories*, 6.

³³ Akdogan, "*De Sensu*," 144.

³⁴ Ibid., 146.

³⁵ Ibid.

³⁶ Ibid.

³⁷ Ibid., 146-147.

³⁸ Ibid., 147.

³⁹ Ibid.

⁴⁰ Ibid.

⁴¹ Ibid., 147-148.

⁴² Ibid., 148.

⁴³ Lindberg, *Theories*, 4.

⁴⁴ Ibid., 11-14.

⁴⁵ David C. Lindberg, "The Intromission-Extramission Controversy in Islamic Visual Theory: Al-Kindi versus Avicenna," pt. IV of David C. Lindberg, *Studies in the History of Medieval Optics* (London: VARIORUM, 1983).