Lecture: Islamic optics and Italian Renaissance representation: Naturalism and Human Nature

1. Ibn al-Haytham (Alhazen) and his importance
    a. Alhazen was the greatest and most influential contributor to Western Europe science of optics.ed[1]
    b. Ibn al-Haytham used experimental evidence to develop a remarkably accurate theory of vision.[2] He introduced the scientific method.
2. Kitab al-Manazir or Book of Optics
    a. Alhazen's Kitab al-Manazir or the Book of Optics, was published sometime between 1028 [418 A.H.] and 1018 [429 A.H.] and was incorporated throughout the core of post-medieval Western culture.[3]
    b. It was introduced to the West about 1200 and became the prime source for thirteenth century optical investigators.73[4][5]
    c. The book initiated a chain of development of the modern understanding of optics as well as understandings of two dimensional pictorial representations of three dimensional space.[6]
    d. The translation of the Book of Optics was absorbed by medieval optical scientists, Roger Bacon, Erazmus Witelo, and John Pecham, whose subsequent work had enormous influence on the progression of optical understandings throughout the centuries that immediately followed.[7]
    e. Ghiberti contributed to Alberti's discussion about a decade later and relied heavily optical theories of Pecham and Witelo, which relied heavily on Alhazen.[8]
    f. The Book of Optic and the Italian Renaissance
        i. It was translated into Italian in the fourteenth century and a version was extracted and copied by Ghiberti in his Commentari. 73[9][10]
        ii. There is a parallelism between Alberti and Alhazen in that both understood spatial perceptions as both optical as well as cognitive. The viewer brings to the optical experience perceptual tendencies that determine what the viewer is seeing. Greenstein in Falco[11]

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[1] Edgerton, *The Renaissance Rediscovery of Linear Perspective*.
[2] Falco and Allen, "Ibn Al-Haytham's Contributions to Optics, Art, and Visual Literacy."
[3] Falco and Allen.
[4] Edgerton.
[5] Falco and Allen, "Ibn Al-Haytham's Contributions to Optics, Art, and Visual Literacy."
[6] Falco and Allen.
[7] Falco and Allen.
[8] Falco and Allen.
[9] Edgerton.
[10] Falco and Allen.
[11] Falco and Allen.

iii. Ghiberti contributed to Alberti's discussion about a decade later and relied heavily optical theories of Pecham and Witelo, which relied heavily on Alhazen.[12]

3. Alhazen's theory of optics (perspectiva as it was called in medieval Europe)
    a. Theories of light
        i. Extromission - light particles emitted from the eye
        ii. Intromission - objects transmitted replicas of themselves that then travelled to the eye of the observer.
    b. Light as rays
        i. Alhazen conceived of light as emitted from objects that traveled in rays
        ii. His experiments with mirrors to control light and camera obscuras, provided him with a theoretical basis for the existence of rays., a theoretical construct. These rays could be represented by geometrical lines associates on a point-by-point basis with an object in space.[13]
        iii. Alhazen's theories created a geometric notion of space and sight based on straight rays of light intersecting planes in discrete ways, a Euclidean continuum or plane, where every point on the plane is a set distance from every other. [14]
        iv. This kind of geometry can be seen in the writings of Renaissance masters as Alberti, Ghiberti and Leonardo. Alberti's most notable work, On Painting, c1415, for example, employs a model for vision taken directly from Ibn al-Haythan.[15]
    c. Vision as both optical and psychological
        i. Vision is a cognitive process that involves not only optics but inner sense and intellect, semantics, semiotics, and the soul. Greenstein in Falco[16]
        ii. Alhazen proposed a kind of intromission that incorporated psychology to explain vision, in combination with the behavior of light and the physiology of the eye.[17]

[12] Falco and Allen.
[13] Falco and Allen.
[14] Falco and Allen.
[15] Falco and Allen.
[16] Falco and Allen.
[17] Falco and Allen.

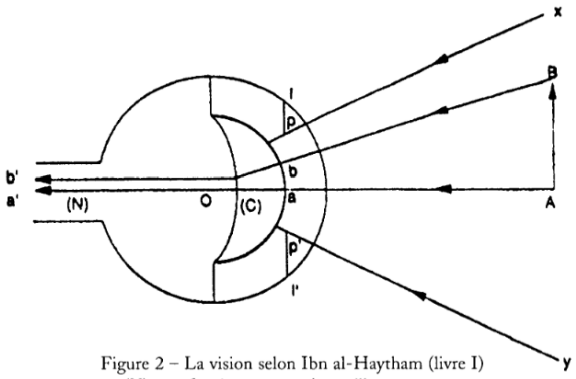
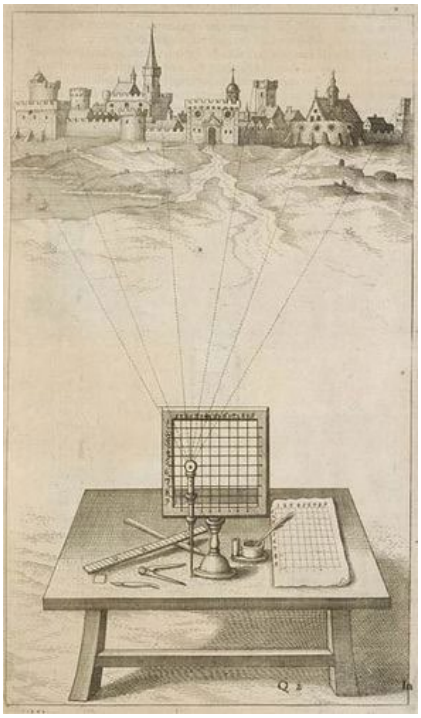


Figure 2 – La vision selon Ibn al-Haytham (livre I)

(N)	nerf optique	pp'	pupille
O	centre de l'œil	II'	iris
(C)	cristallin	AB	objet

Aa, Bb, etc. Rayons lumineux utiles (normaux à la cornée et à la face antérieure du cristallin).
a'b' forme sensorielle de l'objet se propageant dans l'humeur vitrée et le nerf optique.
(La face postérieure du cristallin pourrait aussi être plane ou légèrement convexe. Mais toujours située dans la partie antérieure du globe oculaire, elle transmet par réfraction les formes parallèlement à l'axe de l'œil). – Grâce à la ségrégation des seuls rayons lumineux utiles, on retrouve le vieux cône visuel antique, mais il a changé de sens.

Alhazen's theory of light's interaction with the eye.



Alberti's pictorial plan.

Works Cited

Edgerton, Samuel Y. *The Renaissance Rediscovery of Linear Perspective*. New York: Basic Books, 1975.

Falco, Charles M, and Aimée L. Weintz Allen. “Ibn Al-Haytham’s Contributions to Optics, Art, and Visual Literacy.” *Painted Optics Symposium / SACI, Studio Art Centers International Palazzo Dei Cartelloni. D. Hockney ...*, 2009, 115–28.