

ABSTRACT

Graziella Federici Vescovini *Alhazen's visual pyramid and Leon Battista Alberti's Perspectiva pingendi* pp. 3-18

The contribution evidences the importance of mathematical optics developed by the Arab scientist Ibn al Haytham, namely Alhazen for Latin medieval scholars. His main work on optics was known by Leon Battista Alberti both in the widespread Latin version (*De aspectibus*) and in the vulgar Italian translation realized in mid-fourteenth century (*De li aspecti*).

Graziella Federici Vescovini
Professore Emerito Università di Firenze
ridaldi@gmail.com

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Nader El-Bizri *Alhazen's Theory of Vision* pp. 19-33

This paper examines the theory of vision of Alhazen (d. ca. 1041 CE, Cairo) as contained primarily in his *Book of Optics*. This is set in the context of probing his demonstrative and hypothetical-deductive procedures in experimentation and controlled testing, as grounded on the isomorphic entanglement of geometry with physics *qua* natural philosophy. An emphasis is placed on how he resolved the antique dispute over the nature of vision and light, when assessing the intromission and emission theories. This is complemented by elucidating his analysis of the physiological, neurological, and cognitive aspects of vision, besides the geometric modelling of the comportment of physical light rays as they enter into the eyes. The additional merits of his theory of vision are also evident in their prophenomenological dimensions in connection with analysing the embodiment and kinaesthetic engagement of the observer in the visually perceptible field, and in the perception of spatial depth. Another factor that is

also accounted for in this line of inquiry relates to how visual perception generates verified knowledge about natural phenomena through observational data, which become epistemically validated by Alhazen when the empirical conditions of sight are controlled.

Nader El-Bizri
 American University of Beirut
 nb44@aub.edu.lb

§

Dietrich Lohrmann *Burning mirrors: from Alhazen to Leonardo of Vinci* pp. 35-80

After an introduction to Greek and Arabic prehistory of burning mirrors, this study presents a catalogue of twentytwo short texts on focal mirrors written during the late medieval period by almost all the major medieval scientists, from Robert Grosseteste and Roger Bacon to Regiomontanus and Leonardo da Vinci, including a passage from Grosseteste's or one of his students' *De calore solis*, concerned with the heat of the sun. The catalogue starts with two extracts from Ibn al-Haitam (Alhazen), only one of which had been translated into Latin. The geometric approach dominates these texts, but detailed information on the construction of parabolic mirrors is often included. Johannes Fontana wrote a treatise on the steel of the mirrors. Johannes Fusoris corrected essential errors from the great work of Witelo. The construction of great mirrors was still difficult, and encountered major obstacles even in the modern era up to the 20th century. Leonardo was able to observe experiments with focal mirrors in Florence as early as 1470 and in 1513-14, during his stay in Rome, he concentrated on the difficulties of the practical production of focal mirrors. The multitude and importance of these medieval writings on burning mirrors show that the Arabic suggestion for heat generation from sunlight was taken very seriously. Last but not least, an aim for trying their construction was to reduce the great need for fuel in the building industry, especially where lime and tens of thousands of bricks had to be baked.

Dietrich Lohrmann
 Historisches Institut der RWTH, Aachen
 lohrmann@rwth-aachen.de

§

Jeremiah Hackett *Roger Bacon's Various Texts on perspectiva in his Later Works: The significance of Two New Versions of his Perspectiva* pp. 81-104

This paper is a supplement to David C. Lindberg's introduction to his edition of Roger Bacon's *Perspectiva*. It establishes the existence of two new treatments of *perspectiva* by Bacon. It raises issues concerning the Italian MSS used by Lindberg. Italian scribes were aware of at least two different versions of the *perspectiva*. MS Paris, BnF, lat 7434, fols. 13r-48v contains the earliest version known which has been dated to ca. 1262. I argue that the treatment on *perspectiva* in London MS BL, 7.F.VIII, fol. 3r-12r is an authentic fragment of part five of Bacon's *Compendium studii theologiae*. I provide a critical review of the text in Paris, BnF, lat 7434 and I raise issues about the editorial condition of the text of the *Opus maius*. I argue that the marginal notations on the latter Paris MS include the hands of both Roger Bacon and Pierre de Limoges. In conclusion, I connect Roger Bacon, John Pecham and Pierre de Limoges as part of a «Parisian Optical Tradition» inspired by the work of Robert Grosseteste and Adam Marsh. Both the 1262 version and 1266-67 version of the *Perspectiva* were known and used by early fifteenth century writers on *perspectiva* in Italy such as Lorenzo Ghiberti.

Jeremiah Hackett
University of South Carolina
HACKETTJ@mailbox.sc.edu

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Valeria Sorge *Blasius of Parma and the Perspective* pp. 105-20

This essay reconstructs the theoretical plot of Blasius of Parma's *Quaestiones perspectivae*, in particular the thesis of *visio certificata*, the question of shadows and the theory of colors. The key concept of Blasius' optics is not only his new and original reading of Alhazen's *De aspectibus*, but also his polemical attitude towards Latin medieval *perspectivi*, starting from his remarks on the nature of mathematics, *species* and the act of vision. This theories refer to Alhazen's correction of Euclid's and Ptolemy's geometric optics in the second book of *De aspectibus* and to the importance of the principle of sensible certitude which is linked with the activity of the internal senses, i.e.

memory, cognitive and *aestimativa*. Blasius theorizes the connection of the *operationes* of the human soul, both sensible and intellectual, on the basis of the «materialist» background of his psychophysiology, by means of the concept of mathematic-experimental *cognitio visiva* in a revision of the Aristotelian psychology of the internal senses.

Valeria Sorge
 Università degli Studi di Napoli Federico II
 sorge@unina.it

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Cecilia Panti *The Commentario terzo by Lorenzo Ghiberti and his volgarizzamenti of Vitruvius, Alhazen and the Medieval Perspectivists* pp. 121-56

The compilative nature of the *Commentario terzo* by Lorenzo Ghiberti has posed serious problems to scholars as regards its structure, methodology and aim, which have been long debated. The text is a collection of *volgarizzamenti* from Vitruvius' *De architectura*, Alhazen's *De aspectibus* and the medieval optical works by Roger Bacon and John Peckham. This paper focuses on a single aspect of Ghiberti's *Third Commentary*, namely his original interventions inserted within the flow of his translations. The first section of the paper recalls the main data concerning the *Commentarii* and their transmission in the only manuscript copy which conveyed them to us (Florence, BNC, II, I, 333); this is done through a supplementary examination of Giorgio Vasari's statements concerning this precious witness. Then, a summary of the *status quaestionis* on the sources of the *Commentario terzo* introduces the discussion on selected specimens of Ghiberti's *volgarizzamenti* from Vitruvius, Alhazen, and the medieval perspectivists. Their textual features illustrate how Ghiberti read, understood and used his scientific and literary sources in order to accomplish his huge effort to expose all aspects of a complex and multifaceted science of vision which, at his time, still spoke a demanding scholastic Latin.

Cecilia Panti
 Università di Roma «Tor Vergata»
 cecilia.panti@uniroma2.it

§

Danielle Jacquart *Perspectiva and Franciscan biblical exegesis in the thirteenth and fourteenth centuries: a problematical resort?* pp. 157-80

It is well known that Roger Bacon was convinced that *perspectiva* was necessary in order to attain with certitude the literal as well as the spiritual meaning of the Holy Scripture. Despite this claim, the examples of this use he gives in his *Perspectiva* are disappointing, because of their vagueness or their elementary level of optical knowledge. After having recalled Roger Bacon's claim, this article analyses Bonaventure's *Collationes in Hexaemeron*, Peter John of Olivi's biblical exegesis and Nicolas of Lyra's *Postillae*, in search of an eventual resort to *perspectiva*. In conclusion, it is argued that the example shown in Robert Grosseteste's *Hexaemeron*, in which optics plays a fundamental role, seems to remain exceptional. One of the reasons was perhaps the link between *perspectiva* and the philosophy of cognition, which could lead to problematical discussions from a theological point of view.

Danielle Jacquart
 École pratique des Hautes Études-PSL, Paris
 danielle.jacquart@ephe.psl.eu

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Francesca Galli *The perspectiva ad usum praedicatorum in late 13th-century Florence. Some observations based on an examination of codex Plut. 17 sin. 8 from the Laurentian Library* pp. 181-202

The present contribution offers, first of all, a detailed description of codex Plut. 17 sin. 8 from the Laurentian Library, a manuscript that may have been in Florence (possibly in the library of Santa Croce) since the late 13th century, and which contains numerous texts on the science of *perspectiva* and on physical and spiritual light. Particular attention is devoted to the works of John Peckham (*De numeris mysticis*, *Perspectiva communis*, *Tractatus de perspectiva*, *Quaestiones*) and Bartolomeo da Bologna (*De luce*, *Quaestiones*) transmitted by the miscellany. These texts testify to the close connection between optics and theology, and to the interest in such disciplines shown by friar minors (as well as other clerics) in the mid-13th century. Following an in-depth analysis of each quire and of some marginal annotations, the paper discusses the editorial project that may lie at the basis

of the miscellany, and its potential readers, ultimately presenting some hypotheses with regard to the role played by the Franciscan preacher Ser-vasanto da Faenza in relation to this «publishing venture».

Francesca Galli
Università della Svizzera Italiana, Lugano
francesca.galli@usi.ch

§

Dallas G. Denery II, *Vision and visual error in later Middle Ages* pp. 203-17

Later medieval writers demonstrate a keen interest in visual error and deception. Unlike many early modern thinkers, the possibility that we might see things that do not exist does not cause them to take seriously the skeptical possibility that we cannot know the world around us. Rather, they accept our finitude and fallibility and ask, given those limits, what can we achieve? In this sense, medieval epistemological discussions mirror related discussions concerning the practice of confession. Medieval writers recognize that no confession of sins can be complete, that there are always other sins hiding in the recesses of the soul. Recognizing human limits and the demands of the task at hand, they counsel us to do our best [*facere quod se in est*] and leave the rest to God.

Dallas G. Denery II
Bowdoin College
ddenery@bowdoin.edu

§

Alberto Faliva *Situating perspectiva in Renaissance Florence* pp. 219-38

This paper examines the social and geographical contexts of architectural landscape in Renaissance Italy, as one possible influence on developments in pictorial representation. A key factor in such relationships concerns the responses of architectural language to different urban and rural contexts during the Renaissance, most clearly characterized by the siting and visibility of suburban villas in the Tuscan landscape. In this arrangement of ideally situated buildings in a landscape, mediated by terraces and geometri-

cally organized gardens and surrounding fields, perspective serves not only as a means of reinforcing the privileged position of the viewing 'subject' but also correspondingly communicates to the observer a field of surveillance of the imagined owner /occupant from the villa particularly during times of conflict or dispute. The objective of this contribution is only a hypothesis to work on: these hybrid architectural forms, and their varying perspectival representations, are built within a changing visual panorama of manmade and natural elements where the owner often consciously sought to enhance the importance of his social status, by parading the villa a sort of changeable dress depending upon circumstances or occasion. The people of Florence for example, located within the walls of the city in the Arno valley and surrounded by villas in the foot-hills of Tuscany, would have been acutely aware of these changes manifested through the transformations of landscape and built-form. Consequently, all the villas, with their fortified and classic elements, become a living landscape possessing different characters analogous to the dress and decorum of their owners. This gave rise, within the visual field of the perspectival framework, a hierarchically structured natural, geographical and social tableau.

Alberto Faliva
University of Huddersfield
alberto.faliva@icloud.com

§

Nicholas Temple *Lorenzo Ghiberti and Contested Views of Perspectiva in Renaissance Concepts of Space* pp. 239-63

This paper explores Lorenzo Ghiberti's approach to perspective in early fifteenth century Florence, demonstrating the manner in which his treatment of light, vision, colour and gesture were closely inter-twined in the representation and perception of space. The investigation argues that Ghiberti's artistic practice directly influenced his theoretical understanding of perspective (revealed in his unfinished 3rd Commentary), which constitutes a rather different approach compared to Alberti's codification of *costruzione legittima*. The paper highlights interesting parallels between Ghiberti's luminous treatment and Nicholas Cusanus' model of communing geometric space in perspective (*De vision Dei*), demonstrated in

the spatial and iconographic features of the Gates of Paradise which are examined in the context of the rituals of baptism and the processions/ceremonies associated with Florence Baptistery.

Nicholas Temple
Sir John Cass School of Art,
Architecture and Design, London
n.temple@londonmet.ac.uk

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Filippo Camerota, “*Perspectiva pratica*”: a Bridge Between the Philosopher’s “*Perspectiva*” and the Painter’s “*Prospectiva*” pp. 265-88

The transmission of the optical science in the painters’ workshops at the beginning of the fifteenth century is the cultural event that led to the development of the geometric rules of perspective representation. The modalities with which this transmission took place are generally attributable to the diffusion of the founding text of Leon Battista Alberti’s *De pictura*, written in Florence in 1435. It is likely, however, that Alberti himself benefited from a geometric culture already well established in the painters’ workshops, that is, the practical geometry of the Abachist masters who for at least two centuries had served as a bridge between the mathematical sciences taught in universities and the practical applications implemented by artists and topographers. The methods of measuring by eye, in particular, were based on the principle of intersection of the visual pyramid, the same that Alberti established as the foundation of the new art of painting.

Filippo Camerota
Museo Galileo - Istituto e Museo di Storia della Scienza
f.camerota@museogalileo.it

§

J. V. Field *Perspectiva in painting: Piero della Francesca and the Interaction between Theory and Practice* pp. 289-314

Piero della Francesca, competent both as a painter and as a mathematician, also wrote a treatise on perspective for painting. His surviving paintings illustrate the tension between mathematical perspective and the

painter's concern for the viewer's experience. Architecture is shown scaled down so that enough is visible, as in *The Flagellation of Christ* (Urbino). In the fresco cycle, *The Story of the True Cross* (Arezzo) systematic adjustments are made to allow for its being impossible for the viewer to stand at the ideal viewpoint built into the perspective construction, and the natural light is used to help impose unity on the cycle. Piero also uses lighting, real or imagined, as an aid to illusion, and sometimes to define the structure of the pictorial space, as in the *Madonna di Sinigallia* (Urbino). In his fresco of *St Mary Magdalene* (Arezzo), he even juxtapose real gold with a rendering of gold in paint. Piero's mastery as a painter has largely ensured that art historians have not noticed his mathematical subterfuges.

J. V. Field
Birkbeck, University of London
jv.field@hart.bbk.ac.uk