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Book Review

Kirsti Andersen

The Geometry of an Art. The History of Perspective from Alberti to Monge

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Reviewed by João Pedro Xavier

Faculdade de Arquitectura da Universidade do Porto (FAUP)
Via Panorâmica S/N
4150-755 Porto PORTUGAL
jpx@arq.up.pt

Kirsti Andersen's book, *The Geometry of an Art. The History of Perspective from Alberti to Monge*, will surely become one of the fundamental references concerning the mathematical development of *perspectiva artificialis*, from the first steps, found in *De Pictura* (1435) up to its integration in the last edition of *Géométrie Descriptive* (1820).

Given the wide scope of this study and the author's methodology, based on an extensive and careful analysis of "more than two hundred books, booklets, and pamphlets on perspective" [Introduction, xxi], *The Geometry of an Art* is a monumental work, the work of a lifetime, one could say. The author's lifetime has been filled with accurate investigations on perspective that has already given rise to some of the most important titles about its history regarding the work of Piero della Francesca, Stevin, Desargues and Brook Taylor, among others.

This is actually a book of history of science dealing with a specific branch of geometry, that is, perspective. Although perspective became the geometry of an art, because its history is related to the conquest of exactitude in the representation of space from an identifiable point of projection (the artist's viewpoint), the main scope of this book is to narrate the process leading towards the definition of a mathematical theory of perspective:

My primary sources do not give an adequate background for discussing thoroughly the highly pertinent question of the actual use of perspective in paintings, architectural illustrations, and other drawings [Introduction, xxiii].

In a certain way we needed a comprehensive work that systematically treats the scientific aspects of perspective because these were so often neglected and biased in favour of dubious interpretations of its significance. That is why the author is very careful about her sources and only studies what come from printed materials containing drawings and explanations, such as perspective textbooks or other treatises where the subject is developed. This seems to me a wise approach, because even if we look at paintings

artificially with the aid of x-rays or infrared to find perspective layouts we cannot know for sure which perspective construction underlies them (if indeed there is one... and so many have been “found” that could never exist!). This attitude explains, for instance, why the study begins with Alberti rather than Brunelleschi. In spite of this, the first chapter, “The birth of perspective”, discusses some of the hypotheses regarding the construction of Brunelleschi’s famous *tavolette* but, as it is impossible (at least up to now) to arrive at any certainties, the author prefers to begin the main discussion with the first known description of a perspective construction, the one provided by Alberti. The choice of ending the discussion with Gaspard Monge, seems a little bit surprising to me, as this French geometer did not introduce any novelty into perspective theory, especially if we compare him to Johann Heinrich Lambert. The reason for this choice, as the author explains, is the idea of *closing a cycle*, since Monge incorporates perspective in his *Géométrie Descriptive* by returning to the plan and elevation technique discovered earlier, and for the first time, in Piero della Francesca’s *De Perspectiva Pingendi*.

Also impressive is the wide range of countries and nationalities covered: Italy, Germany, France, Holland and England, areas of Europe which actually were the main stages for the development of perspective. No Spanish or Portuguese contributions were studied, which I presume was due to difficulties with the language. The author writes, “I am confident that my material is so comprehensive that adding further publications would not change my conclusions in any significant way” [Introduction, xxii]. I believe I can confirm that the Iberian works cast no doubt on the author’s conclusions.

In fact, as far as both Spain and Portugal are concerned, what matters is the way perspective constructions are either assimilated (with much misinterpretation as in many other places), or simply refused in favour of alternative techniques, possibly inspired by instruments for taking angular measures. This seems to be the case of the so-called “Spanish Renaissance angular perspective” (studied by Lino Cabezas¹) developed and presented by Rodrigo Gil de Hontañón² (ca. 1500-1577) and Hernán Ruiz, el joven³ (1514?-1569) around 1560, which is an unorthodox and alternative perspective construction similar to the one that was to appear later in Gianfrancesco Costa’s *Elementi di prospettiva per uso degli architetti e pittori* (1747), applied in a different context and pursuing other purposes. This perspective construction is treated by Andersen in the section “A Special approach to Perspective – Costa” [VIII.6, 394].

In order make the investigation coherent and evaluate the relative importance of the protagonists of this story Kirsti Andersen conducts her research using a query composed of the following questions:

How does the work of the author relate to other literature on perspective?
Which perspective constructions did he chose? How did he describe them
and, in particular, to what extent was his presentation based on a
geometrical background? [Introduction, xxii].

The data concerning each author’s knowledge of previous and relevant contributions, the insights added to improve the quality of a specific perspective construction or to provide a new one, the capacity to arrive at complete explanations enlightened by a theoretical mathematical background, led Andersen to select a group of protagonists comprising Guidobaldo del Monte, Simon Stevin, Willem ‘sGravesande, Brook Taylor and finally Lambert, to whom the creation of perspective geometry is credited.

Let me summarize, using here and there a few Andersen’s own words, the main achievements of these most significant figures in the history of perspective.

Guidobaldo is clearly the geometer who marks the end of a cycle and the beginning of a new one. In fact, although he is still concerned with the problem of the section of the visual pyramid, the Albertian *intersecazione*, he turns the interest to what happens in the picture plane as a result of that intersection, which means, in other words, that he became concerned with perspective itself. His main contribution is the definition of the *punctum concursus* and the generalization of that concept for any direction. This is the vanishing point theorem, to use Taylor's updated language, which is directly related to what Andersen calls the *Main Theorem of Perspective*:

The Main Theorem of Perspective (FIGURE VI.5) The image I_l of any line l that is not parallel to the picture plane is determined by the vanishing point V_l and the intersection I_l [VI.2, 245-246]

Although it is possible to detect in the first ideas about the *punctum concursus* some traces of an operative practice, the fact is that its full development puts Guidobaldo in the core of the theory of perspective. This is very interesting, because this scientific iter led him to join the northern empiric tradition, begun with Viator and clearly visible in Vredeman de Vries, characterized by the idea of describing space directly on the picture plane from visual observation.⁴ In the end, Lambert's notable conquest was having revealed the mathematical key to this procedure and achieving the full development of a language of perspective geometry although, paradoxically, this language could only be spoken by a few, and would remain almost inaccessible to practitioners (see [XIV.4, 720 "The Usefulness of the Theory of Perspective"]).

According to Andersen, Stevin was clearly a follower of Guidobaldo and continued the research deep inside the theory of perspective. Feeling the need to build the foundations of a new geometry he tried to establish a set of definitions and postulates (axioms) in a Euclidean manner, from which he deduced six theorems, of which the third "is in effect Guidobaldo's important vanishing point theorem, stated in complete generality" [VI.7, 271]. His influence, and possibly also the insights of van Schooten, reached 'sGravesande, who pushed it further "as he appreciated and exploited its potential more strongly than his predecessors, for instance by focussing upon a very elegant and simple visual ray construction" [XIV.3, 717]. Then 'sGravesande's mathematical understanding of perspective inspired Taylor, who "provided perspective with a new mathematical life, among other things by introducing and applying the general concept of a vanishing line" [XIV.3, 717].

Before returning to Lambert we shall remark the surprising absence of Desargues from Andersen's list of protagonists, particularly if we are talking about the concepts of vanishing points and lines, or in the terminology of the French architect, the points and lines at infinity. Desargues, with his *Brouillon Project...*, can be thought of as the grandfather of Poncelet's projective geometry. However, as the author convincingly argues, the fact is that Desargues's general method, his *manière universelle* applied to perspective, does not reflect the use of such concepts, although it is hard to prove that the first steps in the field of projective geometry were unknown and could not have inspired Lambert. Here Kirsti Andersen reveals that she could not trace the sources for Lambert's mathematical knowledge of perspective although, as she remarks, it is clear that he could not have reinvented the theory:

His work was part of the continuous development of the theory of perspective, and brought this theory as far as it could presumably be taken as an independent discipline. By this I mean that as for the specific question of how to project three-dimensional figures upon a plane surface, no important question seemed to have left unanswered. Nor did there seem to be any way of carrying out perspective constructions more elegantly than by the methods advocated by Taylor and Lambert. As a consequence of this success, the theory of perspective became less attractive for mathematicians, to whom a field with no loose ends hold no appeal [XIV.3, 716].

And so, for mathematicians, projective geometry became more attractive than perspective. But as late as 1775 perspective could still seduce a devotee of Brook Taylor, Thomas Malton, to write, "of all the Mathematical Sciences, the study of perspective is perhaps the most entertaining" [XIV.5, 721].

This is the final quotation chosen by Kirsti Andersen to close her remarkable study on perspective, which is indeed, the Geometry of an Art.

Notes

1. See Lino Cabezas, *Tratadistas y tratados españoles de perspectiva, desde los orígenes hasta la Geometría Descriptiva de Gaspard Monge* (Ph.D. Thesis, Universidad de Barcelona, 1985), p. 181-209.
2. Rodrigo Gil's "angular perspective" is known through the transcription made by Simón García in *Compendio de Arquitectura y simetría de los templos conforme a la medida del cuerpo humano. Con algunas demostraciones de geometría* (1681). Manuscript 8884, Madrid, Biblioteca Nacional.
3. The *Libro de Arquitectura* (c. 1560) by Hernán Ruiz el Joven is kept in the rare books section of the Library of the Escuela Superior de Arquitectura de Madrid. There is a critical edition of this book: Pedro Navascués Palacio, *El Libro de Arquitectura de Hernán Ruiz el Joven*. Madrid: Xarait, 1974.
4. Svetlana Alpers, "'Ut pictura, ita Visio': Kepler's Model of the Eye and the Nature of Picturing in the North" in *The Art of Describing. Dutch Art in the Seventeenth Century*. Chicago: The University of Chicago Press, 1983, p. 26-71.

About the reviewer

João Pedro Xavier is an architect and geometry teacher in the Faculty of Architecture of the University of Porto (FAUP) where he was graduated in 1985 and received a Ph.D. in Architecture in 2005. He worked in Álvaro Siza's office from 1986 to 1999 and, at the same time, he established his own practice as an architect (<http://www.jpx-arq.com>). Xavier has always been interested in the relationship between architecture and geometry, especially perspective. He is the author of *Perspectiva, perspectiva acelerada e contraperspectiva* (FAUP Publicações, 1997) and *Sobre as origens da perspectiva em Portugal* (FAUP Publicações, 2006). He published several works and papers on the subject, presented conferences and lectures and taught courses to high school teachers.