The Geometry of an Art: The History of the Mathematical Theory of Perspective from Alberti to Monge
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One of the most attractive topics in the history of mathematics is the development of single focused perspective. Elementary—but by no means trivial—geometry is involved, the opportunity arises to talk about architecture and renaissance paintings, connections can be made to a rich slice of Western culture, and books can be enlivened with reproductions of marvellous artworks. Interesting creative people from Piero della Francesca to Girard Desargues and J.H. Lambert can be brought in, mathematics seems both useful and beautiful, and the historian has an easy time sounding important. Every time this story has been told, however, some more critical historians of mathematics have wondered just how accurate it is. Specifically: how did the elaboration of principles and theorems in the theory of perspective affect the practise of draughtsmen and especially artists? Were there indeed any links at all? It is this fundamental question that Kirsti Andersen has addressed in the first full-length exploration of the topic, and what she presents is not only a remarkably extensive coverage but a careful analysis of the many different aspects of the mathematical theory of perspective in a richly satisfying historical context.

Understanding this mathematical theory can mean many things. It might be, for example, that you wish to explain this ‘perspectivist’ way of drawing realistic pictures according to a somewhat simplified theory of vision. Or you might wish to make an accurate picture of a specific object, whose shape and size is known to you. Or, you might wish to depict an entirely imaginary view in this realistic manner. For the first activity you might imagine, or even have, a genuine object, a screen (on which the picture will be drawn), an eye piece, and lots of threads or pinpricks in the screen that establish the lines joining points on the object to points on the screen and then the eye piece. The second activity requires that you carry out the first without the cumbersome threads; you have learned the theoretical basics, and perhaps the given object exists only in your mind (say, as a dodecahedron). The third activity is much more elaborate, and even if your picture is the interior of a building with some columns and some furniture it involves several activities of the second kind. If, moreover, your imaginary objects are people then some considerable thought and work is involved.

As this book shows in detail, each of these activities has its historical story. What is more, as people did them they found very quickly that there were rules that had to be followed. Once a few points were in place you could not put down the images of others at will: their places were determined by choices you had already made. What these rules were, what, to a mathematician, were the new theorems in this art, and which of them were fundamental and had the others as consequences was a matter of increasing interest. The reader of this review should now attempt to draw a plausible picture of a regular octahedron resting on a horizontal plane on one of its flat, triangular faces. This will not only acquaint you with the problems in activity two, it will raise an important question that Kirsti Andersen pursues throughout this book: what techniques are allowed in constructing such pictures?
The Geometry of an Art is very thorough in its treatment of techniques. These varied considerably, depending partly on the understanding of each author and partly on the tasks the authors set themselves, and these tasks can be broken down according to what is given and preferences about how the work is to be done. The exercise with the octahedron will have suggested several ways in which the task can be formulated: lengths, angles, coordinates among them. In other figures, for example a net of squares or cubes, collinearity might seem important.

The book begins, after some helpful introductory technical remarks, with a brief treatment of Brunelleschi and then a more detailed account of the writings of Alberti and Piero della Francesca. Then we are given a chapter on Leonardo da Vinci, whose interests and opinions appear rather skew to the simple considerations of single focused perspective. At this point mathematicians and artists had the bare outline of the theory, and the first instructional books appear, by Vignola, Danti, Barbaro and others south of the Alps, and Dürer and his successors to the north. Andersen ascribes the birth of a mathematical theory of perspective to Guidobaldo del Monte and Simon Stevin, whom she treats in considerable detail, before following their successors, including ‘sGravesande. Then she takes us to France, for an account of Desargues’s work, and to Britain, which came to the topic quite late but then in the mathematically sophisticated form of Brook Taylor, whose work she describes at length. Finally, and best of all, we come to Johann Lambert, who has some 70 pages to himself, and then Monge serves as a brief coda to the story.

But that is only to list the highlights of a book that discusses almost 200 authors and covers 350 years. The emphasis is on the development of techniques and ultimately theories of perspective, culminating in Lambert’s account that explains how it can all be done: shadows, rainbows, curved surfaces and, hardest of all, perspective images of pictures in perspective (as in an artist’s studio or a gallery). It emerges from this wealth of description that as the decades went by the mathematical aspects of the theory were ever more deeply explored, but that two other possible developments did not occur. One is that there was no significant impact of all this work on the instruction of painters. Perspective remained the business of stage designers and illustrators, the textbooks the mathematicians produced found little audience among the more artistically gifted. The other dog that did not bark is possibly more surprising: despite Desargues’s work and even Lambert’s there was little direct influence of any of this on the 19th-century rediscovery of projective geometry. It should also be noted that, despite all her efforts, the author could find no women who wrote on perspective in the period considered.

The book is written clearly and well illustrated throughout. The reader with pen and paper to hand can not only learn to draw in perspective but will come to understand how perspective was thought about and clarified, and how this rich topic diffused through several communities in Europe. It is a remarkable piece of historical research, and will surely become the definitive text on the subject.

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Mr Hopkins’ Men: Cambridge Reform and British Mathematics in the 19th Century

Among its other treasures, the Wren Library of Trinity College, Cambridge, contains an album of 42 portraits. Included in this collection are youthful likenesses of Arthur Cayley, William Thomson (later known as Lord Kelvin), J.W.L. Heaviside, and Isaac Todhunter; they and the 38 other subjects of the album all studied under Cambridge mathematical coach William Hopkins and subsequently graduated with high honors on the Cambridge mathematical Tripos examination. This portrait album served as the inspiration for Alex D.D. Craik’s comprehensive study of Cambridge’s role in British mathematics during the 19th century.