Painting by numbers

The Invention of Infinity: Mathematics and Art in the Renaissance
by J. V. Field
Oxford University Press: 1997. Pp. 250. £29.50, $35

Painting the Heavens: Art and Science in the Age of Galileo
by Eileen Reeves
Princeton University Press: 1997. Pp. 310. £29.95, £45

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I wish I'd had a mathematics teacher like J. V. Field. I might even have become a mathematician rather than an art historian. Sad but true, we art historians are by nature notoriously maths-shy, even those of us who study the Renaissance.

This is unfortunate because the Renaissance, more than any other cultural period in world history, regarded mathematics as the essence of its art. Mathematicians and artists during the Renaissance were often colleagues, swapping concepts, writing treatises and making images based on each others' expertise. As Eileen Reeves has amply documented, no less a mathematical luminary than Galileo Galilei was a confidant of the artistic celebrities Peter Paul Rubens and Lodovico Cigoli, not only influencing some of their paintings but also being influenced himself by artistic notions that helped him realize some of his most revolutionary astronomical discoveries.

Field's book is indeed a shot of adrenaline in the timid arm of Renaissance art history. Trained as both an art historian and a mathematician, Field plunges right in with a rigorous analysis of the fifteenth-century Italian painter Piero della Francesca's manuscript treatises on mathematics. Although conventional art historians have generally acknowledged Piero's interest in linear perspective, few have dared to work through the artist's heavy-going study on the five regular geometric solids or his 'abacus' book on practical mathematics, much less being able to relate these to his painting procedure. (See also the Art and Science in *Nature* **390,** 128; 1997.)

Between the fourteenth and seventeenth centuries, European artists from Italy to the Netherlands became ever more obsessed with the application of Euclidian geometry. Field discusses all this in a clear and jargon-free style frequently spiced with witty asides. But make no mistake, the author panders not one bit to the mathematically disadvantaged. When discussing Tommaso Masaccio's fresco *The Holy Trinity with the Virgin and St John* (*c.* 1425) in the Santa Maria Novella Church in Florence, for example, she forces the reader to follow her step by step through a complex of possible geometric solutions before admitting that the painter resorted to none of these at all.

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Geometrical puzzle: Masaccio's *Trinity* (*c.* 1425).

As Field goes on to demonstrate, this obsession reached its peak in the sixteenth century when professional mathematicians such as Federico Commandino and Johannes Kepler appropriated artists' linear perspective for application to their own advancing research on conics and the topology of solids. The invention and perfection of printing, moreover, encouraged a plethora of illustrated treatises on linear perspective written also by professional mathematicians and directed back again to artists. The culmination of this rich interchange, as Field concludes, was the seventeenth-century invention of a whole new mathematical science called descriptive geometry by Girard Desargues, again owing to Renaissance painters' practice.

Perhaps no scientific thinker at the turn of the seventeenth century paid closer attention to this expanding application of perspective theory than Galileo. Reeves's elegantly written and exhaustively documented book reveals just how profoundly the great astronomer was involved in the artistic milieu of his native Florence during the first decades of the 1600s. Indeed, Galileo, because of his familiarity with the Renaissance artistic technique of chiaroscuro (light, shade and shadow rendering), could immediately comprehend the importance of two of his most astounding telescopic observations, the scattered shadows on the lunar surface and earthshine, the dim glow on the still dark portion of the waxing or waning Moon caused by light reflected from Earth.

Reeves goes into the religious implications of these discoveries in great detail, even scrutinizing several paintings by Galileo's friend Cigoli for evidence that the artist was actually justifying Galileo's discoveries by trying to reconcile them to traditional Roman Catholic pictorial iconography.

Cigoli's most famous defence of his friend on this score was the fresco he painted in the cupola of the Pauline Chapel in the Basilica of Santa Maria Maggiore in Rome in 1610–12, supposedly depicting the then popular subject of the Immaculate Conception of the Virgin Mary. According to accepted convention, Mary should be shown standing aloft on a perfectly spherical alabastrine Moon symbolizing her utter purity.

It was this ancient and orthodox notion, of course, that put the Church at odds with Galileo. The Moon, the first of the heavenly planets separating God's realm from the mundane world of mortals, had thus to be, according to sacred doctrine, composed only of perfect ethereal substance as pure as the Virgin herself. What Galileo saw through his telescope, however, quite contradicted this old dogma.

In the face of his friend's evidence, Cigoli made a remarkably courageous decision. The Moon he chose to paint beneath the Virgin's feet displayed the same mountains and craters that Galileo had observed, suggesting that the Moon was hardly ethereal but rather composed of form and matter just like Earth. To this day, the Roman Catholic Church has sidestepped the contradiction apparent in Cigoli's fresco. The painting is never called the *Immaculate Conception*, but simply and uncontroversially *Madonna with Apostles.*

This story has been told before, but Reeves offers much rich new detail including a plausible conspiracy theory that would have Cigoli's nephew secretly censoring his uncle's unpublished perspective treatise of any reference to Galileo, lest his own family name be tarnished by the latter's 'crime'.

I do have one quibble with Reeves's excellent book, however. Nowhere does she acknowledge that Galileo himself was a competent artist in the Florentine Renaissance tradition, that he did not need to consult written treatises of others to comprehend earthshine on the Moon. Any well-trained cinquecento draughtsman, as Galileo certainly was, would have known how to recognize and render reflected light.

Proof is apparent in the wash drawings of the phases of the Moon that Galileo himself rendered in preparation for the engravings published in his 1610 *Sidereus nuncius.* These renderings are now preserved in the Biblioteca Nazionale in Florence, and clearly demonstrate Galileo's own natural proficiency in "painting the heavens". Too bad that Reeves in her book did not reproduce any of these, the most Galilean of all artworks inspired by the astronomer's telescope. □

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