Journey into space

The techniques of perspective have achieved invisibility through omnipresence. Filippo Brunelleschi's Florentine peep-show captured the world in two dimensions and made reality virtual.

Martin Kemp

A historian of visual representation has an easy choice in choosing the act of the millennium — even though the two seminal works that testify to this act are lost. Probably before 1413, Filippo Brunelleschi painted two demonstration panels to show how to represent space and objects on a two-dimensional surface according to the systematic optical rules of perspective. In doing so, he established a mode of depiction that was to affect how images are conveyed in virtually every field of artistic, scientific and technological activity. By looking into the implicit 'boxes' of space behind the screens of our televisions or computers, we are distant legatees of Brunelleschi's vision.

The source for the lost images is an early biography of the Florentine sculptor, goldsmith, architect and inventor, particularly famous for his great dome of Florence Cathedral. The biographer, generally assumed to be his contemporary Antonio Manetti, describes how Brunelleschi charted the optical appearance of the octagonal Florentine Baptistery within its piazza from a vantage point within the central portal of the cathedral. He set up the resulting painting, which was about 30 centimetres square — "no miniaturist could have done better" — as a peep-show.

He drilled a conical hole in the panel at the point where the perpendicular line of his sight struck the Baptistery, and spectators looked through the reverse of the panel at a mirror held in front of the painting. The spectator could raise and lower the mirror to confirm the picture's accuracy.

The second panel represented another site of great moment to the Florentines, the Palazzo della Signoria, the seat of their government, as viewed diagonally from the corner of the piazza. Since this panel was larger, Brunelleschi cut out the upper silhouette of the array of buildings so that the real sky could be seen above the painted roofs.

The conceptual significance of Brunelleschi's invention was enormous. He established that there is a direct and verifiable relationship between something viewed from a particular point and its two-dimensional image on a plane surface – a canvas, panel, wall, sheet of paper and, most significantly, the page of an illustrated book.

We do not know the projective procedures used by Brunelleschi — I am inclined to think that he adapted his mastery of practical surveying techniques — but Manetti tells us that Brunelleschi had invented what "came to be called *perspectiva*", the Latin term for the science of optics. The effect of Brunelleschi's invention on Florentine painting and relief sculpture of the following decade was revolutionary, not least in the fresco of the Trinity by Masaccio. A body of theory quickly gathered around the new science, including Leon Battista Alberti's seminal book, *On Painting*, and a treatise by Piero della Francesca, the painter–mathematician.

During the next two centuries, the painters' science was integrated into the sciences of projection by such mathematical luminaries as Federigo Commandino, Guidobaldo del Monte, Simon Stevin and Girard Desargues.

The conceptual significance of Brunelleschi's invention was enormous. He established that there is a direct and verifiable relationship between something viewed from a particular point and its two-dimensional image on a plane surface — a canvas, panel, wall, sheet of paper and, most significantly, the page of an illustrated book. A machine could be depicted to show how it would look to someone standing in front of it. Johannes Kepler's geometrical model of the cosmos could be shown as if it were a piece of divine clockwork. An animal could be portrayed standing solidly in a credible space. In short, anything could be represented in such a way that we seem to become surrogate eyewitnesses. The skilled image-maker persuades us to trust that what we are being shown has been portrayed, as they say, 'from life'.

But it was not all gain. Painters could use their technique to convince the observer that a depiction of something chimerical, such as a unicorn, recorded the real thing. An illusionistic picture hides aspects that cannot be seen from a single viewpoint, a particular disadvantage if we are seeking to understand a complicated piece of machinery. However, later variants of orthodox perspective, such as orthogonal and isometric — which retain consistent dimensionality rather than showing progressive diminution — allowed further dimensions of precise information to be conveyed.

Not least, as a tool for visualization, the perspectival system lets us imagine objects in measurable space. Artists and scientists gifted with high levels of spatial intuition can manipulate form and space by mental sculpting. And they can demonstrate their results through perspectival images.

Lost they may be, but Brunelleschi's demonstration panels rival any surviving artefacts from art and science for their effect upon what we see on a daily basis. □

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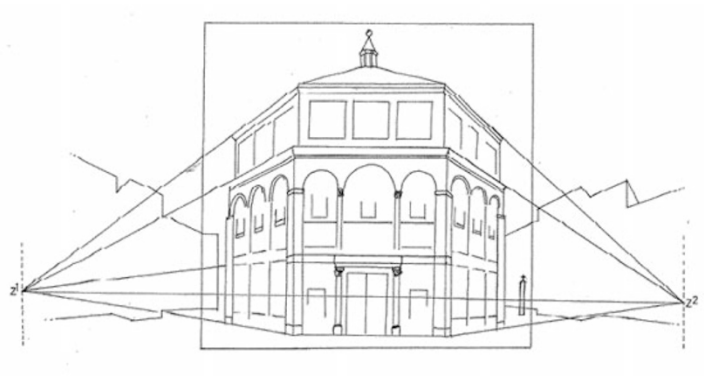

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Reconstruction of Brunelleschi's perspective demonstration of the Florentine Baptistery (left) and the building today, pictured from a different angle.