

dangerous than chemistry. Indeed, chemistry has its own 'atomic' history, which includes chemical warfare during the First World War, the use of Zyklon B in the Auschwitz concentration camp, and environmental disasters.

Beckwith has portrayed a fascinating period in the history of modern biology and

of the interaction of science and society in the Western world. Thanks to him and other activists, social injustices resulting from the application of genetics are now widely discussed and, in democracies, meet with legal measures and regulation. In this book Beckwith, a committed scientist — and here he

has many predecessors — calls for greater humility about what science can and cannot accomplish. This is a call that scientists would do well to take seriously. ■

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Science in culture

The cut-and-paste carafe

Caravaggio's optical naturalism was a success in Rome in around 1600.

Martin Kemp

Caravaggio was a shocking painter. Or, rather, his compelling naturalism enthused a new breed of patrons and seduced young Roman artists, while scandalizing the artistic establishment. Previously, painters had spent long years mastering perspective and anatomy. Now a youthful provincial from Lombardy was achieving startling results without the necessary learning.

Caravaggio did not use drawings to map out perspectival forms within geometrically constructed spaces. Instead, he assembled vividly illuminated items in shallow spaces against dark backgrounds. His paintings appeared (like early photographs in the nineteenth century) to be acts of nature, rather than art.

A typical reaction was that of Giovanni Pietro Bellori, who singled out a painting of the carafe of flowers which had first brought Caravaggio to the attention of Cardinal Francesca Maria del Monte. The painter had miraculously captured "the transparencies of the water and... reflections of the window of a room, rendering the flowers with the freshest dewdrops". The young arrivé was invited to join the cardinal's household on the Palazzo Madama.

Caravaggio's inaugural painting of this carafe is lost — but the motif became a set-piece in compositions involving pretty youths. It appears in *The Lutenist*, the restored version of which will be unveiled in Munich next month, and in two versions of *The Boy Bitten by a Lizard*. No one had previously come close to such scintillating and convincing effects.

A window reflected on the left of the vessel is mirrored upside-down inside the right wall, as if in a concave mirror. Cutting across this reflection is a band of superficial glare, accompanied by smaller smudges of brightness. The radiance casts a glimmer across the water, and catches on the shady plant stems. Four speckles of water on the glass perform optical games that mirror those in the carafe. The upper rim of water is bright with captured light, while the foremost stem drags it into a small peak, bearing witness to surface tension.

How did he achieve such effects? We could say he looked hard. But other artists had looked equally hard. To see simultaneously such effects of multiple reflection and refraction is impossible. David Hockney has reasonably suggested that Caravaggio had recourse to lens-



Encore! The carafe of flowers on the left of *The Lutenist* appeared in several of Caravaggio's paintings.

or mirror-based devices (see *Nature* 412, 860; 2001). Giuseppe della Porta, in the 1589 edition of *Natural Magic*, described an apparatus that combined a lens and concave mirror to achieve "spectacles for my friends, who admired them with great wonder and astonishment. Even though I gave them the explanations of Philosophy and Perspective they didn't want to believe that these were natural things" (see *Nature* 417, 794; 2002).

A physical reconstruction of the optical set-up, commissioned by the owner and carried out by myself and my colleagues, showed that the carafe was mounted more or less at a level with the centre of the window to the left. In addition, a surprisingly high source of light — probably from an aperture cut in the ceiling or high in the wall — accounts for the flare on the right wall of the vessel. Because the placing of the carafes in the paintings with the youths is inconsistent with this set-up, we can be sure that the carafe became a cut-and-paste motif, replicated to satisfy patrons' demands for something comparable to the lost painting.

We can understand why members of the del Monte circle were so excited by the new naturalism. They were promoting sciences that

depended on new modes of observation, as advocated in Tommaso Campanella's *Philosophy Explicated According to the Senses* (1591). The cardinal, who was to become a staunch supporter of Galileo, was an enthusiastic practitioner of alchemy (in its most experimental mode), and actively supported Ferdinando de' Medici's efforts to establish a glass-making industry in Tuscany. Caravaggio, for his part, was closely associated with a leading figure in the mirror business in Rome.

In this conjoined context of observational science and 'natural magic', Caravaggio's optical naturalism was bound to flourish, establishing a symbiotic relationship with the ideas of those who were forging new ways in instrumental seeing, without his being overly concerned with their mathematical basis.

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The Lutenist can be seen at the Stille Welt: Italienische Stilleben aus drei Jahrhunderten in the Kunsthalle de Hypo-Kulturstiftung exhibition in Munich from 6 December 2002 to 23 February 2003.