Optics and the Old Masters

In his March 2004 article, David Stork purports to examine David Hockney's and my optical evidence that the chandelier in van Eyck's "The Arnolfini Marriage" is based on a projected image. However, rather than addressing any of our published evidence,[1] he applies to the image a technique that is inapplicable to anything but a perfectly symmetrical object; an implausible assumption for a handmade 15th century chandelier. Stork compounds this fundamental error by basing his entire analysis on the positions of decorative features attached to the arms, the portions of the image least likely to exhibit symmetry.

Although he offers his Fig. 6 as validation of his analysis technique, this is a very deceptive figure. Large 15th century, six-arm chandeliers exist, but Stork selected a *modern reproduction* of a much smaller, less ornate, four-arm chandelier. Not only does the single decorative feature centered on each of its arms result in symmetry lacking from any complex chandelier, but a four-arm reproduction is also easier to construct symmetrically. Even so, the reproduction has enough imperfections to result in Stork's lines not meeting at ideal foci in his Fig. 6, betraying the failure of his analysis when there are even minor deviations from perfect symmetry (the low camera position and small scale of Fig. 6 further confuse comparison with van Eyck's chandelier).

In contrast to Stork's misleading analysis, our published evidence,[1] summarized in Fig. 1, shows that van Eyck's chandelier indeed exhibits the perspective expected for a painting based on an optical projection.

Stork has a number of other errors of understanding. For example, since the mirror is shown in the painting, irrespective of its focal length it obviously could not have been used to project an image of itself. Stork's contention that the projected images are too dim to use is simply wrong, and his statements about "the historical record" are also at variance with the facts.

For example, 61 treatises on optics were written between the time of al-Haytham and van Eyck,[2] showing this 400-year period was one of remarkable activity. Although only a few of these texts have been translated into English, they describe in detail how to fabricate suitable concave mirrors from metal. One of the shorter descriptions is: "*Make a spherical mirror as before [from clear iron]; smooth and polish its interior along the concave portion of its curvature …*"[3]

Stork's failure to cite our published evidence for this painting[1] is unacceptable scholarship. No less misleading is his citation of extracts printed in the popular media and on Web sites as long as four years ago, rather than the actual scientific and historical evidence for this painting that we have published[1] and presented ourselves, of which he has been aware since at least October 2002.

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Figure 1. Summary of evidence[1] that the chandelier is based on an optical projection: a) perspective-corrected length, width and shape of the main arc of all six arms are identical to within ~ 2 percent; b) radii of all six candle holders are within ± 1.5 percent of the radius of a perfect circle centered on the axis of the chandelier; c) angular positions of all six candle holders are within ± 4 degrees of the points of a perfect hexagon rotated by 5 degrees; d) within ± 1 mm, the positions of the lowest points on the arcs of five of the six arms have the identical 5-degree-rotated hexagonal symmetry as the candle holders; and e) vanishing points defined by the candle holders and by the arcs converge to the same horizon to within the accuracy expected for the imperfections in a real chandelier.

References

1. D. Hockney and C. M. Falco, "Optics at the Dawn of the Renaissance," Technical Digest of the Optical Society of America, 87th Annual Meeting (OSA, 2003).
2. D. C. Lindberg, *A Catalog of Medieval and Renaissance Optical Manuscripts* (Pontifical Institute of Medieval Studies, 1975).
3. A. M. Smith, translator, *Book V of Witelo's Perspectiva* [c 1274] (Polish Academy of Sciences, 1983), p. 98.

Letters to the Editor

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