

Did early Renaissance masters use optical projections while painting?

Image analytic, optical and historical rebuttals to the Hockney theory

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Abstract: We apply image and optical analyses to key works to test the recent claim that some Renaissance artists as early as 1420 used projections while executing their paintings. Our rigorous results, together with a careful consideration of the historical documentary record and putative “re-enactments,” show that the optical projection claim is implausible for adduced paintings of the 15th century.

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Recently the contemporary artist David Hockney and thin-film physicist Charles Falco claimed that some western artists as early as 1420 employed optical projections while painting [1]. To test their claim, we apply rigorous computer vision and optical analyses to key paintings they adduce as evidence. Proponents claim that the trellis in the right panel of Robert Campin’s *Mérode Altarpiece* (1425) is the earliest known recording of a projected image, but a simple geometrical construction using a straightedge reproduces all the visual evidence and leads to a far more plausible explanation, which we demonstrate by simple experiment [2]. Proponents suggest that the convex mirror in Jan van Eyck’s *Portrait of Arnolfini and his wife* (1434) could have been used as a projection mirror for the full painting but our image and optical analyses of the respective focal lengths refute that claim. Proponents claim that the splendid chandelier in that painting “is in perfect perspective” and hence traced under optical projection but our photogrammetric analysis and direct physical measurements of comparison surviving metalwork in museum collections show that this claim demands the physical Arnolfini chandelier be implausibly distorted [3,4].

Proponents claim that van Eyck’s *Portrait of Cardinal Niccolò Albergati* (1432) was copied from a smaller silverpoint study by means of an epidiascope or simple opaque projector, however the recent discovery of pinprick holes along the contour of the silverpoint strongly suggests the reproduction involved *mechanical* (not optical) aids, for instance a *Reductionsziel* [5,6]. Proponents point to the difference in a central vanishing points of the front and back halves of the carpet in Hans Memling’s *Flower still-life* (c. 1490) as evidence each was drawn under optical projection but our additional perspective tests reveal that the geometric evidence is even stronger *against* the use of projections [7]. Proponents claim that the unusually enlarged right hand in Caravaggio’s *Supper at Emmaus* (1601-2) arose from refocusing a projector but we show this claim demands an implausibly awkward studio procedure.

Proponents describe putative optical projectors as “baby optics,” but in the 15th century such projectors would have been the most sophisticated, precise optical systems on the planet, requiring unusually bright (solar) illumination [8]. We have no contemporary corroborating documentary evidence of such projectors when we have every reason to expect it. Modern putative “re-enactments” using large high-quality mirrors and high-power theatrical stage lighting succumb to several historical fallacies and give little if any support for the projection claims.

Our results lead us to reject the claim that 15th-century Renaissance painters traced optical projections.

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