Hockney–Falco thesis

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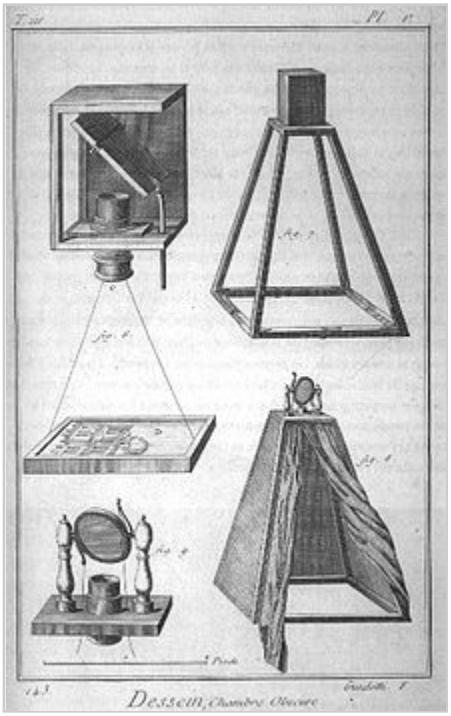
The **Hockney–Falco thesis** is a controversial theory of art history, advanced by artist David Hockney and physicist Charles M. Falco, suggesting that advances in realism and accuracy in the history of Western art since the Renaissance were primarily the result of optical aids such as the camera obscura, camera lucida, and curved mirrors, rather than solely due the development of artistic technique and skill. In a 2001 book, *Secret Knowledge: Rediscovering the Lost Techniques of the Old Masters*, Hockney analyzed the work of the Old Masters and argued that the level of accuracy represented in their work is impossible to create by "eyeballing it". Since then, Hockney and Falco have produced a number of publications on positive evidence of the use of optical aids, and the historical plausibility of such methods.



A diagram of the camera obscura from 1772. According to the Hockney–Falco thesis, such devices were central to much of the great art from the Renaissance period to the dawn of modern art.

Part of Hockney's work involved collaboration with Charles Falco, a condensed matter physicist and an expert in optics. While the use of optical aids would generally enhance accuracy, Falco calculated the types of distortion that would result from specific optical devices; Hockney and Falco argued that such errors could in fact be found in the work of some of the Old Masters.[1]

Hockney's book prompted intense and sustained debate among artists, art historians, and a wide variety of other scholars. In particular, it has spurred increased interest in the actual methods and techniques of artists among scientists and historians of science, as well as general historians and art historians. The latter have in general reacted unfavorably, interpreting the Hockney–Falco thesis as an accusation that the Old Masters "cheated" and intentionally obscured their methods.[2] Physicist David G. Stork and several co-authors have argued against the Hockney–Falco thesis from a technical standpoint.[3][4][5]

Contents

Origins of the thesis

As described in *Secret Knowledge*, in January 1999 during a visit to the National Gallery, London, Hockney conceived of the idea that optical aids were the key factor in the development of artistic realism. He was struck by the accuracy of portraits by Jean Auguste Dominique Ingres, and became convinced that Ingres had used a camera lucida or similar device. From there, Hockney began looking for signs of the use of optical aids in earlier paintings, creating what he called the *Great Wall* in his studio by organizing images of great realistic art by time period. What he saw as a sudden rise of realism around 1420, combined with Charles Falco's suggestion that concave mirrors could have been used in that period to project images, was the germ of the Hockney–Falco thesis.[6]

In 2000, Falco and Hockney published an analysis ("Optical Insights into Renaissance Art") of the likely use of concave mirrors in Jan Van Eyck's work in *Optics & Photonics News*, vol. 11. In 2001, Hockney published an extended form of his argument in *Secret Knowledge*.

Hockney's argument

In *Secret Knowledge*, Hockney argues that early Renaissance artists such as Jan Van Eyck and Lorenzo Lotto used concave mirrors; as evidence, he points to the chandelier in Van Eyck's *Arnolfini Portrait*, the ear in Van Eyck's portrait of Cardinal Albergati, and the carpet in Lotto's *Husband and Wife*. Hockney suggests that later artists, beginning with Caravaggio, used convex mirrors as well, to achieve a large field of view.

Detail of the chandelier and mirror from Van Eyck's

Secret Knowledge recounts Hockney's search for evidence of optical aids in the work of earlier artists, including the assembly of a "Great Wall" of the history of Western art. The 15th century work of Jan van Eyck seems to be the turning point, he argues, after which elements of realism became increasingly prominent. He correlates shifts toward increased realism with advances in optical technologies. The argument of *Secret*

Knowledge is primarily a visual one, as Hockney was largely unable to determine when and how optical aids were used by textual or direct evidence.[7]

Arnolfini Portrait, one of Hockney's key examples

Falco and Ibn al-Haytham

At a scientific conference in February 2007, Falco further argued that the Arabic physicist Ibn al-Haytham's (965–1040) work on optics, in his *Book of Optics*, may have influenced the use of optical aids by Renaissance artists. Falco said that his and Hockney's examples of Renaissance art "demonstrate a continuum in the use of optics by artists from c. 1430, arguably initiated as a result of Ibn al-Haytham's influence, until today."[8]

Criticism

Artist's skill

Art historians and others have criticized Hockney's argument on the grounds that the use of optical aids, though well-established in individual cases, has little value for explaining the overall development of Western art, and that historical records and paintings and photographs of art studios (sans optical devices), as well as present-day realist artists, demonstrate that high levels of realism are possible without optical aids.[6] The Hockney–Falco theory, however, never seeks to explain the "overall development of Western art," but merely *some* of the techniques used in *some* parts of a painting or in *some* parts of the painter's process, and admits that these techniques alone do not account for the final quality of a painting.

Optical distortion

In addition to incredulity on the part of art historians and critics of modern art, some of the harshest criticism of the Hockney–Falco thesis came from another expert in optics, image processing and pattern recognition, David G. Stork. Stork analyzed the images used by Falco and Hockney, and came to the conclusion that they do *not* demonstrate the kinds of optical distortion that curved mirrors or converging lenses would cause.[9] Falco has claimed that Stork's published criticisms have relied on fabricated data and misrepresentations of Hockney and Falco's theory.[10] Stork has rebutted this claim.[11]

Renaissance optics

Critics of the Hockney–Falco theory claim that the quality of mirrors and optical glass for the period before 1550 and a lack of textual evidence (excluding paintings themselves as "documentary evidence") of their use for image projection during this period casts doubt on the theory. However, the historians were more sanguine about the possible relevance of the thesis between 1550 and the invention of the telescope, and cautiously supportive after that period, when there clearly was interest and capacity to project realistic images; 17th century painters such as Johannes Vermeer and Gaspar van Wittel used optical devices in variety of ways, though not the ways postulated by

Hockney.[12]

Leaving the technical optical arguments aside, historians of science investigated several aspects of the historical plausibility of the thesis in a 2005 set of articles in *Early Science and Medicine*. In his introduction to the volume, Sven Dupré claimed the Hockney–Falco analysis rests heavily on a small number of examples, "a few dozen square centimeters" of canvas that seem to show signs that optical devices were used.[6]

Falco has presented evidence describing textual evidence for the manufacture of optically adequate mirrors and their use for image projection.[*citation needed*]

Image projection

One critic argued that the optical ideas of opticians at the time were somewhat incompatible with image projection, though artists might have been more receptive. Two other scholars showed that Renaissance painting treatises and Leonardo's manuscripts also lack any reference to image projection. However, his notebooks include several designs for creating concave mirrors —even if this alone is not evidence of their use for image projection. Leonardo's also describes a camera obscura in his *Codex Atlanticus* of 1478–1519.

The camera obscura projects images and was already well known for centuries and documented by Ibn al-Haitham in his *Book of Optics* of 1011–1021. In 13th-century England Roger Bacon described the use of a camera obscura for the safe observation of solar eclipses, exactly because the viewer looks at the projected image and not the sun itself.

David Lindberg's *A Catalogue of Medieval and Renaissance Optical Manuscripts* (Pontifical Institute of Medieval Studies, 1974) lists 61 manuscripts written in the years 1000–1425. These manuscripts not only describe methods for making mirrors and parabolic mirrors, but also their use for image projection.

Optical glass

Sara J. Schechner claimed that surviving glassware from the 15th and 16th centuries is far too imperfect to have been used to create realistic images, while "even thinking about projecting images was alien to the contemporary conceptual frame of mind."[13] Vincent Ilardi, a historian of Renaissance optical glass, subsequently argued against Schechner's conclusions based on surviving glassware, suggesting that the present condition of Renaissance glassware is not likely to reflect the optical quality of such glassware when it was new. Ilardi documents Lorenzo Lotto's purchase of a high-priced crystal mirror in 1549, bolstering the Hockney–Falco thesis in Lotto's case.[14] Furthermore, even normal eyeglasses (spectacles) can also project images of sufficient optical quality to support the Hockney–Falco thesis and such eyeglasses, along with magnifying glasses and mirrors, were not only available at the time, but actually pictured in 14th century paintings by artists such as Tommaso da Modena.

Dutch draper and pioneering microbiologist Antonie van Leeuwenhoek (1632–1723), a

contemporary of artist Vermeer (and an executor for Vermeer when he died in 1675) in Delft was known to have exceptional lens making skills, having created a single small lenses capable of 200x magnification, far exceeding those of more complex compound microscopes of the period. Indeed his feats of lens making were not matched for a considerable time as he kept aspects of their construction secret; in the 1950s, C.L. Stong used thin glass thread fusing instead of polishing to recreate Leeuwenhoek design microscopes. It was long believed that Antonie van Leeuwenhoek was a master lens grinder (a notion repeated in the recent BBC television documentary "Cell"), however it is now believed that he came upon a relatively simple method of making small, high quality glass spheres by heating and manipulating a small rod of soda lime glass.

Metal mirrors

On his website, Falco also claims Schechner overlooked manuscript evidence for the use of mirrors made from steel and other metals, as well as numerous metal artefacts that belie the claim that sufficiently large and reflective metal mirrors were unavailable, and that other contributors to the *Early Science and Medicine* volume relied on Schechner's mistaken work in dismissing the thesis.[15]

Jan van Eyck's 1434 painting Arnolfini Portrait showing a convex mirror

In Jan van Eyck's 1434 painting Arnolfini Portrait a convex mirror is also clearly visible in the centre of the painting (Van Eyck also left his signature above this mirror).

References

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3. ^ Antonio Criminisi and David G. Stork, "Did the great masters use optical projections while painting? Perspective comparison of paintings and photographs of Renaissance chandeliers," in J. Kittler, M. Petrou and M. S. Nixon (eds.), Proceedings of the 17th International Conference on Pattern Recognition, Volume IV, pp. 645-648, 2004.
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10. ^ Rex Dalton, "Tempers blaze over artistic integrity", *Nature*, Vol. 440, No. 7081 (March 9, 2006), p. 134.
11. ^ David G. Stork and Marco Duarte, "Revisiting computer vision and art," "IEEE Multimedia" Vol. 14, No. 3, pp. 108-109, 2007 and Diatrope.com. (http://www.diatrope.com/stork/HockneyFAQs.html)
12. ^ Sven Dupré, "Introduction. The Hockney–Falco Thesis: Constraints and Opportunities", *Early Science and Medicine*, vol. 10, issue 2 (2005), pp. 128-135; quotation from p. 131.
13. ^ Sara J. Schechner, "Between Knowing and Doing: Mirrors and their Imperfections in the Renaissance", *Early Science and Medicine*, vol. 10, issue 2 (2005), pp. 137-162.
14. ^ Vincent Ilardi, *Renaissance Vision, From Spectacles to Telescopes* (Memoirs of the American Philosophical Society), American Philosophical Society, 2007, pp. 197-199. ISBN 0-87169-259-7.
15. ^ Charles Falco, FAQ: Technical and Historical Support for, and Objections to, our Thesis (http://www.optics.arizona.edu/ssd/faq.html#Objections) (accessed April 2, 2008).

External links

- FAQ by Charles Falco (http://www.optics.arizona.edu/SSD/art-optics/index.html) - a summary of the physical and historical evidence
- FAQ by David G. Stork (http://www.diatrope.com/stork/FAQs.html) - another physicist's response to Hockney–Falco thesis
- - two contemporary paintings depicting complex chandeliers painted entirely by eye. (http://www.nicholascharleswilliams.co.uk/opticsandart.htm)

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