Pleasing Deceptions

Francis Hopkinson was puzzled. On a summer evening in 1784, Hopkinson, a noted Philadelphia writer and statesman, seated himself before his front door and stared at a street lamp one hundred yards away. Reaching into his pocket, he pulled out a silk handkerchief, stretched it gently between his hands, and raised it to his face. The light from the distant lamp shined through the material, magnifying the threads. Hopkinson smiled with satisfaction, for he had anticipated this effect. Casually, he then began shifting the handkerchief from right to left and back again—and his expression instantly soured. Dark bars had unexpectedly appeared before his eyes and remained immobile despite the movement of the material. Perplexed by this illusion, Hopkinson sought an explanation from the astronomer David Rittenhouse, a fellow Philadelphian. "To account for this phenomenon exceeds my skill in optics," Hopkinson admitted. "I shall be much obliged by a solution on philosophical principles."

Rittenhouse acknowledged that his friend was onto something interesting. "The experiment," he responded, "is much more curious than one would at first imagine. For the object we see is not the web of the handkerchief magnified, but something very different . . ." Indeed, he continued, the answer resided in Newtonian physics: when Hopkinson held the textile up to the street lamp, the material inflected the light rays in a manner that made the threads appear thicker and the dark bars immobile. That, anyway, was the explanation in a nutshell; Rittenhouse's full analysis spanned eight pages of optical theory. Lest his friend be put off by the scientific verbosity, Rittenhouse concluded by encouraging Hopkinson's curiosity. By conducting everyday research into the nature of optics, he wrote, "new and interesting discoveries" could be made "respecting the properties of this wonderful substance, *light*, which animates all nature in the eyes of man, and perhaps, above all things, disposes him to acknowledge the Creator's bounty." One small step for science; one giant step for the hankie.

The experiment performed by Hopkinson and Rittenhouse was unique, but their interest in fooling the eye was widely shared in 1784. Visual illusions were the stuff of scientific inquiry, philosophical speculation, and popular intrigue in late-eighteenth-century America, particularly within Philadelphia's thriving intellectual communities. And encounters with objects far stranger than silk handkerchiefs were par for the course. Camera obscuras, magic lanterns, telescopic tubes, magnifiers, zograscopes, magic mirrors, penetrating perspectives, divination boxes, and optical philosophical machines: collectively known as "pleasing deceptions," these oddly-named instruments contributed to a culture of optical illusionism that interested a broad range of viewers in the United States as well as Europe. Stepping behind the doors of early national parlors, bookstores, optical shops, taverns, theaters, and museum galleries, we find a society captivated by optical instruments, virtual images, and phantasmatic projections.

Vision and visual deception were among the great preoccupations of eighteenth-century philosophy. Enlightenment models of learning held that knowledge was received through the senses. The mind was a tabula rasa, asserted the British writer John Locke, a clean slate awaiting the imprint of sensory data. And therein resided a problem: the senses were not always trustworthy informants. The ears and nose occasionally misinterpreted sounds and smells; the hands and tongue sometimes erred in judging sensation and taste. But the eyes, as thinkers from Descartes to Kant emphasized, were the most suspect of all. On the frontlines of perception, vision was susceptible to deceptions of light, color, shadow, magnitude, atmosphere, and distance. An "Anecdote of a Remarkable Deceptio Visus," published in the *Columbian Magazine* in 1786, presented a case in point: traveling through the Sahara desert, an explorer was confounded by the apparent proximity of the pyramids, which appeared to loom within reach despite being miles away. Similarly, when Charles Willson Peale, a renowned Philadelphia portraitist and museum proprietor, sailed aboard a sloop from Manhattan to West Point in 1801, he was puzzled by the "stupendious [*sic*] mountains" rising above the Hudson River: "the blue cast shewed [*sic*] their distance, yet their magnitude always deceived the eye and we always thought them much nearer to us than they really were."

The problem of deception was social as well as epistemological. Shell games and card tricks, curative potions, and alchemical transformations: the specter of dissimulation, of the senses intentionally fooled, deeply troubled a world in which knowledge was meant to be acquired through observation. The cast of types suspected of employing deceptive strategies for personal gain was diverse. Confidence men, forgers, counterfeiters, magicians, artists, demagogues—even jugglers, ventriloquists, and dancing masters—were often named as agents of social disorder. Catholics and Jesuits came under attack as purveyors of "priestcraft" and smoke-and-mirrors ritual. (Indeed, the most enduring emblem of deceit was religious in nature: the devil himself in the disguise of the serpent.) Gamesters were also easy targets. Card sharps and gamblers were associated with the egregious greed of financial speculation and the suspect value of paper currency, which Thomas Jefferson once called "legerdemain tricks

upon paper."

Incidents of deception, whether actual or imagined, naturally aroused anxiety. But deception, as the art historian Barbara Maria Stafford has emphasized, was also an inevitable aspect of the Age of Reason. Like yin and yang, *philosophes* and magicians formed two sides of the same coin. The social threat of charlatanism even gave rise to a new breed of scientists—"natural philosophers"—who sought to combat the world of sneaks and shams by exposing the secrets of visual illusion in the pages of optical treatises. William Hooper epitomized the type. In 1774, Hooper published *Rational Recreations*, a four-volume compendium of scientific experiments for the layperson that would undergo numerous reprintings. Hooper declared at the outset of his book that optical toys could hone visual perception and, consequently, prime social vigilance. Delivering a backhanded compliment to his audience, he predicted that the reader would "unavoidably acquire a knowledge of his own ignorance; and by finding the fallacy of what he thought most certain, the evidence of his senses, he will learn to determine with caution on the seeming convictions of the mind, and divest himself of those prepossessions from whence so many of the evils of life proceed." At the same time, however, Hooper ably stoked the very intrigue with magic and invisibility that probably led many readers to pick up his book in the first place: *Rational Recreations* featured dozens of experiments that promised ocular enigma, such as "The Enchanted Palace," "The Penetrating Perspectives," and "The Boundless Gallery."

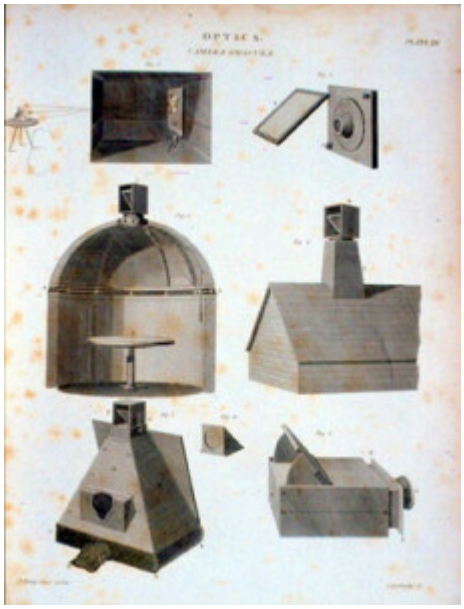

Fig. 1. J. Faxley, Jr. and C. Golbrecht, "Optics: Camera Obscuras," from Abraham Rees, The Cyclopedia; or, Universal Dictionary of Arts, Sciences, and Literature (Philadelphia, 1805-22), vol. 4, plate 3. Courtesy of the Library Company of Philadelphia.

Hooper's twofold appeal to rationality and fantasy underscores a central paradox of his occupation: the line separating dishonest swindlers from

scientific demonstrators was far from absolute, and the latter, like the tricksters against whom they operated, were often motivated by commercial interests. In addition to revealing the hidden workings of illusionistic devices and instructing readers in do-it-yourself gadgetry, optical treatises were occasionally bound together with catalogues selling optical, mathematical, and “philosophical” instruments—shorthand descriptions for a variety of devices enlisted in the service of scientific experimentalism. Benjamin Martin, an inventor and prolific writer who ran a shop at “the sign of Hadley’s Quadrant and Visual Glasses” in London’s bustling Fleet Street, was among the first to issue a lengthy catalogue of the objects in his stockroom. Martin’s wares included ordinary telescopes and microscopes plus objects prized for their illusionistic properties. The camera obscura, or “dark chamber,” was a staple of Martin’s business (fig. 1). Fitted with lenses that projected rays of light into box-like spaces, wherein images of the external world materialized, such cameras were employed by both artists and amateur spectators for drawing and viewing natural landscapes. Martin also sold magic lanterns, which projected ghostly figures onto walls or clouds of smoke, as well as convex and concave glasses, mirrors that curved and distended proportions. By 1800, cameras, lanterns, and glasses were routine fare in optical catalogues. More exotic were the “instruments of recreation or amusement” that W. and S. Jones marketed in 1801. In addition to “magic painters” and “communicative mirrors,” boxes that distorted parts of pictures inserted within, customers were enticed by a “diagonal opera glass,” which enabled spectators to spy on their neighbors while appearing to stare directly forward.

Fig. 2. Perspective glass or “zograscope,” c. 1780-1800, glass, mahogany with inlay, brass and ivory, 27 1/2 x 12 1/2 in. Courtesy of Winterthur Museum.

Among the many kinds of pleasing deceptions listed within optical catalogues, few enjoyed the popularity of the “optical diagonal machine,” also known as a “zograscope” or “perspective glass” (fig. 2). Zograscopes usually featured a

large, round magnifying glass set within a vertical, wooden frame. A rectangular mirror was hinged from the upper rear edge of the device. The instruments were used to study “perspective views”: mass-produced, colored prints that depicted cityscapes, seaports, monuments, festivals, or architectural interiors (fig. 3). When the perspective view was placed backwards on a table behind the base of the frame, the image was duplicated in the mirror positioned at an angle above. The mirror reversed the image and reflected it through the magnifying glass, which enlarged and exaggerated the print’s perspectival lines. Peering through the glass, then, the spectator witnessed a most remarkable illusion: the flat print upon the table was transformed into a three-dimensional space that seemed to project and recede before one’s eyes. Two hundred years before the advent of computer technologies, Americans were already escaping into virtual reality.

Fig. 3. François Xavier Habermann, Vue de Boston, c. 1776, engraving with hand coloring, 10 x 15 1/2 in. Courtesy of the American Antiquarian Society.

By the turn of the nineteenth century, Americans in metropolitan centers could purchase zograscopes and other optical devices directly from local retailers. Indeed, as early as 1758, Hannah Breintwell was importing and selling “perspectives with multiplying glasses” in her shop “at the sign of the spectacles” in Philadelphia, and John Sparhawk stocked camera obscuras and convex mirrors at his Second Street bookstore in 1773. In the decades to come, Philadelphia booksellers and instrument makers regularly advertised a variety of illusionistic images and devices. John McAllister cornered the market in the early 1800s when he expanded his business in whips and canes to include “prospects” (perspective views), “spy glasses” (small telescopes), and microscopes. Sales of just a few magic lanterns and camera obscuras earned McAllister a gross profit of twenty-two dollars in the summer of 1804.

Those without the means or inclination to purchase optical devices could attend public exhibitions and performances of visual deception. Benjamin Franklin printed a broadside in 1744 to advertise a solar “or camera obscura” microscope which had “just arrived from London, for the entertainment of the curious and others, and is now to be seen, by six or more, in a large commodious room, at

the house of Mr. Vidal, in Second-Street." In later years, itinerant lecturers in natural philosophy often featured demonstrations of optical illusion: Signor Falconi, an Italian impresario who entertained Philadelphians with a course on "perpetual electricity" in 1796, made a point of including a lesson about the "pleasing deceptions" that could be "invented by the power of lights, and how far the Catroptricks [*sic*] can deceive the sight." Other enterprising showmen worked the length of the eastern seaboard, staging presentations of "philosophical optical machines" in taverns and theaters from Boston to Charleston. In 1791, for instance, Philadelphia hosted "a curious Transparent Optical representation of most of the remarkable cities and principal public buildings of Europe"; in 1797, the city was treated to "a curious optical machine representing the scenes which took place in the dungeons of the Bastille."

"Optical machines" were perspective boxes—also known as "peepshows"—and they were closely related to the zograscopes and perspective views that were privately enjoyed within parlors. One or more tubular lenses usually punctuated the near end of the box, and the far end contained a concave mirror. Most perspective boxes were made to exhibit perspective views, which were illuminated by transparent panels or candles inserted within. Some views of cityscapes were even pierced and backed by colored paper, so that street lamps and windows would appear to glow when backlit. Other perspective boxes were designed to produce illusions of a different sort. Joseph Harris instructed readers of his *Treatise of Optics* (1775) in the construction of a box that resembled a theatrical stage set: one long image extended across the back of the box, and sections of painted images ("a camp, a colonade [*sic*], or rows of trees &c.") were arrayed like wings along the sides. "Things being properly disposed, if the pictures are good and the subject well chose, the phenomena will be surprizing [*sic*] enough," Harris promised. William Hooper suggested further modifications, including a square of "Four Magical Mirrors" that multiplied images of the pictures inserted within, and a box of "Enchanted Mirrors" (illustrated in the upper right corner of fig. 4) that enabled four individuals to peer through ovals at reflections of adjacent spectators.

Fig. 4. Optical devices including the "Enchanted Mirrors" (fig. 3) and "Penetrating Perspective" (fig. 1), from William Hooper, Rational Recreations, in which the principles of numbers and natural philosophy are clearly and copiously elucidated . . . (London, 1774), vol. 2, plate 10. Courtesy of the Library Company of Philadelphia.

Itinerant entertainers and street magicians were not the only ones who dazzled the public with feats of visual deception. Museum proprietors also capitalized upon the fascination with optics. In 1782, the French immigrant Pierre Eugene du Simitière, who operated a vast curiosity cabinet in Philadelphia named the American Museum, issued a broadside advertising one "curious deception of

perspective” among his collection of natural and human-made wonders. This was probably the anamorphic print that now forms part of the du Simitière Papers at the Library Company of Philadelphia (fig. 5). Unlike perspective views and perspective boxes, which generated illusions of spatial depth, anamorphoses deceived through a radical distortion of linear perspective. To make sense of du Simitière’s image, spectators had to assume an oblique angle in relation to the picture plane or insert the image within an optical device. Only then could they comprehend what the image represented: a view of a horse in profile.

Fig. 5. Anamorphic image of a horse (before 1785), colored engraving, 16 1/2 x 1 15/16 (base) x 1 15/16 (top) in. Courtesy of the Library Company of Philadelphia.

New York City’s Gardiner Baker also understood the popular appeal of optical illusions. In 1797, “an obtical [*sic*] glass to shew [*sic*] prints” was among the highlights of his institution, which, like du Simitière’s, was also called the American Museum. When Charles Willson Peale made his third trip to this museum in 1817 (by which time it was under the stewardship of John Scudder), his attention immediately seized upon a large perspective box that had been configured for simultaneous use by several people. “[There were] a number of perspective Views,” he observed, “shewn [*sic*] through lens[es] of long focus placed in a [partition] convenient distances from each other, so that a number of Persons might view them at the same time—the prints being placed behind the [partition] & lighted by a side window.” Peale returned to the museum a few days later to inspect the device again:

[Scudder’s] prospective [*sic*] views are so complete that they must attract considerable attention. A Dwarf who attends the Roon [*sic*] told me that the Prints were about 4 feet square though not all of the same size, Mr. Scudder informed me that the focus of his lens is 2 feet each—that very few persons could know how to fix them so well as he had done, which I believe is

correct—in his [partition] he has 3 lens to each picture, the diameter of each len[s] is about 7 Inches. He says that by Lamp light they are beauteful [*sic*]. I found that he has a change of Prints, for I seem [*sic*] some different Views from those I saw the other day.

In 1805, inspired by Scudder's perspective box—or perhaps spurred by the competition posed by Christopher Winckelback, a visiting Swissman who staged exhibitions of an "optic glass"—Peale installed the first of many future optical devices in his Philadelphia Museum. (Optical *metaphors* had already informed Peale's mission for years, as when he challenged skeptics who doubted the museum's civic worth to see the place for themselves: "let occular [*sic*] demonstrations prove the extent of his merit," he stated in a newspaper address.) Peale's description of the instrument, which he also sketched in a letter to his son Raphaelle, indicates that it closely resembled Hooper's "Penetrating Perspectives" (illustrated in the upper left corner of fig. 4). "We have added to the Museum a Tube to speak from one end to the other, also an optical delusion," Peale explained to Raphaelle. "The bottom part being hid in the table, the communication by the reflecting Glasses is completely disguised, and it appears wonderful to the most of our visitors that a hat or any thick substance put between the tubes should not obstruct the sight of objects put at the opposite end." A museum broadside of 1813 cited "various optical amusements," and in 1818, Peale added a "contrivance of mirrors" designed by his son Rembrandt.

By 1822, the Philadelphia Museum also boasted a device that Peale called simply "the magnifiers." This was probably a pair of convex lenses set within a tabletop zograscope or freestanding perspective box. Peale decided to test the instrument's illusionistic capabilities; aided by his son Titian Ramsay Peale II, Peale used a drawing machine to sketch the dimensions of the "Long Room," the museum's main gallery on the second floor of the Pennsylvania State House. The sketch was a preparatory study for *The Artist in his Museum* (1822), a large self-portrait commissioned by the museum's trustees, but Peale found an additional application for it. "It looks beautiful through the magnifiers," Peale enthused to his son Rubens (yet another member of the Peale family named for a famous painter). "Coleman [Sellers, Peale's son-in-law], seeing it yesterday, says that it deceived him, he thought he was viewing the Museum in the looking glasses at the end of the Museum. He thinks it might be a good deception, to see it in another room and wood [*sic*] have a good effect on Visitors." Rubens Peale shared his father's enthusiasm, and in December he exhibited the "Long Room" drawing in a perspective box at the family's Baltimore Museum. "On receipt of the drawing by Titian, I placed it in the optic case instead of the *Tyger Hunt*, and it gives very great satisfaction," he reported.

Why did the Peales, together with so many of their contemporaries, find optical illusions so enticing? There are several possible explanations. By instructing individuals in the laws of optics and inviting them to explore the bounds of art and science, visual deceptions satisfied the contemporary yen for "useful

knowledge"—a republican ethos of pragmatic learning that was widely advocated in the decades following the Revolutionary War. Another part of the answer resides in the anxious curiosity about all modes of illusion that characterized Anglo-American culture during these years. While novelists and playwrights spun tales of malicious ventriloquists and dissimulating politicians, ordinary spectators tried to unravel the concealed mechanics of mirrored boxes and magic lanterns. The phrase "pleasing deceptions" perfectly conveys the sense of amusement and gratification they must have experienced. Potential agents of mischief, illusions of light and reflection also inspired delight. And, like Francis Hopkinson, few people were immune to the enticement of unknown optical wonders. On a Philadelphia stoop or in a New York museum, pleasing deceptions opened eyes and minds to the marvels of the visual world.

Further reading: Primary accounts of optical illusions in early national America include "Anecdote of a Remarkable Deceptio Visus, as related by Baron de Tot," *Columbian Magazine* (October 1787): 718; Francis Hopkinson, "An Optical Problem, Proposed to Mr. Rittenhouse, and Solved by Him," in *The Miscellaneous Essays and Occasional Writings of Francis Hopkinson*, 3 vols. (Philadelphia, 1792), 1:375-84; and David Rittenhouse, "Explanation of an Optical Deception," *Transactions of the American Philosophical Society* 2 (1786), 37-42. Charles Willson Peale's many comments on optical devices and incidents of visual deception, together with observations made by members of his extended family, are reproduced on microfiche in Lillian B. Miller, ed., *Collected Papers of Charles Willson Peale and his Family, 1735-1885* (Millwood, N.Y., 1980), and reprinted in Miller, Sidney Hart, Toby A. Appel, and David C. Ward, eds., *The Selected Papers of Charles Willson Peale and his Family*, 5 vols. (New Haven and London, 1983-2000). Thomas Jefferson is quoted in Gordon Wood, *The Radicalism of the American Revolution* (New York, 1991), 318. Peale's watercolor drawing of the "Long Room" is in the collection of the Detroit Institute of Arts; for a reproduction, see Miller, E.P. Richardson, and Brooke Hindle, *Charles Willson Peale and his World* (New York, 1983). Dozens of optical treatises and catalogues were printed in Europe and North America during the late-eighteenth and early-nineteenth centuries. This essay draws mainly upon the following sources: George Adams, *Lectures on Natural and Experimental Philosophy, considered in its present state of improvement*, ed. William Jones, 4 vols. (Whitehall, Penn., 1806-7); Joseph Harris, *A Treatise of Optics* (London, 1775); William Hooper, *Rational Recreations, in which the principles of numbers and natural philosophy are clearly and copiously elucidated, by a series of easy, entertaining, interesting experiments*, 4 vols. (London, 1774); Jeremiah Joyce, *Scientific Dialogues* (Philadelphia, 1817); *A Catalogue of Philosophical, Optical, and Mathematical Instruments Made and Sold by Benjamin Martin*, ([London], n.d.); [W. and S. Jones], *A Catalogue of Optical Instruments* (London, 1801); *A Catalogue of Mathematical, Optical, and Philosophical Instruments, made and sold by Gilbert, Wright, and Hooke, no. 148, Leadenhall-Street, London* (London, c. 1800); and *A Catalogue of Optical, Mathematical, and Philosophical Instruments, Made and Sold by John Bleuler, No. 27, Ludgate Street, London* (London, before 1824). The McAllister Family Papers, which includes a daybook listing sales of camera obscuras and related devices

for 1803-05, is housed in the Joseph Downs Collection of Manuscripts and Printed Ephemera, Winterthur Museum, Library, and Gardens. Winterthur's museum collection also includes several zograscopes and an extensive collection of perspective views. Numerous advertisements for optical devices and illusionistic spectacles—including those of Hannah Breintwell and John Sparhawk—are collected at Winterthur in the Alfred Cox Prime Files, Decorative Arts Photographic Collection. For additional primary and secondary accounts, see David Brigham, "'A World in Miniature': Charles Willson Peale's Philadelphia Museum and its audience, 1786-1827" (Ph.D. diss., University of Pennsylvania, 1992), "Appendix I: Notices of Public Leisure Alternatives in Philadelphia"; [Benjamin Franklin], "Just arrived from London…" (Philadelphia, 1744), broadsheet; Rita S. Gottesman, ed., *The Arts and Crafts in New York, 1726-1776; Advertisements and News Items from New York City Newspapers* (New York, 1938, reprint 1970); Alfred Coxe Prime, compiler and ed., *The Arts & Crafts in Philadelphia, Maryland, and South Carolina, 1788-1800, Gleanings from Newspapers*, 2 vols. (1929, facsimile reprint 1969); and J. Thomas Scharf and Thompson Westcott, *History of Philadelphia, 1609-1884*, 3 vols. (Philadelphia, 1884), esp. vol. 2. Barbara Maria Stafford has extensively explored the problem of visual deception in its scientific, cultural, and philosophical aspects. See especially *Artful Science: Enlightenment Entertainment and the Eclipse of Visual Education* (Cambridge, Mass. and London, 1994), in which Stafford analyzes the emergence and discourse of popular scientific manuals published in seventeenth and eighteenth-century Europe; and Stafford and Frances Terpak, *Devices of Wonder: The World in a Box to Images on a Screen* (Los Angeles, 2001), the catalogue of a recent exhibition at the J. Paul Getty Museum. Recent studies of deception in early America include James F. Cook, *The Arts of Deception: Playing with Fraud in the Age of Barnum* (Cambridge, Mass. and London, 2001); Karen Halttunen, *Confidence Men and Painted Women: A Study of Middle-Class Culture in America, 1830-1870* (New Haven, 1982); Leigh Eric Schmidt, *Hearing Things: Religion, Illusion, and the American Enlightenment* (Cambridge, Mass. and London, 2000); Gordon Wood, "Conspiracy and the Paranoid Style: Causality and Deceit in the Eighteenth-Century," *William and Mary Quarterly* 3rd ser., 39 (1982): 401-41, and *The Radicalism of the American Revolution*. For specialized studies relevant to this essay, see Brooke Hindle and Helen M. Hindle, "David Rittenhouse and the Illusion of Reversible Relief," in *Early American Science* (New York, 1976): 145-50; and Deborah Warner, "Optics in Philadelphia during the Nineteenth Century," *Proceedings of the American Philosophical Society* 129:3 (1985), 291-99. Among the many optical devices manufactured and used during the eighteenth and early-nineteenth centuries, three types of instruments have attracted the greatest scholarly interest: camera obscuras, zograscopes, and perspective boxes. On camera obscuras, see Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, Mass., and London, 1990); Mary Hammond, "The Camera Obscura" (Ph.D. diss., Ohio State University, 1986); David Hockney, *Secret Knowledge: Rediscovering the Lost Techniques of the Old Masters* (New York, 2001); and Martin Kemp, *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat* (New Haven and London, 1990). On zograscopes and perspective boxes, see Richard Balzer, *Peepshows: A Visual*

History (New York,1998); Erin Blake, “Zograscopes, Perspective Prints, and the Mapping of Polite Space in Mid-Eighteenth-Century England” (Ph.D. diss., Stanford University, 2000); Dennis Carr, “Optical Machines, Prints, and Gentility in Early America” (M.A. thesis, University of Delaware-Winterthur Program in Early American Culture, 1999); J.A. Chaldecott, “The Zograscope or Optical Diagonal Machine,” *Annals of Science* 9:6 (December 1953): 315-22; E. McSherry Fowble, *To Please Every Taste: Eighteenth-Century Prints from the Winterthur Museum* (Alexandria, Va., 1991), 192-5, and, *Two Centuries of Prints in America, 1680-1880* (Charlottesville, Va., 1987), 249-51; R.F. Johnson, “A Machine for Viewing Prints,” *Country Life* 125 (February 5, 1959): 252; and C.J. Kaldenbach, “Perspective Views,” *Print Quarterly* 2:1 (March 1985): 87-105.

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Wendy Bellion is an assistant professor of art history at Rutgers University. In 2003, she will begin an NEH fellowship at the Omohundro Institute of Early American History and Culture, where she will be writing a book about trompe l’oeil illusionism in the early republic.