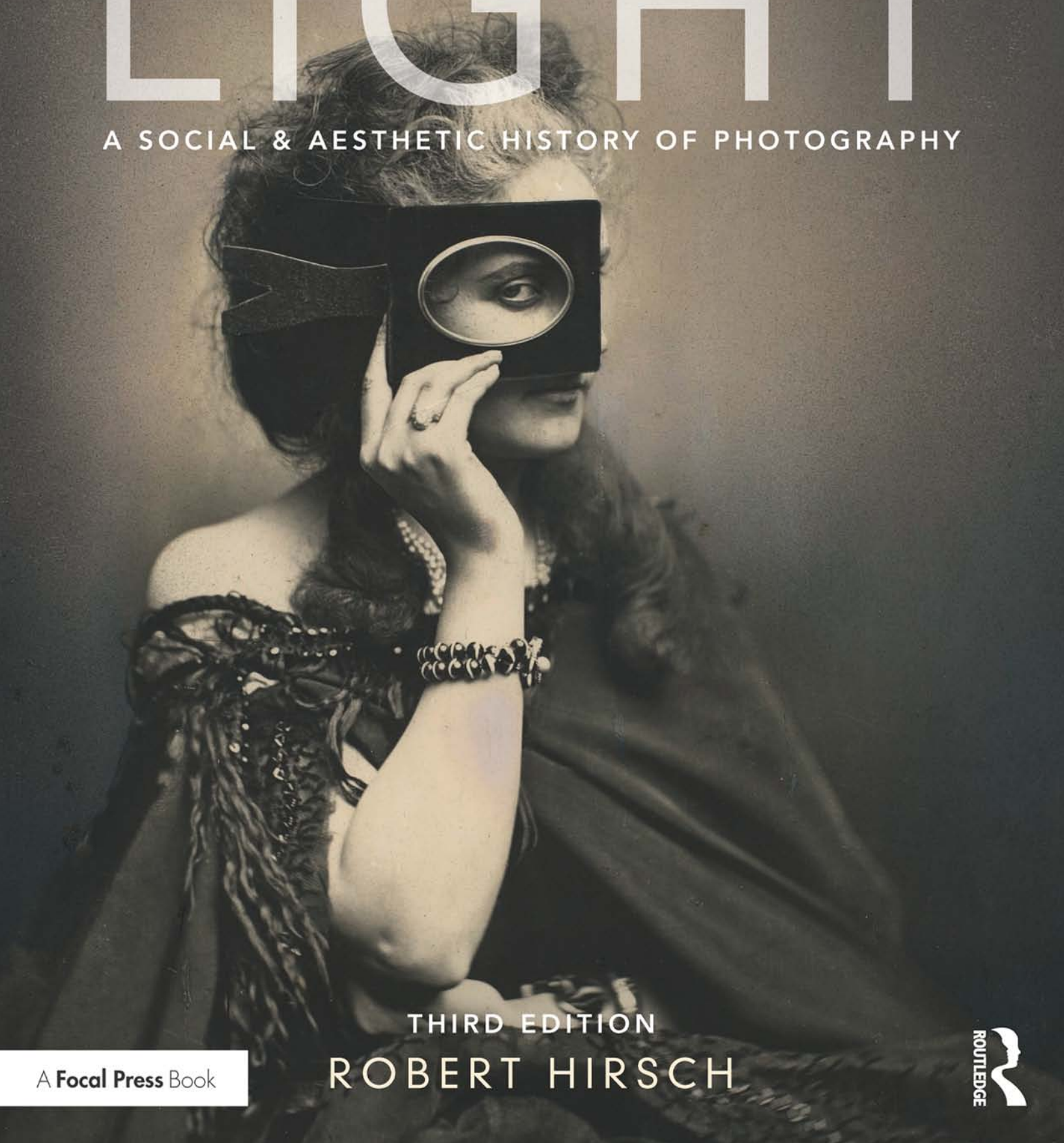


SEIZING THE LIGHT

A SOCIAL & AESTHETIC HISTORY OF PHOTOGRAPHY



THIRD EDITION

ROBERT HIRSCH

A Focal Press Book

ROUTLEDGE

SEIZING THE LIGHT

The definitive history of photography book, *Seizing the Light: A Social & Aesthetic History of Photography* delivers the fascinating story of how photography as an art form came into being, and its continued development, maturity, and transformation.

Covering the major events, practitioners, works, and social effects of photographic practice, Robert Hirsch provides a concise and discerning chronological account of Western photography. This fundamental starting place shows the diversity of makers, inventors, issues, and applications, exploring the artistic, critical, and social aspects of the creative process. The third edition includes up-to-date information about contemporary photographers like Cindy Sherman and Yang Yongliang, and comprehensive coverage of the digital revolution, including the rise of mobile photography, the citizen as journalist, and the role of social media.

Highly illustrated with full-color images and contributions from hundreds of artists around the world, *Seizing the Light* serves as a gateway to the history of photography. Written in an accessible style, it is perfect for students newly engaging with the practice of photography and for experienced photographers wanting to contextualize their own work.

Robert Hirsch is a photographic imagemaker, curator, historian, and writer. Former executive director of CEPA Gallery and now director of Light Research in Buffalo, NY, he has published scores of articles about visual culture and interviewed numerous significant members in the photographic arts. His other books include *Exploring Color Photography: From Film to Pixels*; *Light and Lens: Photography in the Digital Age*; *Photographic Possibilities: The Expressive Use of Concepts, Equipment, Materials, and Processes*; and *Transformational Imagemaking: Handmade Photography from 1960 to Now*. A former associate editor for *Digital Camera* and *Photovision*, Hirsch has also written for *Afterimage*, *Exposure*, *History of Photography*, *The Photo Review*, *Photo Technique*, and *World Book Encyclopedia*, among others. He has curated over 200 exhibitions and has had many one-person and group shows of his own work. For details visit www.lightresearch.net.



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SEIZING THE LIGHT

A Social & Aesthetic History of Photography

THIRD EDITION



— ROBERT HIRSCH —



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*To my wife, Adele Henderson, and my mother, Muriel Hirsch,
for their love and support; Marty for companionship;
and to photographers, past and present, whose pictures have guided
this project.*





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Preface

“I have found a way of fixing the images of the camera! I have seized the fleeting light and imprisoned it! I have forced the sun to paint pictures for me!”

L. J. M. Daguerre, to Charles Chevalier at his Paris optical shop

Daguerre’s energized words—the inspiration for our title—reflect the powerful desire to make permanent, reproducible images through the action of light. These pages convey the fascination surrounding this process we call photography throughout its development over the centuries. *Seizing the Light: A Social & Aesthetic History of Photography*, third edition, offers a significantly expanded and thoroughly revised resource for history of photography courses while providing an accurate and comprehensible introduction to the photographic arts for the general reader. The new subtitle reflects the book’s outlook by examining the imaginative and resourceful individuals who have advanced the practice by challenging the aesthetic, conceptual, and technical conventions of the photographic arts. In turn, we see the societal and aesthetic shifts from the photograph as an unproblematic mirror of reality with a fixed meaning to that of a flexible human construction whose significance is determined by the viewer.

Corresponding to William Henry Fox Talbot’s *The Open Door* (1843), this third edition of *Seizing the Light* invites the reader to become acquainted with key imagemakers, processes, and ideas. In the manner of photography, this work continues to evolve with thousands of updates and revisions plus the addition of numerous new makers, topics, and references. As well as providing the latest information, I pursued a number of new goals for this edition while continuing to provide a revised and comprehensible introduction

into photographic history. As an educator, I strive to provide a perceptive, chronological entryway to the artistic, commercial, scientific, and societal forces that have shaped Western photography, rather than presenting a glancing and overwhelming encyclopedic world survey. This emphasizes the perspective that one cannot begin to comprehend another society without first learning about one’s own roots. As a curator, I choose to offer a fundamental starting place to contemplate the diversity of imagemakers, inventors, issues, and applications. As a former director of photographic arts organizations and galleries, I seek to share my fascination with looking at pictures by presenting intriguing images that would inspire people to visit galleries, museums, and Internet sites devoted to photography. And as an imagemaker, I aspire to explore the artistic and critical aspects of the creative process that motivate people to make, share, look at, and interpret images, stressing how photography was a social medium long before the advent of social media. From a conceptual point of view, I aim to show in a concise and jargon-free manner how makers have responded to academic theories. The knowledge I gained from researching this project has deepened my comprehending of photographic practice; it is my hope that others will find the result to be an accessible starting point for open inquiry and discussion.

Overall, *Seizing the Light* examines how photography developed from centuries of Western

imagemaking, and how photographers have struggled to discover the medium's own visual syntax. The book also examines how capitalism and market forces have shaped photographic practices by standardizing equipment, materials, and procedures, as well as how public applications, desires, expectations, and demands affect our interpretation of images. It offers an initial site for thinking about why we have embraced photography as a medium so enthusiastically, and why and how we make, view, and decipher billions of photo-based images on a daily basis.

Seizing the Light provides a coherent, representational view of select people, events, processes, and movements as a starting pathway that defines the extensive roles and meanings of Western photographic practice. This approach builds a solid, in-depth foundation of how photography interacts and affects our lives. In addition to a variety of new topics, existing themes, from the photobooth to the wars in the Mideast to the Internet, have been given fresh coverage. Other featured themes, which provide a fuller realization of how photography can play with the meaning of cultural images, include the body, the landscape, the portrait, time and space concepts, typologies, and urban life.

Changing technology has always affected how information is shaped, transmitted, and understood; today's digital technology is no exception. This book examines how the flux of the photographic processes over time has changed our notions about photographic truth and how it has affected our conception of galleries and museums as image presenters and repositories. This history continues to be written with research assistance from people all over the world through blogs, emails, Internet sites, listservs, and social media, which is a critical reminder that history is a living thing and its numerous meanings depend on those writing and interpreting it. As John Carey (Emeritus Merton Professor of English Literature at Oxford) puts it: 'One of history's most useful tasks is to bring home to us how keenly, honestly,

and painfully past generations pursued aims that now seem to us wrong or disgraceful.'¹

I gratefully acknowledge and seek to represent the canon of photographic history composed of luminary figures such as Julia Margaret Cameron, Alfred Stieglitz, and Edward Weston; however, *Seizing the Light* also aims for thorough coverage of photography since the 1960s. This has been a time of explosive growth in the number of people working within the photo-related arts, and it demands greater study if we are to recognize its diversity and richness. Attention is given to contemporary artists who are expanding the practice of photography and bringing their works to a broader audience, as well as to ethnically diverse and female photographers throughout photographic history. Furthermore, the text moves beyond the canon in focusing on certain overlooked vernacular genres of historic practice such as stereographs and snapshots, and how classic hands-on processes have been revitalized and influenced the field.

The history of photography is reverent to everyone in the visual arts because all photographs are made from other photographs. With this concept in mind, my new publisher and book team has striven to achieve high production values, including full-color reproduction, with large-sized images that pay special attention to maintaining the subtle tonal variations. Readers need to bear in mind that all reproductions are just approximations of the work—translations from silver and pixels into ink; viewers should make the effort to see actual pieces whenever possible. We hope the images chosen to represent a particular artist or movement will kindle a passion in our readership to further investigate the abundance of our photographic heritage. Due to the book's physical limitations, the individuals featured act as representatives for their many fellow makers who could not be included. The text selectively concentrates on specific aspects of each maker's practice to exemplify particular moments that have influenced photographic practice. It makes no attempt to represent the range of each maker's body of work. Nor does it detail any of their technical processes. Information

about these methods can be found in my other books, especially *Photographic Possibilities: The Expressive Use of Ideas, Materials, and Processes*, and online. A small portion of material has been gleaned and modified from my previous articles, books, and interviews. The text has been carefully fact checked, and endnotes have been limited to maintain readability.

The Select Bibliography of foundational books has been revised. However, monographs on individual artists, plus texts on photographic processes and technology, and artists' books have been eliminated as these can be easily found with an online search or via the endnotes.

All images, except those in the public domain, are courtesy of each artist and/or their representative(s). They retain the copyright, and their work may not be reproduced without their written permission. Note: any maker's name that appears in bold face font when that individual's contribution is first introduced (i.e. **Jane Doe**) indicates that at least one reproduction of their work is included in the text. This is accompanied by their life date (i.e. 1900–1999).

For this third edition, I am particularly grateful to Dr. Andrew Hershberger, professor of art history at Bowling Green State University, for bringing his in-depth knowledge and research to this project by providing an extremely close and sympathetic editing of the manuscript for this edition, which has enhanced its accuracy and readability. I asked Dr. Hershberger to take on this task after reading his publication *Photographic Theory: An Historic Anthology* (2014), when I was struck by the uncanny overlap of the material he had selected that is also referenced in *Seizing the Light*. I highly recommend his book as an outstanding companion volume, since it provides especially accessible readings and references which complement *Seizing the Light*. Additionally, it turns out that *Seizing the Light* is required reading for Dr. Hershberger's students, and he was thus familiar with its use in a classroom setting.

Professor Edward Bateman of the University of Utah worked diligently with me on creating the new

Chapter 20 "Photography Becomes Digital Imaging" and on the division and reorganization of the former Chapter 18, "Thinking About Photography," into two chapters, including the new Chapter 19 "The Politics of Representation."

Thanks also to Samuel Ewing, PhD Candidate, History of Art and Architecture, Harvard University, the project's in-progress technical editor, for his conscientious attention to detail and excellent suggestions which have added clarity to the text and references.

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I especially want to thank the hundreds the artists, their estates and galleries, plus the museums and collections whose names appear throughout the credits for their support in making this project a reality

ROBERT HIRSCH

Buffalo, New York

NOTE

- 1 Margaret MacMillan, “History—Handle with Care,” *Oxford Today*, January 19, 2010, www.oxfordtoday.ox.ac.uk/features/history-handle-care#



© ROBERT HIRSCH PROJECTS. *Ghosts: French Holocaust Children, Boxcar #3*, 2015. 30 x 72 x 18 inches. Mixed media.

During World War II, over 11,000 Jewish children were deported from France to Nazi death camps. At most 300 of these children survived. *Ghosts: French Holocaust Children* is a three-dimensional installation that acts as an ethereal commemoration to these children’s abbreviated lives. The project is based on historic documents and photographs collected by author, lawyer, and Nazi-hunter Serge Klarsfeld and his wife Beate Klarsfeld. Hirsch reinterpreted these materials to convey a haunting sense of lost human possibilities. Its post-documentary approach blends outer and inner realities, constructing stories that examine the extreme boundaries of human behavior regarding identity, loss, memory, racism, and wickedness.

COURTESY CEPA Gallery, Buffalo, NY

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CHARLES RICHARD MEADE. *Portrait of Louis-Jacques-Mandé Daguerre*, 1848. 6³/₁₆ x 4¹/₂ inches. Daguerreotype with applied color.

Charles Richard Meade (1826–1858) began his photography career in Albany, New York, in 1842. After opening “Daguerrean Depots,” as the studios were called, with his brother Henry in Albany, Buffalo, Troy, and Saratoga Springs, the Meade Brothers opened a grand studio on Broadway in New York City. The Broadway studio was the first combined daguerreotype studio and gallery in the United States; the brothers later opened a branch of the studio and gallery in Brooklyn. The main attraction at Meade Brothers was the gallery: a public display of daguerreotypes of famous people they had photographed. At various times between 1848 and 1854, Charles Meade traveled and photographed in Europe. He died just short of his thirty-second birthday after a long illness, reputedly caused by his extensive exposure to photography chemicals. ¹

COURTESY The J. Paul Getty Museum, Los Angeles.

¹ www.getty.edu/art/collection/artists/1962/charles-richard-meade-american-1826-1858/





Advancing Towards Photography: The Rise of the Reproduction

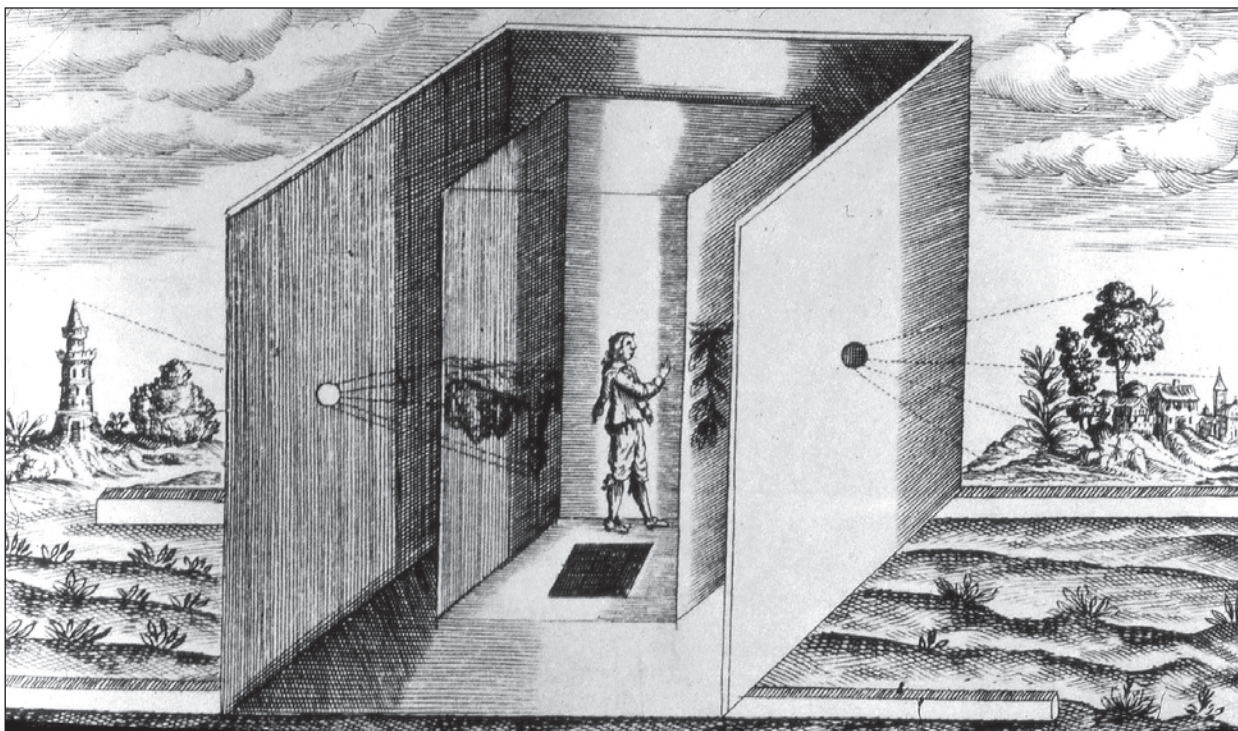
A DESIRE FOR VISUAL REPRESENTATION

The idea of photography existed long before the invention of the camera. A primary function of visual arts originates in the desire to create a likeness of someone or something that society deemed worth commemorating. Dating back to cave paintings as well as to Plato's Cave, according to Susan Sontag and other critics, this human urge to make pictures that augment the faculty of memory by capturing time is at the conceptual base of photography.¹ Since ancient times, artists and inventors have searched for ways to expedite the societal desire for an affordable and repeatable picturemaking process. Eventually, they concentrated their technical efforts on how to automatically capture a "truthful" likeness directly formed by light.

As early as the fifth century B.C.E., the Chinese philosopher Mo Ti discovered that light reflecting from an illuminated object and passing through a pinhole into a darkened area would form an exact, though inverted, image of that object, offering a prototype of the pinhole (lensless) camera. In the West, the first recorded description of the pinhole was made by the Greek philosopher Aristotle, who around 330 B.C.E., during a partial solar eclipse, observed the crescent-shaped image of the sun projected through a small opening between the leaves of

a tree. When these observations were first formalized into a camera remains uncertain, but by the tenth century C.E., the Arabian mathematician Alhazen (Ibn Al-Haitham) demonstrated how a pinhole could act as an image-projecting instrument and that altering the size of the aperture could affect the image's sharpness. Although Roger Bacon's treatises, *De Scientia Perspectivae* and *De multiplicatione specierum* (circa 1267), do not specifically mention the camera, they indicate he used the optical principles to contrive an arrangement of mirrors in order to project images of eclipses, as well as street scenes and interior views of his house. In *Perspectiva communis* (1279), John Peckham, the Archbishop of Canterbury and a likely student of Bacon, made remarks about observing a solar eclipse through a pinhole in a dark room.

The evolution of the camera can be linked to a new Western concentration on science with an increased reliance on observation during the European Renaissance, a period from about the fourteenth to the seventeenth century. With new discoveries based on experimentation and observation, fifteenth-century artists and scientists, such as Leonardo da Vinci and Nicolaus Copernicus, provided a veritable process that meant people no longer had to accept the authority of the unprovable.² Instead, they could look to an open system that was not predicated on belief and magic. Science offered an alternative to blind faith, and the foundation of belief for educated



ATHANASIUS KIRCHER. Illustration of a large portable camera obscura from *Ars Magna, Lucis et Umbrae* (*The Great Art of Light and Shadow*), Rome, 1646, page 807. Engraving.

society began shifting toward objective, documentable, repeatable facts. In addition to praying for their invisible souls to be accepted into an unknowable heaven, scientifically minded people also built large ocean-going sailing ships and complex machines to carry their physical bodies out of the Old World and into a new, material world.

In 1646, Athanasius Kircher, a Jesuit scholar and professor in Rome, described and illustrated a portable camera obscura that could be carried by two people on poles. It consisted of an opaque, outer cube with a lens in the center of each wall, and an inner cube of transparent paper for drawing on. The artist entered the device via a trapdoor in the floor.

PERSPECTIVE

Perspective drawing allows artists to depict a three-dimensional space on a flat surface. Although a system of perspective was known to the Romans, not until around 1413 did Filippo Brunelleschi of Italy devise the linear perspective we know.³ In this system, objects are foreshortened as they recede into space and lines converge to vanishing points that correspond to the spectator's viewpoint. Leon Battista Alberti's treatise *On Painting* (1435) was dedicated to Brunelleschi and provides descriptions for using geometrical linear perspective in picturemaking.⁴ Alberti compared the picture plane to a window:

Let me tell you what I do when I am painting. First of all, on the surface which I am going to paint I draw a quadrangle of right angles of whichever size I want, which I regard as an open window through which the subject to be painted is seen.⁵

Other artists soon converted Alberti's theoretical window into an actual one by drawing on a vertical piece of glass while looking through an eyepiece located opposite the center of the pane, establishing the visual convention of constructing a scene through monocular vision: viewing through one eye at one place at one time. This artificial window was subsequently replicated when light passed through a pinhole onto a vertical plane to form an image in the manner noted by Mo Ti.

Improvements in mapmaking during the fifteenth century reduced three-dimensional space into two-dimensional guides, producing geometrically consistent maps and changes in pictorial description. For the first time, mapmakers began to refrain from rendering opaque surfaces as if they were transparent, dispensing with fixed spatial coordinates, or adjusting the size and position of a site according to its cultural significance. Such improvements, made possible by scientific thinking, coincided with the advent of printed, illustrated books and meant that identical, mass-produced, visual information reached a wider audience.⁶

THINKING OF PHOTOGRAPHY

In 1490, Leonardo da Vinci (1452–1519) wrote the earliest surviving description of the *camera obscura* (dark chamber), a device designed to reproduce linear perspective.⁷ The camera obscura, the prototype of the photographic camera, was a large dark room that an artist physically entered. Light filtered through a small hole in one of the walls and projected a distinct, but inverted, color image onto the opposite wall that could then be traced. Art historian Kenneth Clark stated that before Leonardo, “Alberti invented a device which seems to have been a sort of camera obscura, the images of which he called ‘miracles of painting.’”⁸ German artist Albrecht Dürer

(1471–1528) was one of the first to ingeniously adapt these camera-based principles of perspective and proportion to his drawings.⁹ In 1558, Giovanni Battista della Porta published his treatise *Magiae naturalis* (*Natural Magic*), describing the camera obscura and how it could make drawing easier:

*The manner in which one can perceive in the dark the things which on the outside are illuminated by the sun, and with their colors ... will make possible for anyone ignorant of the art of painting to draw with a pencil or pen the image [made by a camera obscura] of any object whatsoever.*¹⁰

Johannes Gutenberg's perfection of the movable type printing press (circa 1436) indirectly triggered a revolution in lens making during the Renaissance, as people now wanted eyeglasses so they could read more effortlessly. Improved lenses led to better eyeglasses, telescopes, microscopes, and cameras, which changed our understanding of science, our view of the world, and our place within it. In turn, the more widespread use of lenses flattened the physical world by converting it into two-dimensional images, changing how people saw things.

In 1589 della Porta discussed the use of a mirror to reverse the image that was reflected backward in the camera obscura; this is the basis of the contemporary single-lens reflex camera. He also told of staging night-time, torch-light dramas, accompanied by live music, and employing the camera obscura to view them on a screen inside his house, demonstrating that the camera could be used for narrative purposes as well.

Girolamo Cardano's *De Subtilitate* (1550) mentioned attaching a biconvex lens (a lens curved on both sides so it is thickest in the middle) to a camera obscura, making its image brighter and sharper. Daniele Barbaro's treatise *La Practica della prospettiva* (1568) described how fitting a diaphragm to the biconvex lens allowed the amount of light passing through the lens to be controlled, enhancing depth-of-field—the range in front of and behind a focused subject in

which detail appears sharp—and forming a sharper image. By 1611, Johannes Kepler had built a proto-portable camera: a human-size tent that could be dismantled and transported to make drawing easier. By the mid-seventeenth century, a scaled-down modification of Kepler’s device meant that one did not have to enter into the camera but could remain outside of it and view an image projected onto a translucent window, a forerunner to the first truly portable cameras.

By the end of the seventeenth century, advances in lens making included the correction of aberrations to give better resolution. Also, the ability to vary focal lengths allowed the production of different image sizes based on the specific needs of portrait and landscape artists. Image size is proportional to a lens’s *focal length*, the distance from the center of the lens to the point of sharp focus; the longer the focal length, the greater the magnification of the image. Instruction manuals for matching lenses with cameras and situations became necessary.

The optics of the camera obscura were simultaneously ideal and natural, reflecting the empirical, scientific, and humanitarian trends of the Enlightenment. Drawing shifted from the private act of a highly trained individual to a broader commercial enterprise that incorporated ideas of mass production and standardization (making exact copies), as seen in rationalistic works such as Denis Diderot’s *Encyclopédie* (1751–1777). By the close of the eighteenth century the camera had been tailored along the lines of Renaissance pictorial standards to help fulfill a cultural demand to make drawing easier and quicker.

CAMERA VISION

Although they were internally organized by machines—cameras—early photographs resembled drawings and paintings because they depicted the world according to linear perspective. The camera

obscura was popular with artists because it automatically modified a scene by compressing form and emphasizing tonal mass according to Western pictorial standards. The camera was not designed as a radical device to unleash a new way of seeing, but evolved to produce a predefined look that took into consideration formulas and procedures such as composition, angle and point of view, quality of light, and selection of subject matter. *What* was being represented remained unchanged. This does not diminish the camera’s importance in defining an image. As with most inventions, unforeseen side effects create unintentional changes. As imagemakers became more sophisticated they routinely used specific cameras and lenses to shape an image, and knowledgeable viewers can often trace the connections between the camera/lens and the resulting picture.

Recent research indicates that Italian Renaissance painter Caravaggio (1571–1610), known for his dramatic rendering of chiaroscuro (light and shadow), used optical instruments and a darkened room to “take pictures” of his models 200 years before photography was invented. The researcher hypothesizes that “Caravaggio ‘fixed’ the image, using light-sensitive substances, for around half an hour during which he used white lead mixed with chemicals and minerals that were visible in the dark to paint the image with broad strokes.”¹¹

A discussion surrounding the rise of *camera vision*, how a camera visually organizes a scene, often focuses on Dutch painter Johannes Vermeer (1632–1675). While adroit artists like Vermeer, who most likely used a camera, did not need one to physically produce their pictures, the camera did act as a gathering device of fresh approaches for composing space, observing light, and portraying cultural models in innovative ways.¹² Vermeer’s uncanny domestic interiors possess qualities now considered photographic: tight use of space, “unbalanced” compositions, unexpected points of view, exact descriptions of light at specific times of day, concentration on what is happening on the edges of the frame, attention given to detail, use of points of

focus, and representation, through stillness, of time.¹³ His work demonstrates how the camera doesn't merely capture nature or reflect existing beauty but originates entire new ways of visualizing the world.¹⁴

THE DEMAND FOR PICTUREMAKING SYSTEMS

In the eighteenth century, a rising commercial class wanted to be commemorated in the same pictorial style as royalty and the wealthy. Inventors had commercial incentives to harness the camera for portrait making, as less training would decrease the cost of making a picture. Machine-based systems for producing multiple copies of objects were on the threshold of overtaking handmade methods. One such picture-making machine was the *physionotrace*. Invented by Gilles Louis Chrétien in 1786, it combined two inexpensive methods of portraiture, the cutout silhouette and the engraving. An operator could trace a profile onto glass using a stylus connected to an engraving tool that replicated the gestures of the stylus onto a copper plate at a reduced scale. A tracing could be done in about a minute, and multiple copies of the image could be made from the plate. Although it was not a camera, the *physionotrace* reduced portrait making to a mechanical operation that required only moderate hand-eye coordination. It expanded the portrait market to the middle class while imitating the style of the miniaturist painters. The *physionotrace* satisfied society's desire for multiple copies of an accurate visual description of one's presence and social status. The mechanical and scientific nature of the process gave it the power of authenticity. A prototype for an entity like photography, it possessed a key characteristic of what society wanted but had not yet developed: a system for the multiple reproduction of a visual subject that has been directly transcribed from the outer world. This indexicality refers to the

ability to produce a direct visual likeness without the intervention of an artist or technician's hand, and for some theorists would become the essence of what we call photography.¹⁵

The start of the nineteenth century saw the introduction of Aloys Senefelder's 1796 invention of *lithography* that provided a more cost effective means for the mass production and distribution of printed pictures.¹⁶ About this time wood engraving was also revitalized to meet the demand for multiple pictures. Other devices to facilitate personal picturemaking followed. The *camera lucida*, invented in 1807 by the English scientist William Hyde Wollaston (1766–1828), was an optical instrument (not a camera) designed to help one overcome a lack of drawing skill.¹⁷ The *camera lucida* consisted of a glass prism, held at eye level by a brass rod attached to a flat, portable drawing board. One looked into a peephole at the center of the prism and simultaneously saw both the subject and the drawing surface. The idea was to let one's pencil be guided by the "virtual" image and to trace that image onto a sheet of paper attached to a drawing board. In practice the *camera lucida* was difficult to operate, and frustration with this machine would lead a later photographic pioneer, Henry Fox Talbot, to find an automatic way to record a scene without lifting his pencil.

PROTO-PHOTOGRAPHERS: CHEMICAL ACTION OF LIGHT

As alchemy evolved into modern chemistry in the seventeenth century, manufacturing industries were now able to produce and supply experimenters with reasonably reliable chemicals and equipment. By 1614 Angelo Sala had recorded the darkening effects of silver nitrate on exposure to sunlight. In the 1700s, various salts of silver, especially silver nitrate, were found to dye feathers, furs, and leather permanently

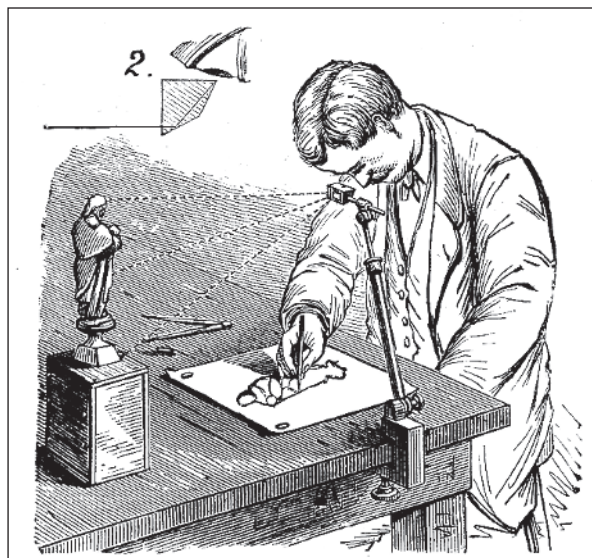
black. Each new discovery and invention suggested that combining the camera and optical systems with the chemical action of light could produce a mechanized image directly from life.

In 1727, Johann Heinrich Schulze (1687–1744) set out to repeat a sixteenth-century alchemist's experiment to make a luminescent substance he called phosphorous. One of the ingredients Schulze used, aqua regia (nitric acid), was impure; it contained silver. When he mixed it with calcium carbonate (chalk), Schulze accidentally created calcium nitrate and silver carbonate, which to his surprise turned a deep purple on exposure to sunlight. He repeated the experiment using heat from a fire and observed no change, deducing that this chemical reaction was caused by light, not heat. Schulze wrote:

I covered most of the glass with dark material, exposing a little part for the free entry of light. Thus I often wrote names and whole sentences on paper and carefully cut away the inked parts with a sharp knife. I stuck the paper thus perforated on the glass with wax. It was not long before the sun's rays, where they hit the glass through the cut-out parts of the paper, wrote each word or sentence on the chalk precipitate so exactly and distinctly that many who were curious about the experiment but ignorant of its nature took occasion to attribute the thing to some sort of trick.¹⁸

Schulze had uncovered a new method of representing an image—ironically, of text—by the action of light in conjunction with silver. Although Schulze made no attempt to permanently fix his results, his findings were duplicated and published in England in 1763 by William Lewis. Upon Lewis's death, Josiah Wedgwood, the renowned English potter, purchased his notebooks and hired his former assistant (see following section on Thomas Wedgwood).¹⁹

By the 1760s, the prediction that something on the order of photography would be generated as the result of information accrued through scientific inquiries into chemistry, color, and light appeared in



UNKNOWN ARTIST. *Camera Lucida in use Drawing Small Figurine*, 1879. *Scientific American Supplement*, January 11, 1879.

Norman Tiphaigne de La Roche's allegorical novel, *Giphantie* (1760) (English translation, *Giphantia*, 1761). Tiphaigne equated a large hall to a camera obscura, whose walls carried a "painting" that precisely traced a storm at sea. He then imagined "elementary spirits" that "fix these passing images" on material soaked in a "very subtle substance," making a permanent image "much more precious than anyone can produce, and so perfect that time cannot destroy it."²⁰

In *With a View to a New Art of Dying and Painting* (1794), Elizabeth Fulhame suggested that maps could be made using silver imprinted by the action of light. Her work demonstrated that the chemistry to make a photographic process was in place; what was needed was the stimulus to combine the components into a new form. The character of the thing called "photography" was not found at a single source. Hindsight reveals that proto-photographers had multiple purposes and destinations.

At the opening of the nineteenth century, Thomas Wedgwood (1771–1805), the son of Josiah Wedgwood, experimented with placing flat objects and painted transparencies on top of white leather and

paper sensitized with silver nitrate. His experiments verified the feasibility of chemically transferring images of objects and pictures through the agency of light, establishing the foundation of silver-based camera photography. His work was described by the British chemist Humphry Davy (1778–1829) in the *Journals of the Royal Institution* for 1802:

*White paper or white leather, moistened with solution of nitrate of silver, undergoes no change when kept in a dark place; but, on being exposed to day light, it speedily changes colour, and, after passing through different shades of grey and brown, becomes at length nearly black ... When the shadow of any figure is thrown upon the prepared surface, the part concealed by it remains white, and the other parts speedily become dark.*²¹

The paradoxical problem with these profiles, antecedents of photograms (cameraless photographic images), was that the light that created them and that was needed to view them also brought about their destruction. Wedgwood could not stop the action of additional light from causing an image to darken until it disappeared into blackness. Consequently, he could only show the profiles by candlelight. Still, Wedgwood's underlying concept was vital, which according to Davy was to “copy” images of the camera obscura “by the agency of light upon nitrate of silver” instead of hand tracing. Although he did not achieve this goal, the rationale suited the emerging tenets of the modern era by substituting mechanical work for human labor. His published efforts point toward the invention of a photographic system that brings together the direct action of light to chemically record an image constructed by a camera.

MODERNITY: NEW VISUAL REALITIES

The nineteenth century ushered in the urban, industry-based movement known as modernity. The modern era unleashed vast new resources in finance, management, and technology, leading to self-sustaining capitalist growth that shook and eventually swept away the foundations of ancient European regimes. Potent new directions in science, philosophy, and the arts also accompanied these unprecedented economic, political, and demographic changes. Such fundamental displacements produced ruptures in the societal framework that allowed the notions about the camera and its optics to be recast in different terms.

The new and expanding capitalist economy and its urban labor force demanded more visual information. Daily life was accelerating and changing as never before. Machines, such as the railroad, the steamship, the telegraph, and the iron printing press, were moving people and information at paces once considered impossible. With the advent of state-subsidized education in England and France, literacy was on the rise. The more people learned, the more information they wanted. Newspapers and the penny presses increased circulation, their pages filled with new “human interest” stories and engraved illustrations. Publishers learned that pictures helped to sell their product, and by 1842 the world's first picture weekly, the *Illustrated London News*, was circulating. *Realism*, depiction without obvious distortion or stylization, was on the rise in literature and in painting. People wanted to know exactly what their world looked like, and the photographic image was ready to arrive at this ripe moment with the type of proof they had been prepared to accept.

The classical view of nature as a perpetual, immobile entity had begun to shift with the dynamics of the Industrial Revolution. Pre-photography thinkers like Johann Wolfgang von Goethe (1749–1832), Georg Wilhelm Friedrich Hegel (1770–1831), and Immanuel Kant (1724–1804) were transforming

nature into an active, living, and tumultuous organism that shifted form and appearance depending on who was observing it. In Paris and London in the 1770s, Philippe Jacques de Louthembourg combined magic lanterns (a predecessor of the slide projector), automata with clock drives (that is, mechanical toys), and painted glass transparencies to create a new form of visual entertainment. The invention in 1784 of the *Argand Oil Lamp*, the first modern lighting system, made it possible for a concentrated beam of light to project images onto a screen, giving Louthembourg the idea for his *eidophusikon*. The *eidophusikon* consisted of a miniature theater with a stage 6 feet high, 10 feet wide, and 8 feet deep. Colored glass slides, illuminated by concealed Argand lights, produced a multitude of colors. Sound and weather effects were created by revolving cylinders filled with shells and stones and thin sheets of copper, while a harpsichord provided music. Louthembourg's financial success allowed him to create a visual show based on Captain Cook's voyages, which the *Daily Universal Register* (later *The Times*) in 1788 hailed as "the most magnificent [spectacle] that modern times has produced ... bring[ing] into living action the customs and manners of distant nations—to see exact representations of their buildings, marine vessels, arms, manufactures, sacrifices and dresses."²²

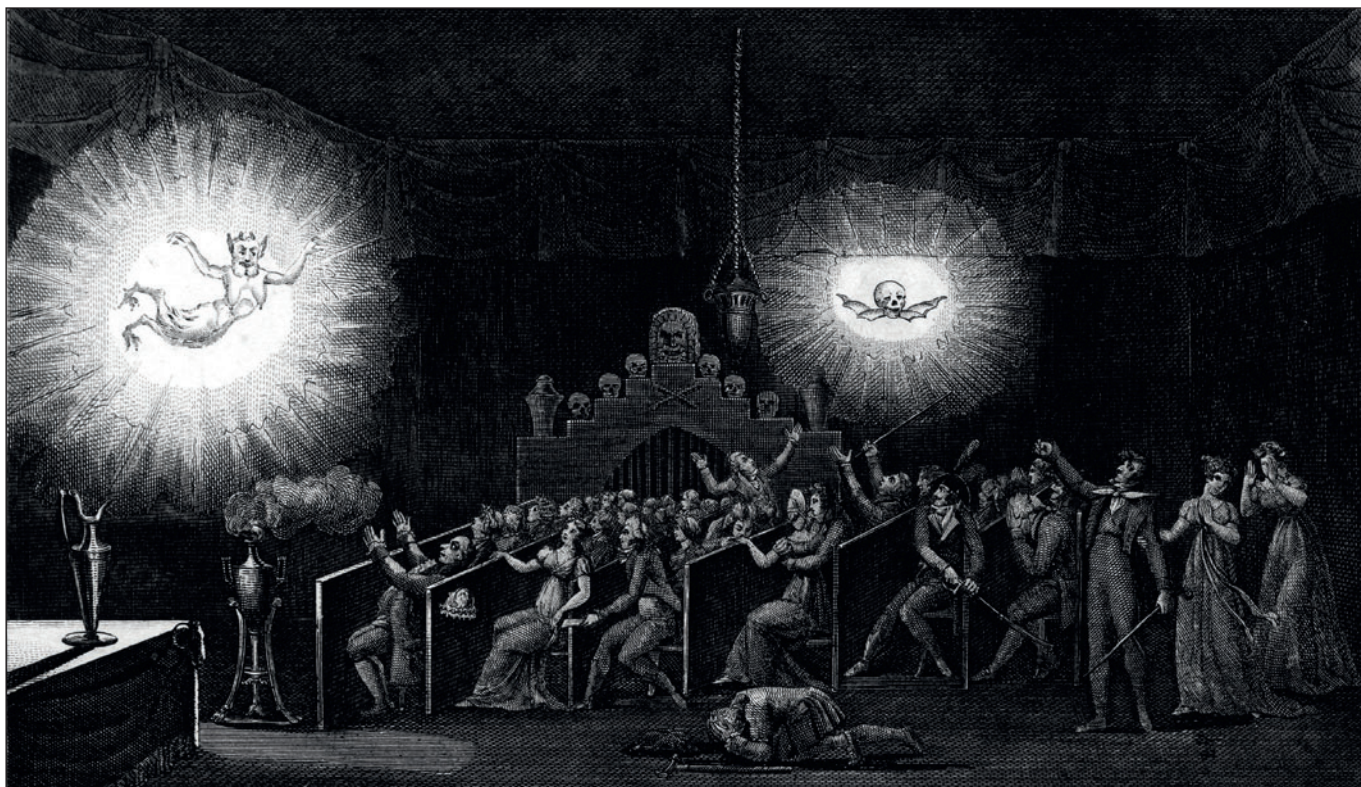
In Paris in 1800, Étienne-Gaspard Robert and Paul de Philipsthal unveiled the *phantasmagoria*. Illuminated by the Argand Oil Lamp, the *phantasmagoria* was an advanced magic lantern that created rear-screen image projections of ghosts, skeletons, and celebrities in a semi-darkened theater. Special effects of lightning, thunder, and smoke enhanced the eerie atmosphere. One popular scene, "Dance of the Witches" used multiple light sources to create moving projections that appeared to advance on the audience, only to vanish just as they seemed ready to leap off the screen. A group of magic lanterns with comb-like shutters focused on the same spot on the screen, so that one image could blend into the next, making viewers less conscious of the

mechanics and more likely to be swept away by the visual illusions.

In 1826 the Drummond Light, popularly called *limelight*,²³ replaced the Argand light. Limelight not only transformed the look of stage productions, it permitted magic lanterns to project a more powerful and accurate beam of light, facilitating larger audiences. The acceptance of the camera-projected image as fact changed the perception of the magic lantern from a toy of amusement to a tool for education and social change. These innovative devices typify how the science-based industrial revolution transformed how the world was viewed, altered public desires, and signaled an emergence of new forms of representation and entertainment in the visual arts.

Gothic horror, a fictional mixture of horror and romanticism, was what the public came to see in these live productions, but these new devices utilized in popular theater also retrained people in what they would accept and expect in a system of visual representation. As the demand for beauty and truth was thus reshaped, many minds set out to satisfy the new hunger. Artists, realizing that verisimilitude was an avenue toward acceptance, recognition, and financial success, felt the incentive to get the details "right." Various visual presenting systems, such as the Cosmorama, Goerama, Neorama, and Uranorama, were tried, but the one that captured the public's imagination as being visually authentic was the *panorama*.

The panorama presented a picture on a large, cylindrical surface, with the spectator in the center, or else a picture that unrolled in front of the viewer to reveal its parts in sequence. In 1794, the Irish-born painter Robert Barker built a circular exhibition space in London's Leicester Square and presented a 1,479-square-foot painted canvas of the city.²⁴ Barker's multi-sheet, bird's-eye view situated the audience in the center of London. It was a commercial hit and the idea was widely imitated in other countries, including the United States.



Phantasmagoria at the Cour des Capucines, 1797. Frontispiece of E.G. Robertson's Mémoires récréatifs, scientifiques et anecdotiques du physicien-aéronaute, Volume 1, 1831.

Belgian inventor and physicist Étienne-Gaspard “Robertson” Robert was known for his phantasmagoria productions. His hauntings entertainment was staged in the abandoned cloisters kitchen of a Capuchin convent that he set up to a subterranean chapel, using several lanterns and special sound effects to generate an eerie and frightening atmosphere. Robert claimed he was only gratified if his spectators were shivering and shuddering, raising their hands or covering their eyes out of the fear of ghosts and devils that were dashing towards them.

In 1815, **Louis Jacques Mandé Daguerre** (1787–1851) was considered Paris’s leading theatrical designer. His *trompe l’œil* (fool the eye) dramatic effects were particularly successful. *Trompe l’œil* refers to the illusion that one is seeing an actual subject and not a two-dimensional representation of it. In 1822, Daguerre opened his first 350-seat *diorama* theater. The diorama consisted of a dark circular seating chamber in front of which large, flat painted scenes on translucent linen were represented. Each picture was seen through a 2,800-square-foot calico window that was painted half opaque. The opaque portion was frontally lit and the translucent part was illuminated from behind, producing the startling illusion

that the picture emitted a radiant light and was not on a flat surface, and that certain objects within the scene moved, such as an avalanche of snow. The color, brightness, and direction of the light was controlled through a system of cords, pulleys, shutters, and slides, and its pictorial effects were soon enhanced with real animals, stage props, and sound effects.²⁵ The diorama was an immediate success and, as an astute impresario, Daguerre went on to build an elaborate amphitheater in London, with 200 seats capable of pivoting viewers from scene to scene.

Daguerre’s dioramas indicate his wide-ranging understanding of visual culture, and they altered the way the public experienced a picture. The moving