Lesson 5: Photography and Optics

Background

Photography, like life on earth, begins with light. Light is a type of electromagnetic energy. Study of the behavior of light is called optics. This energy and behavior is inherent in photographic processes as implied by the word photography, which derives from the Greek words *phos*, meaning light, and *graphe*, meaning drawing. The term translates literally to "drawing with light." Light from the sun (or another source) is reflected from objects into our eyes or, in the case of photography, through the lens of a camera and onto a light sensitive surface. Indeed, photographs were often called "sun pictures," by early scientists and writers. Before the advent of photography, artists had been using the camera's most basic technology to reproduce the physical world accurately for hundreds of years. The camera obscura cast images onto a screen they could trace to copy over later in paint. Photography's great attribute was rendering nature as it appeared to the human eye as "fixed" or long-lasting image.

Prompt

How does the science of optics help us understand photographic principles and practices?

Reference Images

Image 1
Windsor Castle, salted paper print (Calotype), ca. 1841, William Talbot,
The Metropolitan Museum of Art.

Image 2
[Main Street, Cincinnati], daguerreotype, ca. 1850, James P. Ball, Cincinnati Museum Center.

Academic Fields

Science:

- Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.
- Scientific Knowledge is open to revision in light of new evidence.
- Science is not static. Science is constantly changing as we acquire more knowledge.

Technology:

- Analyze and integrate textual, visual, and quantitative information (e.g., images, diagrams, maps, graphs, infographics, videos, animations, interactives) from multiple digital learning tools and resources.
- Critique specific instances of how technology has impacted access to information, communications and collaboration.
- Explain the positive and negative impact the use of technology can have on personal, professional and community relationships.
- Discuss and define how issues (e.g., economic, political, scientific and cultural) are influenced by the development and use of technology.
- Explain how new technology development is driven by factors such as commercialization, creative/inventive thinking and cultural/historical influence.
- Examine the progression of a product to identify how the functional, aesthetic and creative elements were applied.
- Describe of Wave properties relate to photography

Documentary Reference Clips

Clip 1: The Dawn of Photography, 3:20 - 8:05
Clip 2: Ezekiel Cooper Hawkins, 9:45 – 14:22
Clip 3: The Wet Collodion Processes, 18:18 – 19:24

Discussion Questions

- What is light? Electromagnetic waves, electromagnetic spectrum, the visible spectrum.
- How do we see light? Physiology of the eye, reflection.
- How does early photography use light sensitized media? Surfaces, sensitivity to light, chemistry.

- What is camera obscura? What is a pinhole camera? Why is the image reversed?
- Why are lenses important in photography?
- What is exposure and how is it controlled in a camera? Aperture and shutter speeds; aperture's effect on depth of field.
- What are some qualities of lighting in photography? Intensity (luminance), direction (angle), quality (hard or soft, color temperature).

Activities

- Create a timeline of photography in the 19th century showing new advancements with corresponding images as illustration. How do science and image connect?
- Recreate early photographic experiments and processes, for example with camera obscura or sun images.

Online Resources

- **Photographic Process Videos**: The George Eastman Museum photography collection is among the best and most comprehensive in the world. The museum also produced the best video series on the science behind early photographic processes, from early daguerreotypes to digital prints. Archive link: https://www.eastman.org/processvideos
- **William Henry Fox Talbot:** The Metropolitan Museum of Art has a large collection of photogenic drawings (aka Calotypes) made by William Henry Fox Talbot in England. This MET website has a great introduction of Talbot's contributions to photography and downloadable examples of his early works. Archive link: https://www.metmuseum.org/toah/hd/tlbt/hd_tlbt.htm
- **Louis Jacques Mande Daguerre:** The Metropolitan Museum of Art has a good introduction of Daguerre's contributions to photography. MET Archive link: https://www.metmuseum.org/toah/hd/dagu/hd_dagu.htm

Bibliography

American photographic history:

There are plenty of outstanding books about the history of photography in America. Here are some of the academic publications that we used to research the documentary:

Davis, Keith F. Keith, *The Origins of American Photography: from Daguerreotype to Dry-Plate, 1839-1885*," with contributions by Jane L. Aspinwall; Hall Family Foundation in Association with The Nelson-Atkins Museum of Art, Distributed by Yale University Press, New Haven and London, October 28, 2007. An accompaniment to *Developing Greatness: The Origins of American Photography, 1839 – 1885*, an exhibition of The Hallmark Photographic Collection at The Nelson-Atkins Museum of Art.
Newhall, Beaumont, *The Daguerreotype in America*, Third Revised Edition, Dover Publications, Inc., New York, 1976.
Orvell, Miles. *Photography in America*, Temple University, Oxford University Press, New York, 2016.
Taft, Robert. *Photography and the American Scene, A Social History 1839-1889*, 1938; paperback, Dover Publications, 1964.
Welling, William, *Photography in America: The Formative Years, 1839-1900,* original Thomas Y. Crowell Company, New York, 1978; paperback reprint, University of New Mexico Press, Albuquerque, 1987.

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