

# *Photography - a new art or yet another scientific achievement*



By [Alex Sirota](#)

<http://iosart.com/photography-art-or-science>

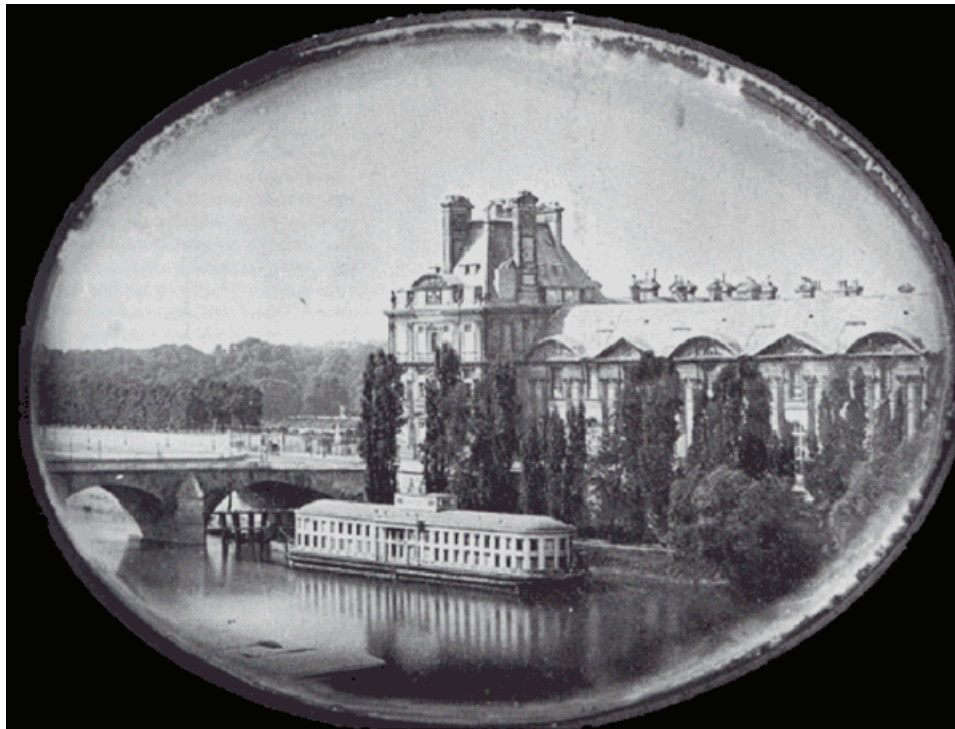
# *Contents*

- **Part I - History of Photography**
  - Camera Obscura
  - Reflex Mirror
  - Optical Glass and Lenses
- **Part II - Technology of Photography**
  - Light Sensitive Materials
  - Daguerreotypes
  - Roll Film
  - Color
  - Digital Photography
- **Part III - Photography as Art**
  - Pictorialism and Impressionism
  - Naturalism
  - Straight Photography
  - New Vision of the 20th Century
- **Part IV - Photographic Techniques**
  - Stereoscopic Photography
  - Infrared Photography
  - Panoramic Photography
  - Astrophotography
  - Pinhole Photography

*Part I*  
*History of Photography*

# *Photography*

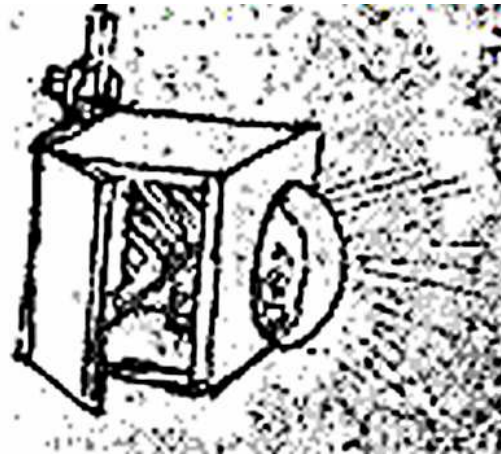
The word "photography" which is derived from the Greek words for "light" and "writing", was first used by Sir John Herschel in 1839, the year the invention of the photographic process was made public.



L.J.M Daguerre, "The Louvre from the Left Bank of the Seine"  
daguerreotype, 1839

# *Scientific Discoveries*

- The basics of optics - Camera Obscura
- Optical glass
- Chemical developments - light sensitive materials
- Digital Photography

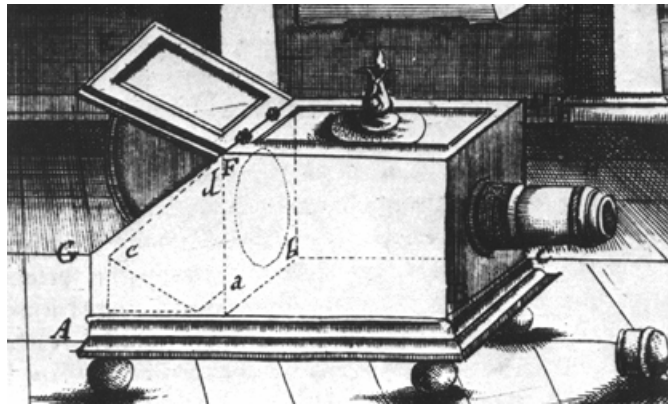


Leonardo Da Vinci, The Magic Lantern, 1515

# *Camera Obscura*

**Camera obscura** - *Latin, camera - chamber, obscura - dark*

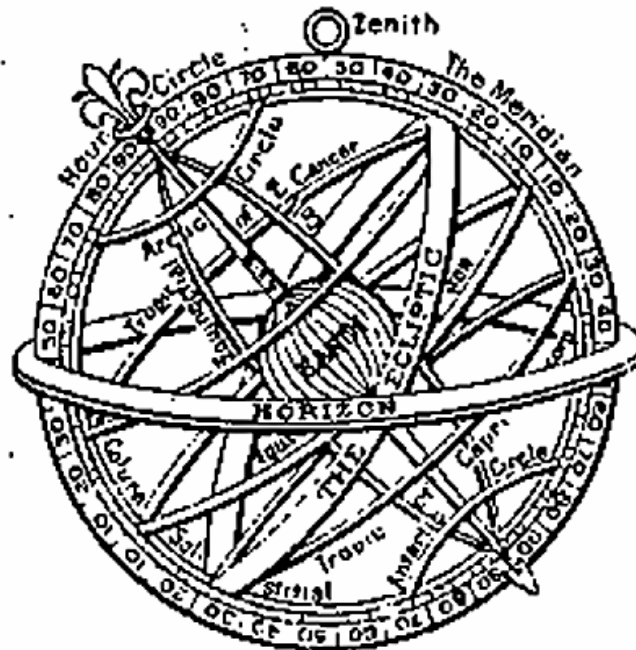
A dark box or room with a hole in one end. If the hole is small enough, an inverted image can be seen on the opposite wall.



Reflex Camera Obscura, Johannes Zahn, 1685

# Camera Obscura - Ancient Times

- China, Mo Ti (470-391 B.C.)
- Greece, Aristotle (384-322 B.C.)
- 
- Egypt, Alhazen (965-1039 A.D.)



## *Chinese texts*

- The basic optical principles of the pinhole are commented on in Chinese texts from the 5th century B.C.
- Chinese writers had discovered by experiments that light travels in straight lines.
- The philosopher Mo Ti (470-391 B.C.) was the first to record the formation of an inverted image with a pinhole or screen.
- Mo Ti was aware that objects reflect light in all directions, and that rays from the top of an object, when passing through a hole, will produce the lower part of an image.



## *Aristotle's observations*

- Greek philosopher and scientist Aristotle (384-322 B.C.) comments on pinhole image formation in his work "Problems".
- He asks his readers: *"Why is it that an eclipse of the sun, if one looks at it through a sieve or through leaves, such as a plane-tree or other broadleaved tree, or if one joins the fingers of one hand over the fingers of the other, the rays are crescent-shaped where they reach the earth? Is it for the same reason as that when light shines through a rectangular peep-hole, it appears circular in the form of a cone?"*
- Aristotle found no satisfactory explanations to his observation and the problem remained unresolved until the 16th century.



## *Alhazen's experiments*

- Arabian physicist and mathematician Ibn Al-Haitam (965-1039 A.D.), also known as Alhazen, experimented with images seen through the pinhole.
- He arranged three candles in a row and put a screen with a small hole between the candles and the wall. He noted that images were formed only by means of small holes and that the candle to the right made an image to the left on the wall.
- From his observations he deduced the linearity of light. He also described how to view a solar eclipse using a camera obscura and was the first scientist to make this observation.

# *Camera Obscura during the Renaissance*

- Leonardo da Vinci (1452-1519) describes pinhole image formation in his "*Codex atlanticus*" (1502)
- Gemma Frisius (1508-1555), an astronomer, uses the pinhole in his darkened room to study the solar eclipse of 1544.
- Giovanni Battista della Porta (1538-1615) describes the camera obscura in his "*Magiae Naturalis*" (1558)
- Johannes Kepler (1571-1630) coins the term "Camera obscura" and invents a portable camera obscura
- The Camera Obscura is being used by both artists and scientists

# *Leonardo da Vinci's work*



Leonardo da Vinci, Self-Portrait, 1512

## *Leonardo da Vinci's work (contd.)*

- Leonardo (1452-1519), familiar with the work of Alhazen and after an extensive study of optics and human vision publishes the first detailed description of the camera obscura in "*Codex Atlanticus*" (1502):

"In the facade of a building, or a place, or a landscape is illuminated by the sun and a small hole is drilled in the wall of a room in a building facing this, which is not directly lighted by the sun, then all objects illuminated by the sun will send their images through this aperture and will appear, upside down, on the wall facing the hole"

"You can catch these pictures on a piece of white paper, which is placed vertically in the room not far from that opening. The paper should be very thin and must be viewed from the back."

- Leonardo calls the camera obscura the "*oculus artificialis*" - "the artificial eye"

## *Leonardo da Vinci's work (contd.)*

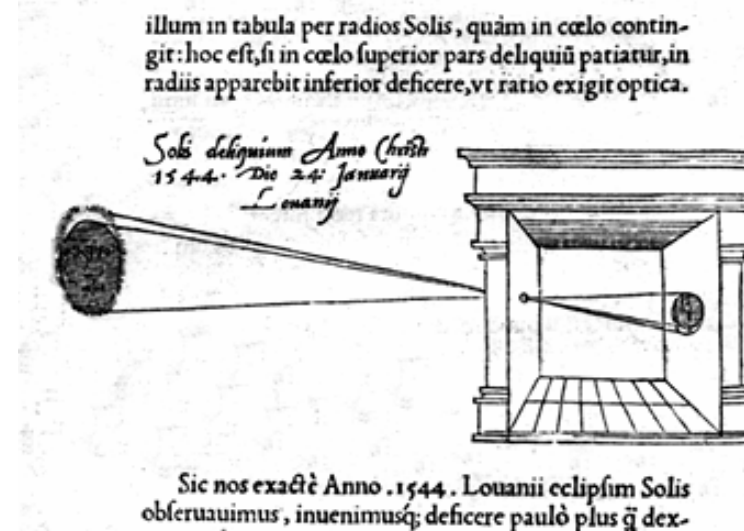
- Leonardo's manuscripts give detailed accounts of the camera obscura effect, observations, diagrams and explanations of its principle.
- Due to Vinci's special form of writing (written backwards called Mirror Writing), his work on the camera would not become common knowledge in the civilized world for almost three centuries - these descriptions would remain unknown of for 297 years when Professor Venturi would decipher and publish them in 1797.



Handwritten text in Leonardo da Vinci's mirror writing style, appearing as a stylized, cursive script.

# Gemma Frisius

- Gemma Frisius (1508-1555), a Dutch astronomer, had observed an eclipse of the sun at Louvain on January 24, 1544 using pinhole in his darkened room.
- He later described the process in his book "*De Radio Astronomica et Geometrica*" (1545) along with an illustration of the camera obscura he used.
- It is thought to be the first published illustration of a camera obscura.



# *Giovanni Battista della Porta*

- The Neapolitan scientist, Porta (1538-1615) gave elaborate details in physics, alchemy, astronomy, magic, cooking, perfumes, toiletry and optics in his "*Magiae Naturalis*" (1558)



## The Cover of "Magiae Naturalis" (English Translation)

## *Giovanni Battista della Porta (contd.)*

- This work was a popular piece of scientific literature in the sixteenth century in which Porta gives a thorough description of a camera obscura and the images that one would see. From about this point on, the camera obscura would become a useful tool to artists.
- In the second edition of his popular title, which was published in 1588, Porta includes a lens for the camera instead of a pinhole. This improved definition and allowed an image to be sharply focused on a piece of ground glass, allowing the operator to trace a picture on a sheet of paper laid over the glass.



The first page of "Magiae Naturalis"  
(English Translation)

## *Giovanni Battista della Porta (contd.)*

- Della Porta has long been regarded as the inventor of the camera obscura because his description of the device has received much publicity, as did his camera obscura shows, but he was not the true "inventor".
- In fact there exists an earlier published description of the camera obscura - a translation of Vitruvius's "*Treatise On Architecture*" (1521) by Cesare Cesariano (1483-1543).
- It is said that Della Porta made a huge "camera" in which he seated his guests, having arranged for a group of actors to perform outside so that the visitors could observe the images on the wall. The story goes, however, that the sight of up-side down performing images was too much for the visitors; they panicked and fled, and Battista was later brought to court on a charge of sorcery!



# *Johannes Kepler*

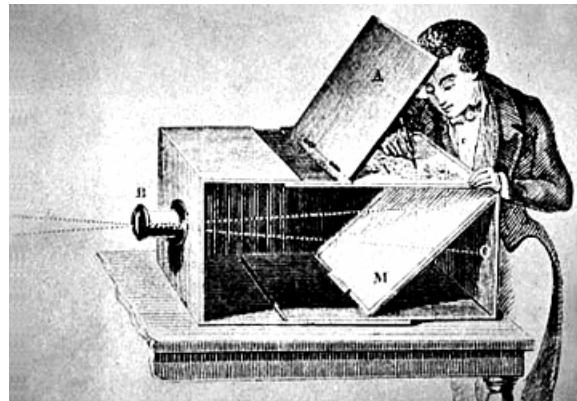
- Johannes Kepler (1571-1630), scholar and astronomer wrote about observing the sun using a room camera similar to the one described by Porta. Kepler described this event in his first published work on astronomy, "*Ad Vitellionem Paralipomena*" (1604). The first occurrence of the name "camera obscura" is found in this work.
- Kepler's portable camera obscura (tent) is described in a paper "*Reliquiae Wottonianae*" (1651). This is one of the earliest *English language* descriptions given to the camera obscura.



Portable 'Tent' Camera Obscura, Johannes Kepler

# *Camera Obscura as an Artistic Aid*

- Since Giovanni Battista della Porta popularized the camera obscura in 1558 through his "*Magiae Naturalis*" book, it became increasingly popular among both artists and amateur painters.
- Camera obscuras as drawing aids were soon found in many shapes and sizes.
- When looking through the lens of a camera obscura, the view presented is actually reflected through the mirrors onto the paper or cloth and allows the artist to draw by tracing the outline.



## *Camera Obscura as an Artistic Aid (contd.)*

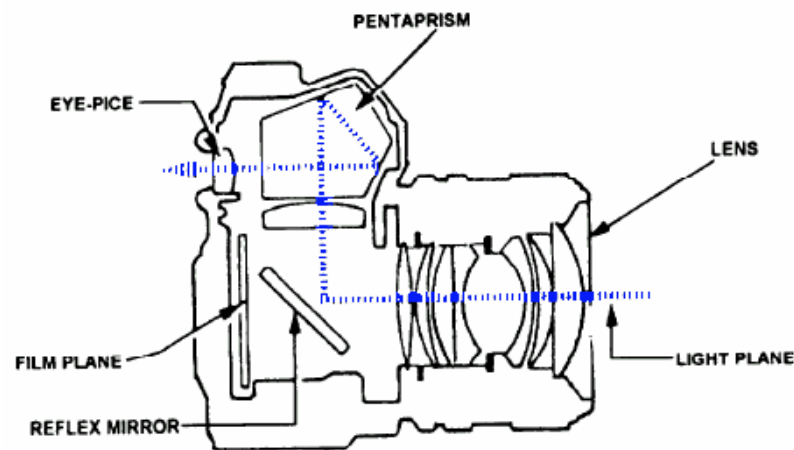
- Its strength as an aid to drawing resides in its ability to distil onto a flat surface the confused visual information which strikes the eye. It was much used by Dutch still-life and by topographical painters. Eminent practitioners include the Dutch genre painter Vermeer in the 17th century and the Veduta painter Canaletto in the 18th century.



Johannes Vermeer, *Woman Holding a Balance*, 1664

# *Reflex mirror and other improvements*

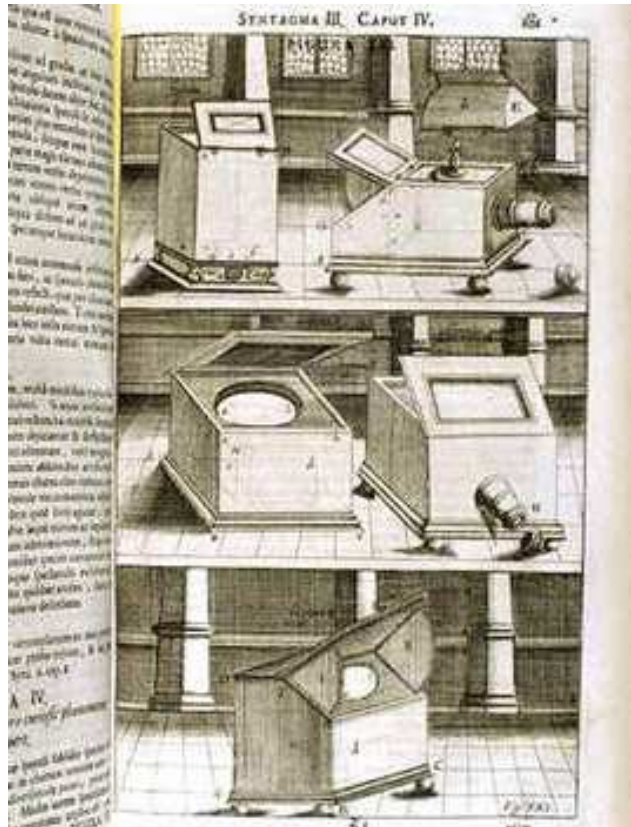
- As remarkable as the instruments were, they didn't fully satisfy the needs of artists. While canvas painting is a vertical pursuit, many artists preferred to sketch a scene on a laptop pad. In 1676, Johann Christoph Sturm, a professor of mathematics at Altdorf University in Germany, introduced a reflex mirror. Mounted at a 45 degree angle from the lens, the mirror projected the image to a screen above. This elegant configuration is at the core of modern single lens reflex cameras.



Design of a modern single lens reflex camera

## *Reflex mirror and other improvements (contd.)*

- In 1685, Johann Zahn, a monk from Wurzburg, solved the final piece in the optical puzzle. Improving upon Sturm's design, he introduced lenses of longer and shorter focal lengths. Scenes as wide as a landscape or as close as a portrait could be viewed with a simple change of lens.



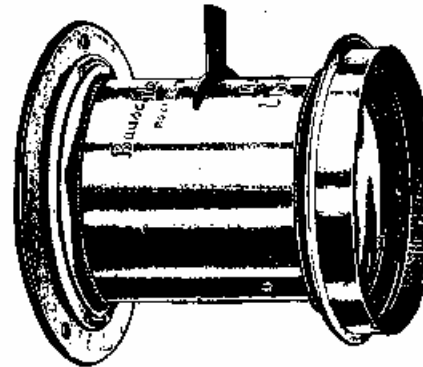
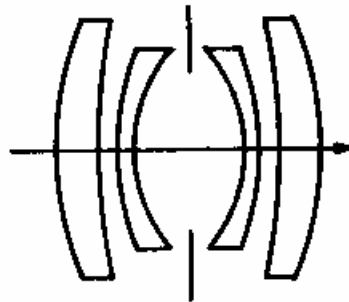
Page from "Oculus", Johann Zahn, 1685

# *Optical Glass*

- Nearly all the technological knowledge needed to manufacture optical glass was present since the ancient times.
- Glass occurs in Egypt and Babylon in 2600 B.C., bottles were made 14th - 15th century B.C., and large scale production in Egypt dates from the 6th century B.C.
- Glass blowing is discovered at Sidon in the first century and clear glass is made at Alexandria at about the same time. In Roman times glassworks are established in Italy, Spain, and the Rineland.
- In the 13th century Venice again discovers how to make clear glass and established a virtual monopoly.

# *Lenses*

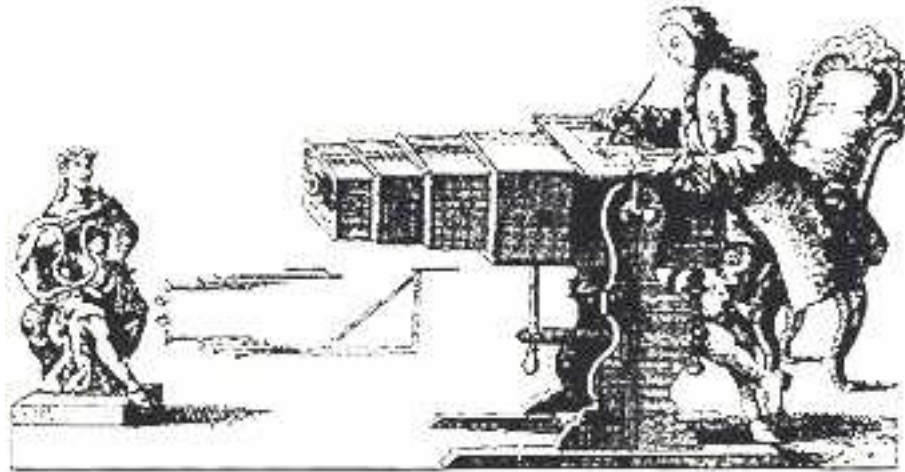
- Lenses for eyeglasses are first mass-produced in Venice in about 1275. Porta gives the first description of the process in "*Magiae Naturalis*" (1588), which differs little in principal from that generally used up to 1915.
- Porta uses the term *pilae vitreae* to designate the cylinders of glass from which sections are sliced with a diamond cutter and are sent from Germany to Venice for polishing. This is the term (hollow balls, filled with water) used by to describe magnifiers in antiquity.



*Part II*  
*Technology of Photography*

# *Light Sensitive Materials*

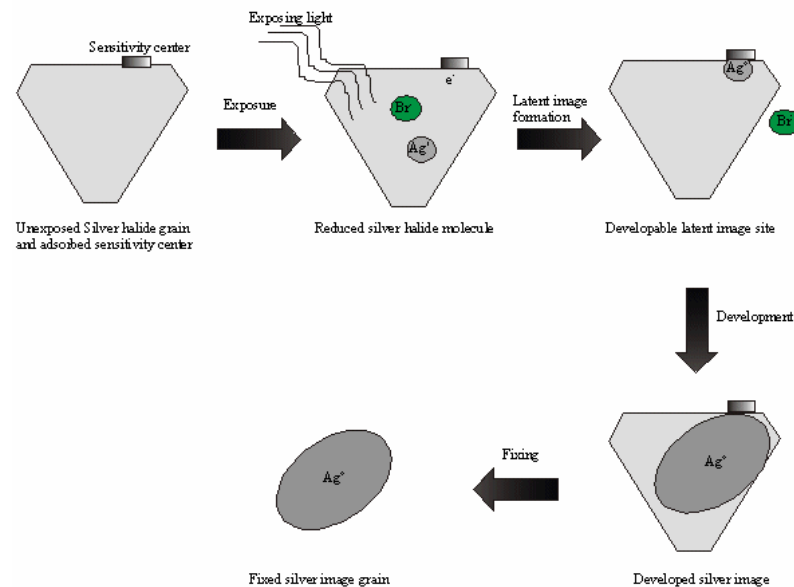
- After the camera obscura had been invented and its use widely popularized, many dreamt of capturing the images obtained by the camera obscura permanently.
- For hundreds of years before photography was invented, people had been aware that some colors are bleached in the sun, but they had made little distinction between heat, air and light.



Camera Obscura, Georg Friedrich Brander (1713 - 1785), 1769

# *Light Sensitive Materials (contd.)*

- In 1727, Johann Heinrich Schulze (1687-1744), a German scientist found that silver salts darkened when exposed to sunlight and published results that distinguished between the action of light and heat upon silver salts.
- Even after this discovery, a method was needed to halt the chemical reaction so the image wouldn't darken completely.



A Simplified Schematic Representation of the Silver Halide Process



## *The first permanent picture*

- Joseph Nicéphore Niépce (1765-1833), a French inventor, was experimenting with camera obscura and silver chloride.
- In 1826, he turned to bitumen of Judea, a kind of asphalt that hardened when exposed to light.
- Niépce dissolved the bitumen in lavender oil and coated a sheet of pewter with the mixture.
- He placed the sheet in the camera and exposed it for eight hours aimed through an open window at his courtyard.
- The light forming the image on the plate hardened the bitumen in bright areas and left it soft and soluble in the dark areas.

## *The first permanent picture (contd.)*

- Niepce then washed the plate with lavender oil, which removed the still-soft bitumen that hadn't been struck by light, leaving a permanent image.
- Niepce named the process heliography - Greek, helios - "sun", graphos - "drawing".



View from the Window at Le Gras, Joseph Nicéphore Niépce, 1826



## *Daguerreotypes*

- News of Niepce's work had reached another Frenchman, Louis Jacques Mande Daguerre (1787-1851) who had been experimenting to capture camera obscura images
- In 1829 Niepce and Daguerre became partners, a partnership which lasted until Niepce's death in 1833.
- Daguerre perfected the process, reducing the exposure time from eight hours to half an hour. He found that an image could be made permanent by immersing it in salt.
- In 1839 he announced the new process which he named "daguerreotype" before the French Academy.

## *Daguerreotypes (contd.)*

- A French newspaper praised the process: "What fineness in the strokes! What knowledge of chiaroscuro! What delicacy! What exquisite finish!... How admirably are the foreshortenings given: this is Nature itself!"



Still Life in Studio, Louis Jacques Mande Daguerre, 1837

The earliest known daguerreotype

## *Daguerreotypes (contd.)*

- Almost immediately after the announcement, hundreds of daguerreotype studios were opened to provide “Sun Drawn Miniatures” to the public.
- By 1853 an estimated three million daguerreotypes per year were produced in the United States alone.



Daguerreotype of Couple Holding Daguerreotype, Unknown Artist, 1850

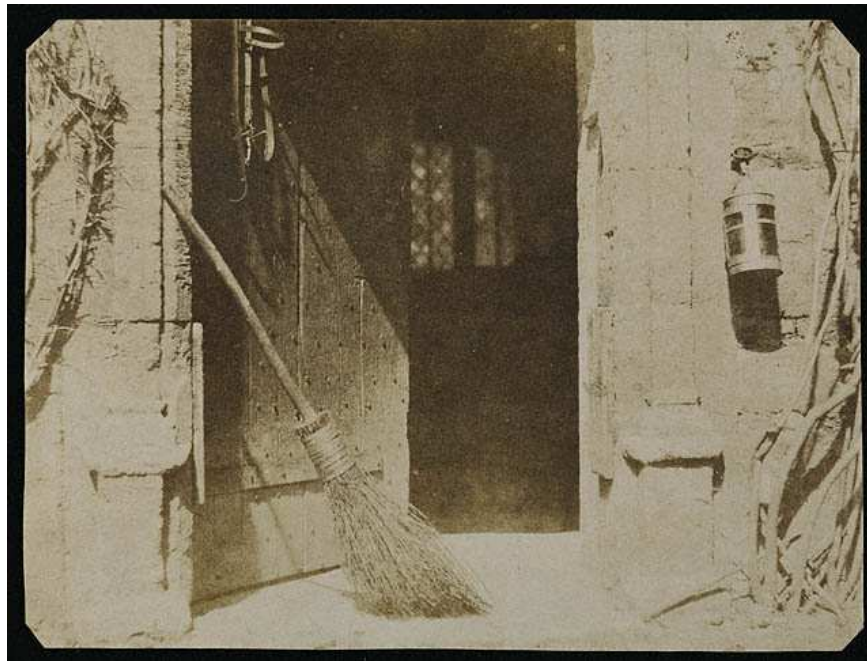
## *Daguerreotypes (contd.)*



Emily Dickinson at 17, Unknown Artist, 1847

## *Following achievements*

- Daguerreotypes had one major drawback, there was no way of producing copies of the original plate.
- In June 1840, an English amateur scientist Henry Fox Talbot (1800-1877) announced a technique which became the basis of modern photography. He called it "calotype" (Greek for "beautiful picture").



The Open Door, William Henry Fox Talbot, 1843

## *Following achievements (contd.)*

- The great advantage of Talbot's method was that the process involved both a negative and a positive. The negative image, the calotype, was repeatable indefinitely in a positive print, finally allowing multiple prints.
- By 1880, a convenient "dry plate" process was developed, allowing very fast development and opening the field to the general public.



Xie Kitchin with Umbrella,  
Lewis Carroll, 1875



## *Roll Film*

- Much of the credit for popularizing photography goes to George Eastman (1854-1932). He began as a bank clerk in Rochester, NY, and built his Eastman Kodak Company into a great enterprise it is today.
- In 1884 Eastman invented the equipment to mass produce roll film. "Eastman's American Film" was a roll of paper coated with thin gelatin emulsion.
- Roll film made possible a new kind of camera - inexpensive, light and simple - that made everyone a potential photographer.



Royal Gold Kodak film, 1994



In the early years of the company, film base was manufactured and coated on long glass tables.

# *Kodak Camera*

- Kodak camera was introduced in 1888. Their slogan was “You push the button, we do the rest”.
- The Kodak camera became an international sensation almost overnight.
- A new photographic era, of simple light cameras and easy to handle roll film had begun.



The first Kodak camera, 1888

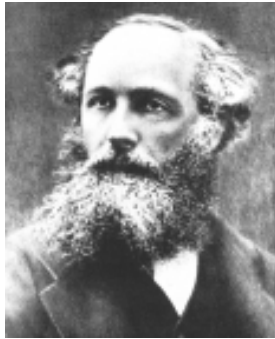


Kodak camera advertisement, 1890

## *Kodak Camera (contd.)*



George Eastman with a Kodak camera, Fredrick Church, 1890



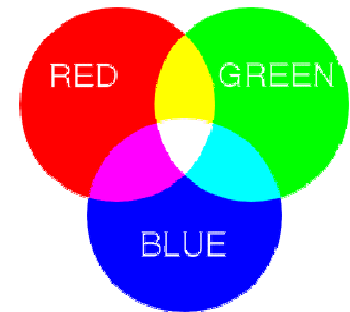
## *Color - First Steps*

- One of the first successes in color photography was demonstrated in 1861 by the Scottish physicist James Clerk Maxwell (1831 - 1879).
- Maxwell devised a way to recreate the colors of a tartan ribbon. He had three negatives of the ribbon made, each through a different color filter - red, green and blue.



Maxwell's tartan ribbon

- Positive black and white transparencies were made of the three negatives. While projected superimposed through three color filters like those on the camera, the three positives produced an image of the ribbon in its original colors.
- This technique is called "additive color mixing". Colors are produced by adding together varying amounts of red, green and blue.

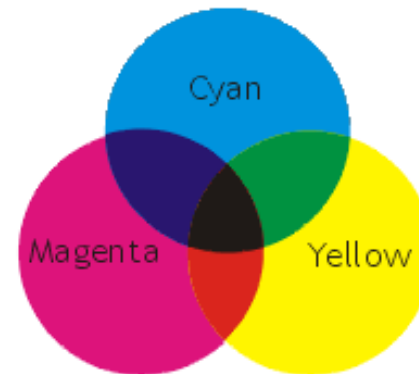


# *Subtractive Color Mixing*

- In 1869, Louis Ducos du Hauron (1837-1920) and Charles Cros (1842-1888), two Frenchmen working independently announced their research on subtractive color mixing.
- In subtractive mixing, which is the basis for modern color photography, colors are created by combining cyan, magenta and yellow dyes (the complements of red, green and blue). The dyes subtract colors from “white” light that contains all colors.



Louis Ducos du Hauron  
Leaves and Flower Petals, 1869



# *Commercial Color Photography*

- The first commercially successful color process was developed by Antoine and Louis Lumiere, two French brothers, in 1907. It was an additive process called "Autochrome".



Jean-Baptiste Tournassoud (1866-1951), Autochrome,  
Early 20th century.

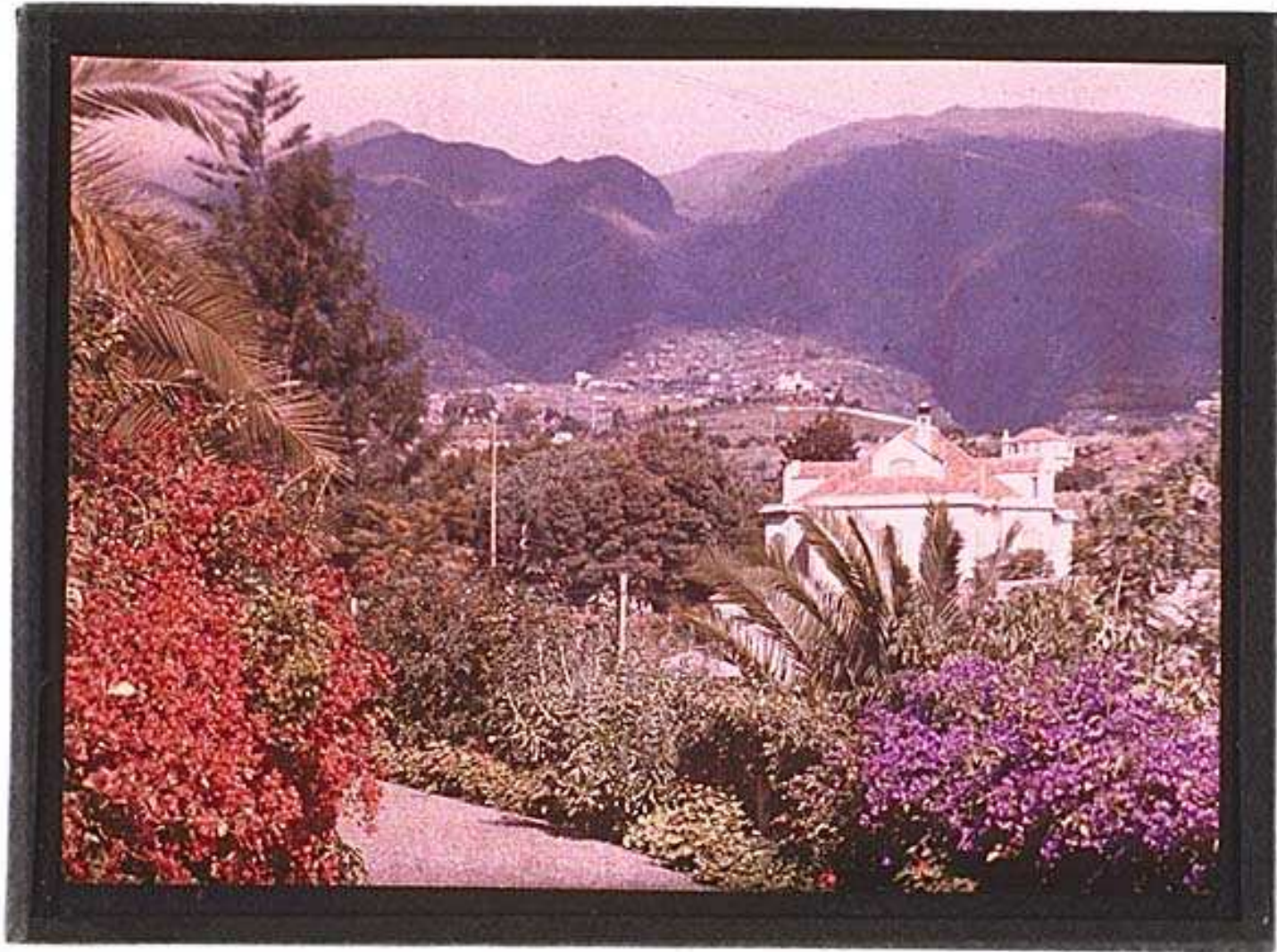
# *Autochrome*

- A glass plate was covered with tiny grains of potato starch dyed red-orange, green and violet in a layer only one starch grain thick.
- Then a light sensitive emulsion was added. Light struck the emulsion after passing through the colored grains. The emulsion behind each grain was exposed by light from the scene that was the same color as that grain.
- The result was a full color transparency.

Jean-Baptiste Tournassoud,  
Autochrome, Early 20th  
century.



## *Autochrome (contd.)*



Autochrome landscape of Madeira by Miss Sarah Angelina Acland, 1908-15

# *Kodachrome*

- A subtractive color process called kodachrome made color photography practical.
- It was perfected by Leopold Mannes (1899-1964) and Leopold Godowsky (1900-1983), two musicians and amateur photographic researchers.
- Their collaboration with Eastman Kodak scientists led to the introduction of Kodachrome in 1935. Kodachrome was a single sheet of film coated with three layers of emulsion, each sensitive to one primary color (red, green and blue). A single exposure produced a color image.



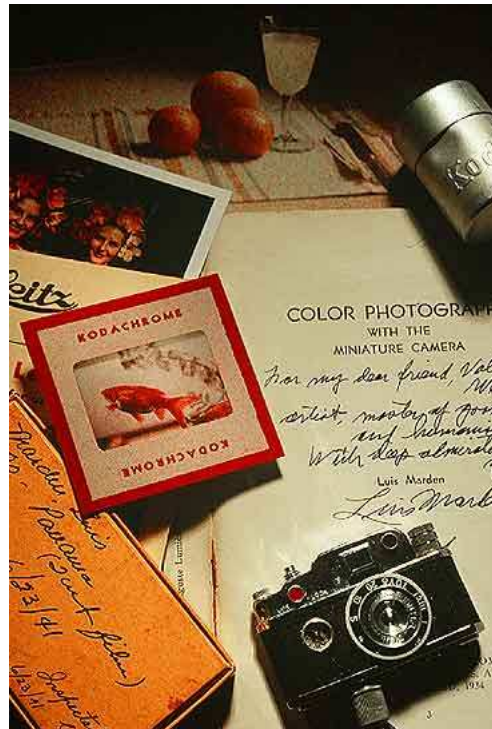
2000



1935

# *Kodachrome (contd.)*

- Luis Marden, a great photographer working for the National Geographic Society was one of the first pioneers of the revolutionary new film.



Luis Marden Career Collage, Sarah Leen

## *Kodachrome (contd.)*



Party-mask with Shells, Paul Outerbridge, 1936

# *Digital Photography*

- In the mid 1970s, Kodak and other companies began investigating filmless technologies that could capture images with solid state circuitry
- In 1986, Kodak succeeded in creating a sensor that could record 1.4 million picture elements, or megapixels.
- In the 1990s the first digital cameras appeared for commercial use.

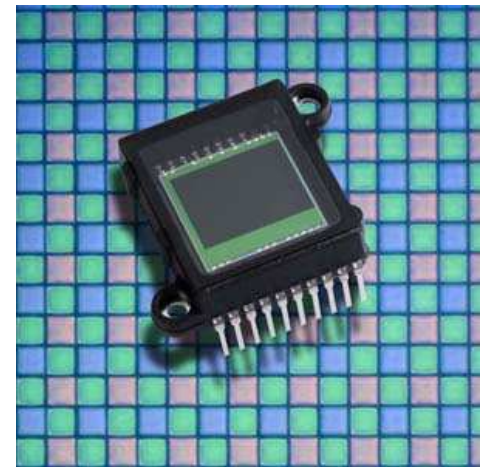


KODAK PROFESSIONAL DCS 760 Digital Camera,  
6 million pixels, 2001

# *Digital Photography (contd.)*

- The big difference between traditional film cameras and digital cameras is how they capture the image.
- Instead of film, digital cameras use a solid-state device called an *image sensor*, usually a charge-couple device (CCD).
- On the surface of each of these fingernail-sized silicon chips is a grid containing hundreds of thousands or millions of photosensitive diodes called *photosites*, *photoelements*, or *pixels*. Each photosite captures a single pixel in the photo-graph to be.

*An image sensor sits against a background enlargement of its square pixels, each capable of capturing one pixel in the final image*



*Part III*  
*Photography as Art*

# *Photography as Art*

- Almost from the moment of its birth, photography began staking out claims in areas that had long been reserved for painting.
- Some artists refused to accept photography as an art form. In 1862 a group of French artists formally protested that photography was a soulless, mechanical process, “never resulting in works which could ever be compared with those works which are the fruits of intelligence and the study of art”
- On the other hand, the invention of the photography caused considerable concern to many artists, who saw their means of livelihood coming to an end. Some even claimed that painting was dead.
- Many artists turned to photography, while some used photography as an artistic aid.

# *Pictorialism*

- From 1850s through the 1870s there was a rage for illustrative photographs similar to a storytelling style of painting popular at the time.
- The most famous and commercially the most successful of those intending to elevate photography to an art was Henry Peach Robinson.



Fading away, Henry  
Peach Robinson,  
1858

## *Pictorialism (contd.)*

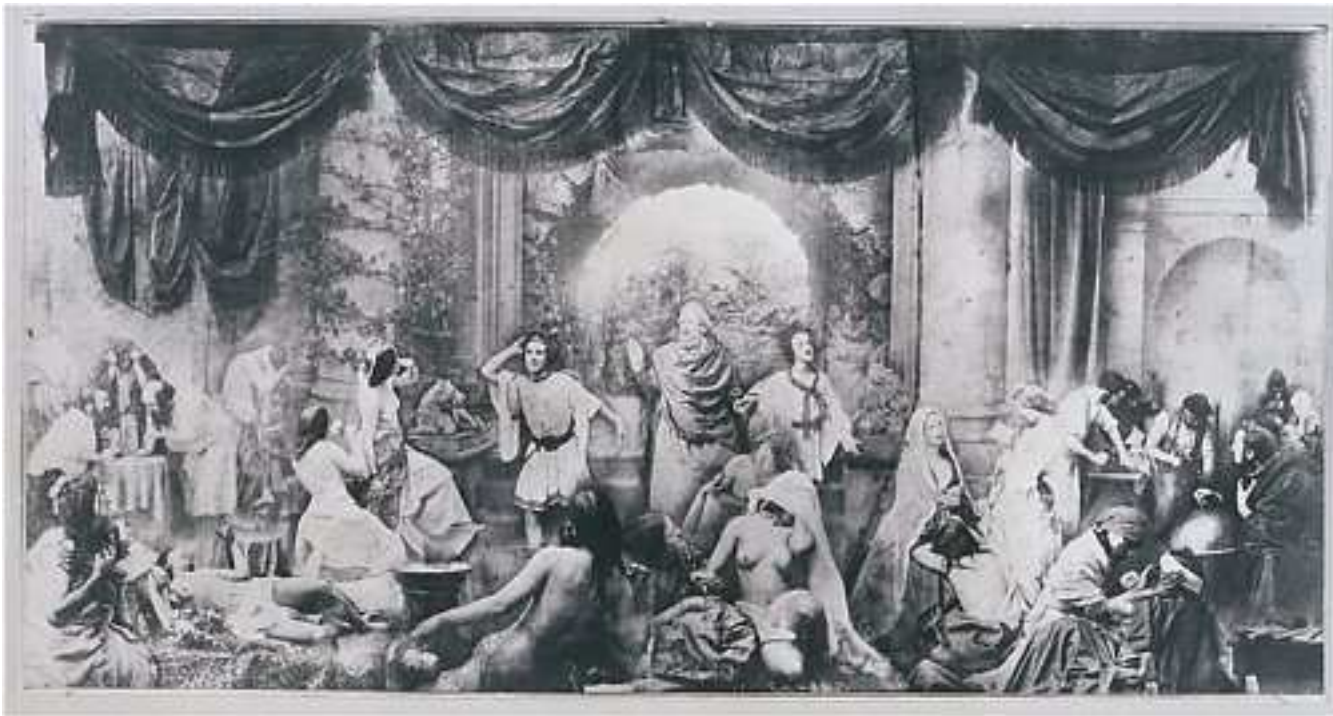
- Robinson produced many illustrative and allegorical composite photographs, and became a leader of a so called “High Art” movement in 19th century photography, which advocated beauty and artistic effect no matter how it was obtained.



A Holiday in the  
Wood, Henry Peach  
Robinson, 1860

## *Pictorialism (contd.)*

- Pictorialism is a style of photography in which the actual scene depicted is of less importance than the artistic quality of the image. Pictorialists would be more concerned with the aesthetics and, sometimes, the emotional impact of the image, rather than what actually was in front of their camera.



The Two Ways of Life, Oscar Rejlander, 1857

# *Pictorialism and Impressionism*

- Because pictorialism was seen as artistic photography, current styles of art were reflected in the works of pictorialists.
- This impressionist movement developed from naturalistic painting, particularly landscape, a central feature of 19th Century art.
- In May 1874 a group of French artists began to exhibit impressionistic photographs at the studio in Paris. The group continued in being for the next twelve years, and work was exhibited by, among others, Cezanne and Gauguin.



Robert Demachy (1859-1936), Untitled, 1906

## *Pictorialism and Impressionism (contd.)*

- Another photographer who was influenced by the impressionists was George Davidson, who contended that a sharp photograph was not always to be striven for. In "The Onion field" (1889) he used rough-surfaced paper and a soft-focus technique.



The Onion Field,  
George Davidson,  
1889

# *Naturalism*

- The leader of the naturalistic movement in photography, which emerged in 1880s, was Peter Henry Emerson (1856-1936)
- Emerson's main claim was that one should treat photography as a legitimate art in its own right, rather than seek to imitate other art forms; imitation was not needed - it could confer its own legitimacy without it.
- Emerson claimed that true photographic art was possible only through exploiting the camera's ability to capture reality in a direct way.
- The rules of naturalism were: no "faking" by means of lighting, posing, costumes or props; no retouching. A so called "scientific focusing" technique was promoted, which imitated the way the eye perceives a scene: sharply focused on the main subject, with the foreground and the background slightly out of focus.

## *Naturalism (contd.)*



Gathering Water Lilies, Peter Henry Emerson, 1885

## *Naturalism (contd.)*

- Although Emerson later became convinced that photography was not an art form at all but only “a handmaiden to science and art”, his earlier ideas had already influenced a new generation of photographers who no longer felt the need to imitate painting but began to explore photography as an art form of its own right.



Ricking the Reed, Peter Henry Emerson, 1885

## *Naturalism (contd.)*



A Sea of Steps, Frederick H. Evans, 1903

# *Straight Photography*

- In the beginning of the 20th century, with the pictorialism being as strong as ever, a movement was forming to return to the direct and unmanipulated photography, which characterized much of the 19th century imagery.
- Alfred Stieglitz (1864-1946), an American photographer, was the leader and catalyst for photography as an art form.



Two Towers, New York,  
Alfred Stieglitz,  
1911

## *Straight Photography (contd.)*

- In his magazine "Camera Work", Stieglitz published photographic criticism and works whose only requirement was that they would be worthy of the word "art".
- Stieglitz eventually forced museums and art critics to grant photography a place besides the other arts.



The Hand of Man, Alfred Stieglitz, 1902

## *Straight Photography (contd.)*

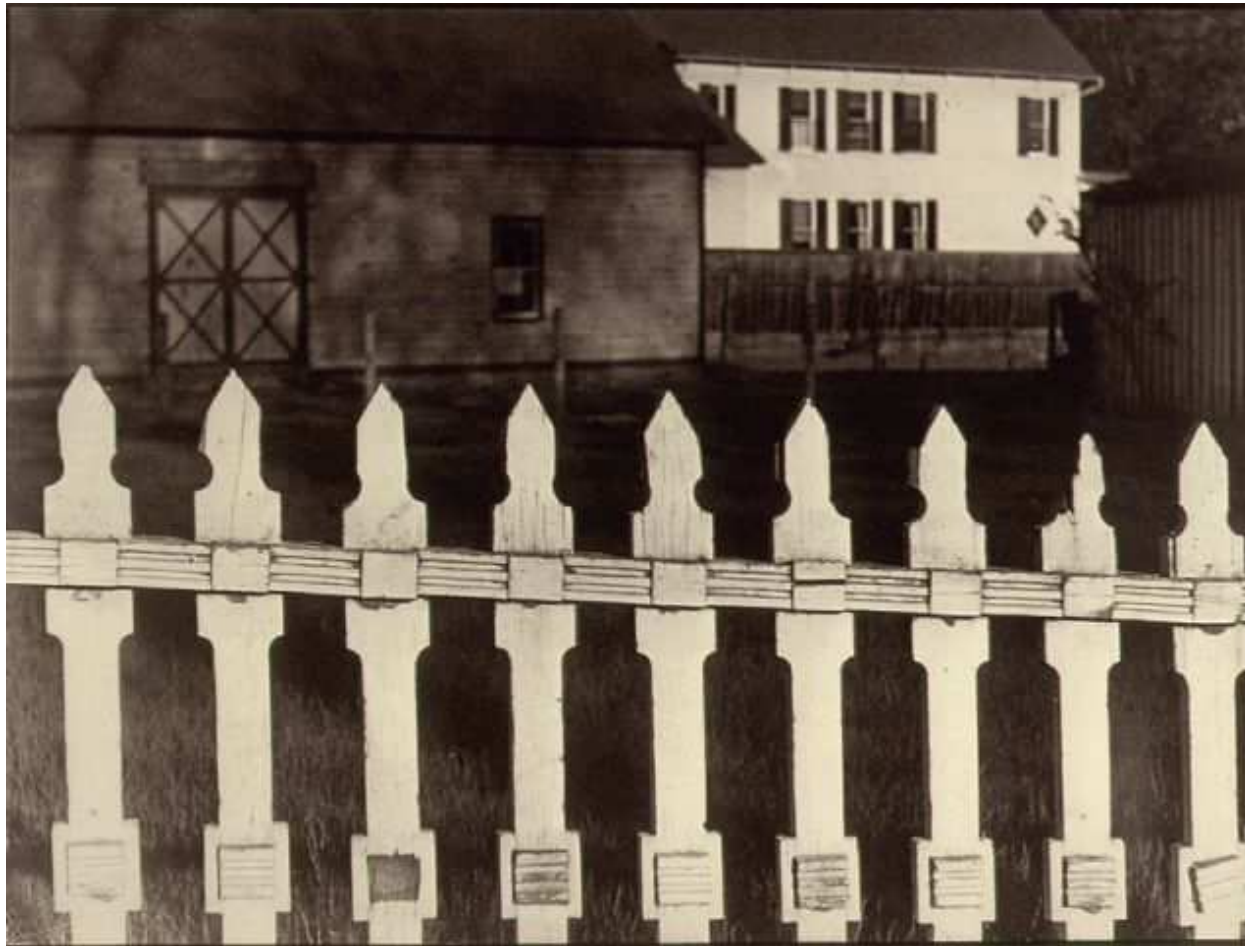
- While first he belonged to the impressionistic movement, he later became a strong advocate of a sharply realistic, “straight photography”.



City of Ambition,  
Alfred Stieglitz, 1910

## *Straight Photography (contd.)*

- Paul Strand represented a powerful new approach to photography as an art form. He believed that “objectivity is of the very essence of photography...”



Paul Strand,  
White Fence,  
1916

## *Straight Photography (contd.)*



Blind, Paul Strand, 1916



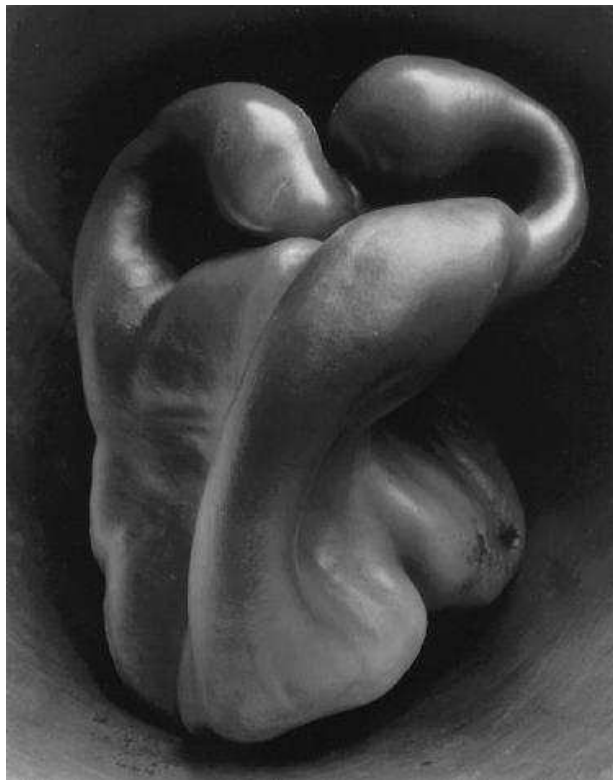
City Hall Park, New York, Paul Strand, 1915



Abstraction, Twin Lakes,  
Connecticut, Paul Strand,  
1916

## *Straight Photography (contd.)*

- Straight photography dominated photography as an art form from the 1930s to the 1950s.
- Many famous photographers, such as Ansel Adams, Paul Caponigro and Imogen Cunningham have used the straight approach.



Edward Weston,  
Pepper No. 30,  
1930

# *New Vision of the 20th Century*

- Laszlo Moholy-Nagy (1895-1946), a Hungarian artist attempted to find new ways of seeing the world and experimented with radical uses of photographic materials in an attempt to replace 19th century pictorialist conventions with a “new vision” compatible with modern life.



Through the fence, Laszlo Moholy-Nagy, 1927

## *New Vision of the 20th Century (contd.)*

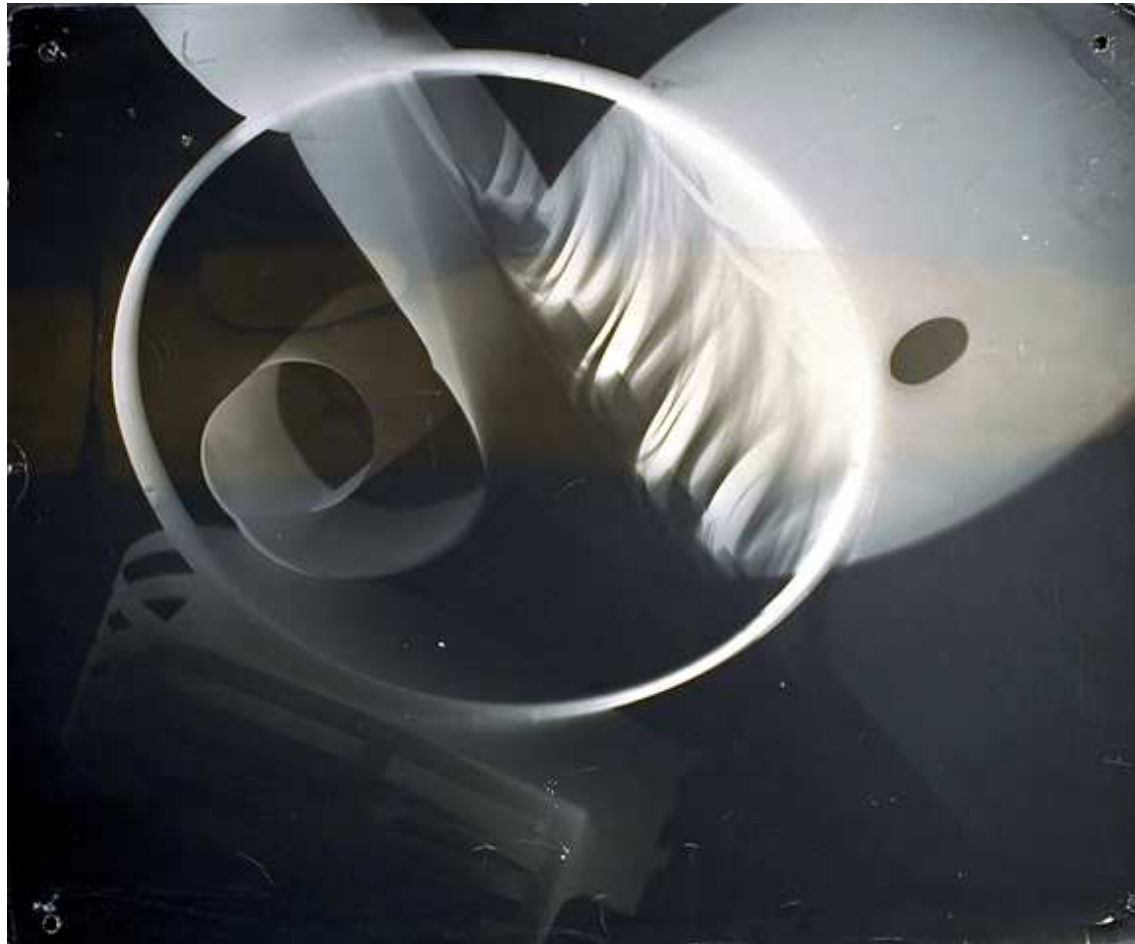
- Laszlo Moholy-Nagy explored many ways of expanding photographic vision, through photograms, photomontage, the Sabattier effect (often called solarization), unusual angles, optical distortions and multiple exposures.



Chairs at Margate, Laszlo Moholy-Nagy, 1935

## *New Vision of the 20th Century (contd.)*

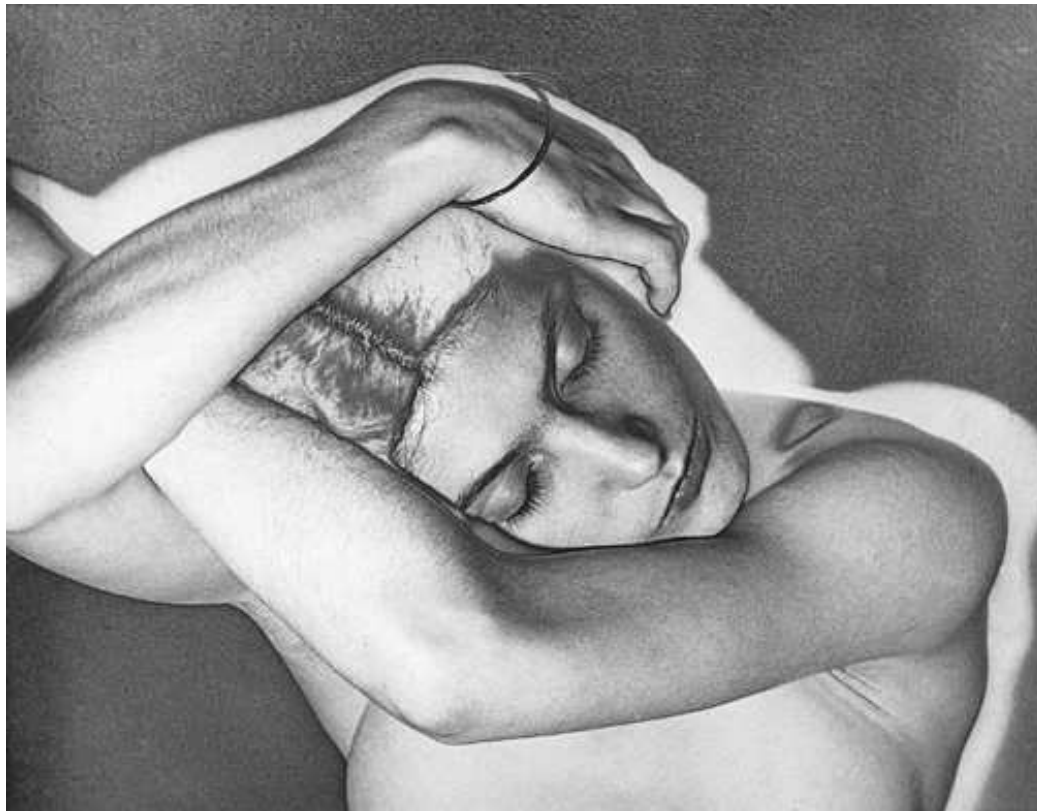
- Moholy felt that these effects “if properly used, help to create a more complex and imaginary language of photography”



Photogram, Laszlo Moholy-Nagy, 1939

## *New Vision of the 20th Century (contd.)*

- Another artist exploring new art forms was Man Ray (1890-1976), an American living in Paris. Like Moholy, he used many techniques in his work.



Solarization, Man Ray, 1929

## *New Vision of the 20th Century (contd.)*



Juliet in Mud Mask, Man Ray, 1945

# *Acceptance of Photography as an Art Form*

- Since the 1950s, photography has gained a wide acceptance as an art form throughout the world.
- Photography has become a part of the college and art school curriculum.
- Art museums have devoted considerable attention to photography.
- Art galleries started to sell photographs.
- Magazines such as Artforum and Art in America began to regularly publish photographs and essays about photography.

# *A Selection of Photographs*



Eleanor, Harry Callahan, 1947



The Soul, Drtikol Frantisek, 1930



Sebastiao Salgado, The Serra Pelada Goldmine, Brazil 1986



Fox Games, Sandy Skoglund, 1989



Sula Bassana, Manuel Vilarino, 1985



I + cat, Wanda Wulz, 1932



Ansel Adams, The Tetons and the Snake River,  
Grand Teton National Park, Wyoming 1942



Nude on Sand, Edward Weston, 1936



John Lennon and Yoko Ono, New York City, December 8, 1980

Annie Leibovitz

*Part IV*  
*Photographic Techniques*

# *Alternative Photographic Techniques*

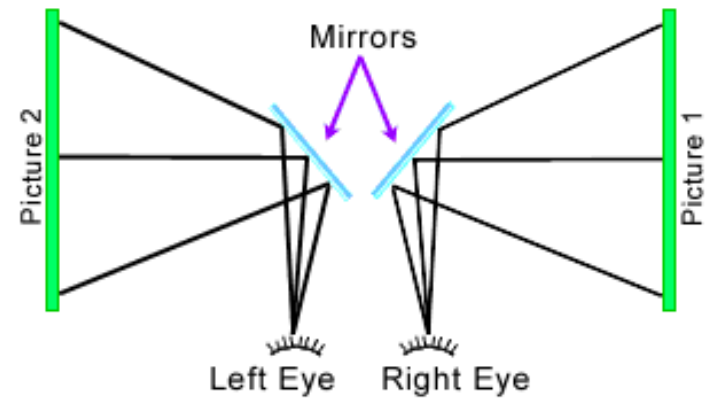
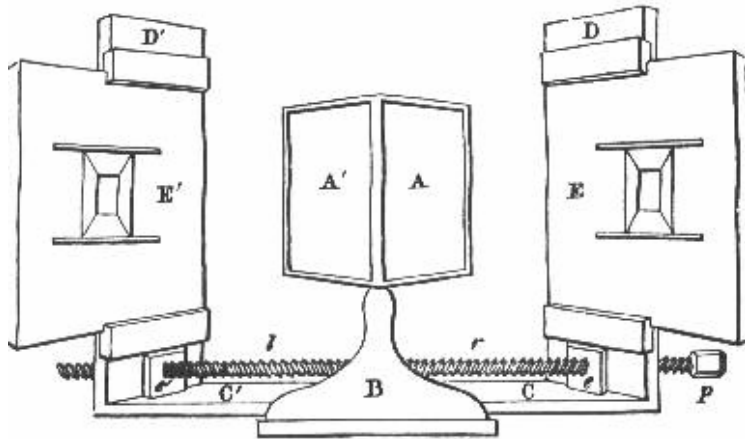
- Photography has become an important part of our life. We see photographs everywhere - in magazines, books, on billboards and on the internet. We make photographs ourselves.
- But there's more to photography than that. Like in every other art form, imagination is the only limit.
- In the following sections I will describe the less known photographic techniques:
  - Stereoscopic (3D)
  - Infrared
  - Panoramic
  - Astrophotography
  - Pinhole

# *Stereoscopic Photography*

- Stereoscopic, or 3D photography, works because it is able to recreate the illusion of depth. Human eyes are set some distance apart, so each eye sees an image slightly differently. If one takes two separate photographs that same distance apart, with a suitable viewer it is possible to recreate that illusion of depth.
- Binocular drawings were made by Giovanni Battista della Porta (1538-1615), which clearly indicated his understanding of binocular vision.
- In 1613 the Jesuit Francois d'Aguillion (1567-1617), in his treatise, coined the word "stereoscopique"

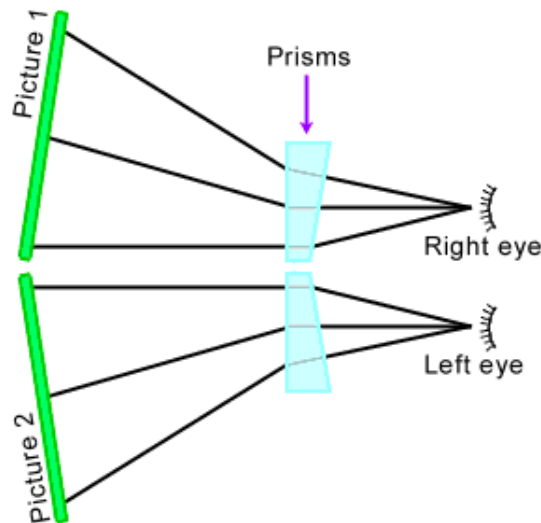
# *Stereoscopic Photography (contd.)*

- The first stereoscope viewer was created in 1833 by Sir Charles Wheatstone (1802-1875), a British inventor. Because photography was unknown at the time, drawings were used.



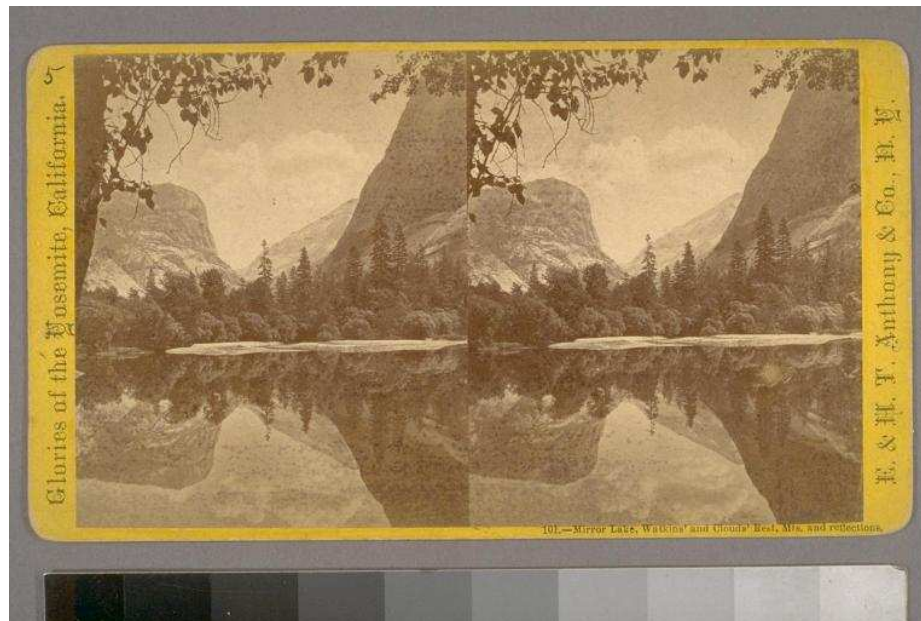
# *Stereoscopic Photography (contd.)*

- In 1849 Sir David Brewster (1781-1868), an English scholar, invented a box shaped viewer.



# *Stereoscopic Photography (contd.)*

- The stereoscope took off in a big way when Queen Victoria and Prince Albert observed one at the exhibition at the Crystal Palace, and Brewster presented her with a stereoscope.
- A new industry and form of entertainment was created, it is estimated that by the mid eighteen-fifties over a million homes owned a stereoscope.



Mirror Lake, Watkins' and Clouds' Rest, Mts. and Reflections.  
Photographer: E. & H. T. Anthony & Co.

## *Stereoscopic Photography (contd.)*

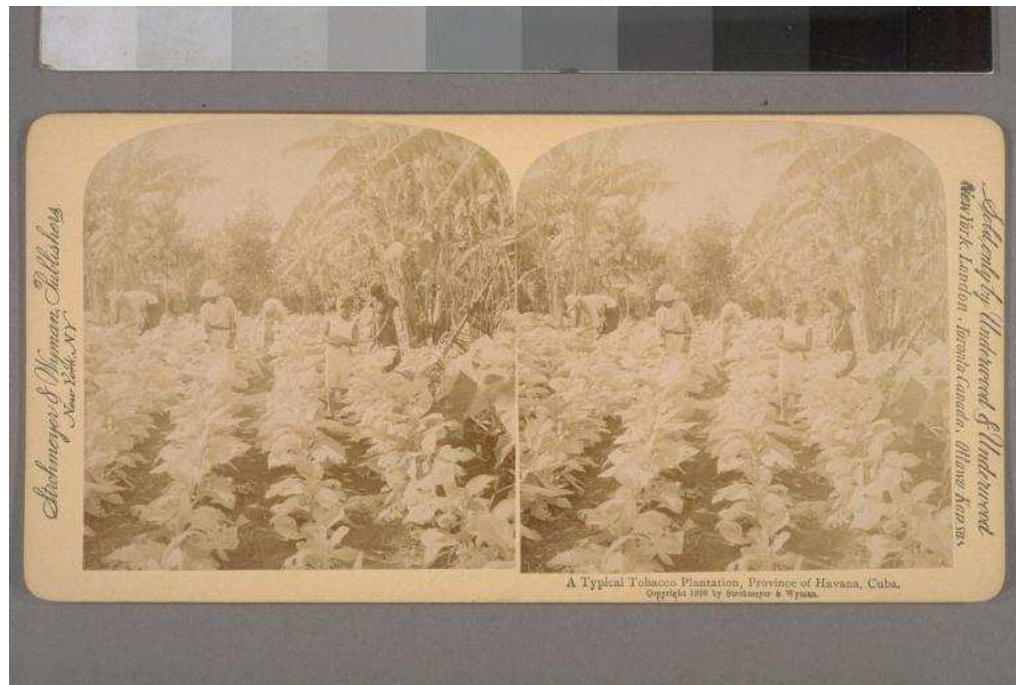
- Stereo pictures are taken by means of a camera with two lenses. This provides two separate pictures 6 cm apart, about the distance between the eyes. Although the pictures appear the same, they are not. When looked at in a viewer, which has prismatic lenses, your eyes will blend the two views into one and the brain perceives it in three dimensions the same as normal vision.



Wet Plate Stereo camera, 1860

# *Stereoscopic Photography (contd.)*

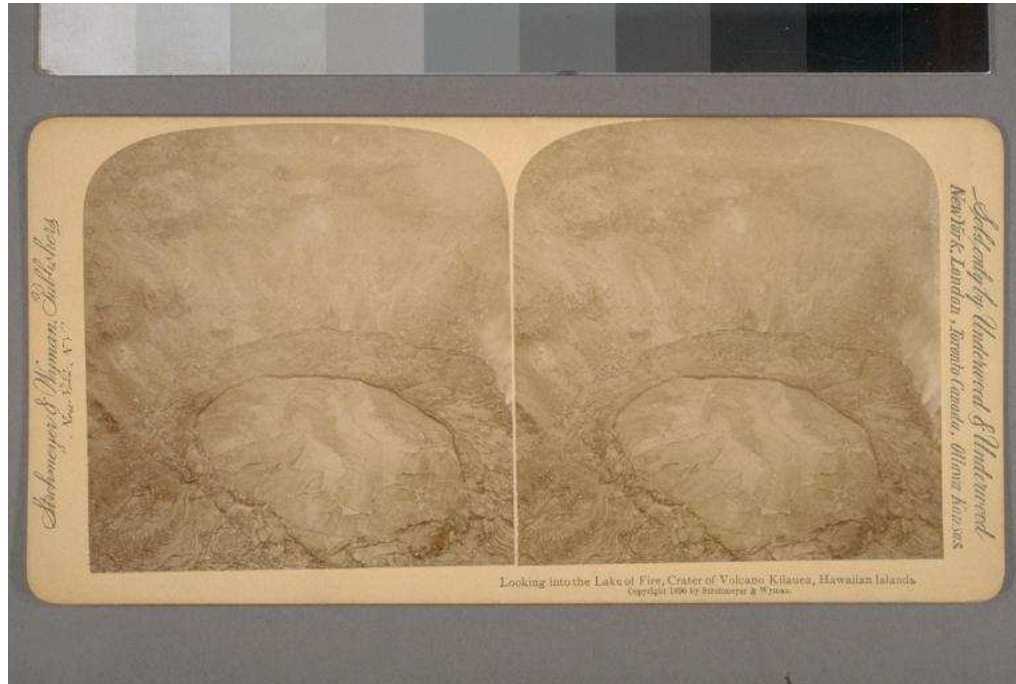
- From 1850 until World War I, the stereoscope allowed our forefathers to visit every corner of the world. It provides us with a three dimensional historical record of those 70 years.



A Typical Tobacco Plantation, Province of Havana, Cuba

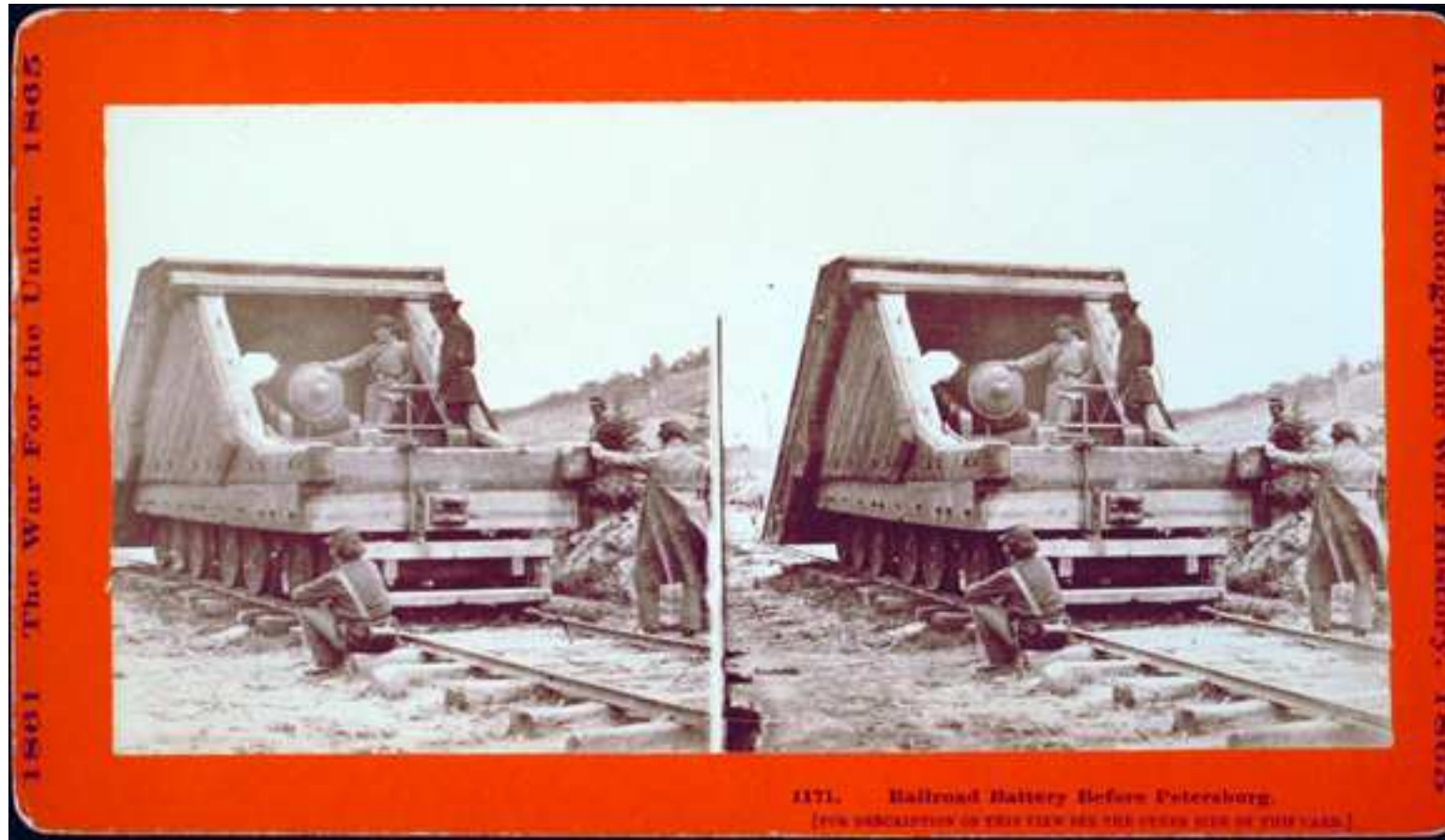
Strohmeyer & Wyman, 1899

# *Stereoscopic Photography (contd.)*



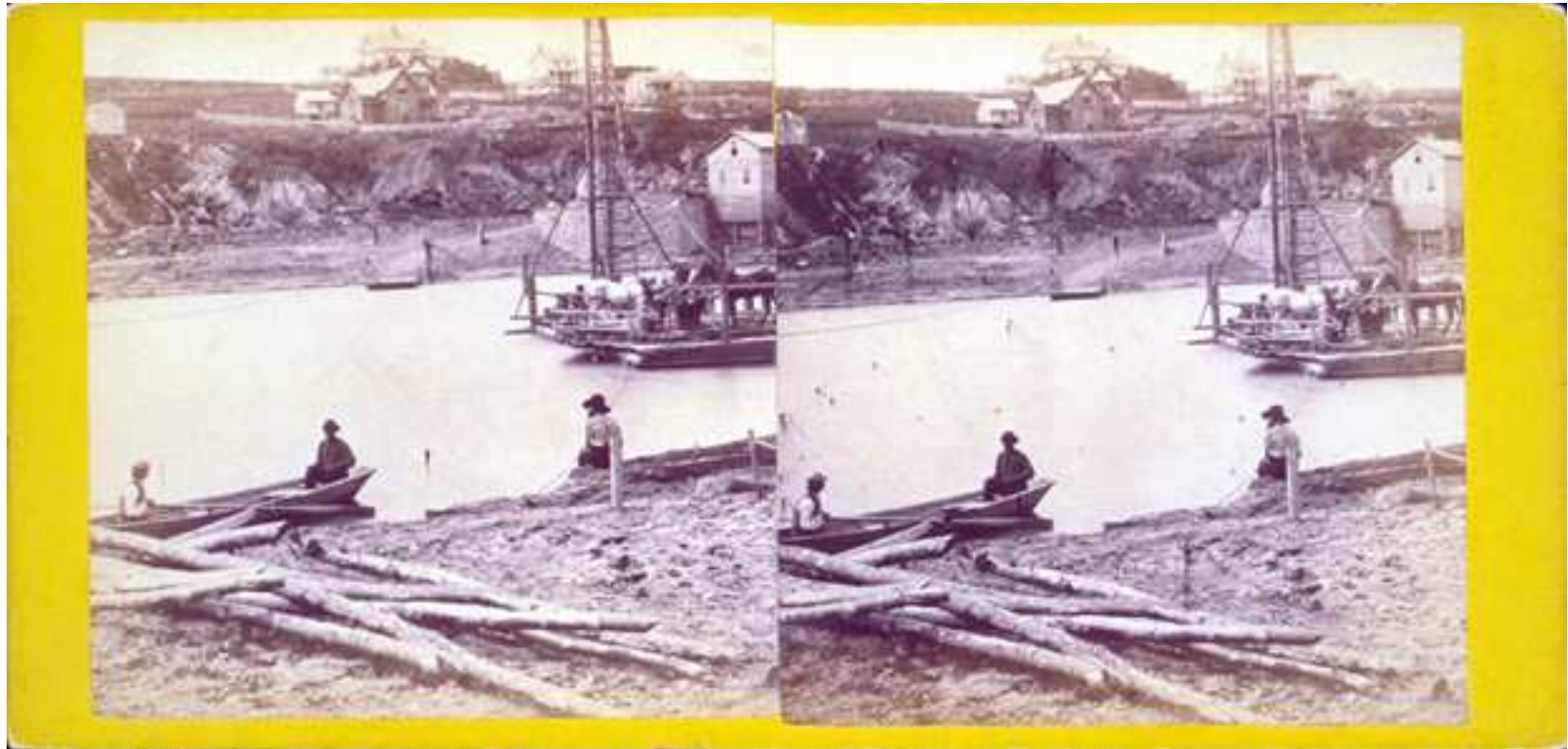
Looking into the Lake of Fire, Crater of Volcano Kilauea, Hawaiian Islands  
Strohmeyer & Wyman, 1896

# *Stereoscopic Photography (contd.)*



Railroad Battery Before Petersburg, The War for the Union 1861-1865  
neg. 1860s; print 1890s  
Publisher: Taylor & Huntington

## *Stereoscopic Photography (contd.)*



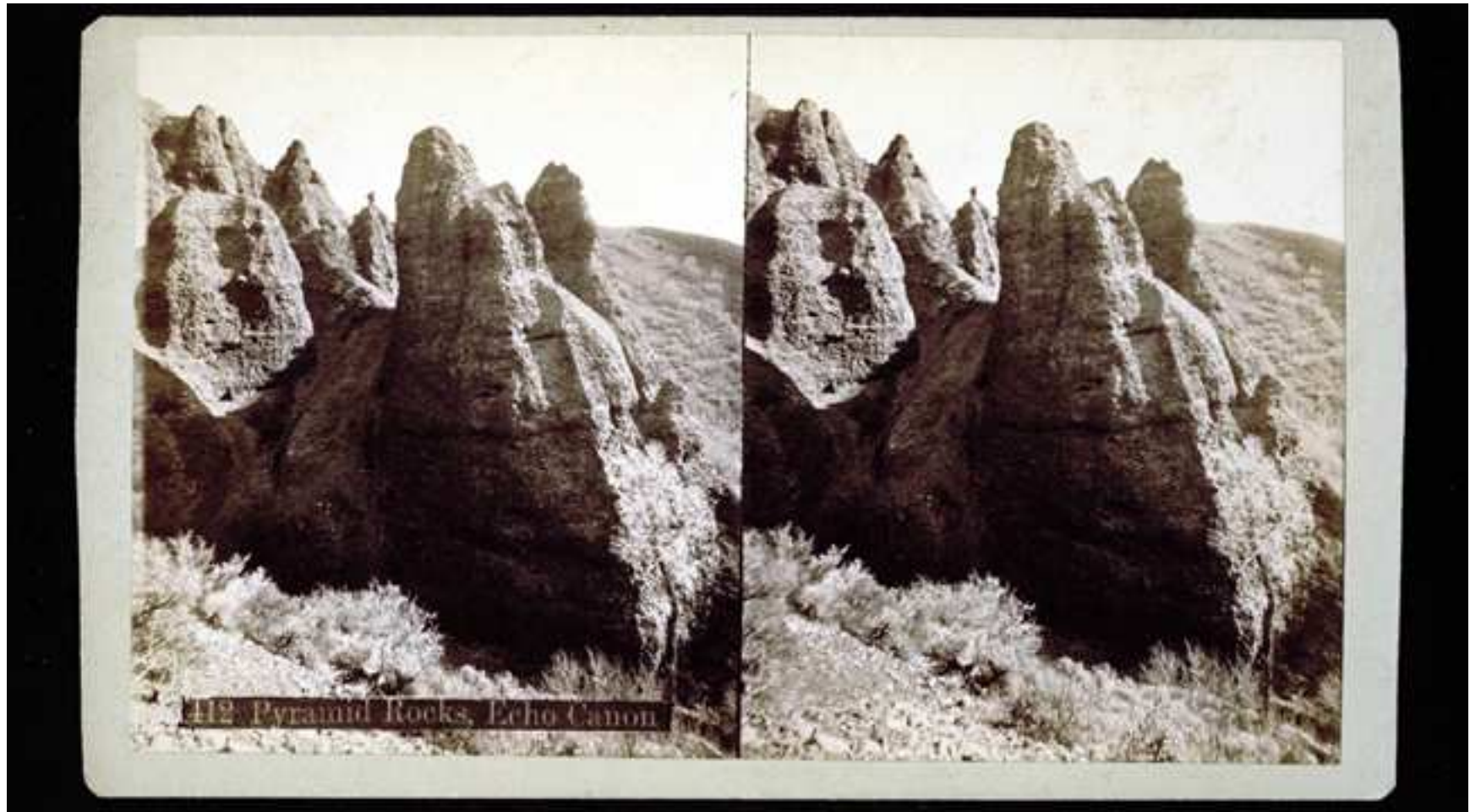
View on Kansas River, near Wyandotte, Kansas.  
Alexander Gardner, 1867

# *Stereoscopic Photography (contd.)*



French cavalry horses swimming river in northern France, World War I  
Keystone View Co.

## *Stereoscopic Photography (contd.)*



Pyramid Rocks, Echo Canyon  
Charles Weitfle, 1878

# *Infrared Photography*

- Infrared film is sensitive to light in the infrared spectrum and is not visible to the human eye.
- The results is that everything looks different than it normally would; foliage is white, skies are black and the photo takes on an eerie and dramatic look.
- These film special characteristics which can be exploited for artistic purposes.

Windmill on Faial, Andy Finney, 1997



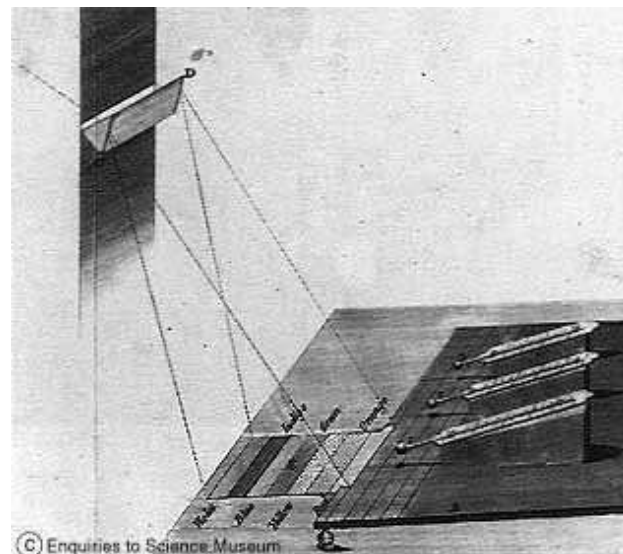
# *The History of Infrared Photography*

- Sir William Herschel (1738-1822), a German-born astronomer was searching for suitable glass for colored filters to be fitted on his telescope.
- He needed a color that would transmit a maximum of light and a minimum of heat.



## *The History of Infrared Photography (contd.)*

- Using a glass prism to refract light from the sun into its component colors, he moved thermometers through the spectrum. The temperatures increased as the thermometers were moved from violet to red and reached a maximum in the dark region beyond the red end of the visible spectrum.
- The Royal Society of London was notified of this discovery in 1800. In his writings, Herschel referred to this phenomenon as “invisible light”.



Herschel's Prism and Mirror c1800

## *The History of Infrared Photography (contd.)*

- In the following years, experiments on the subject were conducted by Joseph von Fraunhofer (1787-1826), a German scientist and Sir John Herschel, son of Sir William.
- It was Sir William Abney, president of The Royal Astronomical Society and of The Physical Society of London, who devised the earliest method of direct photography far into the infrared region. Abney published a chart of the infrared region of the solar spectrum, and is credited with first using the term "infra-red," in 1880.
- After years of further experiments, in 1904, Ben Homelike, an Austrian chemist, discovered the first practical sensitizer for all visible red, pinacyanol. Immediately after the invention of pinacyanol came dicyanide, the first infrared sensitizer.

## *The History of Infrared Photography (contd.)*

- First commercial infra-red film became available around 1931.
- Its earliest applications were primarily for scientific purposes; as an investigative tool in criminology, in ophthalmology and other medical fields, in the exploration of space, and in aerial survey work.



Varadero, Cuba - Coconut Palm, Andy Finney

## *The History of Infrared Photography (contd.)*

- Infrared film has also been employed to create special effects in cinema, and to take photographs in the dark without detectable flash.
- In recent years, infrared film has gained an ever-widening audience as its accessibility has increased.



Hermitage of St John of the Desert, Andy Finney

## *The History of Infrared Photography (contd.)*



Wandsworth Park, Andy Finney

# *Panoramic Photography*

- A panorama is an unusually wide picture that shows at least as much width-ways as the eye is capable of seeing.



Tower of London, James Rigg, 1997

# *Panoramic Photography (contd.)*

- The most common techniques in panoramic photography are "scanning" and "fixed lens".
- With the scanning technique the lens is rotating around its rear nodal point (the optical point from which the focal length is measured) opposite a curved film plane.
- This method gives a very wide angle of view, similar to that of the fisheye lens, but without the extreme distortion of lines within the image.
- In a fixed lens panoramic camera, a wide view angle is achieved optically by the lens.



Noblex scanning camera



Art Panorama fixed lens panoramic camera

# *The History of Panoramic Photography*

- Shortly after the invention of photography, the desire to show overviews of cities and landscapes prompted photographers to create panoramas.
- The earliest panoramas were made by placing two or more daguerreotype plates side-by-side.



View from the top of Lookout Mountain, Tenn., George Barnard, 1864

## *The History of Panoramic Photography (contd.)*

- In the late nineteenth century, cameras were manufactured specifically for producing panoramas. These cameras were either swing-lens cameras, where the lens rotated while the film remained stationary, or 360-degree rotation cameras, where both the camera and the film rotated.




Wonder Panoramic camera , Manufacturer: Rudolph Stirn, 1890

C.P. Stirn's patent "The Wonder" Panoramic Camera, covering up to 360°, for up to five exposures on transparent roll film

# *The History of Panoramic Photography (contd.)*

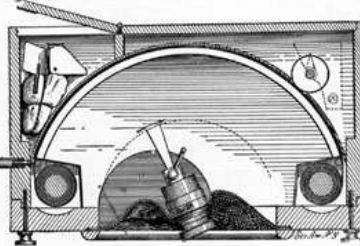
- The first mass-produced American panoramic camera, the Al- Vista, was introduced in 1898.
- The following year Eastman Kodak introduced the #4 Kodak Panoram panoramic camera that proved popular with amateur photographers.
- The panoramic format has never ceased to evolve since and is very popular with contemporary photographers.

## THE AL-VISTA



B 3½ x 10 AND SMALLER.

**Sweeps the Field.** Takes everything in sight, rotating in such a way as to take a series of separate views, covering an area of one hundred and eighty degrees. The most wonderful of all modern cameras. If you are looking for holiday presents, ask the nearest dealer to show you an AL-VISTA. It will satisfy all demands for an acceptable gift. . . . .



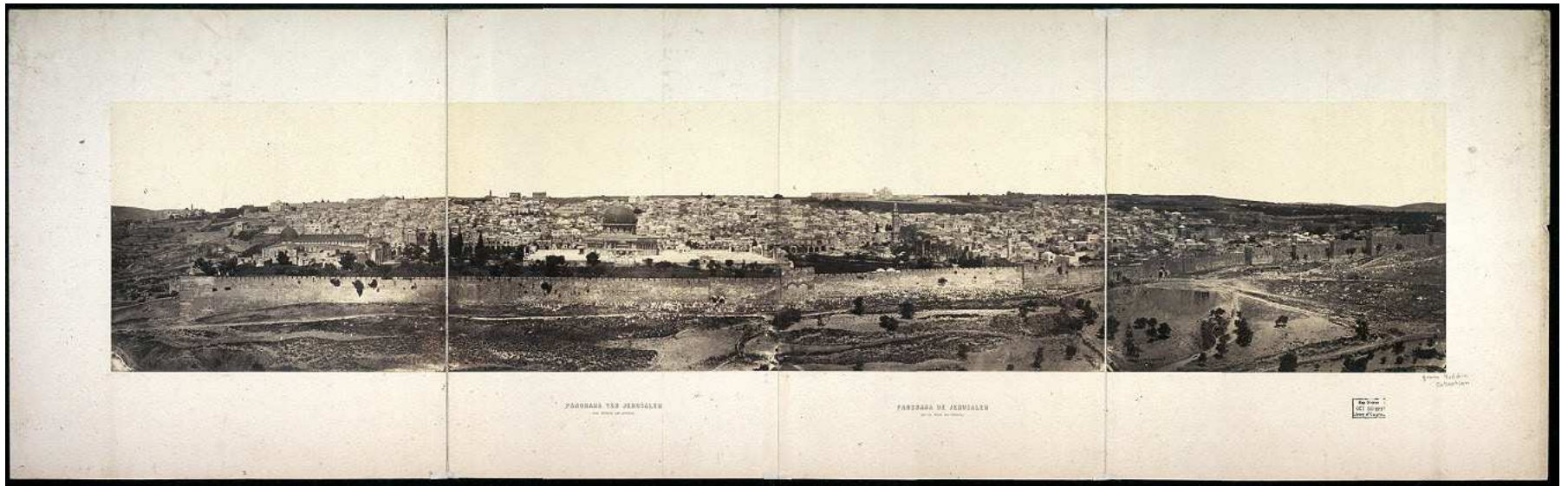
This diagram shows the wonderful field covered by the AL-VISTA. It is eminently fitted for broad landscapes, marine views, mountain ranges, yacht races and field sports. Uses regular stock film and is light and compact.

A large catalogue containing reproductions of marvelous pictures taken with the AL-VISTA sent on receipt of two cents.

**THE MULTISCOPE AND FILM COMPANY - - BURLINGTON, WIS.**

PLEASE MENTION CAMERA CRAFT

## *The History of Panoramic Photography (contd.)*



Panorama of Jerusalem, view from the Mount of Olives, 1867

## *The History of Panoramic Photography (contd.)*



Davenport, IA, 2nd & Harrison Sts.; F.J. Bandholtz, 1907

## *The History of Panoramic Photography (contd.)*



Panoramic landscape along the Elbe, Josef Sudek, around 1956

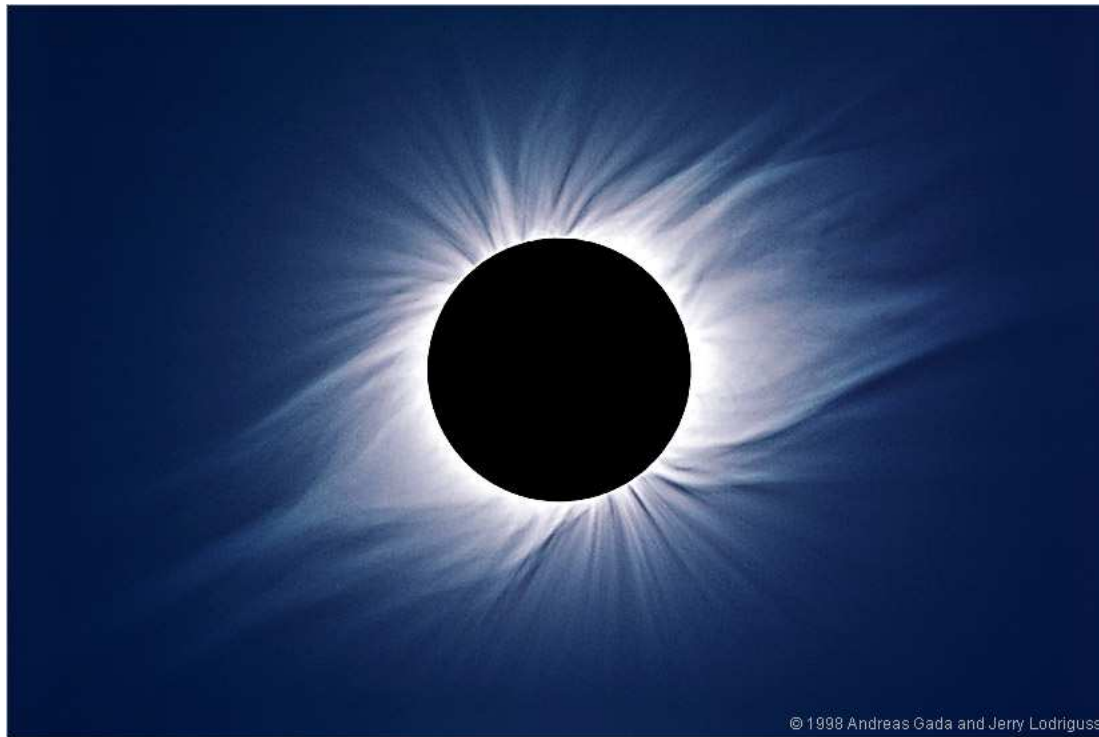
## *The History of Panoramic Photography (contd.)*



Vultures Dale, Province of Chubut. Argentina, Alberto Gandsas

# *Astrophotography*

- The universe is full of spectacular things. What can be seen with the naked eye is a small fraction of those wonders.
- Astrophotography is about capturing parts of our universe with a camera.



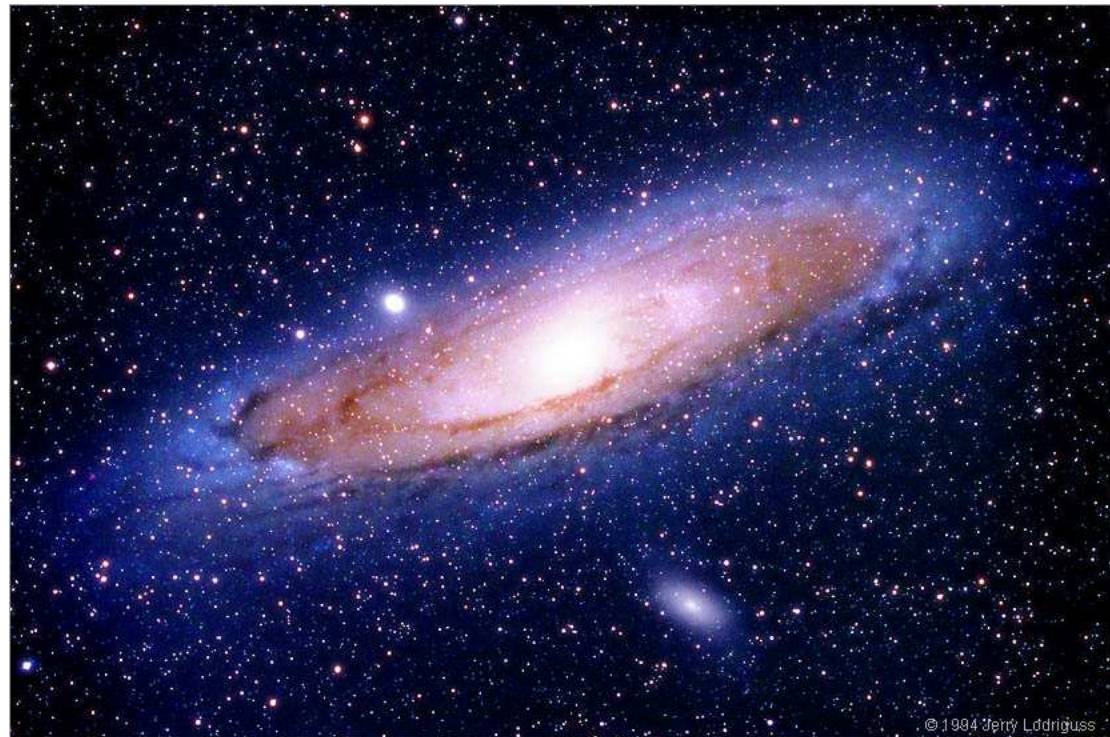
Corona - Total Solar Eclipse, Andreas Gada and Jerry Lodriguss

# *The History of Astrophotography*

- Before the invention of photography observers sat at telescopes and sketched what they saw.
- Combining the optics of a telescope with a specially constructed camera to make the first photographic plates took place around the 1840s.
- By the turn of the 1900s astronomers turned their attention to making telescopes specifically for photography and not for observing.
- This in turn led to even better imaging of galaxies and star clusters as well as better spectral images for deeper scientific analysis.

# *The History of Astrophotography (contd.)*

- During the middle of the 1900s telescopes were manufactured for consumers leading to an explosion in the amateur astronomical community.
- Color film that works well with the pursuit of astrophotography appeared on the market during the early 1980s and quickly evolved into a fantastic tool for capturing beautiful color images of space.



M31 - The Great Galaxy  
in Andromeda,  
Jerry Lodriguss

## *The History of Astrophotography (contd.)*

- Today, astrophotography is a science and an art form. The images of the heavens captured by amateur astronomers at the dawn of the 2000s truly would astound astronomers of just 25 years previous.



B33 - The Horsehead Nebula, Jerry Lodriguss

# *Pinhole Photography*

- Pinhole photography is lensless photography. A tiny hole replaces the lens. Light passes through the hole; an image is formed in the camera.
- Basically a pinhole camera is a box, with a tiny hole in one end and film or photographic paper in the other.



Tom Baril,  
1998

# *Pinhole Photography (contd.)*

- Pinhole cameras are used for fun, for art and for science.
- Pinhole images are softer - less sharp - than pictures made with a lens. The images have nearly infinite depth of field. Wide angle images remain absolutely rectilinear. On the other hand, pinhole images suffer from greater chromatic aberration than pictures made with a simple lens, and they tolerate little enlargement.



From the window series,  
Robert Mann

## *Pinhole Photography (contd.)*



Paris, Ilan Wolf, 1998

# *The History of Pinhole Photography*

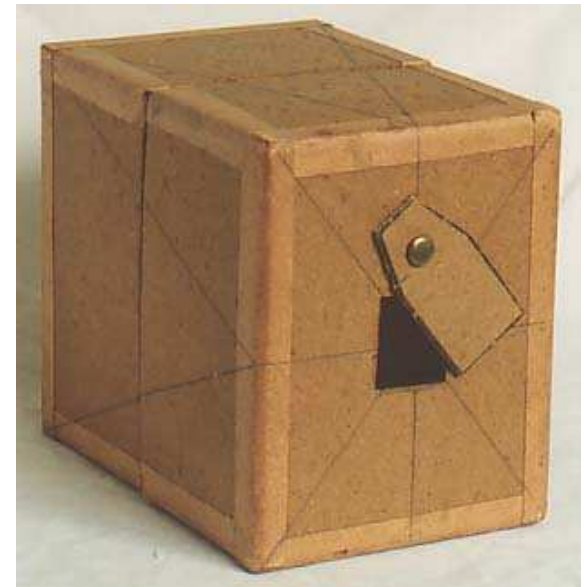
- Sir David Brewster, a Scottish scientist, was one of the first to make pinhole photographs, in the 1850s. He also coined the very word "pinhole".
- By the late 1880s the Impressionist movement in painting was a certain influence on photography. Different schools or tendencies developed in photography.
- The "old school" believed in sharp focus and good lenses; the "new school", the "pictorialists", tried to achieve the atmospheric qualities of paintings. Some of the pictorialists experimented with pinhole photography.

*"Expeditions"* , Ruth Thorne-Thomsen,  
1979



## *The History of Pinhole Photography (contd.)*

- Pinhole photography became popular in the 1890s. Commercial pinhole cameras were sold in Europe, the United States and in Japan. 4000 pinhole cameras ("Photomnibuses") were sold in London alone in 1892.
- The cameras seem to have had the same status as disposable cameras today - none of the "Photomnibuses" have been preserved for posterity in camera collections.
- Mass production of cameras and "new realism" in the 20th century soon left little space for pinhole photography.
- By the 1930s the technique was hardly remembered, or only used in teaching.



Eastman Kodak Pinhole Camera  
1930

# *The Revival of Pinhole Photography*

- In the mid-1960s several artists, unaware of each other, began experimenting with the pinhole technique - Paolo Gioli in Italy, Gottfried Jager in Germany, David Lebe, Franco Salmoiraghi, Wiley Sanderson and Eric Renner in the USA.
- In 1971 The Time-Life Books published *The Art of Photography* in the well-known Life Library of Photography and included one of Eric Renner's panoramic pinhole images.



Lago Maggiore, North Italy, Peter Olpe, 1978

## *The Revival of Pinhole Photography (contd.)*

- The June 1975 issue of *Popular Photography* published the article "Pinholes for the People", based on Phil Simkin's month-long project with 15,000 hand-assembled and preloaded pinhole cameras in the Philadelphia Museum of Art. People came into the museum, picked up a camera, made an exposure. The images, developed in a public darkroom in the museum, were continually displayed in the museum



Brooklyn Bridge,  
Dona McAdams,  
1983

## *The Revival of Pinhole Photography (contd.)*

- In the 1970s pinhole photography gained increasing popularity. A number of articles and some books were published, but the critics tended to ignore pinhole photography in art.



Beth III, Mimbres Hot Springs Ranch, Nancy Spencer, 1995

## *The Revival of Pinhole Photography (contd.)*

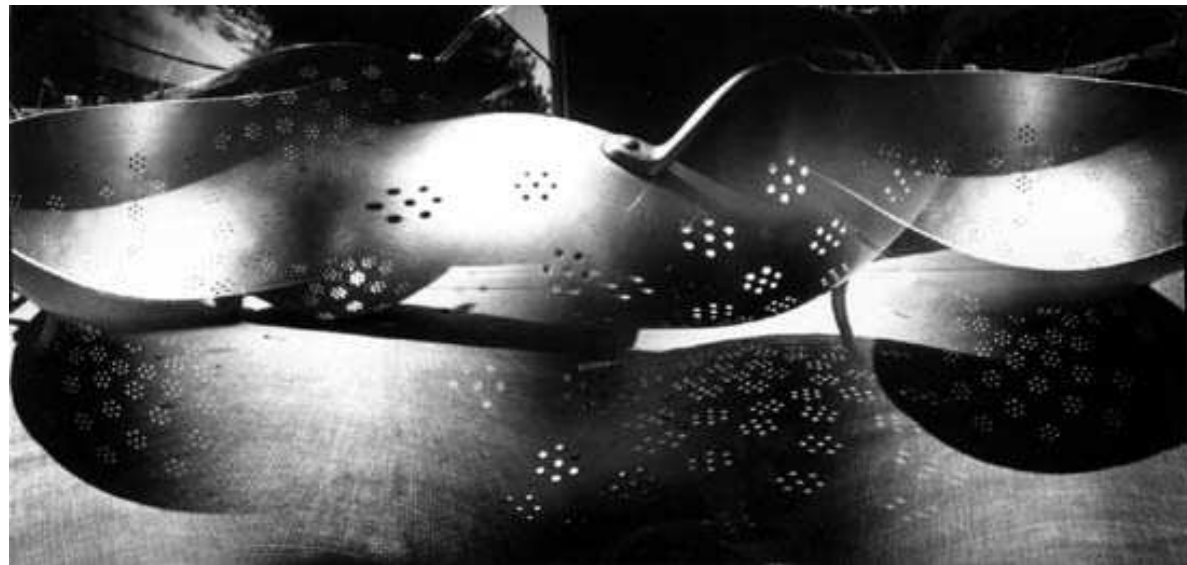
- In 1985 Lauren Smith published *The Visionary Pinhole*, the first broad documentation of the diversity of pinhole photography.
- The first national exhibition of pinhole photography in the USA was organized by Willie Anne Wright, at the The Institute of Contemporary Art of the Virginia Museum in 1982. In 1988 the first international exhibition, "Through a Pinhole Darkly", was organized by the Fine Arts Museum of Long Island.



B.B. and Me, David Lebe, 1974  
hand colored pinhole photograph from 4 pinhole camera

## *The Revival of Pinhole Photography (contd.)*

- Large number of pinhole artists became active in the 1980s.
- At least six commercial pinhole cameras were manufactured in the 1980s.
- Today, thousands of pinhole artists are active throughout the world.



Sieb, Jurgen Konigs, 1990

## *The Revival of Pinhole Photography (contd.)*



London, Ilan Wolf, 1991

*The End...*



# *Bibliography*

- A New History of Photography, edited by Michel Frizot
- Photography, Barbara London and John Upton
- A History of Photography, Robert Leggat  
<http://www.rleggat.com/photohistory/>
- Pinhole Photography, Jon Grepstad  
<http://home.online.no/~gjon/pinhole.htm>
- The Complete History of Cinematography  
<http://www.precinemahistory.net/>
- Reclaiming Technology, Jno Cook  
<http://jnocook.net/reclaim/>
- Invisible Light, Infrared Photography by Andy Finney  
<http://www.atsf.co.uk/ilight/>

# *Images*

- Title page: Harold Edgerton, Milk Drop Coronet, 1957
- Final Page: View of the Earth from the Command Module Columbia. 20 July 1969.
- Museum of the History of Science, Oxford  
<http://www.mhs.ox.ac.uk/>
- George Eastman House, International Museum of Photography and Film  
<http://www.geh.org/>
- Niepce Museum of Photography  
<http://www.museeniepce.com/>
- Explore Art at the Getty  
<http://www.getty.edu/>
- The Metropolitan Museum of Art  
<http://www.metmuseum.org/>
- Masters of Photography  
<http://www.masters-of-photography.com/>

## *Images (contd.)*

- California Heritage Collection  
<http://sunsite.berkeley.edu/CalHeritage/>
- Taking the Long View, Panoramic Photographs Collection  
<http://lcweb2.loc.gov/ammem/pnhtml/pnhome.html>
- Panoramic landscape photography of Argentina  
<http://www.gandsas.com/>
- Catching the Light - Astrophotography  
<http://www.astropix.com/>
- Pinhole Resource Online  
<http://www.pinholeresource.com/>