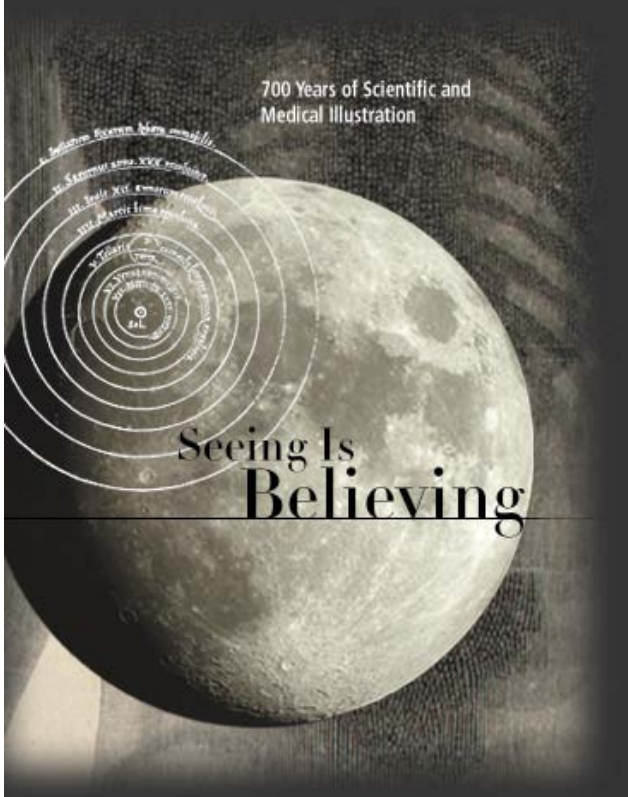

Illustrations were essential in spreading new scientific and medical ideas and it was often the case that new developments in the sciences were accompanied by corresponding developments in illustrative techniques. These techniques are the subject of Seeing Is Believing, which complements an exhibition of the same name on view from October 23, 1999-February 19, 2000 at The New York Public Library's Humanities and Social Sciences Library.

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Illustration Processes Overview

Scientific and medical illustration is often characterized by a twofold need: for accuracy and for clarity in presenting information. It would be more appropriate, however, to say that such illustration is utilized in assisting the reader in "seeing" information within the context of a particular theory or scientific reality. Some images present theory based on careful study. Other images are based on observed, though selective, reality. A third type of image shows the way to conduct an experiment or procedure, or simply the equipment needed. The developments in book illustration techniques shown on this website should be viewed with an eye to economic factors which have always been a major component of book production.

All book illustration processes can be divided into four basic groups: relief printing, chiefly woodcut and wood engraving; intaglio printing, including engraving, etching, and mezzotint; planographic printing, chiefly lithography and chromolithography; and photography. In the 1960s, when the text as well as the illustrations began to be reproduced photographically, offset lithography, a photolithographic printing process, took over commercial book production and held the field until today's digital revolution.

These examples, which enable detailed study of the illustration processes featured in this website, provide a better understanding of the different printing techniques and the utility of these processes in illustrating scientific and medical concepts over the last 700 years.

Detail Studies

NEXT SECTION

VIEW STUDIES

Color study:

Andreas Vesalius
***De humani corporis fabrica*, 1543**

Relief printing study:

Pietro Andrea Mattioli
Commentarii … Pedacii Dioscoridis … de materia medica, 1565

Intaglio printing study:

Robert Hooke
Micrographia, 1665

Planographic printing study:

Jean Marc Bourgery
Traité complet de l'anatomie de l'homme, 1831—54

Photography study:

Lick Observatory
Transparencies of the Moon, ca. 1896

A WORD ABOUT COLOR

NEXT SECTION

Today we live in a color-saturated age, as advances in digital cameras, copiers, and printers make color printing more affordable than it has ever been. But it is important to remember that until the middle of the nineteenth century and the development of **chromolithography**, color was always a luxury. The earliest book in this exhibition, Sacro Bosco's ***De sphaera*** (ca. 1275) belongs to the age of the illuminated manuscript, books made for and owned by the nobility or the Church elite. The only known hand-colored copy, of Vesalius's ***De humani corporis fabrica*** (1543) was made for Emperor Charles V, to whom the work is dedicated.

Most scientific and medical illustration was done in black and white before the invention of chromolithography. Except for a few experiments, color had to be added by hand, as in Edward Lear's ***Parrots*** (1832), greatly increasing the cost of production. The popular print ***Prang's Prize Babies*** (1888), a composite made from nineteen lithographic stones, aptly illustrates the labor intensiveness of the chromolithographic printing process.

VIEW EXAMPLES

Andreas Vesalius
De humani corporis fabrica,1543
Anonymous Private Collector; photo courtesy of Christie's, New York

Images of these items illustrate but a few of The New York Public Library's major holdings in science and medicine as well as items from other institutions which were featured in the exhibition *Seeing Is Believing,* on view from October 23, 1999—February 19, 2000 at the Humanities and Social Sciences Library, and related publication.

A WORD ABOUT COLOR

Hand-colored woodcut
Andreas Vesalius (1514-1564)
De humani corporis fabrica libri septem
Basel: Johannes Oporinus, 1543
Courtesy of an Anonymous Private Collector; photo courtesy of Christie's, New York
Dedication copy presented by Vesalius to Charles V (1500-1558), Holy Roman Emperor

BACK NEXT
ENLARGE STUDY THIS IMAGE IN DETAIL

(220 k)

This dedication copy was sumptuously bound in purple velvet, with gilt and gauffered edges and four pairs of blue silk ties. Presented by the author to the Holy Roman Emperor, Charles V, in the autumn of 1543, this is the only known copy with contemporary hand-colored and illuminated illustrations throughout the text. Vesalius was appointed physician to the Emperor's household immediately following the presentation of this volume.

As the title-page illustration — a portrait of the author pointing to a female cadaver on a table in front of him — makes clear, Vesalius insisted that physicians do their own dissecting and not leave the work to assistants. The more than two hundred woodcut illustrations were drawn in Venice by an artist or artists from the studio of Titian, and the woodblocks were cut by some of the finest Venetian woodblock cutters. Vesalius took great care with the depiction of anatomical subjects and supervised the artists' work closely. When completed, the woodblocks were sent to the printer, Oporinus, in Basel, with the author's precise instructions as to where they were to be placed in the text.

A WORD ABOUT COLOR

Hand-painting and illumination on vellum
Joannes de Sacro Bosco (fl. 1230).
Comptus, quadrans, de sphaera, algorismus
France, ca. 1275
Manuscripts and Archives Division, The New York Public Library
Gift of Alexander Maitland

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(220 k)

Sacro Bosco's early life history is unknown, but it is commonly held that he was educated at Oxford and then entered the Order of St. Augustine at the Monastery of Holywood in Nithsdale, Scotland. Around 1220 he went to Paris, where he became professor of mathematics at the university and promoted the new classical and Arabic learning that was causing such ferment in Europe. Arabic scholars had not only preserved classical treatises on mathematics, but had developed their own simpler number system and algebra.

De sphaera, Sacro Bosco's most important work, first appeared in 1220 and was used as an astronomy textbook at the University of Paris. It remained the textbook for astronomy throughout Europe for the next 450 years. This is one of the many surviving manuscript copies of the work; its gold illumination and fine vellum made it far too expensive a book for a student to own. Its representation of the medieval cosmos is characteristic of illustrations that persisted until well into the seventeenth century. At the center is the imperfect sphere of the Earth, surrounded by the spheres of water, air, and fire, and then the concentric circles representing the spheres of the known planets and the fixed stars. The last concentric circle represents the Primum Mobile or Prime Mover, i.e., God, the First Cause.

A WORD ABOUT COLOR

Hand-colored woodcut
Petrus Apianus (1495—1552).
Astronomicum caesareum.
Ingolstadt: for the author, 1540
Rare Books Division, The New York Public Library
Purchased from the Bequest of Alexander Maitland

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS

(228 k)

Until well into the seventeenth century, the determination of appropriate bloodletting sites, of childbirth times, and of the optimum time for the treatment of various ailments required the accurate plotting of planetary conjunctions, eclipses, and other astronomical phenomena. The *Astronomicum caesareum* provided for this need in a magnificent book that combined elegant typography with exquisite woodcuts and hand-coloring. For this book, Apianus created thirty-five elaborate mechanical devices called volvelles whose multiple disks, pointers, and string allowed the reader to accurately determine the position and movement of the planets and other celestial phenomena.

A WORD ABOUT COLOR

Hand-colored engraving
Maria Sibylla Merian (1647—1717).
Metamorphosibus insectorum Surinamensium . . . Dissertation sur la generation et les transformations des insectes de Surinam.
The Hague: Pierre Gosse, 1726
Rare Books Division, The New York Public Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(192 k)

Maria Sibylla Merian was one of the world's great entomologists, working both as an author and as an illustrator. A woman of great independence, she came from a long line of European engravers. Her first important work, *Der Raupen wonderbare Verwandelung* [*Wondrous Transformation of Caterpillars*], appeared in 1679. It included 186 European moths, butterflies, and other insects, each depicted in all stages of metamorphosis, along with the particular plant it selected for feeding and to lay its eggs. These she drew from life rather than from preserved specimens. She then became interested in the insects of the Dutch colony of Surinam (Dutch Guiana) in northern South America through her oldest daughter, Johanna Helena, who had married a merchant involved in trade with the colony, and from seeing specimens of Surinam insects in Dutch collections.

In 1699, after leaving her husband and selling a collection of her paintings to finance the voyage, she and her youngest daughter, Dorothea Maria, went to Surinam, spending two years drawing and painting insects, flowers, fruit, and reptiles. After returning to Amsterdam, she produced her greatest work, *On the Metamorphosis of the Insects of Surinam*, following a format similar to that of her first book on insects.

A WORD ABOUT COLOR

Hand-colored lithograph
Edward Lear (1812—1888).
Illustrations of the Family of Psittacidae, or Parrots.
London: Published by the author, 1832
Stuart Collection, Rare Books Division, The New York Public Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(140 k)

Best known today for his "nonsense books," created after he began to lose his sight, Edward Lear was one of the finest bird painters. This work was his first project, begun when he was only eighteen years of age. It was also the first illustrated work of ornithology devoted to a single family of birds, and the first English bird folio book to be produced using lithographed plates (printed by Charles Joseph Hullmandel) that were then colored by hand. Wherever possible, Lear worked from live birds at the Regent's Park Zoological Gardens in London. When it was completed, his *Parrots* established a format and style that was made famous by John Gould, for whom Lear worked following its publication. Shown here is the *Hyancinthine macaw* or *Macrocereus hyancinthinus*.

A WORD ABOUT COLOR

Chromolithograph
Louis Prang (1824-1909)
Prang's Prize Babies: How This Picture Is Made
Boston: L. Prang & Co., [1888]
Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS

(156 k)

View selected progressive proofs of "The Prize Babies"

Using a different lithographic stone for each color to create a composite multi-colored image was a complex and labor-intensive process. However, once the stones were made they could be reused, making chromolithography not only the primary means of printing in color in the nineteenth century but an inexpensive one at that. While the most pervasive use of chromolithography was in advertising, it was also used extensively for making popular prints, as well as for scientific and medical illustrations.

Nineteen stones, each one containing a different color, were used to create the composite image for the popular nineteenth century print, "Prang's Prize Babies." The image on view is the thirty-eighth, and final, progressive proof. To better understand how chromolithographs were made, view selected progressive proofs of "The Prize Babies."

Relief printing is the oldest of the printed illustration processes. The **woodcut**, in which a knife is used on the plank side of a piece of wood to carve away everything except the lines to be printed, was invented in China during the eighth century, and reached Europe around 1400. With the invention of the printing press and movable type around 1455, the relief process, though tedious, became the primary means of printing illustrations in books, since the lines of the image stood up in relief in the same way as did the type, and they could be printed together on the same press. Early printers of scientific and medical books were quick to utilize the **relief** process, setting a precedent for those who followed.

A GRAVER IS USED TO INCISE THE LINE TO BE PRINTED INTO THE PLATE DIRECTLY.

The **intaglio** process, which appeared in the mid-fifteenth century, allowed the artist to produce the image directly instead of indirectly. Despite the fact that these illustrations could not be printed on the same press as text pages since they required much more pressure to print, by the seventeenth century intaglio had generally replaced the woodcut.

A method developed toward the end of the eighteenth century used engraving tools on the end grain of a hard wood, such as boxwood, to cut away the nonprinting surfaces while creating very fine details. This technique, which again

A NEEDLE IS USED TO CREATE FINE LINES ON A METAL PLATE

VIEW EXAMPLES

Georgio Liberale and Wolfgang Meyerpeck
Woodblock for *"Bellis minor"* [*Bellis perennis*]
The New York Botanical Garden

allowed text and image to be printed together, led to an explosion of illustrated books, magazines, and newspapers beginning in the mid-nineteenth century. After the invention of **photography**, some wood engravers were able to mimic the appearance of a photograph. With the invention of the **relief halftone** process in the 1880s, printing blocks could be made directly from photographs, and wood engraving became obsolete for commercial publishing.

Images of these items illustrate but a few of The New York Public Library's major holdings in science and medicine as well as items from other institutions which were featured in the exhibition *Seeing Is Believing,* on view from October 23, 1999—February 19, 2000 at the Humanities and Social Sciences Library, and related publication.

SEE the Exhibit | LEARN About the Exhibit | The New York Public Library Homepage

RELIEF PRINTING

Georgio Liberale and Wolfgang Meyerpeck
Woodblock for *"Bellis minor"* [*Bellis perennis*]
Courtesy of The LuEsther T. Mertz Library, The New York Botanical Garden, Bronx, New York

BACK NEXT
ENLARGE

(220 k)

For the 1562 Czech edition of Mattioli's *Commentaries on the Materia Medica of Dioscorides*, Georgio Liberale of Udine and Wolfgang Meyerpeck made large woodblocks from pear wood. Many of these blocks have survived, including the one of the common English daisy shown here.

VIEW THE PRINT MADE FROM THIS BLOCK

RELIEF PRINTING

Woodcut
Pietro Andrea Mattioli (1500-1577)
Commentarii in sex libros Pedacii Dioscoridis . . . de materia medica
Venice: Valgrisiana, 1565
Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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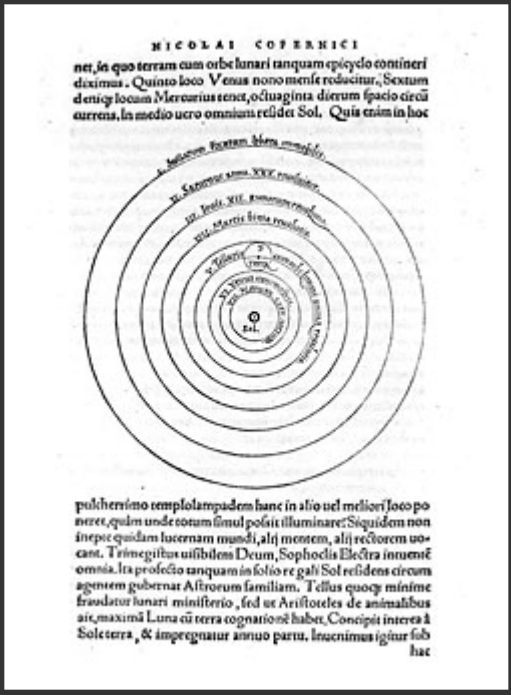
ENLARGE
(92 k)
PHOTOGRAPHIC SERVICES AND PERMISSIONS
STUDY THIS IMAGE IN DETAIL

The first edition of Italian physician and botanist Pietro Andrea Mattioli's *Commentaries on the Materia Medica of Dioscorides* was printed in Venice in 1544. For this edition of 1565, the large woodblocks made for the Prague, 1562, edition were used, including the block for *"Bellis minor"* [*Bellis perennis*], the common English daisy.

VIEW THE BLOCK THAT MADE THIS PRINT

SEE the Exhibit | LEARN About the Exhibit | The New York Public Library Homepage

RELIEF PRINTING



Woodcut
Nicolaus Copernicus (1473-1543)
De revolutionibus orbium coelestium
Nuremberg: Johannes Petreius, 1543
Rare Books Division, The New York Public Library
Astor Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(160 k)

The most justly famed illustration of Western science, this image in the first printed edition of *De revolutionibus orbium coelestium* [*On the Revolutions of the Heavenly Spheres*] shows the Sun at the center of the universe. Copernicus's theory of a heliocentric universe made use of the cycles and epicycles that characterized the Ptolemaic system. But by placing the Sun at the center, Copernicus was able to explain observed phenomena in a simpler and more elegant manner. The concentric circles, which represented the heavenly spheres, continued to be used until the end of the seventeenth century.

RELIEF PRINTING

Woodcut
Leonhart Fuchs (1501—1566).
De historia stirpium commentarii insignes.
Basel: Michael Isingrin, 1542
Spencer Collection, The New York Public Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(256 k)

Leonhart Fuchs, a physician and professor of medicine, was quite famous on the Continent and very much in demand as a physician and teacher. His reputation became international in scope after his successful treatment of victims of a plague-like epidemic that swept Germany in 1529. A book of medical instruction and prayers against the plague, printed at the end of the sixteenth century in England with the title *A worthy practice of the moste learned Phisition Maister Leonerd Fuchsius . . .*, attests that his reputation had reached even England.

This botanical masterpiece by Fuchs contains over four hundred native German plants and about one hundred foreign plants. The descriptions of the plants are not original, but the illustrations are quite magnificent, far surpassing those in Brunfels's *Herbarum.* To emphasize the importance of the process of creating the illustrations, Fuchs included portraits of the three artists as a kind of colophon to the book. Albrecht Meyer (upper right) is shown drawing the design from a live plant; Heinrich Füllmauer (upper left) is shown transferring the drawing to the woodblock; and Veit Rudolf Speckle, the engraver or *sculptor*, is shown below. This was the first time that such an acknowledgment had appeared in a printed book.

RELIEF PRINTING

Wood-engraved block
Alexander Anderson (1775—1870).
"Tees-Water Old or Unimproved Breed."
New York, ca. 1804
Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS

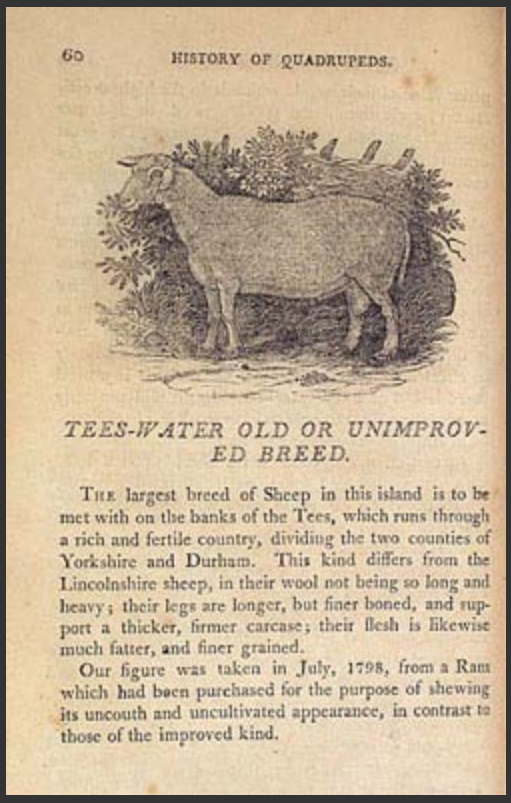
(196 k)

This is one of a number of blocks engraved by Alexander Anderson held by the Print Collection. It was copied directly from the rendition of this breed of sheep made by Thomas Bewick for his *A General History of Quadrupeds* (1790).

VIEW THE PRINT MADE FROM THIS BLOCK

SEE the Exhibit | LEARN About the Exhibit | The New York Public Library Homepage

RELIEF PRINTING



60 HISTORY OF QUADRUPEDS.

TEES-WATER OLD OR UNIMPROVED BREED.

The largest breed of Sheep in this island is to be met with on the banks of the Tees, which runs through a rich and fertile country, dividing the two counties of Yorkshire and Durham. This kind differs from the Lincolnshire sheep, in their wool not being so long and heavy; their legs are longer, but finer boned, and support a thicker, firmer carcase; their flesh is likewise much fatter, and finer grained.

Our figure was taken in July, 1798, from a Ram which had been purchased for the purpose of shewing its uncouth and uncultivated appearance, in contrast to those of the improved kind.

Wood engraving
Alexander Anderson (1775—1870).
A General History of Quadrupeds. The figures engraved on wood, chiefly copied from the original of T. Bewick. First American edition, with an appendix containing some American animals not hitherto described.
New York: G. & R. Waite, 1804
Duyckinck Collection, Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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PHOTOGRAPHIC SERVICES AND PERMISSIONS

(100 k)

Alexander Anderson, considered the father of American wood engraving, followed literally in the steps of Thomas Bewick, inventor of the wood-engraving process, with this book and accompanying engraved woodblock. Bewick's *A General History of Quadrupeds* first appeared in 1790. Anderson's copy of the second edition of this work, published in 1791, is now owned by The New York Public Library. From it, Anderson copied each image and published his own edition, the first American, with some added images of American animals, such as the "Hamster of Georgia," the "Wild Sheep of California," and the "Mammoth of New York (Peale's)," in 1804.

VIEW THE BLOCK THAT MADE THIS PRINT

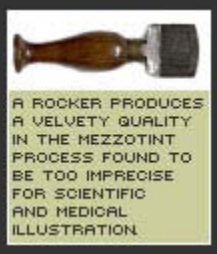
SEE the Exhibit | LEARN About the Exhibit | The New York Public Library Homepage

INTAGLIO PRINTING

NEXT SECTION

Intaglio (Italian, "to incise") includes engraving, etching, and mezzotint, among other techniques. Reversing the relief process, in intaglio the artist cuts the lines to be printed, rather than cutting away the nonprinting surfaces. Although it is an ancient process, intaglio did not come into use in Europe for printing illustrations until the fifteenth century. **Engraving** allowed the scientific or medical artist to create a more precise and detailed line in a metal plate — copper at first, but later steel — than was possible in relief. Intaglio printing requires much more pressure than relief, since the ink is held in recessed grooves instead of on the surface of the plate, and so illustrations could not be printed on the same press as the text.

Etching, a less arduous process developed in the early sixteenth century, uses acid to cut into the plate, which allows the artist much greater freedom to create a line. Easily combined with engraving, it became the intaglio process most favored by artists.



Another type of intaglio process, the **mezzotint** (Italian, "half-tint") allowed an artist to create the middle range of tones between black and white. In a laborious process, the overall ground is laid down with a rocker. The resulting velvety quality made mezzotint ideal for portraits but too imprecise for scientific and medical illustration.

VIEW EXAMPLES

Robert Hooke
Detail from: *Micrographia,* 1665
The New York Public Library





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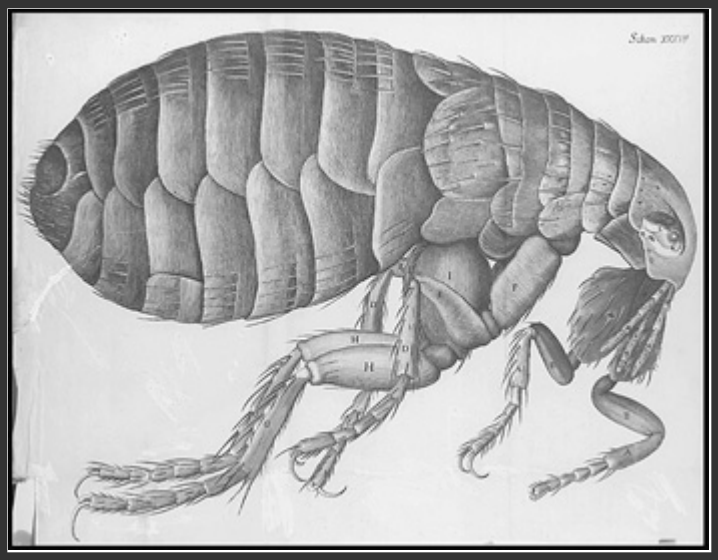
INTAGLIO PRINTING



Engraving
Robert Hooke (1635—1703).
Micrographia, or, Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses.
London: John Martin and James Allestry for the Royal Society, 1665
Rare Books Division, The New York Public Library
Astor Library

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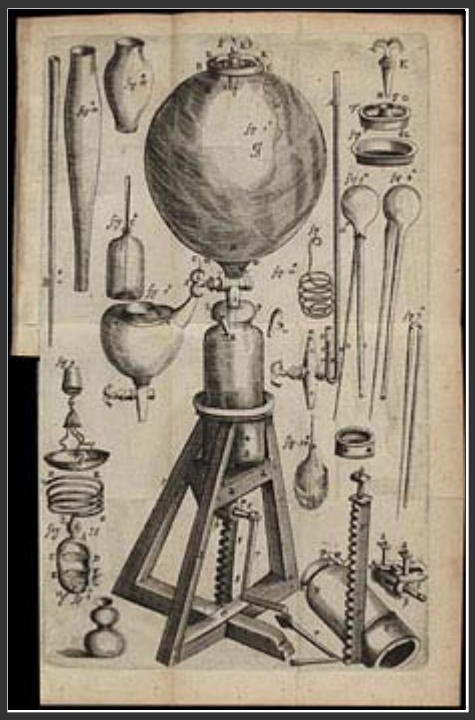
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(124 k) STUDY THIS IMAGE IN DETAIL

Although Robert Hooke's *Micrographia* was not the first book to reproduce microscopical observations, it was the first devoted to them, and the first to reproduce observations made with Hooke's newly perfected compound microscope. It was also the first book to include detailed illustrations for each section of text, drawn and in some cases also engraved by the author himself. Hooke observed the structures of many common things, such as woven cloth, the eye of a fly, and human hair. In describing the honeycomb structure of cork tissue, he coined the use of the word "cell" in biology. His engravings of the flea (shown here) and the louse are reported to have changed the hygiene habits of many of his contemporaries. The impact of this book was tremendous, and Hooke's name became synonymous with microscopical observations.

INTAGLIO PRINTING



Engraving
Robert Boyle (1627-1691)
Nova experimenta physico-mechanica de vi aëris elastica
Rotterdam: Arnold Leers Junior, 1669
Wheeler Collection, Rare Books Division, The New York Public Library

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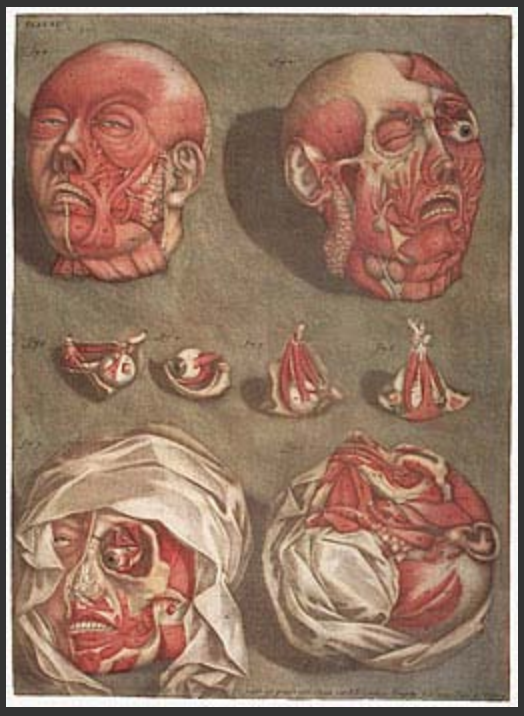
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(220 k)

Born to great wealth, Robert Boyle was the son of one of Queen Elizabeth I's more successful gentleman adventurers, Richard Boyle. *New Experiments Physico-Mechanicall, Touching the Spring of the Air and Its Effects* (1660) was his first book. This Latin edition made the work accessible to a wider scientific community.

Three years earlier, Boyle had learned of Otto van Guericke's invention of the air pump to create a vacuum, and with the help of various assistants, including Robert Hooke, had constructed improved models. He then carried out a series of brilliant experiments, using the sort of equipment shown here to determine the physical nature of air. He concluded that air was truly necessary for life and flame, that sound did not exist in a vacuum, and that air was permanently elastic. In the second edition of 1662, he developed this last discovery into what has become known as Boyle's law, that volume varies inversely with pressure. He also refuted the idea, still held by many in his day, that a vacuum could not exist.

INTAGLIO PRINTING



Mezzotint engraving
Arnaud Éloi Gautier-d'Agoty (d. 1771).
Cours complet d'anatomie peint et gravé en couleurs naturelles.
Nancy: J. B. H. Leclerc, 1773
Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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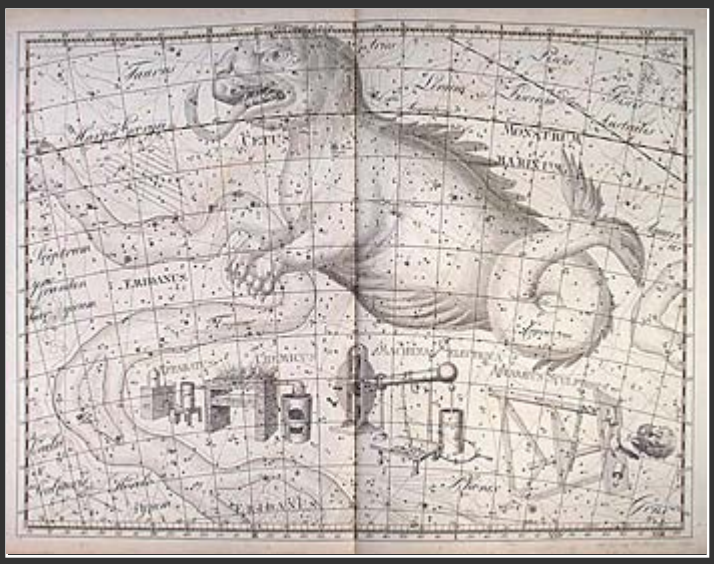
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(220 k)

The best examples of anatomic illustration in the eighteenth century demonstrate the gradual progress in engraving from the *Osteographia* of William Cheselden to William Hunter's *Gravid Uterus* and the works of Sömmerring and Albinus. Colored copperplates were introduced in the early part of the eighteenth century by Jacques-Christophe Le Blon (1667—1741). But it was his assistant, Arnaud Éloi Gautier-d'Agoty, who first printed anatomical plates in color on a large scale. But Gautier-d'Agoty's striking mezzotints tended to be a little too artistic and fuzzy for serious anatomic illustration. The technique was not really suitable for accurate detail work.

INTAGLIO PRINTING



Engraving
Johann Elert Bode (1747—1826).
Uranographia.
Berlin: for the author, 1801
Science, Industry and Business Library,
The New York Public Library
Astor Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(204 k)

A gifted mathematician, Johann Elert Bode taught himself astronomy while still in his teens. From 1774 until his death in 1826, he produced a series of well-received astronomical almanacs for the observatory of the Berlin Academy, where he was appointed director and royal astronomer in 1786. His *Uranographia,*the most comprehensive sky atlas that had yet appeared, listed over 17,000 stars and 2,500 nebulae, and was the first to include the nebulae, star clusters, and double stars. This innovative star atlas presented scientific apparatus, as well as a new rendering of the constellation figures. Here, in a depiction of the constellation Cetus, shown not as a whale but as a sea monster, chemical and electrical apparatus are included.

INTAGLIO PRINTING

Hand-colored etching
James Gillray (1757—1815).
"Scientific Researches! New Discoveries in Pneumatics! — or — an Experimental Lecture on the Power of Air."
London: Hannah Humphrey, May 23, 1802
Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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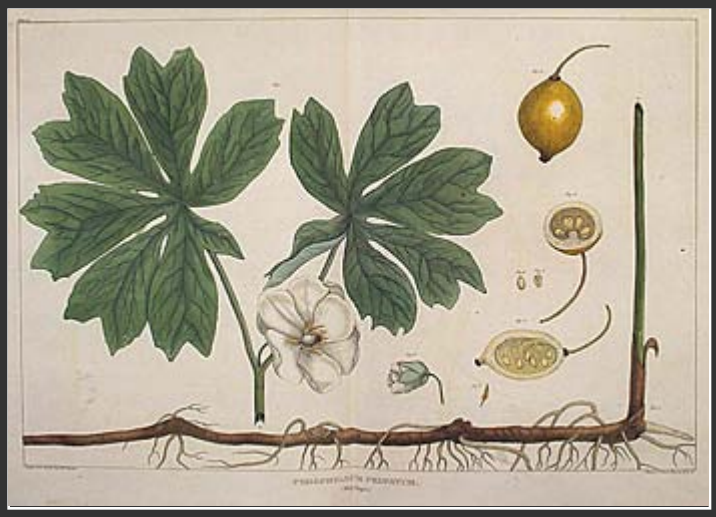
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(184 k)

The "original object of the Royal Institution was to combine the dissemination of useful knowledge with amusement and instruction of the higher ranks." Gillray chose that venue to present this satire on fashionable society figures and their penchant for scientific lectures. The lecturer depicted here is Thomas Young, professor of natural philosophy at the Institute from 1801 to 1803. His lectures were not well received as they were rather dense and quite dull, and the *Edinburgh Review* ridiculed them as fit only for ladies of fashion.

Young is shown experimenting on Sir John Coxe Hippisly on the left. To the right is Sir Humphry Davy, Michael Faraday's mentor, shown holding a pair of bellows with gas spouting from its nozzle. In 1801, Davy had given a more successful series of lectures at the Institute on "pneumatical chemistry" and had administered nitrous oxide to several gentlemen. Facing the table from the right is Count Rumford; on the extreme right is Isaac Disraeli (wearing glasses), the father of the statesman Benjamin Disraeli. In the center of the image is Frederica Augusta Locke, turned in profile taking copious notes. A well-known bluestocking, Mrs. Locke is not watching the experiment at all.

INTAGLIO PRINTING



Hand-colored engraving
Benjamin Smith Barton (1766—1815).
Vegetable Materia Medica of the United States: or, Medical Botany.
Philadelphia: M. Carey & Son, 1817—19
Arents Collection of Books in Parts, The New York Public Library

BACK | NEXT SECTION
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS

(128 k)

Benjamin Smith Barton wrote the first original textbook of botany published in the United States, *Elements of Botany* (Philadelphia, 1803). Trained in medicine at various universities, including the University of Edinburgh, he taught natural history, botany, materia medica, and physic at the University of Pennsylvania. He owned the largest private collection of natural history books and the largest collection of native American plants of his day.

Thomas Jefferson urged Barton to write a natural history of the Lewis and Clark expedition. Left unfinished at Barton's death, the work began appearing two years later, and was one of the first botanical works with colored plates to be published in the United States. The illustrations, including this one of the May Apple, were drawn from nature by Barton's nephew, William Paul Crillon Barton. The Library's copy is unbound, in its original portfolios and wrappered parts.

PLANOGRAPHIC PRINTING

NEXT SECTION

Lithography, invented in Germany in 1798 and now considered the first and most important method of planographic printing (printing from a flat surface, or plane), is based on the chemical principles that oil and water do not mix but will attract like substances, and that both will adhere to a porous ground, such as a stone. The process came into widespread use in the 1820s as commercial printers and artists realized that images could be drawn as easily on stone as on paper, and that the stones could be reused. All methods of drawing could be used on the stone, including pen-and-ink, chalk, or crayon, and by about 1830 a watercolor-like wash, applied with a brush, was used to provide tints known as **lithotints**. Only after the development of cheaper printing methods such as wood engraving and lithography did it become possible to print inexpensive illustrated medical textbooks. Although lithographs could be produced more easily, and generally more cheaply, than relief or intaglio illustrations, color was still expensive since it had to be applied by hand and so was used only for relatively **upscale colored scientific and medical books**.

During the nineteenth century, lithographers perfected the art of printing in color by using multiple stones to achieve very complex colored images through a process known as chromolithography. Cheap color printing was then available for the first time in the history of printing. While the most pervasive use of chromolithography was in advertising, it was also used extensively for making **popular prints** as well as for **scientific and medical illustrations**.

VIEW EXAMPLES

Francisque Poulbot
Detail from: "Joyeux Noël, Bella C. Landauer," [1928]
The New York Public Library

To better understand the chromolithographic process, view selected **progressive proofs** of *Prang's Prize Babies*, a popular print of the late nineteenth century made from 19 stones.

Images of these items illustrate but a few of The New York Public Library's major holdings in science and medicine as well as items from other institutions which were featured in the exhibition *Seeing Is Believing*, on view from October 23, 1999—February 19, 2000 at the Humanities and Social Sciences Library, and related publication.

PLANOGRAPHIC PRINTING

Lithography stone prepared with drawing
Francisque Poulbot (1879—1946).
"Joyeux Noël, Bella C. Landauer."
[Paris?, 1928]
Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library
Gift of Bella C. Landauer

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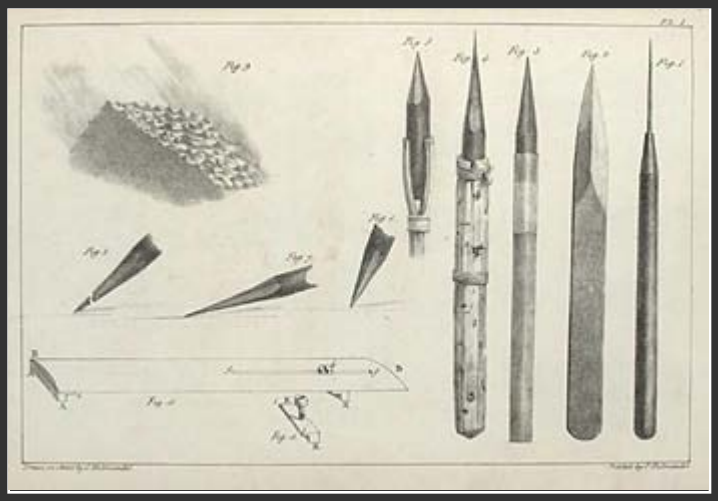
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(128 k)

Poulbot, as he was known, created this Christmas card for collector-historian Bella C. Landauer in 1928. He specialized in drawing children, often using as models those of his concierge, Mme. Hourdequin. The image was drawn in reverse on the lithographic s tone. When inked and printed the image appeared in its proper orientation.

PLANOGRAPHIC PRINTING



Lithograph
Charles Joseph Hullmandel (1789—1850).
The Art of Drawing on Stone.
London: Published by C. Hullmandel & R. Ackermann, [1824]
Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(88 k)

Charles Joseph Hullmandel was a leading figure in British lithography from about 1822 until his death in 1850. Established around 1820, his was one of the few lithographic presses to stay in business for more than ten years. Hullmandel systematized crayon drawing on stone and wrote about it in this work. By 1822 it had become clear to him and to others that crayon lithography could be used to produce large editions of books and prints. He made lithography a reliable and quicker process that attracted both printers and artists.

PLANOGRAPHIC PRINTING

Lithograph
Louis Agassiz (1807—1873).
Études sur les glaciers. . . . Dessinés d'après nature et lithographiés par Joseph Bettannier.
Neuchâtel: Jent & Gassman, à la Lithographie de H. Nicolet, 1840
Science, Industry and Business Library, The New York Public Library

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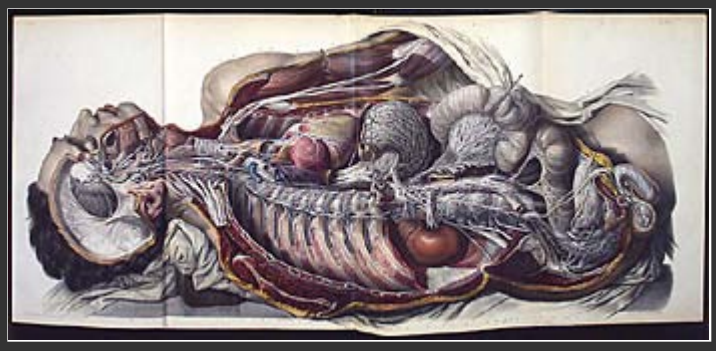
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(188 k)

With this work, Agassiz became the founder of glacial geology. While observing various glaciers near Chamonix and in the Rhone Valley, including this one in Zermatt, Agassiz realized that the smooth rock faces must have been created by ice flow and not by water flow. Further research led him to the discovery that most of Europe, North Asia, and North America had once been covered by ice, during a period that he named the Ice Age. Although these events are now known to have been of much longer duration than Agassiz thought, his observations convinced naturalists such as Lyell and Darwin that it was just such an Ice Age that caused so many genetically related flora and fauna to be distributed in areas separated by vast land and water masses.

PLANOGRAPHIC PRINTING



Hand-colored lithograph
Jean Marc Bourgery (1797-1849)
Traité complet de l'anatomie de l'homme
Paris: C.-A. Delauney, 1831-54
General Research Division, The New York Public Library
Astor Library

BACK NEXT
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(176 k) STUDY THIS IMAGE IN DETAIL

A French surgeon and anatomist, Jean Marc Bourgery began publishing his atlas of illustrations of anatomy and surgery in 1839 to accompany the text volumes, which began publication in 1831. Not completed until five years after his death, the massive eight-volume atlas contains 726 spectacular hand-colored lithographs by Nicolas Henri Jacob. The life-size images are remarkable for their clarity and aesthetic appeal.

PLANOGRAPHIC PRINTING

Chromolithograph
John James Audubon (1785-1851)
"Iceland or Jer Falcon." No. 13-2, Plate 19, from:
The Birds of America
New York: Julius Bien, 1860-61
Rare Books Division, The New York Public Library
Lenox Library, Gift of Mrs. Henry Draper

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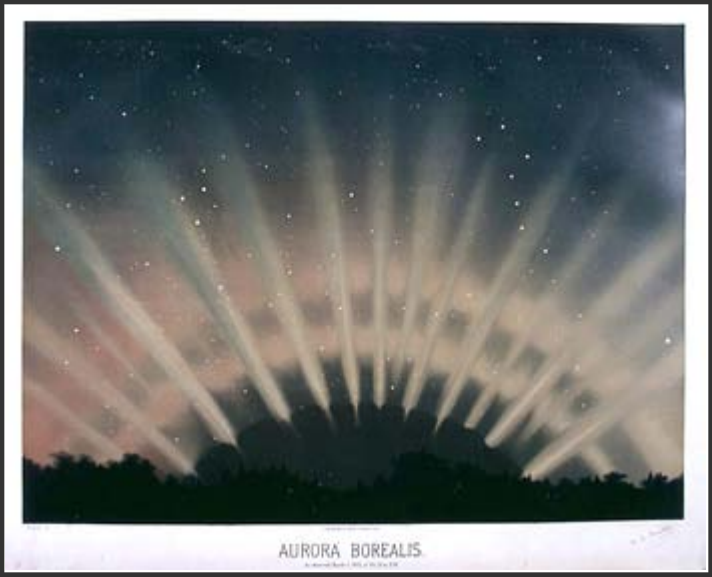
ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(176 k)

The New York Public Library owns a full set of the never-completed reprint of the original plates, published by Audubon's son, John Woodhouse Audubon (1812—1862). Offered at $500, half the price of the original edition, the plates were to be produced by chromolithography. This work was executed by New York lithographer Julius Bien (1826—1909), who had immigrated to America in 1848. Only 105 of the original 435 plates were completed by 1861 when the Civil War began, and the project came to a halt for lack of subscribers and possible mishandling of funds.

PLANOGRAPHIC PRINTING



Chromolithograph
Étienne Léopold Trouvelot (1827-1895)
Astronomical Drawings
New York: Charles Scribner's Sons, [Reproduced from the original drawings by Armstrong & Company, Riverside Press, Cambridge, Massachusetts], 1882
Science, Industry and Business Library, The New York Public Library
Astor Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(92 k)

E. L. Trouvelot, a French-born artist and amateur astronomer, spent 1872—74 working with the 15-inch refractor at the Harvard Observatory. During this time he prepared a number of large pastel drawings representing, as he wrote in his *Astronomical Drawings*, "the celestial phenomena as they appear to the trained eye and to an experienced draughtsman through the great modern telescopes." To illustrate the principal classes of celestial objects and phenomena, Trouvelot selected fifteen of these drawings to be reproduced using chromolithography, an illustration process that was at the zenith of its development in the 1880s.

PLANOGRAPHIC PRINTING

"CHROMOLITHOGRAPHY is the name of the process which served in the production of our picture, "The Prize Babies." The word Chromolithography means printing in colors from drawings on stone..."
From: "Epitome of the Process For which the Progressive Proof Prints in this Volume serves as Illustrations," (Boston: L. Prang&Co., [1888]).

Chromolithographs (progressive proofs and prints)
Louis Prang (1824-1909)
Prang's Prize Babies: How This Picture Is Made
Boston: L. Prang & Co., [1888]
Print Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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You need Macromedia Shockwave Player to view the progressive proofs. If you do not have this plugin (for example, if the Install On Demand failed), download for free the latest version of Macromedia Shockwave Player. The download time will take up to 8 minutes, depending on your configuration. Once you have the Macromedia Shockwave Player installed and you refresh/reload this page, the progressive proofs will take up to 5 ½ minutes to load, depending on your configuration. Please note that during the downloading of the plugin and the reloading of the progressive proofs, the status bar of your browser may falsely indicate that the download and reloading has been completed.

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS

Prang's Prize Babies was sold door-to-door by traveling salesmen and saleswomen. The thirty-eight progressive proof prints (some of which are shown here) using nineteen separate stones to create the final image were printed in a limited edition given to those who sold the most prints, as an encouragement for their successful sales record. The proofs and the following excerpt describing the process are taken from the fifteen volumes of Prang scrapbooks held by the Library's Print Collection.

PHOTOGRAPHY

NEXT SECTION

Credit for the invention of photography is attributed variously to Joseph Nicéphore Niépce (1765—1833), **Louis Daguerre** (1787—1851), and **William Henry Fox Talbot** (1800—1877). Talbot's discovery of a process using a negative allowed the image to be printed repeatedly, unreversed, on another medium such as paper. It is this process that became the standard for photography until the recent advent of digital photography. Most early use of photography in books required that separately printed photographs be inserted into each volume of an edition by hand, a costly process. By the 1880s, a much cheaper method had come into use: the **halftone** photomechanical process used a screen to transform the photographic image into dots. Depending on how the dots were reproduced, halftones could be printed by relief or planographic printing methods. When combined with the use of the three primary colors, halftones drove out chromolithography for most color printing by the beginning of the twentieth century.

Scientific uses for photography were seen from the beginning. In anatomy and in botany, the old graphic methods are still used to illustrate general principles, since photography can show only a specific human body or plant specimen.

VIEW EXAMPLES

Lick Observatory, University of California
Transparencies of the Moon, ca. 1896
The New York Public Library

Images of these items illustrate but a few of The New York Public Library's major holdings in science and medicine as well as items from other institutions which were featured in the exhibition *Seeing Is Believing*, on view from October 23, 1999—February 19, 2000 at the Humanities and Social Sciences Library, and related publication.

PHOTOGRAPHY

Glass plate photograph
Lick Observatory, University of California.
Transparencies of the Moon.
[Mount Hamilton, California, ca. 1896]
Photography Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library
Gift of Prof. Edward S. Holden

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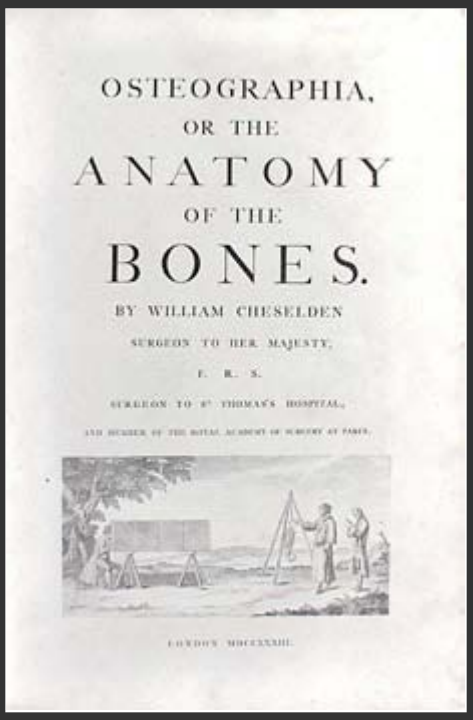
ENLARGE
(148 k)
PHOTOGRAPHIC SERVICES AND PERMISSIONS
STUDY THIS IMAGE IN DETAIL

The Lick Observatory was founded through the bequest of millionaire and "generous miser" James Lick (1796—1876). Built on Mount Hamilton, in the Diablo Range east of San Jose, it was the first permanently occupied mountaintop observatory in the world. One of the men involved with the project was Edward S. Holden, President of the University of California at Berkeley from 1885 to 1888. Holden presented this and another glass plate "transparency" to the Library, along with a set of the *Observatory Atlas of the Moon*, containing printed versions of many of the Lick photographs. The Lick Observatory is now administered by the Santa Cruz campus of the University of California, and is open daily for visitors.

PHOTOGRAPHY



Tinted engraving
William Cheselden (1688-1752)
Osteographia, or the anatomy of the bones
London: W. Bowyer for the author, 1733
Courtesy of The New York Academy of Medicine Library

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ENLARGE

(80 k)

For this book, the most famous osteological atlas ever produced, William Cheselden used the camera obscura for the first time to produce book illustrations. Its use allowed for much greater accuracy in drawing the illustrations of the individual human bones.

The camera obscura, the lensless pinhole camera, is one of the oldest known optical devices. It appears in Chinese texts dating from the fifth century B.C.E., and was used by the Chinese and Greeks for observations of solar eclipses. Light, traveling in straight lines, will form an image when projected through a small hole, but the image will be upside down. To compensate for this, Cheselden suspended the bones so that the image in the camera would appear right side up. The title page contains a charming engraved vignette showing exactly how this was done.

PHOTOGRAPHY

Engraving
Louis Jacques Mandé Daguerre (1789—1851).
Historique et description des procédés du daguerréotype et du diorama.
Paris: Alphonse Giroux et Cie, 1839
Rare Books Division, The New York Public Library
John Shaw Billings Memorial Collection

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(160 k)

The process that became known as the daguerreotype was first announced early in 1839 to the Chambre des Députés by François Dominique Arago, an astronomer, physicist, chemist, and member of the Chambre. Louis Daguerre and Nicéphore Niépce had been working to perfect Niépce's invention, and had tried without success to market the process. Arago was instrumental in arranging that the French government acquire the invention and give it to the world, in exchange for granting pensions to Daguerre and to Niépce's son Isidore. During the summer, Arago gave a more detailed presentation to the Chambre, but it was not until Daguerre published this pamphlet that a step-by-step description became available.

PHOTOGRAPHY

Cyanotype photograph
Anna Atkins (1799—1871).
Photographs of British Algae: Cyanotype Impressions.
Halstead Place, Sevenoaks, England: Anna Atkins, 1843—53
Spencer Collection, The New York Public Library
Inscribed by the author to Sir John Herschel, Sevenoaks, October 1843

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS
(256 k)

Anna Atkins was the first woman photographer. She was also the first person to print and publish her own book illustrated entirely by photography. This work, *British Algae*, made clear the enormous potential of William Henry Fox Talbot's 1839 invention of photography on paper as, in his words, "every man his own printer and publisher." Moreover, Atkins's work showed how the new medium could overcome, as she wrote, "the difficulty of making accurate drawings of objects as minute as many of the Algae and Conferva," by the use of "Sir John Herschel's beautiful process of Cyanotype, to obtain impressions of the plants themselves."

Herschel, a good friend of Anna and her scientist father, had invented the cyanotype, better known today as the blueprint, in 1842. Atkins intended her work as a companion to William Harvey's unillustrated *Manual of British Algae*, published in 1841. Her work appeared in parts, published on a regular schedule over ten years, and while the edition was probably not many more than the dozen copies known today, it stands as an important and generally overlooked milestone in the history of scientific illustration.

PHOTOGRAPHY

Albumen print photograph
Desiré Magloire Bourneville (1840—1909) and Paul Régnard (1850—1927). *Iconographie photographique de la Salpêtrière, Service de M. Charcot*. Paris: Bureau du Progrès Médical, V. Adrien Delahay et Cie, 1877—80
Photography Collection, Miriam and Ira D. Wallach Division of Art, Prints and Photographs, The New York Public Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS

(84 k)

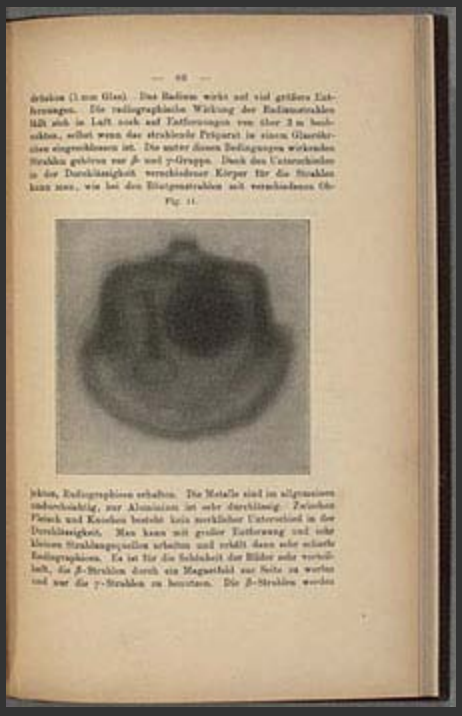
Jean-Martin Charcot (1825—1893) was the most famous student of noted neurophysiologist and innovative photographer Guillaume-Benjamin-Armand Duchenne (1806—1875). In 1862, Charcot became the director of the hospital of Salpêtrière and proceeded to create there the greatest neurological clinic of the nineteenth century. Continuing Duchenne's photographic experiments, Charcot sought to track the physical manifestations of neurological disorders in facial expressions and gestures. He employed Bourneville and Régnard to photograph the progression of grand mal seizures and hysteria. Their efforts resulted in this work, a unique photographic chronicle of the patients of Salpêtrière.

It was also at Salpêtrière that Charcot introduced a pedagogic innovation. He demonstrated his case studies in a miniature theater, the stage of which was supplied with footlights and other theatrical paraphernalia. The patients were presented on the illuminated stage while Charcot, on the side of the stage, verbally explained their case histories. Very often he would also mimic a patient's tics, tremors, spasms, manner of walking, etc. When the patient was dismissed or removed from the stage, Charcot would

project the particular pathological lesion or the physiological details of a disorder onto a screen at the back of the stage.

SEE the Exhibit | LEARN About the Exhibit | The New York Public Library Homepage

PHOTOGRAPHY



Halftone photograph
Marie Sklodowska Curie (1867-1934)
Untersuchungen über die radioaktiven Substanzen
Brunschweig: Friedrich Viewig and Son, 1904
Science, Industry and Business Library, The New York Public Library

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ENLARGE
PHOTOGRAPHIC SERVICES AND PERMISSIONS

(156 k)

Before her marriage, Marie Sklodowska received degrees in physics and mathematics from the Sorbonne in Paris. She met Pierre Curie, director of laboratory work at the École, in the spring of 1894 and they were married the following year.

Recherches sur les substances radioactives (1904) was the second, revised edition of her 1903 doctoral thesis, and presents her research in radioactivity from 1897 to 1904. This image, from the German translation of that edition, demonstrates the effectiveness of passing beta and gamma rays through nonmetallic substances to achieve an effect very much like Röntgen's X ray. Various metallic objects, such as this key and coin in a coin purse, become visible when beta and gamma rays are stopped by the metal.

About the Exhibition *Seeing Is Believing*

NEXT SECTION

The website *Seeing Is Believing: 700 Years of Scientific and Medical Illustration* complements an **exhibition** of the same name on view from October 23, 1999 to February 19, 2000 at the Library's **Humanities and Social Sciences Library**.

Earlier exhibitions at The New York Public Library, such as *Splendid Plumage: Bird Illustrations, 1550—1900; Kingdoms of Land, Sea, and Sky: 400 Years of Animal Illustration; Nature's Mirror: 200 Years of Botanical Illustration;*and *P. J. Redouté, the Rembrandt of Roses,*have featured the Library's wide-ranging collections in the areas of illustrated bird, plant, and animal books. However, *Seeing Is Believing* is the first major exhibition to showcase the Library's collections in science and medicine.

Support for *Seeing Is Believing* and The New York Public Library's Exhibitions Program has been provided by Pinewood Foundation. This exhibition has also been made possible by funding from The Pfizer Foundation, Inc. Additional support has been provided by the New York Council for the Humanities, a state program of the National Endowment for the Humanities, as part of State Humanities Month, and the Bertha and Isaac Liberman Foundation in memory of Ruth and Seymour Klein.

The exhibition *Seeing Is Believing: 700 Years of Scientific and Medical Illustration* was co-curated by Jennifer B. Lee, Associate Curator of Rare Books, and Miriam Mandelbaum, Rare Books Librarian. Ms. Lee is now Librarian for Public Services and Programs, Rare Book and Manuscript Library, Columbia University.

Seeing Is Believing: 700 Years of Scientific and Medical Illustration, an 88-page companion to the exhibition, is available in The Library Shop. **Members** of the Library receive a ten percent discount. For information on current and upcoming exhibitions, programs, and services of The New York Public Library, visit the Library's **Events and Exhibitions** page.

ABOUT NYPL'S SCIENCE AND MEDICINE COLLECTIONS

SEE THE EXHIBIT

About NYPL's Science and Medicine Collections

NEXT SECTION

Images from some of the items described below illustrate but a few of the New York Public Library's major holdings in science and medicine included in the exhibition ***Seeing Is Believing,***on view from October 23, 1999—February 19, 2000 at the **Humanities and Social Sciences Library**, and related **publication**.

NICOLAUS COPERNICUS
DETAIL FROM
DE REVOLUTIONIBUS ORBIUM COELESTIUM, 1543
THE NEW YORK PUBLIC LIBRARY

At its founding in 1895, The New York Public Library already possessed a splendid array of important books in the fields of science and medicine. These came to the new library from the two private collections whose merger, along with a bequest from the Tilden Trust, created the new institution. The first of those private collections, the Astor Library, founded in 1848 through the bequest of John Jacob Astor, was very strong in first and early editions of astronomy, mathematics, physics, chemistry, medicine, natural history, and microscopy. The Astor Library included such great medical works as the extremely rare first edition of William Harvey's landmark treatise on the circulation of the blood (1628) and William Hunter's work on the gravid uterus (1774). In the sciences, it included the first edition with the rare errata sheet of Nicolaus Copernicus's ***De revolutionibus orbium coelestium*** (1543); Robert Hooke's ***Micrographia***(1665); and Leopold Trouvelot's magnificent ***Astronomical Drawings***(1882).

The Lenox Library, founded in 1876 through the bequest of James Lenox, included many important books of science and medicine, as well as many books on natural history from the collection of Robert Leighton Stuart, which had become part of the Lenox Library in 1892. The Lenox Library owned not only the original elephant folio edition of Audubon's *Birds of America* (1827—38) but also a full set of the never-completed **American reprint**, made by Julius Bien using the process of chromolithography (1860—61); the Stuart Collection included a copy of Edward Lear's magnificent ***Illustrations of the Family of Psittacidae, or Parrots*** (1832), the first illustrated work of ornithology devoted to a single family of birds.

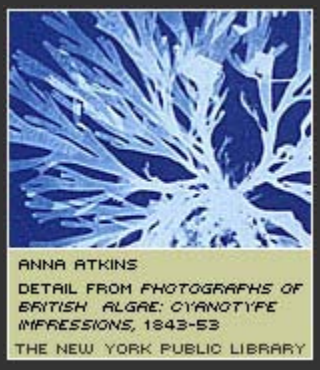
EDWARD LEAR
DETAIL FROM *ILLUSTRATIONS OF THE FAMILY OF PSITTACIDAE, OR PARROTS*, 1832
THE NEW YORK PUBLIC LIBRARY

Dr. John Shaw Billings, the first Director of The New York Public Library, was also a physician of considerable stature: he had been Assistant Surgeon General of the United States and head of the Johns Hopkins Medical School prior to his appointment at the Library. He was also a friend and colleague of Sir William Osler, the noted physician and bookman who generously bestowed first editions of Andreas Vesalius's *De humani corporis fabrica* (1543) on various libraries, including the Library of Congress and **The New York Academy of Medicine**. (It is conjectured that Osler did not donate a copy to The New York Public Library because he knew that the Academy's copy would be available to the general public.) The first Vesalius *Fabrica* to come to The New York Public Library was thus a second folio edition (1555), which came as part of the original bequest that formed the **Henry W. and Albert A. Berg Collection of English and American Literature**. The Berg brothers, whose principal collecting interest was nineteenth-century British and American literature, were both prominent New York physicians, and no self-respecting physician—book collector would have been without a Vesalius. The Bergs were wide-ranging in their

definition of literature; they collected, for instance, the works of Charles Darwin, including *On the Origin of Species* (1859) and *The Descent of Man* (1871).

The second important *Fabrica* to come to the Library was purchased in the 1930s. The Library's interest in printing history and the private press movement made mandatory the purchase for the collections of the 1935 Bremer Presse edition, made from the original woodblocks (which would not survive World War II) and published by the University of Munich in collaboration with The New York Academy of Medicine, an institution with which The New York Public Library has always had a special relationship. Because the Academy maintains a medical research library that is open to the public — the only medical library in New York City that affords such access — The New York Public Library does not seek to duplicate its resources, and therefore collects medicine only in cases where a medical book complies in some other way with one of the Library's collecting policies, such as printing history, the African American experience, and medicine in art and music.

After the death of John Shaw Billings in 1913, Anna Palmer Draper, a major supporter of the Library in its early years, made provisions for a special fund in his memory: when she died the following year, her bequest to The New York Public Library included not only her own books but also the sum of $200,000 to endow "The John Shaw Billings Memorial Fund." Proceeds from this fund have been used to purchase special works that the Library could not otherwise afford to acquire, including first editions of Euclid's *Elements* (1482) and Newton's *Principia* (1687); the first edition of Thomas Geminus's reprinting, using copperplate engraving, of Vesalius's *Fabrica* (1545); and the second edition, but first French translation, of Charles Estienne's *La dissection des parties du corps humain* (1546).


ANNA ATKINS
DETAIL FROM *PHOTOGRAPHS OF BRITISH ALGAE: CYANOTYPE IMPRESSIONS*, 1843-53
THE NEW YORK PUBLIC LIBRARY

The **Spencer Collection** of illustrated books in fine bindings came to the Library in 1913 after the death of William Augustus Spencer on the *Titanic*, on April 14, 1912. The original collection has grown considerably, thanks to a fund that came with the books and carried the directive to purchase "the finest illustrated books in fine bindings that can be procured of any country and in any language, and to be bound in handsome bindings, representing the work of the most noted bookbinders of all countries, thus constituting a collection representative of the arts of illustration and bookbinding." Among the Spencer Collection books in *Seeing Is Believing* are the first editions of Joannes de Ketham's *Fasciculo di medicina* (1493), Otto Brunfels's *Herbarum vivae eicones* (1530), and Leonhart Fuchs's ***De historia stirpium*** (1542); and one of the dozen known copies of Anna Atkins's ***British Algae*** (1843—53), the work of the first woman photographer.

Over the course of the past century, the Library's scientific collections have continued to grow. In 1934, the Library's science and technology collections were augmented by the acquisition of the library of William Barclay Parsons, the engineer for the New York City subway system. The gift of Mrs. Parsons, the collection is devoted to engineering and transportation, and includes a great many rare books, including the first printed edition of the works of Archimedes (1544), and is now housed at The New York Public Library's **Science, Business and Industry Library**.

Most recently and notably, the Library received in 1995 the gift of the Wheeler Collection of Electricity and Magnetism. This gift from the United Engineering Trustees consisted of the library formed by Josiah Latimer Clark, which represented one of the most complete collections of books

and periodicals on the subject of electricity assembled in the nineteenth century. It was Clark's wish that his library should eventually go to the United States, since the library of his colleague, friend, and rival collector Sir Francis Ronalds was to stay in London. The move of the collection was accomplished through the good offices of Schuyler Skaats Wheeler, who purchased the Latimer Clark Library in 1901 and presented it to the American Institute of Electrical Engineers in New York City. In 1903, Andrew Carnegie contributed funds to house, catalog, and add to the Latimer Clark Library, which became known as the Wheeler Gift.

As one of the stipulations of his gift, Mr. Wheeler required that the "Library remain in New York City and . . . be a reference library, free to all." In 1995, when the overseers of the collection, the United Engineering Trustees, decided to give up running a library, the Wheeler Gift came to The New York Public Library, where it is administered by the **Rare Books Division**. Important Wheeler books in *Seeing Is Believing* include William Gilbert's monumental *De magnete* (1600), the first major English scientific treatise based on the then-new experimental methods of research; Luigi Galvani's *De viribus electricitatis in motu musculari* (1791); and James Clerk Maxwell's *Treatise on Electricity and Magnetism* (1873).

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The Library is grateful to The New York Academy of Medicine for its generous loans to the exhibition; thanks, also, to an anonymous lender and to The New York Botanical Garden for lending items from their collections and for all these lenders' permission to include images of loaned items in this virtual exhibition.

Miriam Mandelbaum and Jenny Lee, co-curators of *Seeing Is Believing: 700 Years of Scientific and Medical Illustration*, wish to thank the chiefs, curators, and staff of the following New York Public Library collections for their cooperation in making available materials for the exhibition and images of these items for this website:

> **Humanities and Social Sciences Library**: Rare Books Division; Spencer Collection; Photography Collection and Print Collection of the Miriam and Ira D. Wallach Division of Art, Prints and Photographs; Henry W. and Albert A. Berg Collection of English and American Literature; Arents Tobacco Collection and Arents Collection of Books in Parts; Manuscripts and Archives Division; General Research Division; Carl H. Pforzheimer Collection of Shelley and His Circle; Map Division; Oriental Division; Dorot Jewish Division
>
> **Science, Industry and Business Library**
>
> **The New York Public Library for the Performing Arts**: Music Division
>
> **Schomburg Center for Research in Black Culture**: Manuscripts, Archives and Rare Books Division

It would be disingenuous of the curators to pretend that the exhibition, accompanying book and website for *Seeing is Believing* were accomplished without the unstinting support, encouragement and practical assistance of a great many people at The New York Public Library. The curators of the exhibit have been truly fortunate in that a good many members of the staff of The New York Public Library have been so generous with their support and assistance at every turn.

First and foremost, we should like to thank our colleagues in the Rare Books Division, John Rathé and Daniel Tierney. Their good humor, patience, ideas and assistance in finding just the right phrase or editing out that piece of purple prose were invaluable and much appreciated. Thanks also to William Stingone who not only put the Wheeler Collection into good order, making the process of selection much easier, but also helped make some of the early selections for the exhibit.

John Ganly and his assistant, Jack Van Bibber, were very generous with their time. Their enthusiasm and suggestions helped tremendously throughout the long process of book selection at The Science, Industry and Business Library. Thanks go also to Madeleine Cohen, Head, Information Services, and Angel Pagan, Assistant Head, Access Services, for their help.

Julia VanHaaften has been a major supporter of the exhibit from the time it was proposed over four years ago. Her staff, Sharon Frost and Devon Cummings, have been most helpful as have Roberta Waddell, Margaret Glover and Elizabeth Wyckoff of the Print Collection.

Developing the text, which has been utilized for all three projects, has been facilitated by the work of

Barbara Bergeron; her task was herculean and her good humor and support much appreciated. The images for the exhibition, book, and website have been made possible because of the work of Anthony Troncale, Head of the Digital Imaging Unit, and his assistant, Danielle Mericle. The splendid graphic designs of Ann Antoshak have inspired us along the way.

For their expertise in completing the production and testing of this website, thanks to Future Phase Computer Systems. For additional advice and efforts regarding this website, thanks to Renée Roberts, Stephen T. Ruddy, Michelle Misner, and Jane Moffitt.

Our special thanks go to Jeanne Bornstein and Meg Maher, Exhibitions Research Coordinators, for invaluable assistance in formulating the intellectual concept and design of the exhibition and website and for keeping all the threads of such a complex project in hand. To Myriam de Arteni, Exhibitions Conservator, and her staff and Jean Mihich, Registrar, and her staff, especially Patrick T. Day, we also offer our great appreciation. We should also like to specially thank Barbara Suhr whose design has inspired the exhibit and the present website. She, and her installation staff, were able to take ideas and give them concrete physical form.

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RELATED WEBSITES

The New York Public Library has no control over the content or availability of sites that are not part of http://www.nypl.org, the Library's website.

History of Books and Printing (Research Guide #31)
The New York Public Library, General Research Division

John De Pol's How to Make a Wood Engraving

Color Printing in the 19th Century
University of Delaware Library, Special Collections Department

What Is a Print?
The Museum of Modern Art, New York

New York Academy of Medicine

LuEsther T. Mertz Library
New York Botanical Garden

Virtual Library for the History of Science, Technology & Medicine

History of Mathematics
Clark University, Department of Mathematics and Computer Science

Eureka! The Archimedes Palimpsest
Walters Art Gallery

Antiqua Medicina: From Homer to Vesalius
University of Virginia Health System, Claude Moore Health Sciences Library

The Medieval Medical Bibliography
ORB: The Online Reference Book for Medieval Studies

The Garden, the Ark, the Tower, the Temple: Biblical Metaphors of Knowledge in Early Modern Europe
Museum of the History of Science, Oxford, England

Paracelsus, Five Hundred Years: Three American Exhibits
National Institutes of Health, National Library of Medicine

Catalog of the Scientific Community in the 16th and 17th Centuries
Rice University, The Galileo Project

Jesuits and the Sciences, 1540-1620
Loyola University, The Science Library

The Correspondence of Athanasius Kircher: The World of a Seventeenth Century Jesuit
Institute and Museum of the History of Science, Florence, Italy

Newtonia

"Every Man His Own Doctor": Popular Medicine in Early America

Bloodletting
UCLA Louise M. Darling Biomedical Library, History & Special Collections Division

Profiles in Science
National Institutes of Health, National Library of Medicine

A. Einstein: Image and Impact
American Institute of Physics, Center for History

Internet Medieval Sourcebook
Fordham University Center for Medieval Studies

Manuscripts: Medieval Studies
Stanford University Libraries

A Romantic Natural History
Department of English, Dickinson College

of Physics

Heavens Above: Art and Actuality
The New York Public Library, Science, Industry and Business Library

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EXHIBITIONS

At the New York Public Library Humanities and Social Sciences Library

Fifth Avenue and 42nd Street
New York, NY 10018

Seeing Is Believing: 700 Years of Scientific and Medical Illustration

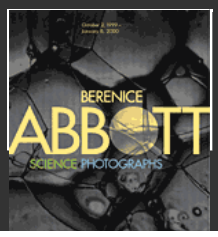
D. Samuel and Jeane H. Gottesman Exhibition Hall,
October 23, 1999—February 19, 2000

Approximately 300 illustrated books of astronomy, mathematics, physics, chemistry, medicine, and natural history from The New York Public Library's four research centers, augmented by materials on loan from the New York Academy of Medicine and elsewhere. Examines the materials displayed on three levels: the scientific, by looking at many seminal texts; the illustrative, by focusing on the rich illustrations; and the artistic, by explaining the various techniques and tools used to make these illustrations.

Sight/Insight: Visual Commentaries on the Physical World

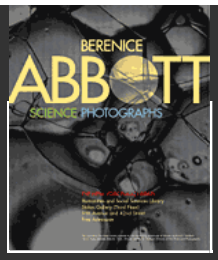
Print Gallery (Third floor),
September 18, 1999—January 8, 2000

More than 100 prints, portfolios, and illustrated books by contemporary artists who have drawn inspiration from the
natural and physical sciences. Included are works by Louise Bourgeois, Kiki Smith, Frank Moore, Terry Winters,
and Yukinori Yanagi, among others.



Berenice Abbott: Science Photographs

Stokes Gallery (Third floor),
October 2, 1999—January 8, 2000



Forty photographs of scientific phenomena, principles, and equipment, as well as archival materials demonstrating how Abbott pplied her interest in science to her photography.

Drawings by Charles Addams: Adventures in Science and Exploration
Charles Addams Gallery (Third floor),
September 10, 1999—January 29, 2000 Humorous drawings by Charles Addams depict perilous and bizarre discoveries by scientists and explorers.

At the Science, Industry and Business Library
188 Madison Avenue (at 34th Street)

Heavens Above: Art and Actuality
Healy Hall, December 2000-June 30, 2001
The exhibit and complementary website show the startling similarities between drawings of celestial phenomena by 19th Century artist and amateur astronomer Etienne Leopold Trouvelot and contemporary photographic images taken by the National Aeronautics and Space Administration (NASA).

Earth from Above: An Aerial Portrait on the Eve of the Year 2000
Healy Hall, October 26, 1999—April 29, 2000
Color photographs by Yann Arthus-Bertrand portray the marvels of the natural world and man's presence as seen from the air.

At the PaineWebber Art Gallery
1285 Avenue of the Americas (between 51st and 52nd Streets)

Beyond Appearances: Imagery in Science at the Millennium
January 7—March 31, 2000
Approximately 100 contemporary scientific photographs, digital recordings, and other images produced during the last decade of the twentieth century, which capture nature from the subatomic to the cosmic.

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LECTURES

In the six Pforzheimer Lectures on Printing and the Book Arts held during fall/winter 1999-2000, scholars Christine Ruggere, Edward Tufte, William B. Ashworth, Jr., Nancy Siraisi, Michio Kaku, and Roger Gaskell explored the history and future of representing scientific and medical concepts. This series has been made possible by a generous grant from The Carl and Lily Pforzheimer Foundation, Inc.

For more information on public programs at the Humanities and Social Sciences Library, call 212.930-0885 or visit the **Public Programs** site.

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Seeing Is Believing: 700 Years of Scientific and Medical Illustration, an 88-page companion to the exhibition written by curators Jennifer B. Lee and Miriam Mandelbaum, includes nearly forty illustrations (some in full color), a checklist of the exhibition, and a selected bibliography. Published in softcover by The New York Public Library, it is available in The Library Shop. **Members** of the Library receive a ten percent discount on all purchases.

The Library Shop at the Humanities and Social Sciences Library (Fifth Avenue and 42nd Street) is open Monday—Saturday, 11 a.m.—6 p.m. The Library Shop in the Mid-Manhattan Library (Fifth Avenue and 40th Street) is open Monday—Friday, 10 a.m.—7 p.m.; Saturday, 10 a.m.—6 p.m.; and Sunday, noon—5 p.m. The Library Shop accepts mail orders; call for information: 212.930.0641. To place an online order, visit **http://www.thelibraryshop.com**.

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