Wunderkammer

In the 1550s a new kind of collecting emerged among wealthy Europeans as they confronted the explosion of knowledge following the discovery of distant lands and new, basic scientific principles. Emperors, princes, nobles, and merchants assembled paintings, precious objects, scientific instruments, games, and natural wonders to create individualized microcosms. In these chambers of wonder *(Wunderkammern)*—and their smaller counterparts, the cabinets of wonder *(Wunderkabinette)*—rare and unusual natural specimens co-existed with exquisite artificial productions and the latest technological inventions. Designed as storehouses of knowledge and instruments for learning, these all-embracing collections also provided occasions for intellectual amusement, meditation on God's creation, and the display of wealth and status.

Playful and profound, compact yet universal, these singular spaces encouraged visitors to assemble objects into ever-changing configurations—like their cyber equivalent, the Internet. Both invite constant visual engagement as the primary mode of interaction. By bringing the exceptional into the world at hand, *Wunderkammern* accustomed the eye to visual stimulations not unlike those dominating our contemporary life. Leading toward the modern public museum, *Wunderkammern* inspired the mind to expand the limits of imagination and to be transported beyond the here and now.

Little Epiphanies

With the invention of the microscope in the early 1600s, viewers could experience sudden insight (epiphanies) into a formerly invisible universe of minute things. The multiple-lens compound microscope, initially produced by Dutch opticians and commercialized about 1660, was the first such instrument. Paradoxically, the single-lens microscope seems to have been invented after the compound microscope. Even though chromatic aberration—caused by the differences in refraction of the colored rays of the spectrum—often blurred and distorted the images, fundamental scientific discoveries were enabled by both types of early microscopes.

More than any other instrument, the microscope had the strongest following among amateurs, who enjoyed it as a source of amusement as well as a tool of scientific investigation. Microscopy swept through European salons and drawing rooms in the 1700s, comparable to the rage for photography in the latter half of the 1800s. Vivid book illustrations of magnified creatures encouraged readers to contemplate details of the natural world, archived and compressed between glass, while solar microscopes made a social occasion out of learning. Projecting a specimen's enlarged image on the wall of a darkened room, the solar microscope transformed the salon from a place of polite conversation into an arena of exciting conjecture and scientific debate.

Phantomware

The art of projected images dates to 1656, when Christiaan Huygens, a Dutch astronomer and mathematician, devised what is now the oldest extant instrument for projecting pictures painted on glass slides. In the 1660s the Danish mathematician Thomas Rasmussen Walgenstein not only gave Huygens's device the evocative name *magic lantern* but also demonstrated its powers to audiences in cities such as Rome, Paris, Lyons, and Copenhagen.

As it traveled across Europe, the magic lantern came into its own as an instrument of demonstration. Showmen used it to conjure views of different countries for the public's amusement, while scientists employed it in experiments that made invisible forces of nature visible. Their shows anticipated the use of the slide projector in twentieth-century classrooms and at family gatherings.

In the late 1700s, after "showmen of the supernatural" devised ways to project large-scale images from hidden machines, the magic lantern moved from the home, coffeehouse, and laboratory into the theater. Within two hundred years the magic lantern developed from a rudimentary device that cast small, dim, single images to magnificent mechanisms that presented huge, brightly colored animated entertainments. The magic lantern was a "curious machine" whose wildly popular spectacles led to the modern fascination with cinema.

Special Effects

Built in Paris in 1822, the Diorama was a two-screen, special-effects theater in which the transitory moods of nature were re-created by the controlled lighting of huge translucent paintings. Seated in the dark, 350 spectators were rotated from one scene to another, marveling as day changed to night, buildings were engulfed by fire, or fog dispersed to reveal a forested valley.

Louis-Jacques-Mandé Daguerre, working in collaboration with the architectural painter Charles-Marie Bouton, was the genius behind the Diorama. Daguerre, more widely known as an inventor of photography, drew on his experience as a stage designer and scenery painter to explore the ephemeral effects created by illuminating a scene painted in opaque and semitransparent pigments on either one or both sides of a towering white calico canvas (45 x 71 feet). Different parts of a scene came into view depending on the amount of natural light admitted via adjustable skylights, louvered windows, and colored curtains. Decades after the Diorama in Paris burned to the ground in 1839, its thirty-minute shows remained in the memories of a generation, preparing them for a modern world filled with rapidly changing images.

Home Entertainment

Today the phenomenon of the in-home electronic retreat is on the rise. But the conversion of domestic interiors into media-saturated surroundings is not new. A swarm of pleasure-enhancing household equipment, represented by myriad objects in this gallery, prefigured our ubiquitous digital devices. Before there was color television, there were lighted peep shows and praxinoscopes that provided glowing visions with thrilling intimacy. Before video games, such inventions as Rotoreliefs, Kinoras (miniature movies), and stereoscopes lured users into alternative domains.

The household has long been a familiar territory from which to embark on fantastic voyages. Beginning in the 1700s grand public theaters were reproduced in miniature as toys with multiple and interchangeable scenes. Large-scale operas, masquerades, and other dramatic diversions were compressed into fragile, portable stages. Popular do-it-yourself kits customized the luminous apparatuses exhibited by showmen at outdoor fairs. Wooden peep shows displaying *vues d'optique* (optical views), miniature paper theaters, and eventually photography all optically transported events, myths, and monuments of the world into the parlor.

These all-but-forgotten devices bring us back to play as an activity involving not only imitation, pretending, and fantasy, but also the freedom to improvise, to make and break rules, and to create surprise.

Dark Chambers

The camera obscura (dark chamber) exploits the scientific principle that when rays of light are focused by passing through a tiny hole into a darkened interior, they will form an inverted image of the scene outside. In the 1200s the English scientist Roger Bacon and his contemporaries realized that by using a room-size camera obscura they could study solar eclipses without looking directly at the sun and risking damage to their eyesight. Until the mid-1500s the camera obscura was used chiefly for such astronomical studies.

The camera obscura took on the functions of drawing aid and visual entertainment under the influence of the lively descriptions published in Giambattista della Porta's 1558 *Magiae Naturalis* (Natural Magic) and other popular treatises. The engraving above illustrates the popularity of the camera obscura in the 1700s. The top right shows a portable tent style; the middle left depicts a permanent room-size camera obscura; in the lower right a woman uses a portable book-style camera obscura set on a table. The camera obscura is remembered primarily as a forerunner of the photographic camera, yet it also helped lay the foundations for motion pictures, as it captured silvery phantoms suspended in midair. Standing in a room-size camera obscura or peering into a small, portable version was for inhabitants of earlier centuries a way to view moving images in color. A camera obscura also enabled them to perceive the world in framed sequences and to regard scientific devices as accessible, affordable, useful, and even amusing.

Interior Reflections

Invented in the late 1500s, the glass mirror—reflecting small and ghostly images—spurred the desire to bring reflections into the home. Initially the shimmering wares of a developing glass industry were available only to the very rich, but by the 1800s mirrors brightened interiors throughout Europe. There they generated lively phantom doubles of the occupants. This reflective power was redoubled in the sparkling surfaces of porcelain cups and saucers, polished silver knives, and faceted crystal.

While the proliferation of gleaming tableware contributed to the rise of social dining and conviviality, the zigzagging reflection and refraction of light activated the conversational space of the salon. The mirror fashioned a glassy land of illusions where light played with everything it touched. Doubling reflections coordinated the material, spatial, and social dynamics of a room, and crisscrossing emanations rebounded from polished woodwork and shiny fixtures.

Artificial Life

Automatons are complex machines that seem to move of their own volition. The earliest such devices—built in the first century A.D. in Alexandria, Egypt—employed levers, weights, gears, cams, and other interlocking parts to execute sequences of predetermined actions. The most innovative of the ancient designers, Hero of Alexandria, left several illustrated treatises. Rediscovered and translated into Latin in the 1500s, they inspired a new generation of mechanical wonders. Soon large-scale automatons populated Renaissance and Mannerist gardens, where they were featured in elaborate allegorical programs, while smaller versions embellished princely *Wunderkammern* (chambers of wonder).

In the 1700s realistic automatons such as performing animals, chess players, fortune-tellers, and acrobats astonished audiences throughout Europe; other fanciful automatons such as George Adams II's silver centaur were used to teach mechanical principles to students of physics.

Competition with nature, as much as necessity and practical innovation, is the driver of technological advance. Imagination was the prerequisite to creating the preprogrammed, refined machinery known as automatons. Automatons embodied the mechanical and creative ingenuity that fueled the Industrial Revolution (beginning in about 1760). The hidden wheels and pistons that activated flutists, trapezists, and magical orange trees provided the imaginative as well as practical basis for advanced machinery. Current technology, which replaces gears with computer chips, has integrated itself into our daily routines—from retrieving information from a Palm Pilot to driving a computerized car.

Shadow Show

Everyone has a shadow. These faint and fleeting apparitions can suddenly climb the walls of a room or haunt the hallucinatory chamber of the mind. Filmy darkness expands and contracts to express shape and size, abstracting the three-dimensional world around us or magically deforming the contours of objects and bewitching the imagination. The print above, *The Origin of Painting; or, Fashionable Portraits,* demonstrates how rendering a portrait by tracing a cast shadow was the way to make a fashionable silhouette in the mid-1700s, and it also dramatizes one legend of the origins of painting.

Seemingly flat and static, silhouettes come to life as protagonists in the repertoire of moving shadows that historically has animated daily life from ancient Greece to modern Indonesia. They appear in this gallery in the virtuoso performances of Javanese puppeteers, Kara Walker's ambiguous scenes of slavery, and André Dupuis Kerhor's game that depicts in unfurling scenes Napoléon's victories and defeats.

Wraparound Spectacle

Overwhelming in scope, panoramas literally surrounded nineteenth-century visitors, enveloping them in realistic scenes of contemporary battles, cities, and landscapes. The word *panorama* (all view) first appeared in 1792 in a notice by Robert Barker in the *London Times*. The Irish entrepreneur and painter was advertising the premiere of his huge 360-degree painting depicting London "as large and in every respect the same as reality." Barker built the first permanent panorama rotunda in London's Leicester Square in 1793, and soon Paris, Brussels, Berlin, Cologne, Hamburg, Leipzig, Geneva, Salzburg, and Vienna all boasted at least one panorama theater. Offering a new painting about every six months, panorama rotundas were commercial successes that attracted broad audiences.

Barker set in motion an international craze for panoramas of all sizes. The spectacular circular or semicircular paintings displayed in rotundas were reduced to small scrolling versions presented by lecturers, even smaller curved vistas exhibited in lensed boxes by traveling showmen, and miniature strip versions rolled into handheld cylinders. By immersing visitors in a heady combination of entertainment, education, and documentation, the panorama anticipated contemporary visual culture, in which we are gripped by a dizzying, all-encompassing, and far-reaching global technology.

Light & Virtual Substance

The paradox of visual technologies is that they generate a more vivid sense of reality. In the past this heightened presence was contained in boxes or frames flooded with light. From engravers of *vues d'optique* (optical views) and molders of lithophanes to the painter Thomas Gainsborough and the photographic innovator Louis Lumière, ingenious artists have envisioned the transformative and diaphonous effect of illumination on their works.

Today packets of streaming data routinely arrive in desktop "windows" of futuristic consoles. These cubes adorned with glowing screens fuse and diffuse videos, games, music, and movies. Like a *Wunderkabinett*, whose dynamic collection of objects can be endlessly rearranged, the World Wide Web has the capacity to amaze us, linking a labyrinth of information at the touch of a finger.

Alternative Realities

Metamorphosis is a change in appearance, character, or function. Anamorphosis derives from a mathematical conversion that requires a certain perspective or an optical device to unscramble the image. In metamorphosis, a picture of a mountain turns into a bearded profile, and the photographer/self-portraitist Cindy Sherman slips from vamp to railroad engineer. With anamorphosis, however, we can discern an image (for instance, the mother and child pictured above) in an arc of color only by using a cylindrical mirror to reorganize what we see. In another type of anamorphic painting, the skewed portrait of Francis I (on the opposite wall) can only be divined by peering from the side.

Techniques for creating such visual puzzles emerged during the Renaissance (1400–1600) as artists struggled to make the figures that were painted on cathedral ceilings look correctly proportioned when viewed from far below. In a religious setting, metamorphic and anamorphic works carried spiritual overtones of inversion and conversion. As part of a *Wunderkammer* (chamber of wonder), such optical transformations both amazed the visitor and illustrated principles of reflection and perspective. Magically illusionistic, these devices were employed in the 1800s to create popular games that encouraged players to discover multiplicity in apparent singularity. Today we experience perceptual transformations as we are pulled into the imaginary worlds of action movies, video games, and virtual reality. Wandering into Lucas Samaras's shimmering *Mirrored Room*, we enter an alternative dimension where we are multiplied, projected, and transformed.