

Camera obscuras fascinate new generations

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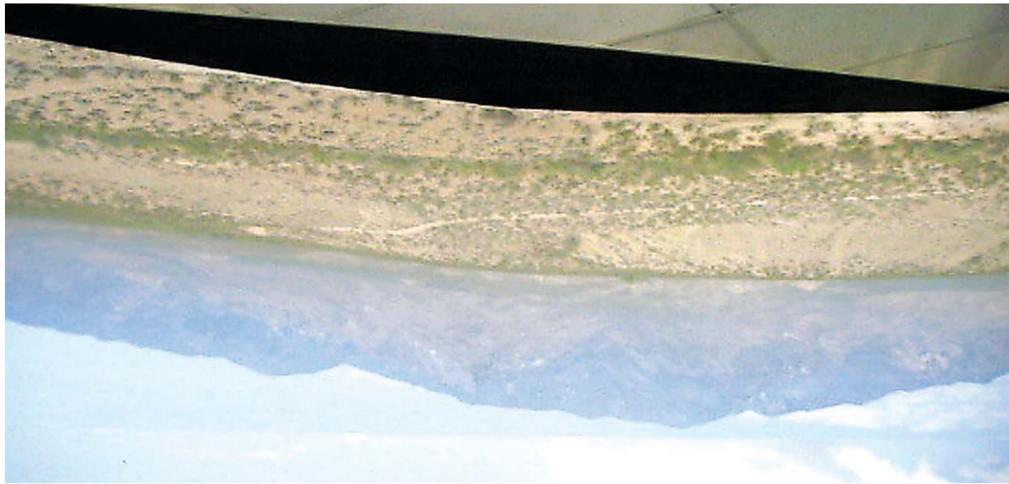
PORTLAND, Maine — What if you could stand in a windowless room yet see the surrounding outdoors. Could you observe wildlife or people going about their business, without them knowing you are there? It's possible with an optical instrument called a camera obscura.

The term, meaning "dark room" in Latin, was first used in the early 1600s by the German astronomer Johannes Kepler. Eventually, portable versions evolved into what we know as a camera and led to the development of photography and movies. But for centuries, scientists, artists, and ordinary folks have been fascinated by the image that appears when a camera obscura projects outdoor light through a small hole into a dark enclosed space. A recent revival of interest has led to several that can be visited today.

Mo-Ti, a Chinese philosopher in the 5th century BC, was the first to record seeing an upside-down but otherwise accurate image in a dark enclosure with a pinhole in its side. In Greece in the next century, during a solar eclipse, Aristotle noticed the crescent shape of the sun where light rays shined through dark foliage onto the dark ground. Alhazen, an Arab scholar and philosopher in the 10th century, noted that the larger the aperture, the fuzzier the image that formed.

In 1490, Leonardo da Vinci made one of his most important observations when using a camera obscura. He noted that objects reflect rays of light in all directions, which led him to explain how the eye works. Later, camera obscuras were used by Renaissance painters as basic drawing tools; by fortune tellers and magicians who fooled audiences into believing they were looking at the future; and in Victorian England, at seaside resorts where they were popular entertainment, often located in small octagonal buildings near beaches or on piers.

The only camera obscura available to the public in New England is at the Children's Museum of Maine, in Portland.



HARRY SWANSON (ABOVE); JANET MENDELSON FOR THE BOSTON GLOBE

Camera obscuras project images accurately but upside down, as our eyes see them before our brains turn them upright. This view of Mount Graham is through one of the world's largest camera obscuras, at Eastern Arizona College in Safford. New England's only public camera obscura is at the Children's Museum of Maine in Portland.

When you enter the big box, about 14 feet by 20 feet, with walls 12 feet high, there's nothing to look at. Everything is painted the deep blue of a starless night sky except for two carpeted risers where visitors can sit or stand, and a round, white-topped table with mechanical controls attached. To see how the camera obscura works, you need to join a guided tour. Most here are led by Suzanne Kahn Eder, science coordinator, who tells young visitors it's like being inside an eyeball.

On a recent Friday morning, an unusually quiet group of 3- to 5-year-olds from New Foundations Nursery School in Old Orchard Beach, their adult chaperones, two families, and this reporter filed into the room. Eder calmed a few children afraid of the near-



dark by telling us we were about to see something magical. And she was right. At one end of the room, she slid the cover off what the museum calls its "natural camera," a room-sized pinhole, or shoebox,

camera that is simply a small hole in the otherwise solid wall. When she uncovered the hole, sunlight spilled in, casting a soft-focus moving picture high on the wall. There was Free Street, outside the building, at that very moment.

"I see cars! I see people walking!" youngsters shouted, pointing above our heads. One adult gasped. The entire scene — cars, trucks, pedestrians, buildings — was upside-down, the same way images enter our eyes before our brains flip them upright. This simple version, which gives only a fixed view, works like the one used by Mo-Ti and other early experimenters before a lens and angled mirror were added around the 17th century.

Eder directed our attention to the table in the center of the room and above it, a

hole in the ceiling containing the elements of the camera obscura. When she uncovered the hole, we could see partway up a long tube. At its top, sunlight streamed through windows in the cupola on the roof, struck a 20-inch-diameter mirror, flowed through a 12-inch lens and down 15 feet (its focal length). Where the light landed on the white tabletop, suddenly, in full color, we saw seagulls flying, pigeons strutting on a rooftop, and vehicles moving down the street. It was like watching a movie in high-definition, so real I felt I could touch the birds. Sure enough, little hands reached out as if to grab them.

Gradually, Eder rotated the rooftop mirror to give us a full-circle panorama of the Portland landscape. We watched pedestrians on the sidewalk and trucks making deliveries. The view gradually moved from the buildings of the Old Port district out to Portland Head Light and followed oil tankers and tugboats crossing Casco Bay. The scene was silent and compelling.

Kids often understand that it's like looking through a submarine's periscope, Eder said. Camera obscuras can project images from as far as the eye can see. The day was slightly overcast yet we could identify Peaks Island in the harbor. On a clear day, mountains in New Hampshire are visible in the opposite direction.

Eder handed everyone index-card-size pieces of white paper but before she could demonstrate, the children were "lifting" trucks and people by raising the paper as much as a foot above the table. She showed us how to place folded sheets in the path of oncoming cars so they appeared to ride up and over the peaks.

The museum's camera obscura was designed in 1993 by Richard Albrecht, a research associate at Eastman Kodak, which financed the project.

Many artists have used camera obscuras to make their paintings more realistic and learn accurate perspective because the projected image is proportionately correct. By using portable camera ver-

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