



Pinhole

P H O T O G R A P H Y

A pinhole camera is an age-old tool that evolved from the Camera Obscura. It has no lens, light meter, or shutter, not even a viewfinder. A pinhole camera is simply a light-tight container with a small pinhole replacing the lens. Light passes through the hole and is projected inside the camera and onto photo sensitive material where the image is formed. Exposure times can be seconds or hours long due to the miniscule size of the pinhole. Due to light diffraction through the pinhole, the image becomes soft and somewhat "impressionistic." Other inherent characteristics of pinhole imagery are the fall-off of light that occurs toward the edge of the image and the infinite depth of field. These characteristics of the pinhole camera give this unique tool its intriguing qualities that produce time after time, images that often surprise and continually amaze the viewer.

B Y R A L P H H O W E L L



Whether it's made in an oatmeal container, a shoebox or a potato, the pinhole camera is merely a light-tight container in which a tiny hole replaces the lens. Rays of light reflect in straight lines off the subject in all directions. Some of the rays pass through the pinhole and land inside the camera onto photo-sensitive film. But the fun of working with a pinhole camera doesn't stop with the science.

"Pinhole cameras are used for fun, for art and for science," said Jon Grepstad, author and photographer. "Designing and building the cameras are great fun. Making images with cameras you have made yourself is a great pleasure, too. But in serious photography the pinhole camera is just an imaging device with its advantages and limitations, special characteristics and potentials. By making the best of the camera's potential, great images can be produced."

It is the simplicity and uniqueness that attracted Craig Coyle, photography instructor at Arlington (Texas) Sam Houston High School, to the project for his students.

"It requires very little in the way of materials to produce something that is a big teacher of students," Coyle said.

In fact, Coyle said, the exercise can be used to teach many of the basic concepts of photography, everything from lighting to processing.

"It introduces the student to basic concepts of lighting, exposure, aperture size and relation to available light when making exposure. Most

students' concept of light tight is weak. It also introduces my students to the print process lab, chemistry and times for print processing."

Pinholes are usually made by "drilling" an extremely small circular opening into a thin metal plate with the tip of a sewing needle or a pushpin. The pinhole plate is then attached to a light tight container with film in it. Exposure times can be minutes or hours long due to a pinhole opening that is often $f/150$ to $f/300$ in size.

These extremely small pinhole apertures create the appearance of infinite depth of field. Because there is diffraction of light as it passes through the hole, the image becomes soft, somewhat "impressionistic" or dream-like in appearance, part of what attracts students.

"One day I read that Steiglitz used a pinhole camera to make an image of a mechanical wheel. He went on to describe the image and his feelings on the outcome, and I went on to become fascinated by the possibility of making images that were not bound by the technology of optical formulas," said Bryon Bignell, a photographer in Ontario.

"What struck me was how simple photography could be if one had a mind to embrace it," Bignell said. "I experimented for a few years and 'caught the bug,' as it were. I built numerous cameras and made myriad images, some successful and others not, but all a learning experience. It was this learning experience and the experience to see the world anew as if through new eyes that was so compelling."

"This is so much fun to do, and you can reinforce to kids the lessons about light, exposure and aperture."

LAURI NEGRI
Houston, Texas



WHY PINHOLE?

“This is so much fun to do, and you can reinforce to kids the lessons about light, exposure and aperture,” said Lauri Negri, adviser at Alief Kerr High School in Houston. “The results are unpredictable. With digital photography, we have forgotten some of the mystery and excitement we used to have with more traditional photography methods.”

The future of photography seems to rely on rapid advances of the high-tech camera and its use to pursue the optically perfect image. However, photographers are still fascinated with the idea of constructing simple, low-tech, pinhole cameras in an attempt to see and understand what has been hidden by conventional representation.

Lynda Farabee, publications adviser at Levelland High School in Texas, said, “What’s cool about it is the reaction of the kids (when it works!) they are literally amazed that something so elementary can produce an image.”

Coyle said his students are equally excited.

“You can get some very interesting distortions is what I like most about it,” he said. “You then have a paper negative that can be used to print a positive by using contact printing. I have even used the enlarger to make prints from paper negs.”

The pinhole camera doesn’t have a clicking shutter, a computer designed lens, a built-in light meter or even a viewfinder. Part of the process is working intuitively without a viewfinder

or light meter while making exposures that may be many seconds to minutes long. The photographer must “point and shoot from the hip.” As a result, it is a process that encourages intuitive responses, exploration and experimentation. The pinhole photographer now improvises and risks chancy outcomes. For some, the fun is waiting for the outcome of their developed images, which often produce serendipitous results.

“Getting a light-tight box and a pinhole the right size and “film”/paper that reacts correctly, not to mention the time of day/light are all challenges offered by pinhole photography,” Farabee said. “If results aren’t achieved quickly enough, the students bore easily.”

Coyle explained that the challenges reinforce basic concepts and that his students learn about how exposure is determined by the size of the hole, about the distance the light must travel inside the camera and about the intensity of the available light

outside. Students also learn basic concepts of perspective and angle of view. It’s a project that requires patience.

“Whatever is used for a dark chamber must be light tight above all else,” Coyle said. “Other than that, some patience is required when testing for proper exposure of film used.”

The use of a cylinder box, such as the oatmeal box, makes pre-visualization of the final image harder to master. The surface allows the negative to be curved during exposure. The arrangement

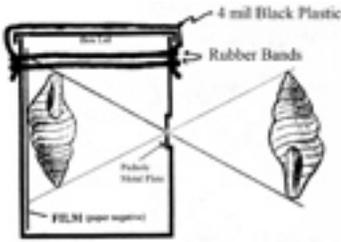
“I went on to become fascinated by the possibility of making images that were not bound by the technology of optical formulas.”

BRYON BIGNELL

Ontario

Step by Step

An oatmeal box pinhole camera



Materials

- 18-ounce or 42-ounce oats box, Quaker Oats brand or similar
- Flat black spray paint
- Black permanent marker
- Black tape: inch wide Bogan photo tape or electrical tape
- Aluminum metal — use the thin, inexpensive aluminum metal from disposable oven liners, cookie sheets or pie tins (purchased at your local grocery store)
- Cardboard sheet (or use cut cardboard from empty enlarging paper box)
- Pushpin or small T-pin, which must be very sharp pointed
- #600 grit sand paper or emery cloth
- 8x or larger magnifier (loupe) — inexpensive magnifiers used to inspect stamps and coins work well
- Clear tape — Scotch brand or similar
- 4mm black plastic or the plastic used to enclose enlarging paper, use 7-inch diameter for 18-ounce oat box, 10-inch diameter for 42-ounce box
- Two rubber bands, #64 size
- Thin metric ruler: make a paper ruler by using a copying machine
- Scissors
- Enlarging paper, 5x7 inch or 8x10 inch size, RC Multigrade, semi-matte surface (note: glossy will cause unwanted light reflections)
- X-acto knife (must be sharp)

- 1. PREPARE THE OATMEAL BOX.** (Select an 18-ounce box size to accommodate a 5x7 inch negative or the 42-ounce box to accommodate an 8x10 inch negative.)
 - Spray the inside of the box with flat black paint. Blacken the inside of the box lid with a permanent marker. Note: Spray paint will flake off the plastic part of the lid.
 - Use an X-acto knife to cut a ¼ inch square window half way down from the top of the box rim. Later, you will attach the pinhole metal plate to the square window from the inside.
- 2. PREPARE THE PINHOLE.**
 - Cut a 1-inch square metal plate from a thin aluminum cookie sheet or from an oven liner sheet and place it on a piece of cardboard. Use a pushpin or T-pin to make the pinhole by rotating the aluminum metal plate until the point barely sticks through it. For optimal image sharpness, the 18-ounce box needs a pinhole diameter of .40 mm while the 42-ounce box requires a .45 mm pinhole diameter (however, pinholes for both 18- and 42-ounce boxes can be between .35 mm and .50 mm and still give very good results).
 - Flip the plate over and use #600 sand paper to sand off the raised metal around the hole. It is important that the hole be sanded flat (no “donut” shaped ring around the hole) and no ragged metal burrs should exist within the pinhole. Blow or use canned air to remove the metallic dust from the pinhole.
 - You can approximate the pinhole size by using a metric ruler and an 8x or higher magnifier. You may need to repeat the “drilling” and sanding process until the right size pinhole is made. The process may take 5-15 minutes.
- 3. ATTACH THE PINHOLE PLATE TO THE BOX.**
 - Blacken one side of the pinhole plate with a permanent marker. Make sure the marker ink doesn't plug the pinhole.
- 4. Use black tape to ATTACH THE PINHOLE PLATE TO THE INSIDE OF THE BOX** (black side of plate facing inside the box) and centered with the ¼ inch square window opening.
- 5. COVER THE OUTSIDE OF THE SQUARE WINDOW OPENING AND PINHOLE WITH A PIECE OF BLACK TAPE.**
 - Note: You will remove the tape during the exposure time. It helps to apply clear tape around the square window opening to keep the black tape from ripping the paper covering on the box when you remove it during the exposure.
- 6. LIGHT PROOF THE TOP OF THE OATS BOX.**
 - Put the lid on the box. The lid is not fully light proofed, so place 4 mm black plastic over the lid and secure it with two rubber bands. Use 7-inch diameter black plastic for the 18-ounce box; 10-inch diameter plastic for the 42-ounce box.
- 7. CONTROL THE PAPER NEGATIVE AND EXPOSURE TIME.**
 - In the darkroom, place a piece of enlarging paper (paper negative) inside your camera opposite of the pinhole but with the emulsion side facing the pinhole. Make sure a piece of black tape is covering the pinhole window.
 - For your first exposure, place the camera on the ground about one arm's length away for a self-portrait. Or, instead of placing the camera on the ground, try a chair, a car hood, etc. (be creative!). Remove the cover tape from the pinhole and try a 30 to 60 second exposure on a very bright, sunny day, and four to six minutes on a heavily overcast day. On windy days, place a small heavy object on top of the camera to keep it from shaking.
 - Develop and dry your exposed paper negative. Your teacher will give you a demonstration.

TWO WAYS TO CHANGE THE PAPER NEGATIVE INTO A PAPER POSITIVE:

1. Your teacher will demonstrate how to make a contact print from your paper negative. You may want to use Marshall Photo Oils to tint your best images for greater impact.
2. Pinhole to pixels: Scan your negative and transfer the image into the computer. Your teacher will help you to convert the negative image into a positive photo. Print it.

P I N H O L E B Y M E R E D I T H K N A P P
T H E K I N C A I D S C H O O L , H O U S T O N , T E X A S



encourages the study of space relations whereby the pictorial space becomes ambiguous and more abstract. Exploring endless new space relations becomes more conceptual when you consider the philosophical implications of infinite depth of field, an inherent quality of the pinhole.

“We use oatmeal tubes and old photo paper boxes (250 box is Ideal),” Coyle said. “We use aluminum from empty coke cans and a sewing needle to punch the hole. We use photographic paper for our negative and masking tape to hold the paper in place.”

Because the exposures are long, some photographers step in front of the pinhole camera, move around and become part of the process itself — a process that encourages self-discovery. The portrait is not a split-second documentation but is, instead, a recording of an event or a series of events through time and space.

In summary, the pinhole camera is an artistic tool for getting away from technique and pre-visualized, technically flawless images made by high-tech cameras. Moreover, the pinhole camera is a playful and philosophical tool guided by intuitive insight that allows the photo artist to create intriguing pinhole images through the process of exploration, experimentation and risk taking. Pinhole photography is not for everyone. However, it reminds the photographer that no matter what the camera is, the visionary behind it is most important.

PINHOLE HISTORY

The earliest recorded description of pinhole optics in the West comes from Aristotle, circa 330 BC. The Western world’s concept of the one-point perspective radically changed when

the Renaissance architect, Filippo Brunelleschi, invented the Small-aperture Perspective Device (pinhole camera obscura) in 1525. During this time, Donatello used the one-point perspective pinhole camera obscura (camera obscura means dark room) in making sculpture and thus initiated the historical use by other artists, including Leonardo de Vinci (“The Last Supper”).

Ingeniously made camera obscuras, as drawing tools, were used by famous Renaissance artists to duplicate the one-point perspective with paint or pencil on the inside of the pinhole camera obscura box. Some of these boxes were fitted with a lens over an enlarged hole to let in more light.

“I have also made shoebox cameras and tiny ones out of film canisters. There are two key factors: the camera must be light-tight when sealed, and the pinhole must be as tiny as possible,” Negri said.

Post-Renaissance: In 1826, Joseph Niepce made the first photograph by using a pinhole camera fitted with a light sensitive plate and an eight-hour exposure period. Thus, the invention of photography is attributed to the chemistry of preserving an image on a light sensitive surface (film). Since then, exposure times have been shortened to a fraction of a second due to the altered pinhole camera obscura. The pinhole was made into a much wider opening to let in more rays of light and was fitted with a lens to focus the light rays at a certain focal distance for a sharper image.

“Pinhole photography removes the traditional perspectives from photography,” Bignell said. “It forces people to think creatively, to take risks and to reap the rewards.”



The paper poppies are only centimeters from the camera and are still in focus, as is the background some 30 meters away. This is one of the amazing things about pinhole photography - everything in focus. Another thing is the incredibly wide angle of view. By using a cylinder-shaped camera (made from a cardboard cashew nut container in this case, but the little Pringles cans are good too), you get the wrap-around effect.

With all the high technology now used in photography, it is refreshing to get back to the absolute fundamentals of photography, using a phenomenon that has been observed even in prehistoric times - the camera obscura, or dark room. It's a very hand-on experience, in contrast with digital photography and computer-controlled output, which tends to remove you from the real essence of photography. We set up a camera obscura in the

Photospace gallery on pinhole day, so that through a hole the size of a 5c piece, you can see, in color, upside down and back to front, a 5-meter-long vista of Courtenay Place with buses and cars whizzing past. It shows you what goes on inside the little camera that you make.

JAMES GILBERD, Photospace studio/gallery, Wellington, New Zealand, www.photospace.co.nz, j.gilberd@xtra.co.nz

BY WIM MINTJES • HOLLAND



Photography is playing with subject and light. Pinhole photography is playing with subject, light and time. In a good photo I like to see this three elements. It will be like painting, a lot of time before you make the photo is there in studying the object. It takes two minutes to make the photo, but three hours for studying the object!
Contributed by **WIM MINTJES**, Holland • mintjeswim@msn.com

Worldwide Pinhole Photography Day

BY TOM MILLER

The idea for Pinhole Day came from Zernike Au, of Hong Kong, the owner of Zero Image Company and designer of the Zero Image cameras, in the email pinhole discussion list. On Valentine's Day 2001, he offered Valentine's wishes and suggested that it would be a wonderful to have one day a year dedicated to pinhole photography.

The idea "took."

A committee of volunteers rapidly formed and the first Worldwide Pinhole Photography Day happened on April 29, 2001. The first year, there were 300 participants. The 2004 event had 1,512 participants from 43 countries coordinated completely by volunteers.

The coordinating team, who live all over the world and who make decisions by e-mail or discussion forums, sets the overall direction of the celebration, oversees areas of operation and collectively make decisions when issues arise, a method of operation that has proved effective, even though many of the coordinators have never been able meet in person.

Important operational areas include the Web site, translations, publicity and events. There is a team of translators that keep the Web site's 14 languages up-to-date. The translators also help when support questions are submitted in languages other than English. There is a global team of publicity volunteers that contact periodicals, schools, art centers, etc. in their various countries and regions. For the most recent event, organizers sent out information to 4,000 addresses.

There were 90 events around the world that were timed to coordinate with Pinhole Day, all organized by local volunteers and organizations. The events ranged from elementary classroom participation to "Bootiful Footographs," an event organized by Justing Quinnell in England where a walking club made photographs using boots and shoe boxes as cameras.

Tom Miller is the WPPD 2004 Coordinating Team Leader
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<http://www.pinholeday.org>



Self portraits by **CHLOE REMMERT, CHRIS SANCHEZ, LAUREN JOHNSON** of the Kincaid School in Houston, David Veselka, instructor.

I can tell - it was a very funny experience to walk around with "nerds" in the city, putting up funny boxes, sit and wait and running up in the top of the house to see what happened. That was my first time with pinhole - time is suddenly so different. normally I'm the type who can blow a roll of film in 30 minutes. but pinhole showed me another side of time - of waiting - of seeing. It's a kind of Zen... and luck.



BY HEINRIEKE I. STRECKER • GERMANY

ANNMARI LUDVIG ANDERSON, Denmark

Remaining at a place, emerging from the usual all day mad rush, which has no chance, no hope of arrival, permits a perception to come up, what actually happened will appear again. Tales will step out of this rush, gestures threatened to be drowned by this quickness, almost covered by it.

I want to give an account of these small movements, atmospheres, not an isolated moment, "painting a realistic picture," according to a report, but the experience of the situation, in which the taking was undergone.

Especially in the series of portraits you can observe what is going on, when people are forced to wait, which traces are left behind in this period of time. While our forefathers - more than a hundred years ago - sat stiffly, appearing therefore pregnant with meaning, in front of the camera, hemmed in dreadful machineries to avoid any move during these long exposures, I take advantage of this factum to track down these slight gestures, to paint the happenings behind the obvious poses - something we hardly become aware of.

My desire is, that the observer gets in touch with the images, that he tries to follow their history - and by chance a new, very personal arises, realising, how these gestures show through; and I want to avoid, that the tale is no longer available, because it is buried by filing in drawers and categorizing. Just have - and trust - your own look, and immerse in this dialogue.

HEINRIEKE I. STRECKER, Germany

TIMELINE

1558 • *Natural Magic* by Giovanni Battista della Porta. Porta was the first to describe the use of a small aperture to view an image in a camera obscura.

1856 • *The Stereoscope* by Sir David Brewster. Although the basic principles of images formed by small apertures were known in antiquity, the first mention of anyone taking a photograph this way, and the first use of the term pinhole to describe it are in this book.

1887 • *Pinhole Photography* by William Forgan. The text of a presentation to a meeting of the Edinburgh Photographic Society published in the *British Journal of Photography*. He describes his experiences making and using a pinhole camera.

1895 • *Stenopaic or Pin-hole Photography* by Frederick Wm. Mills and Archibald C. Ponton. In addition to the advancement of the Greek term stenope for pin-hole, according to H.D'Arcy Power it is "chiefly notable for its profusion of algebraic calculations." Reviews lots of other work on optimum pinhole size, angle of view and exposure.

1901 • *Pinhole (Lensless) Photography* by Reverend J.B. Thomson (1901). Straightforward and plainly told explanation of pinhole photography, including how-to instructions and even a section on stereo photography.

1902 • *Photography: the Watkins Manual of Exposure and Development* by Alfred Watkins. He is notable in that his interest in photography began using a pinhole camera.

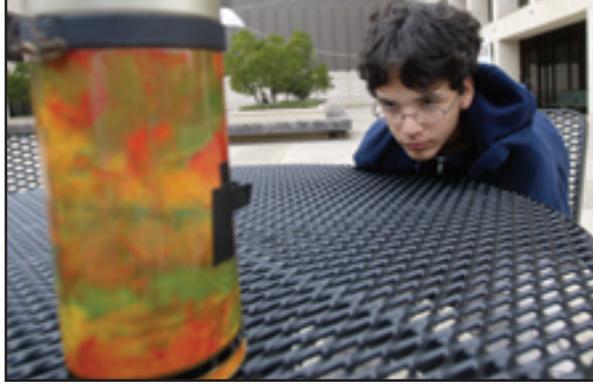
1911 • *Photography: Its Principles and Applications* by Alfred Watkins. In Chapter 1 on "First Principles," he describes the formation of an image by a pinhole aperture, and at the end of the book is the an addendum on pinhole photography.

1904 • *Pinhole Photography* by A.H. Baird. Includes a short attempt at "Why Pinhole?," an unusual method for making a pinhole.

1905 • *Advanced Pinhole Photography* by H. D'Arcy Power. He approaches pinhole photography not as "an optical problem or scientific hobby", but from a "practical standpoint" to "produce pictures with a serious purpose."

1925 • *Pinhole Photography* by H. D'Arcy Power. D'Arcy Power updates his 1905 work with comments on better materials and methods for making pinholes.

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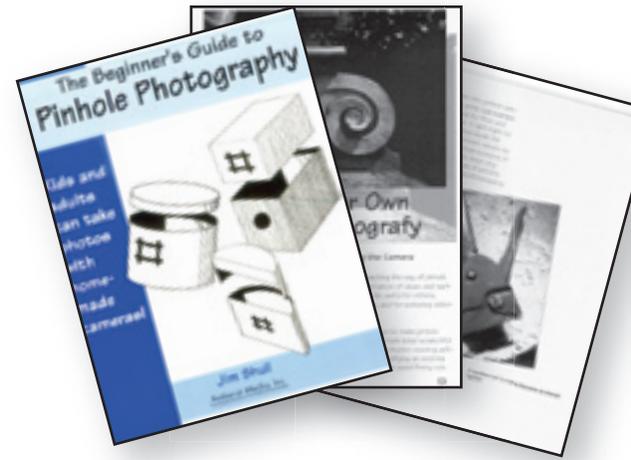
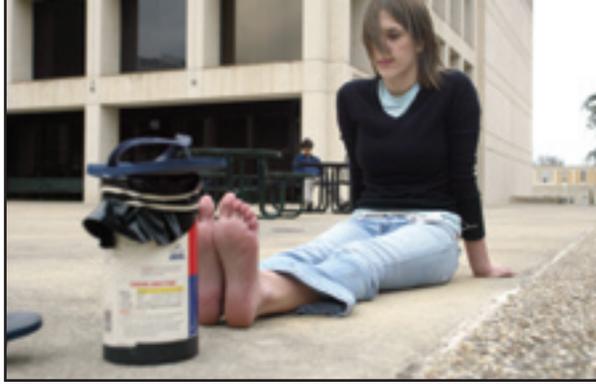
Ralph Howell, Clay Johnson, Colin Moe and Ellie Goebel work on the large camera obscura using a prop from the musical *Carnival*. Howell said he likes the challenge of transforming common, everyday objects into extraordinary cameras. Virtually, anything can be turned into a pinhole camera: a coconut, a coffee pot, a matchbox, or any chambered object that can be light proofed. Recently, Howell converted a carnival wagon from a recent school musical into a camera obscura (Latin for "darken chamber") fitted with a pinhole. Because of its size, people can walk into the wagon and view images projected through the pinhole and onto the 4 ft. by 8 ft back wall. Viewers react with surprise and awe at seeing the dreamlike, upside down and reversed image. Photo by Matthew Berler.



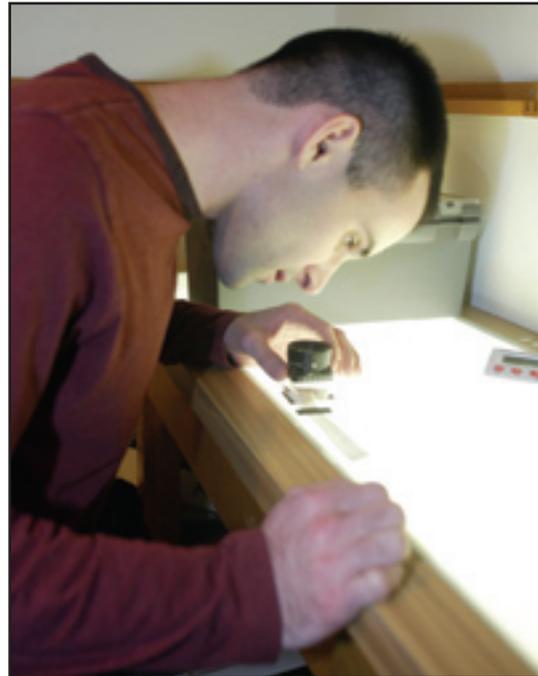
Ralph's class was very illuminating. My kids are in the middle of their Build a Pinhole Camera project and they are just going on about how cool it is. Ralph's class helped me make a more exciting lesson using the pinhole camera to introduce kids to the physics of photography. My advance kids will remember the feeling of seeing their first image come to fruition in the dark room.

• Dan Regalado, instructor, Martin High School (Arlington, Texas)





At the Association of Texas Photography Instructors Winter Shortcourse, Ralph Howell demonstrates how to make a pinhole for his camera. "Ralph Howell's class is definitely fun, but even better is the fact that the information is absolutely authoritative. He knows what works and how to take advantage of the pinhole for seriously creative photography. For Ralph it's not just a gimmick or toy. • David Vesekla, instructor, The Kincaid School (Houston)



Ryan McGrath watches Howell prepare the pinhole for his pinhole camera. Ralph's class is a "wow" generator. Within one hour a person has a chance to make his own pinhole camera. Ralph kindly provides the cameras and after a few minutes of captivating instruction, the participants get to experiment with creating their original photograms. They also get to take it with them at the end of the session. Many experienced photographers have never tried pinhole the way Ralph does pinhole-with a Quaker Oats cylinder. It's fun, original, fresh and a way to enjoy a very simple, yet quite remarkable technique. • Deanne Brown, instructor, Westlake High School (Austin, Texas)

PHOTOS BY MATT STAMEY



REVIEW The Beginner's Guide to Pinhole Photography

BY PAT GATHRIGHT

The *Beginner's Guide to Pinhole Photography* is a great resource to introduce students to the art of pinhole photography.

According to the author, Jim Shull, this manual has the basic information about the way of pinhole for uncommitted amateurs, artists who are allergic to technical information, elementary and high school teachers, and anyone baffled by f-stops, SLRs, RFs, and GTOs, who wants to learn photography without the confusion of the immense amount of jargon that abounds in photography.

Examples included in the paperback book compare the same image taken with a regular camera and a pinhole. Students can easily observe the infinite depth of field using a pinhole.

The best feature of the book is specific instructions with clear illustrations for making different types of cameras. There are even plans for a camera that can be constructed from heavy duty card stock. This is perfect for kids who do not like oatmeal cookies!

The book is available from Porter's and sells for \$17.⁹⁵ (list) or for \$12.⁵⁷ from amazon.com.