From pinhole to print

Inspiration, instructions and insights in less than an hour

Gary Fabbri, Malin Fabbri and Peter Wiklund

First published 2009.

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Cover design, photography and illustrations by Gary Fabbri, Malin Fabbri and Peter Wiklund.
Printed by GRAFIX centrum poligrafii in Poland.

Published by
AlternativePhotography.com
Vikingagatan 10
113 42 Stockholm
Sweden.

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ISBN: 978-91-633-4380-3

For further information go to:
http://www.AlternativePhotography.com/PinholeToPrint.html

Use this booklet to guide you from drilling your first pinhole to printing your first pinhole photograph.

The authors

Gary Fabbri grew up in Rhode Island, USA. He moved to London after college to work as a writer/director. He has created award winning short films, television adverts and programs. Experimentation with visual media, pinhole and alternative processes lead to writing *Blueprint to cyanotypes* and *From pinhole to print.* Gary is now a Creative Director and runs his own company, Shed9, in Stockholm. See www.Shed9.com

Malin Fabbri moved from Sweden to London to study. She earned an MA in Design at Central St. Martin's and is an authority in alternative photographic processes. She has worked professionally with big media names like Time magazine and CNBC Europe. In 1999 she started - and is still the editor of AlternativePhotography.com. She is the co-author of *Blueprint to cyanotypes*, *From pinhole to print ,* and the editor of *Alternative Photography: Art and Artists, Edition I*, a collection of artists working with historic processes today. See www.AlternativePhotography.com

Peter Wiklund started taking pinhole photographs in the early 1990s, after discovering the technique in *The Pinhole Journal* (R.I.P.). He uses a variety of cameras and materials; film, paper and Polaroids. He has exhibited his photographs frequently in galleries all over the world. Peter lives and works in Stockholm, Sweden, writing, making photographs and holding pinhole workshops. See www.PeterPinhole.com.

Why pinhole?

One of the best things about pinhole photography is its simplicity. Almost any container that can be made 'light-tight' can be turned into a pinhole camera.

Building your own camera is not only a great way to learn the true basics of photography, it is also incredibly fun to create something from scratch, that can take a photo. The world may be going digital, and it is fun and spontaneous to take a picture with your phone, but there is a mystery in taking a photograph with a pinhole camera, and a thrill in developing your own print in the darkroom.

Depth of field

Pinhole photographs have many interesting qualities, including a virtually infinite depth of field. This means that everything in the image, no matter how close or distant, lies in the same focal plane.

If you place an apple in the foreground and a tree stands far away in the background, then both the apple and the tree will be in focus. With an ordinary camera, either the apple or the tree would be in focus, not both. This 'infinite look' is quite unique to pinhole cameras, and can help you create very startling images.

Long exposure times

It may be possible to adjust your ordinary camera to have long or short exposure times, but long exposure times are part and parcel of pinholing.

Exposure times can range from several seconds to several minutes. Taking advantage of this time allows you to produce a multitude of blur effects as the subjects of your photographs move, or as you move the camera.

Timeless quality

Pinholes have a 'timeless' quality, that makes you want to release your creative potential. It is sometimes hard to tell whether the image was taken yesterday or a hundred years ago. Imperfections such as reflections and light leaks become values in a pinhole image. Pinhole cameras simply see the world differently from the way our eyes see it.

Limitations lead to freedom

At first glance the pinhole camera may seem too simple to offer versatility to an experienced photographer. But, as is often the case, limitations release creativity.

Make a pinhole camera – from a can

A PINHOLE CAMERA can be made out of almost anything that you can make light tight. Cans, cookie jars and boxes have perfect pinhole potential. But other, more unusual items like a walnut, a red pepper and even someone's mouth have been transformed into pinhole cameras.

The most important feature is that it is possible to make the camera light tight. If you want to use a box, pick a sturdy one with a tight top. If you use a can, try finding one with an opaque lid, or take steps to make the lid light proof. Using a square container will give you a flat film plane, a curved one will result in a bent film plane. Creating your own camera will be a lot more fun if you start with a good container.

Let's make a simple pinhole camera starting with a can. Search your cupboards, you will most likely have one at home already.

Materials list

Need to have - without these it will be hard to make a camera:

- Can or box
- Scissors and a hobby knife
- Ruler
- Flat black paint & brushes, paint in a spray can, or black paper
- Black tape (preferably photographic tape, lots of it!)
- Glue
- Thin metal, like an aluminium can
- Fine sandpaper or abrasive cloth
- Thin needles
- Cork or eraser to hold needle
- Photo paper, RC paper

Nice to have - extra bits that will make life easier:

- Scanner, projector or micrometer for measuring needles and holes
- Backing paper from 120-film, great for covering light leaks
- Light meter, for determining the right exposure time
- Darkroom bag, or light proof bags for changing paper outside the darkroom

Building the camera in six simple steps

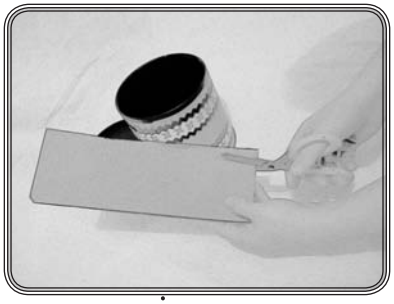
Step 1. Light proofing

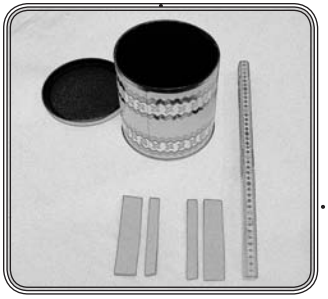
Your can is probably not light proof. Hold it up to the light and you will see any obvious light leaks. A metal can will probably have fewer light leaks than a cardboard box. Leaks are a standard dilemma for pinholers, but nothing that black tape can't fix.

Tape all folds and corners on the outside of the container.

Tape all inside corners and joints if you suspect they are leaking light. Hold the container up to the light, to make sure you can't see any obvious light leaks. Do the same with the lid. If using a cardboard box, try finding one where the lid comes down a fair amount and fits tightly. If it does not fit, find a better box, or try making a U-shaped lip for the lid.

Cover your work surface. Spray both the inside of the lid and the can with flat black paint. Do not use gloss paint. A shiny layer of paint will reflect light inside your camera, affecting your final image. Leave the paint to dry and spray it again. If you are using a Pringles or an oatmeal can with a transparent plastic lid, it also has to be blackened properly. Alternatively, you can glue mat black paper to the inside of the can and lid. Both the paint and the paper should be as non-reflective as possible.





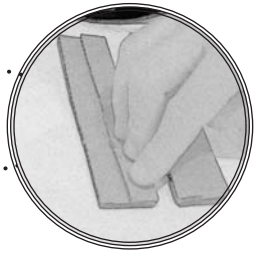
Step 2: Making a paper holder

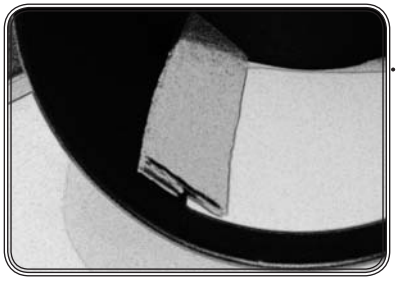
While you are waiting for the paint to dry, make a paper holder that will hold the photo paper at the back of the camera.
Take a piece of thick cardboard and cut four strips. The strips should be slightly shorter than the height of the can, so they don't hold the lid open.

Cut two strips that are roughly 1 cm / 0.5 inches wide, and two that are 2 cm / 1 inch wide.

Glue the thinner pieces on top of the thicker ones.

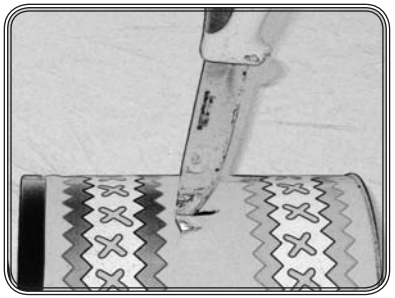
Take a piece of paper that is the same size as your photo paper. Turn the can over, so that the paper lies flat when you load it. Glue the cardboard pieces in place just outside the outer edges of the paper.





A slot is made for the paper to fit into. Once the glue has dried you can slide a piece of paper into the holder to test it.

If you are using a metal can to make your pinhole camera, you can use two fridge magnets to hold your photo paper in place.



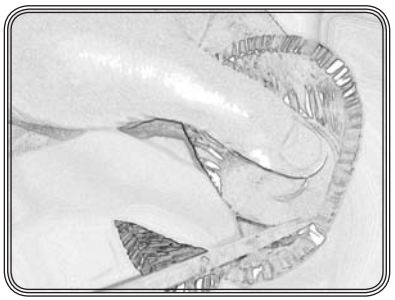
Step 3. Making the hole for the pinhole

To make the hole in the front of the can, you need to find the center of the can. Measure carefully. The hole also needs to be exactly opposite the paper holder you just made.

Use a utility knife to cut the hole in the can - it shouldn't do too much damage to the knife. If it is a heavy duty metal can, a drill can be used, though make sure the hole is not too small. A pair of scissors can be used if the container is made of cardboard. Once you have made the hole, you are ready to make a pinhole.

Step 4. Making the pinhole

Use a thin metal sheet for the pinhole, a baking tray, aluminium drink can or similar material will work. Many pinholers use a thin brass sheet called a 'shim'. Cut a small square or circle. You can use ordinary household scissors for this, although it will make them blunt quite quickly.

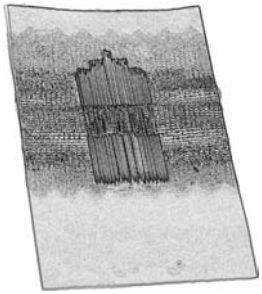


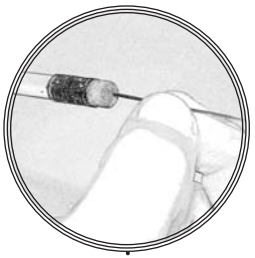
Pinhole material

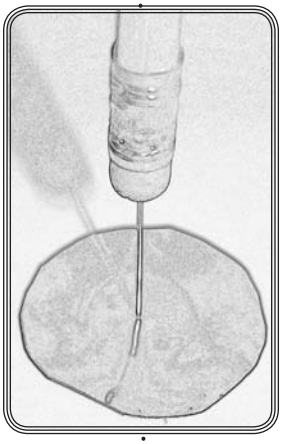
Some items you can use for the pinhole:

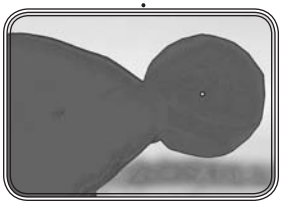
- Brass or aluminium shim
- Disposable aluminium baking pan
- Any metal sheet of tin, brass or silver
- Soft drink can

Cooking foil can be used, but is very thin and rips easily.

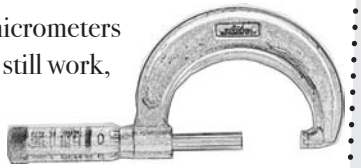








Chose the needle that will make the pinhole. If you can find needles that are numbered in the traditional way, you can determine the size of the hole using the guide to the right. Or, measure them with a micrometer. Most people don't have micrometers these days, but they still work, and can be found on eBay.



You may also use acupuncture needles. They are often sold in packs of 100 with minimum sizes down to approximately 0.15 mm. However, they can be soft and tricky to use.

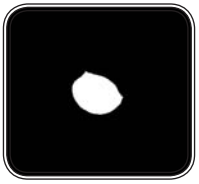
Insert the needle into the eraser on a pencil or use a cork. Place the shim on a cutting mat, a foam core, or another sturdy material like a phone book or a writing pad. Put the needle in the middle of the shim, and drill by turning the metal sheet around, instead of the needle. This makes it more likely that you will end up with a good round hole.

Drill once, turn the shim over and sand it lightly with very fine sand paper or abrasive cloth, until the material is smooth. Sand the front of the sheet too. After sanding, gently put the needle in the hole and twist it back and forth without pushing. This clears the hole of any trash and burnishes the edges of the hole.

Hold the shim up to the light, and see if the pinhole is round.

Needle size guide

Needle number	Diameter in inches	Diameter in millimeter
1	0.046″	1.17 mm
2	0.043″	1.09 mm
3	0.040″	1.02 mm
4	0.037″	0.94 mm
5	0.034″	0.86 mm
6	0.030″	0.76 mm
7	0.027″	0.69 mm
8	0.024″	0.61 mm
9	0.021″	0.53 mm
10	0.018″	0.46 mm
11	0.016″	0.42 mm
12	0.014″	0.35 mm
13	0.012″	0.30 mm
14	0.011″	0.28 mm
15	0.010″	0.25 mm



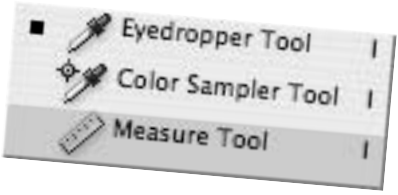
You may decide to keep the pinhole rough (right) in order to take advantage of the diffracted light as in this example (above).

Any deformations may cause diffraction, a type of distortion, caused when light scatters and bends around the edges of the hole, giving you unexpected results.

For our purposes, we'll make the hole as perfect as possible. If you don't trust your eyes there are a number of ways to check if your pinhole is round.

- Use a magnifying glass
- Use an enlarger to view the circle of light
- Scan the sheet and view it at the highest resolution on your computer monitor

Once it is scanned, open the image in Photoshop or Photoshop Elements and use the Measure Tool to find out the size.



Size matters!

There is an optimum relation between the sharpness of an image, the focal length of the camera, and the size of the pinhole.

The aperture controls the amount of light that reaches the paper. In pinhole cameras the aperture is the size of the hole. A bigger hole needs less exposure time. But a hole that is too large will create a softer, blurry image or even overexposure.

What size pinhole will work with your camera? There are several complicated formulas around, worked out by pinhole-interested scientists, all of which give us more or less the same answers. Many pinholers use the formulas, whilst others simply test their way to finding the right pinhole for their camera.

The ideal hole size

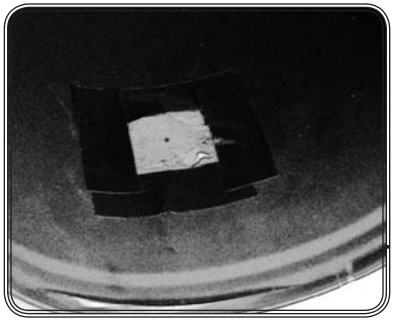
If you know the focal length of your camera you can easily find out the best pinhole size, and your camera's f-stop. The diameter is the length from one side of the hole to the other.

Measured in millimeters

The camera's focal length	Optimum diameter of pinhole	F-stop (and nearest standard f-stop)
10	0.117	85 (90)
20	0.166	121 (128)
30	0.203	148 (128)
40	0.235	171 (180)
50	0.262	191 (180)
60	0.287	209 (180)
70	0.310	226 (256)
80	0.332	241 (256)
90	0.352	256 (256)
100	0.371	270 (256)
150	0.454	330 (360)
200	0.524	381 (360)
250	0.586	426 (360)
300	0.642	467 (512)
350	0.694	505 (512)
400	0.742	539 (512)
450	0.787	572 (512)
500	0.829	603 (512)

Measured in inches

The camera's focal length	Optimum diameter of pinhole	F-stop (and nearest standard f-stop)
0.5	0.0052	96 (90)
1	0.0074	136 (128)
2	0.0104	192 (180)
3	0.0127	235 (256)
4	0.0147	272 (256)
5	0.0165	304 (256)
6	0.0180	333 (360)
7	0.0195	360 (360)
8	0.0208	384 (360)
9	0.0221	408 (360)
10	0.0233	430 (360)
11	0.0244	451 (512)
12	0.0255	471 (512)
13	0.0265	490 (512)
14	0.0275	509 (512)
15	0.0285	526 (512)
16	0.0294	544 (512)
17	0.0303	560 (512)
18	0.0312	577 (512)
19	0.0321	592 (512)
20	0.0329	608 (512)



Step 5. Mounting the pinhole

Now that you have produced a decent hole, let's get back to the can. Use the black tape to fasten your pinhole into place. Be certain to center it.

Make a simple shutter using a piece of black tape. Test your camera with the shutter in place.

Step 6. Loading the paper & testing for leaks

Load your camera in the darkroom, with room lights turned off and safelight turned on. The safelight will not harm your photo paper, but the room lights will. Slide your paper into the slots.

Close and seal your camera like you will do later on, when you take a photograph. Expose the camera to bright light for fifteen minutes *without* opening the shutter.

Take the camera back into the darkroom, unload the paper and develop it normally. If the paper is still white, the camera is light proof. If it has turned grey, black or has streaks of black, the camera most probably has a light leak. Find the leak and light proof it with lots of black tape - the pinholer's best friend. Use black photographic tape if possible, it is superior to other types of tape.

Keep testing and taping until the paper comes out unexposed and white. Once you have got a pure white sheet, you are ready to start making pinhole photographs.

Load your camera. Close the lid and take a picture with your pinhole camera!

Making an advanced shutter

AlternativePhotography.com conducted a large survey among pinhole photographers. The one thing that made them sweat and swear the most was how to make the perfect shutter.

Don't feel limited, shutters can be as elaborate as your camera. If you are feeling adventurous, experiment your way to a unique shutter. Below are a few tips on how to make an advanced shutter.

Black tape shutter

The simplest way possible to make a shutter is to use black tape. Photographic tape is superior to the other varieties, but many pinholers still use electrician's tape, and are happy with this. Aluminium tape can also be used, it is light tight, and is easily torn to the right size. It can be found in building supply stores.

Test your camera with the shutter in place. Once the glue does not stick properly, just replace the old tape for a fresh piece.

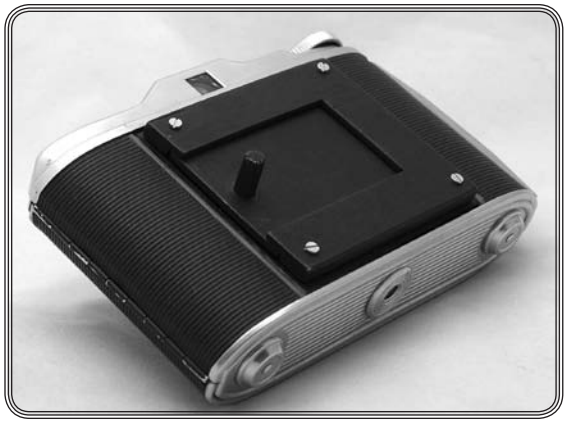
Bumper sticker shutter

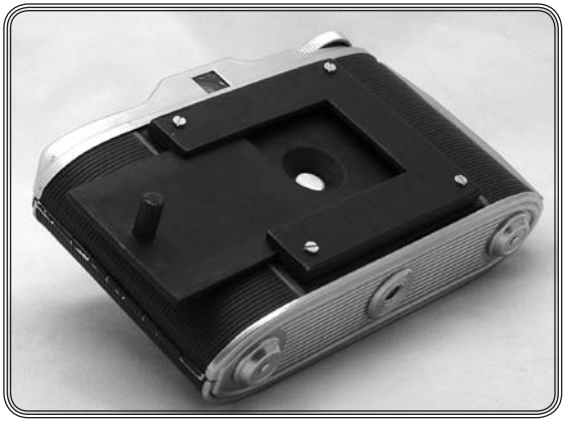
If your pinhole camera is made from a metal can, and is magnetic, a fridge magnet or a bumper sticker can be used as a simple shutter. Just make sure the magnet is flexible enough to cover the hole, fastens tightly to the can, and that the magnet is a strong one. Genius!

Three plate shutter

If you feel like taking an adventurous detour, see the instructions on the next page. You can use thin plywood or thick cardboard as sturdy and durable base materials.

Optional advanced shutter





1. The bottom plate

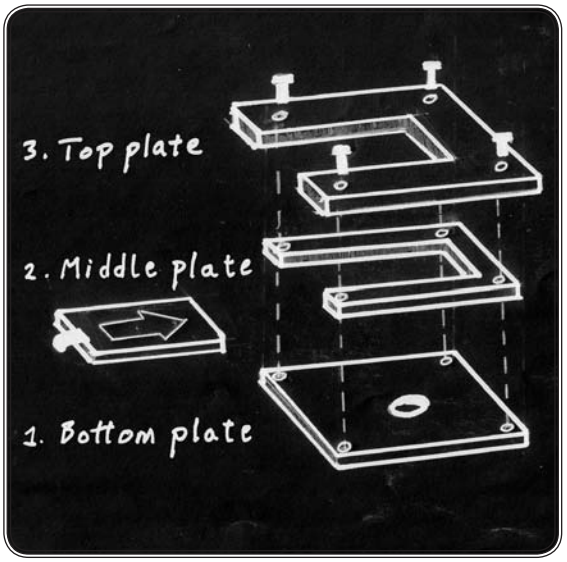
The bottom plate covers the opening of the camera. It also has a hole which is drilled and countersunk where the pinhole plate is placed. The hole should be wide enough to avoid creating a vignette.

2. The middle and shutter plate

The shutter plate should fit tightly into the middle plate, but still be able to slide.

3. The top plate

Use screws to mount the top plate, which will hold the shutter and the other two plates in place.



Shutter on the camera above by Lena Källberg.

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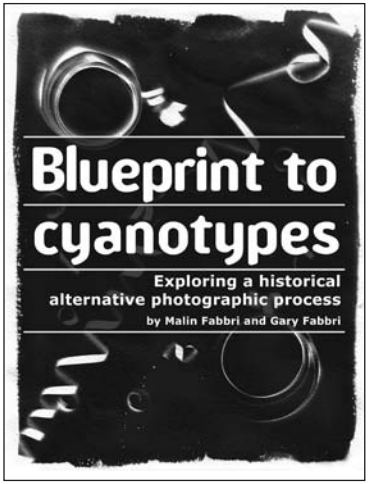
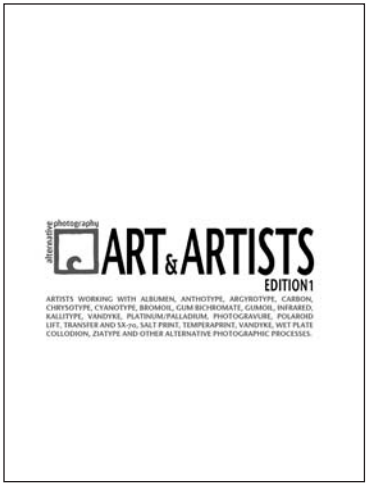


Blueprint to cyanotypes
Exploring a historical alternative photographic process
Written by Malin Fabbri and Gary Fabbri
The cyanotype is often the first alternative process that people try. It is relatively easy and safe enough to nurture a child's interest in photography. It can also be seen as a gateway to further exploration of historic photographic methods. *Blueprint to cyanotypes* is all you will need to get started with cyanotypes. It offers the beginner a step-by-step guide, from choosing material to making the final print. It is full of information and tips. Even the experienced cyanotyper may learn a thing or two.
Format: Paperback, 68 pages, full color, ISBN: 978-1-4116-9838-3
Go to: AlternativePhotography.com/BlueprintToCyanotypes.html



Alternative Photography: Art and Artists, Edition I
Edited by Malin Fabbri
Alternative Photography: Art and Artists, Edition I highlights the work of over 100 of today's most active photographers working with alternative processes. Discover how the different processes create a unique look in a print, and get an insight into how the processes function. Artists introduce themselves, their work and why they chose the qualities of that particular process. A wide variety of processes, concepts and ideas can be found. And, the purpose of this book? To inspire.
Format: Paperback and hardback, 238 pages, full color
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From pinhole to print will guide you from drilling your first pinhole to printing your first pinhole photograph. It is an easy to read, step-by-step guide to making a pinhole camera and creating images.

Today – when most cameras are brimming with digital functionality – many seek relief in the simplicity of a basic pinhole camera. Pinholing is a very pure form of photography.

The pinhole camera that you will build is simple, but pinholing has few limitations.

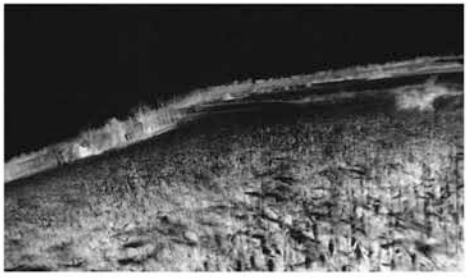
Pinholing is a fantastic way to discover photography. Building the camera, loading the paper and taking a first picture gives the beginner an understanding of the basic skills used in photography. Developing your first print can be a thrilling experience.

The artists' gallery will inspire you to experiment and see how you can take your pinholing further. Once you get started you may even become a dedicated pinhead!

"From pinhole to print is an excellent book. Short, succinct and yet filled with all the information that the beginning pinhole photographer needs to know to get started."- Tom Miller, Coordinating Team Leader, Worldwide Pinhole Photography Day, and pinhole photographer

"A quick read and perfect for teaching the wonders of pinhole to any age from grade schoolers to college students and beyond. It is an excellent resource for the photographic library as well as a good text for teaching the process." - Christina Z. Anderson, Author, and Assistant Professor, Montana State University

"Written in clear, direct language, and illustrated with drawings, diagrams and photographs that speak volumes. If you are the least bit intrigued by pinhole photography, you'll find this little book an indispensable aid." - Anthony Mournian, The Photographers' Formulary

"A well-designed, inviting introduction to pinhole photography. If I were learning pinhole photography I'd have this slender manual on my person at all times." - Sarah Van Keuren, Adjunct Professor, University of the Arts, Philadelphia, PA

ISBN 978-91-6334-380-3
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