

**Visual Arts Lessons for Joe O'Donnell's  
*Japan 1945: A U.S. Marine's Photographs from Ground Zero*  
Grades 9-12**

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*“My official photographs were sent on to Pearl Harbor undeveloped. I developed my personal photos almost daily in makeshift labs in tents, empty rooms, or demolished houses. Thanks to my training at MIT prior to my assignment to Japan, I understood the process of developing enough to make field labs using whatever I could find. At one point I resorted to using my helmet and liner for the chemicals and a nearby stream for washing the negatives, hanging them on a tree to dry.”— Joe O'Donnell*

## **LESSON: DIY Photo Development**

### **Essential Questions:**

- What are the basic principles of film development?
- What household materials can be substituted for commercial film developing chemicals?
- Can the photo development process be more environmentally friendly?
- What makes a “good” negative?

### **Introduction:**

In this lesson, students will learn to develop black and white film using household materials in place of commercial photographic chemicals.

In a nutshell, film developer consists of a reducing agent and an activator. Commercial reducing agents are typically made from hydroquinone, which the FDA identifies as a carcinogen. Coffee, high in caffeic acid, and Vitamin C are excellent reducing agents. They allow the exposed silver halides in film to convert into metal silver, which will form the negative image. The soda used makes the solution alkaline to activate the developing agents. Once developed, the film is still sensitive to light and with continuous development, all of the film’s emulsion would convert to silver, not just those particles exposed to light.

Thus, the film must be “fixed” and the development process stopped. Here we will use a concentrated saltwater solution as a substitute for a thiosulfate solution. A salt fixer will remove the unexposed silver halides to prevent further development—it just takes quite a bit longer than the commercial fixer. A drop of anti-spotting agent used in a dishwasher stands in for one that may be purchased, like Kodak’s PhotoFlo.

The appeal of making one’s own photo chemistry, beyond the hazards of commercial products, are in its cost effectiveness and ease of acquisition. Depending on where one lives, the ingredients can be purchased at a local grocery store or online. The potential for expanded exploration of the chemistry behind the processes and alternative approaches may be a draw for some.

While a DIY approach has its advantages, it is worth noting that the process does not yield archival results. If one wants their negatives to last for a lifetime (or longer), coffee-based developer and salt fixer are not ideal.

### **Objectives:**

Students will understand the basics of black and white (b/w) film development and will successfully process their own film using homemade chemistry.

### **National Visual Arts Standards (grades 6-12):**

Creating: Conceiving and developing new artistic ideas and work.

Anchor Standard #1. Generate and conceptualize artistic ideas and work.

Anchor Standard #2. Organize and develop artistic ideas and work.

Anchor Standard #3. Refine and complete artistic work.

Producing (media arts): Realizing and presenting artistic ideas and work.

Anchor Standard #4. Select, analyze and interpret artistic work for presentation.

Anchor Standard #5. Develop and refine artistic techniques and work for presentation.

Connecting: Relating artistic ideas and work with personal meaning and external context.

Anchor Standard #11. Relate artistic ideas and works with societal, cultural and historical context to deepen understanding.

### **Materials:**

Presentation:

- Japan 1945: A U.S. Marine's Photographs from Ground Zero, by Joe O'Donnell
- Printed reproductions of O'Donnell's photographs (or projected images from the FCCEAS website)
- Excerpt from article, "A Straight Path Through Hell." *American Heritage Magazine*

For taking photos:

- Black and white 35mm film (ISO 100 or slower is recommended)
- 35mm film camera

For processing film:

- See *DIY Darkroom Chemistry* (supplemental material) for developer, fixer and wetting agent recipes
- Film development tanks & reels
- Light-tight room or film changing bag
- Assorted cups and containers for dry ingredients and liquid storage
- Permanent marker
- Masking tape
- Film reel washer (optional)
- Wire hangers or clothesline
- Clothespins
- 35mm negative sleeves or envelopes

### **Teacher Preparation:**

Note: This lesson presumes students know the basics of photography and how to make properly exposed images on film. If this is not the case, teacher will need to frontload this information. There are many fantastic books and websites dedicated to the fundamentals of photography (see suggested resources).

Teacher will read O'Donnell's book along with the *Historical and Cultural Context* by John Frank, and the excerpt from *American Heritage Magazine* to become familiar with Joe's story and photographs. Select image reproductions that may be most appropriate to share with students. Suggested images include:

- *Joe in Front of Tent City & Standing on the Roof* (page 12)

- *Passing the Cremation Site* (page 24)
- *Athletic Day, Fukuoka* (page 40)
- *Children Working* (page 43)
- *Schoolhouse* (page 44)
- *Hiroshima, Aerial View* (page 54)
- *Aioi Bridge* (page 55)
- *Nagasaki, Ground View* (page 64)
- *Three Brothers, Nagasaki* (page 71)
- *Dressed Up Little Girl* (page 72)
- *Classroom* (page 73)

### **Lesson Plan:**

#### **DAY ONE:**

Give a brief overview of Joe O'Donnell and the book, [Japan 1945: A U.S. Marine's Photographs from Ground Zero](#). Show the photos of Joe from page 12 (Joe in front of Tent City and Standing on the Roof) and the Graflex Speed Graphic supplemental resource.

Ask students

- How would taking photographs be different then, compared to today?
- What are the challenges and limitations of using the type of camera/film that Joe used?

Show students Joe's photographs and discuss the living conditions evident through those images:

- What would life have been like for Japanese civilians after their city was bombed?
- How would American military personnel have lived, while in Japan? (Joe in front of Tent City, p.12)
- How would Joe have been able to process the film he shot, if he did not have access to a darkroom or photographic chemicals?

Have students read the supplemental material, Excerpt from "A Straight Path Through Hell" article.

Ask students:

- What do you know about how photographic film is developed?
- What are the chemicals used in film development and what do they do?

Explain how Caffinol is an alternative method for processing film that involves ingredients that can easily be found around the house or purchased at the grocery store (or online). Give an overview of the process and explain that students will develop the film they shoot with only these materials, as Joe might have.

#### **DAY TWO:**

Students will shoot a roll of film to document their environment; this could be their school, home or community. Note: High contrast images produce better results when developed in Caffinol.

## DAY THREE:

Prepare for processing film.

Students will premeasure dry ingredients for Caffenol film developer and store individually, in paper cups, until they are ready to process their exposed film. Each cup of ingredients should be labeled with the student's name/group name and the number indicating the order in which it will be dissolved and the ingredient name.

Example: Jordan & Taylor  
2  
Vitamin C

Pre-mix the salt fixer solution in very warm water and store until ready to use. (This takes quite a bit of time to dissolve.)

Have the students load their exposed film into the film developing tanks, either in a darkroom or changing bag. Students should label the outside of the tank with their name(s) written on strip of masking tape. **KEEP CONTAINERS CLOSED UNTIL PROCESSING!**

Note: An interior room/closet with no windows and light blocked around doors can suffice—the space must be completely dark. Black electrical tape, heavy blankets, rolled towels can all be used to eliminate light coming in from cracks and under doors.

## DAY FOUR:

Process film, using instructions from supplemental resource, *DIY Darkroom Chemistry*.

Note: When I have a large group of students developing, I will wait until everyone has their mixture ready to synchronize agitations, using a single timer. This slows things down a bit, but it is more organized because students are able to follow along with their classmates.

## DAY FIVE\*:

Students will empty the saltwater fixer solution that has been sitting overnight.

Use a film reel washer or fill and empty tank 10 times with running water, to completely rinse salt.

Open the tank's light-tight lid and fill with water to cover reels. Add one drop of dish soap and spin reels vigorously to mix and coat film, about 45 seconds. (This should prevent water spots from forming.)

Remove film from reel and squeegee between first two fingers to remove excess water, or use a film squeegee.

Hang to dry, by clipping one end of film to a line and letting it hang down (without touching the floor). On the lower end, use a clothespin with the student's name to identify film.

\*Processing can be completed in one class period, by using commercial fixer, instead of salt fixer.

## DAY 6

Evaluate negatives. How did they turn out? Which images are better than others? Why do you think that may be? What would you do differently next time?

Print or scan negatives. Depending on your resources, you may choose to enlarge the negatives, scan them with a digital film scanner or use an app to convert the negatives into positive images. An easy way to do this is to lay the film onto a white piece of printer paper and hold both up against a window with bright light coming in. Photograph the negatives with a smartphone, one by one. Use a free app, like Adobe Photoshop Express, to crop, invert and flip the image.

## DAY 7

Display and critique student images.

Discuss pros and cons, related to environmental impact, cost, process and longevity.

## EXTENSION ACTIVITIES

- Tone darkroom-processed prints in coffee solution, to dye the photos and give them a vintage look.
- Have students research/try other recipes for developing film using grocery store items. Some alternative ingredients include: orange juice, caffeinated soft drinks, tea, vanilla extract, etc.

## Supplemental Material:

“DIY Darkroom Chemistry: Make your own darkroom chemistry using household ingredients”

Excerpt from article, “A Straight Path Thorough Hell.” *American Heritage Magazine*

## Suggested Readings and Resources:

“Photograph Toning with Tea and Coffee”. *The Art of Photography*. April 14, 2013.

<https://www.youtube.com/watch?v=LXlZtuFa1qA>

“The Beginner’s Guide to Film Photography”. *I Still Shoot Film*. 2009-19.

<https://istillshootfilm.org/beginners-guide-film-photography>

“The Graflex Speed Graphic FAQ”. *Graflex.org*. <https://graflex.org/speed-graphic/>

Bunting, Roger K. **The Chemistry of Photography**. Photoglass Publications Division. 1987.

G. Reinhold, et al. **The Caffenol Cookbook & Bible**. Community Spirit Publications. 2012.

Horenstein, Henry. **Black and White Photography: A Basic Manual Third Revised Edition.** Little, Brown and Company. March 2004.

Marquardt, Christopher & Monika Andrae. **The Film Photography Handbook: Rediscovering Photography in 35mm, Medium, and Large Format; 2<sup>nd</sup> Edition.** Rocky Nook. October 8, 2019.

O'Donnell, Joe. "A Straight Path Through Hell." *American Heritage Magazine*, 56:3. <http://www.americanheritage.com/content/%E2%80%9Cstraight-path-through-hell-%E2%80%9D> O'Donnell provides additional background and information about the photos in a 2005 American Heritage Magazine article.

Petersen, Bjorn. "Develop Film at Home! A Step-by-Step Guide". *B & H Foto & Electronics Corp.* Updated Dec. 2019. <https://www.bhphotovideo.com/explora/photography/buying-guide/develop-film-at-home-a-step-by-step-guide>

## Excerpt from “A Straight Path Through Hell” article

American Marine photographer, Joe O’Donnell, describes taking photographs to document the aftermath of U.S. bombing in post-war Japan, both for the government and himself:



*“One day I met a Japanese photographer who had shot three pictures of the bomb explosion. I asked him why he hadn’t shot more, and he answered, “It was too horrible.” I got to be friendly with him, and he told me, “Be careful with your negatives. The military will take them. They took my film, they took my cameras, they took every record I made.”*

*The Marines had issued me a camera back in the States. Then, in the best bureaucratic tradition, they issued me another one. I put them both in my trunk and kept them there. A Speed Graphic is heavy—it must weigh six or seven pounds—but its 4-by-5-inch negatives make really sharp enlargements, better than any 35-millimeter camera. Carrying one Speed Graphic by shoulder strap was bad enough. But since I had to send one set of negatives to Pearl Harbor to be developed and then to Washington, I hauled both cameras with me. When I got a shot I wanted, I usually took two pictures, one for the Marines and one for me.*

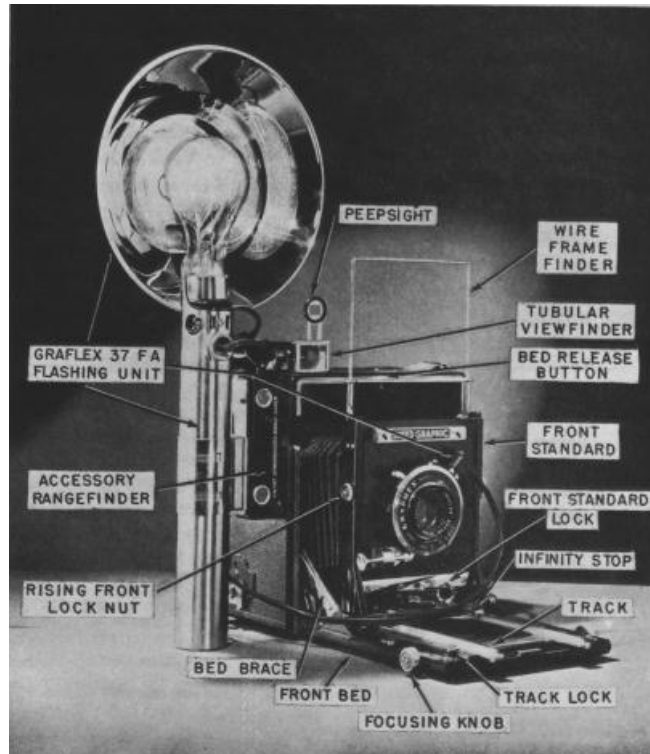
*I had a room in the barracks set up as a darkroom. I had my own trays, my own chemicals. Since I could not control the temperature of the water, which needs to be 68 degrees, I couldn’t develop by the clock. I had to do it by inspection. I got to where I could use the reflected light of the full moon to examine the negatives without fogging them. I’d put a negative in the chemicals for a while, take it over to the window, open the curtain and inspect it, take it back to the tray again, and so forth. After I was satisfied with the exposure, I would rinse the negative, put a hole in one corner, and hang it on the branch of a tree to dry. The guys in the barracks thought it was all official.”*

Image: “Joe in Front of Tent City”

O’Donnell, Joe. “A Straight Path Through Hell.” *American Heritage Magazine*, 56:3. <http://www.americanheritage.com/content/%E2%80%9Cstraight-path-through-hell-%E2%80%9D>



## Graflex Speed Graphic



The Graflex Speed Graphic camera was the standard for press, military and portrait photographers in the 1940s. Graflex cameras were renowned for their portability and ease of use. It was called a “Speed” Graphic because its shutter was capable of capturing an image at 1/1000 of a second, using two shutters. Many famous photographs from the early to mid-20<sup>th</sup> century were shot using a Graflex camera, such as: “Raising the Flag at Iwo Jima” (Joe Rosenthal) and “Elvis Presley” (Charles Trainor). By today’s standards it would be painstakingly slow and cumbersome to shoot with this camera. For each exposure one would:

- Load or switch the film holder (each holder held two sheets of 4”x5” film)
- Set the shutter speed
- Open the shutter on the lens
- Cock the focal plane shutter
- Remove the dark slide cover from the film holder
- Focus the image
- Release the focal plane shutter
- Replace the dark slide
- Remove or rotate the film holder

Photographers had to have a keen sense of timing to get the “right” shot and would need to act quickly to load the next sheet of film. A photographer could take two photographs with each film holder.

# DIY Darkroom Chemistry

## Make your own darkroom chemistry using household ingredients

### MATERIALS

For making developer (Caffenol):

- Thermometer
- Stirrer
- Beaker for liquid measure (1 liter)
- Measuring spoons (one teaspoon, ½ teaspoon)
- Condiment cups, paper mouthwash cups, empty plastic 35mm film containers, or other small containers\*
- Paper cups\*
- Film development tank

### CAFFENOL INGREDIENTS

- Water (distilled optional)
- Washing soda (NOT *baking* soda)
- Vitamin C powder
- Iodized salt
- Inexpensive instant coffee (NOT decaffeinated)

For making saltwater fixer:

- Thermometer
- Stirrer
- Measuring cup (one cup)
- Measuring spoon (½ teaspoon)
- Beaker for liquid measure (1 liter)
- Storage container (if mixing in advance)
- Rubber or latex gloves

### SALTWATER FIXER INGREDIENTS

- Water (distilled optional)
- Iodized salt
- Household bleach (optional)

For making anti-spotting wetting agent:

- Fragrance-free liquid dishwashing liquid
- Eye dropper

\*Optional (For premeasuring ingredients, prior to processing)

# **CAFFENOL DEVELOPER INSTRUCTIONS**

## **CAFFENOL INGREDIENTS**

(May be doubled for two rolls of 100 speed film)

1. 4 teaspoons Washing Soda (NOT baking soda)
2. 1 ½ teaspoons Vitamin C Powder (NOT capsules)
3. ½ teaspoon Iodized Salt
4. 5 rounded teaspoons Instant Coffee (NOT decaf-- the cheaper the better)

## **PREPARATION**

Fill a beaker with 500 ml of water at 70° and stir in the ingredients (in the order listed above), until each has dissolved.

Let mixture sit for 5 minutes.

While the above mixture is sitting, add 70° water to developing tank to pre-soak the film.

## **DEVELOPMENT**

Develop the film for a total of 12 minutes, agitating\* the tank constantly for the first 30 seconds and then for 5 seconds, every half minute thereafter.

\*Agitate by inverting the tank and returning to upright position about once every second or two. Try to be smooth, to avoid creating air bubbles. A couple gentle taps of the tank to the side of the sink will release to the surface any air bubbles that may have formed.

Between agitations in the development process, have students prepare the salt fixer according to directions. (You may substitute commercial fixer to speed up the process.)

Empty coffee mixture from development tank (used Caffenol can be disposed of down the drain).

Fill and empty developing tank with water until water runs clear (3-4 times)—be certain not to open the light-tight lid!

## **FIXER**

Fix the film using saltwater fixer or commercial film fixer.

### **SALTWATER FIXER INGREDIENTS**

- Water (distilled optional)
- 1 cup Iodized salt
- ½ teaspoon Household bleach

## **PREPARATION**

Add salt to a beaker. Pour in enough warm water to bring volume to 1 liter.

Stir to dissolve as much salt as possible-- this will take some time! Wait, let salt settle and stir some more. When as much salt is absorbed as possible, use a coffee filter to strain out any salt left in the bottom of the beaker.

Stir in bleach.

## **PROCESSING:**

Pour fixer solution into development tank and agitate for 30 seconds. Leave for an hour or two (or overnight). Open the tank to check the film, unexposed areas should be transparent. If they are not, close lid and agitate again. Continue to check every couple of hours-- just when it's convenient.

## **WASH**

Wash the film by filling and emptying the tank with water ten times.

Finish by adding a drying agent solution or solution of water mixed with a drop of dishwashing liquid soap.

## **DRY**

Carefully squeegee excess water from film, using your first two fingers or a film squeegee.

Hang to dry in a film drying cabinet or on a line in a dust-free environment. Use a clothespin or clip on the bottom, so film dries straight.

Store film in negative sleeve or envelop, emulsion is easily scratched.