JILL ENFIELD'S GUIDE TO
PHOTOGRAPHIC ALTERNATIVE PROCESSES

POPULAR HISTORICAL AND CONTEMPORARY TECHNIQUES

SECOND EDITION

JILL ENFIELD

A Focal Press Book

ROUTLEDGE

Jill Enfield's Guide to Photographic Alternative Processes

Jill Enfield's Guide to Photographic Alternative Processes, 2nd edition, is packed with stunning imagery, how-to recipes, techniques and historical information for emulating the ethereal, dream-like feel of alternative processing.

This fully updated edition covers alternative processing from its historical roots through to digital manipulation and contemporary techniques and how to combine them. It features several new techniques alongside new approaches to older techniques, including hand painting on silver gelatin prints, ceramics and photography, cyanotypes, wet plate collodion, digital prints and many more. Enfield showcases the different styles and methods of contemporary artists together with suggestions for vegan and vegetarian friendly alternative processing, transforming 2D images to 3D installations, and how to apply darkroom techniques to digital captures.

Professionals, students and hobbyists will discover how to bring new life and imagination to their imagery. Whether in a darkroom using traditional chemicals, at the kitchen sink with pantry staples, or in front of the computer re-creating techniques digitally, you will learn how to add a richness and depth to your photography like never before.

Jill Enfield is a fine art photographer, educator, curator and author with many years of teaching experience. While well versed in digital imagery, Enfield's concentration is on historical techniques and alternative processes, with annual workshops and lectures in locations throughout the USA, South America and Europe. Enfield's work has shown in galleries and museums as well as private collections, and recently featured in a 3-month solo show on Ellis Island, USA, at PhotoVille in the DUMBO section of Brooklyn and in Los Angeles at the Annenberg Space for Photography.

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Jill Enfield

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Dedication

Immeasurable credit goes to my husband, Richard. He has been there since the beginning, for 40+ years. He has been my fixer, my cheerleader, my strategist, my critic, my advance-man, my friend and my devil's advocate. He has celebrated with me at every turn calling for celebration, and been my steady force in the face of every project challenge. Thank you, Richard.

Watching daughters, Eve and Sally grow to strong, independent women and simultaneously share their lives with each other and their parents has made me so very proud. This book is for them.

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Acknowledgements

This book would not have been possible without the patience, organizational skills and gentle prodding exemplified by the Routledge team, especially Sarah Pickles. Thank you so much.

There were others who helped and gave their advice on the unending array of details, which required attention for the proper completion of this publication, particularly Cindy Beams, who freely gave her editing expertise and made sure that my writing was clearly elucidated for both novice and expert printmakers. Savannah Spirit, who was my student many years ago at Parsons and is now a photographer in her own right, helped me organize the artists list and contacts. Sophie Chalk, helped me with the final edits before I sent this off to the publishers. I can't thank her enough.

I was also lucky enough to be able to send chapters off to people to read for fact checking purposes. Pradip Malde and Mike Ware were instrumental in making sure that my cyanotype and platinum and palladium chapters were correct. Renowned potter, Kate Missett not only taught me the art of ceramics, but then generously took time and effort to make sure that the chapter on ceramics and photography reflected the full array of clays and their interplay with temperature and stains in terms that the novice could understand.

Of course, I thank the Art, Media and Technology department at Parsons (The New School for Design) in NYC for granting me a sabbatical to allow me to finally finish up this next edition! Also instrumental were my students at Parsons, who would read chapters and let me know their thoughts on following along while learning new processes. In general, Parsons and all of their resources have been an inspiration for learning new techniques and launching new projects for over 20 years now.

Other educational facilities who have invited me to teach workshops and exhibit work have also been crucial toward the ongoing evolution of improved and new ways of developing creative results for a variety of photo materials and techniques, whether through providing access to materials not easily available or through meeting other artists who became collaborators. Some of those programs include Maine Media Workshops & College in Rockport, Maine, NORDphotography in Inderoy, Norway, Palm Beach Photographic Center, in West Palm Beach, Florida, Palm Springs Photo Festival in Palm Springs, California, Penland School of Craft, in Spruce Pine, North Carolina, RISD in Rhode Island.

For the last seven years, the founders of Photoville, produced by United Photo Industries, annually tributes photojournalists and their projects, dramatically set under the Brooklyn Bridge of NYC. The program has grown to a level of world respect and my hearty thanks goes to this team who, in September, 2018, included my statement on the plight of the immigrants of the US, "The New Americans-Glass House of Wet Plate Collodion Immigrant Portraits." Photoville's far reaching callout will hopefully help to decrease the suffering and discrimination imposed upon visionaries who courageously leave their ancestral homes and help to grow the cultural wisdom, commercial strength and overall enlightenment of this nation.

There are many others who are mentioned within the chapters of the book who have been wonderful throughout this process. Perhaps most helpful of all are all the contributors who took time away from their own projects to send me work for inclusion in this book.

As the former US president Lyndon B. Johnson, who wrote the National Endowment of the Arts and Humanities into existence in 1965, once said:

Art is a nation's most precious heritage. For it is in our works of art that we reveal to ourselves and to others the inner vision which guides us as a nation. And where there is no vision, the people perish.

Imagine a world without artists!

Thank you everyone.
This has been a true group project.

XV.01 © Jill Enfield. This image is part of a series photographed using a smart phone. A digital negative was made and printed on Revere paper using the Malde-Ware technique.


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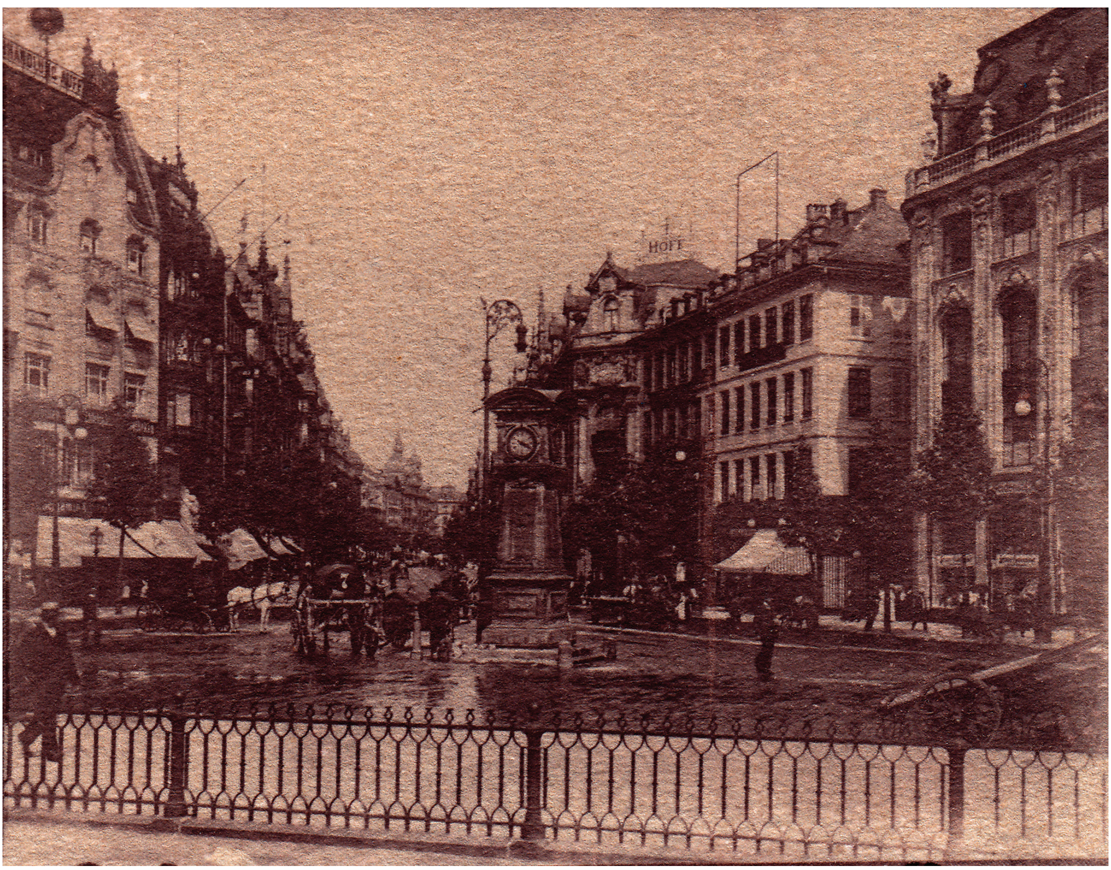
INTRODUCTION

1.1 © Jill Enfield. Flatiron Building, NYC. Image was originally shot on 2¼" black-and-white film enlarged in the darkroom onto glass using the wet plate collodion process. This image became the cornerstone for my Glasshouse of Immigrants that was made in 2015.

When I wrote my first book in 2002, digital photography was still in its infancy. Photography was all about the darkroom and few people were saying digital would be taking over. Within a few years, schools began tearing down their darkrooms making way for digital "darkrooms." Old timers were saying that is it – the end of the wet darkroom is here! Just like in the 1800s when photography was introduced to the public, painters were saying it was the end. But what has happened, both then and now, is that artists have adopted new ways of working so that old techniques could be folded into the new ones. I have included some wonderful work that brings together every tool by combining inkjet prints with alternative processes as well as striking montages.

Now, we have more tools available to us than ever before, all of which complement each other, and, if you keep an open mind, you will be able to expand your photographic skills. Embrace all of the processes with experimentation in mind so that you can develop the freedom to implement new ideas. If something does not work for you, try something else. Remember that the first photographers were not photographers at all, but chemists, astronomers and inventors.

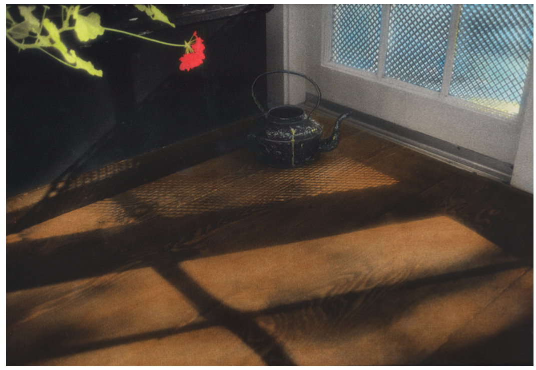
I am far from a scientist, and while I like to play in the darkroom and mix chemicals, it is more like cooking to me. Of course, you have to take precautions and be mindful not to mix the wrong chemicals together (read the first chapter carefully), but all in all have fun! If I start looking at recipes that are way over the



1.2 © Hans Ehrenfeld (a.k.a Henry Enfield) c.1900, printed by Jill Enfield, 2011. Hans was my grandfather and this is an image of their store and surroundings on the Zeil in Frankfurt am Main, Germany. I found the dry glass plate among my father's effects after he died and made a matte albumen print. Amazing to use these old plates taken by family members 100 years ago.

Timeline of processes discussed in this book. (For a complete timeline see books in Bibliography.)

Process	*Approximate dates of major use*
Photogenic drawing	1834–40s
Paper negatives	1840–60s
Salted paper print	1840–60s
Wet plate collodion	1851–1890
Albumen print	1850–1895
Gelatin dry plate	1880–early 1900s
Cyanotype	1880–1920s
Platinum and palladium printing	1873–1937
Platinotype paper manufactured	1879–1937
Gelatin silver print	1885 to present
Gelatin film	1887 to present
Gum bichromate print	1890s–1930
Digital imaging	1990s to present
Rockloid Company introduces Liquid Light	1965
Photography departments get very popular in universities	1970s
Historical techniques are called “alternative processes” and a small revival has begun	1970s to present
Argyrotype developed by Dr. Mike Ware and Pradip Malde	1986
Digital negatives start to be used	1990s
Ziatype developed by Dick Sullivan and Carl Weese	1990
New cyanotype developed by Dr. Mike Ware and Pradip Malde	1995
Phones with cameras introduced	1999
Polaroid files for Chapter 11 bankruptcy	2001
Polaroid announces it is discontinuing production for good	2008
Impossible Project starts production on instant film	2010
January 19 – Kodak files for Chapter 11 bankruptcy	2012
Ready-made dry plates become available from Pictoriographica	2017



1.3 © Jill Enfield. Geranium was photographed using Kodak Infrared film, printed on Kodak Ektalure G (silver gelatin) paper and then hand painted using oil paints and pencils. Neither the film, nor the paper, are being manufactured any longer and they are missed by many of us.

top of mixing, my eyes glaze over. Personally, I like to experiment with all materials and techniques, mixing and matching as I see fit for a particular image. If I have an idea, I try and bend the rules, and find others that do the same in their work, to get the results that I see in my mind down on paper (or tile, or glass). I hope that when going through this book you can take away ideas that you can expand on and make your own.

I could fill this book with great sentences from *Art & Fear* by David Bayles and Ted Orland, but I have picked just one that I believe is a good thought before you turn the page:

> Vision, Uncertainty, and Knowledge of Materials are inevitabilities that all artists must acknowledge and learn from: vision is always ahead of execution, knowledge of materials is your contact with reality, and uncertainty is a virtue.
>
> Bayles, D. and Orland, T., *Art & Fear*, p. 15


sium
cyanide
Ferric Ammonium
Citrate
PYREX
PV-100
ON
OFF

One

SAFETY WITH CHEMICALS

01.1 © Pete Kolonia. Covering your scale protects it from contamination and wearing gloves is a must in any darkroom.

When working with any of the chemicals mentioned in this book, safety precautions should be your primary concern. This said, such precautions always sound worse than they really are, particularly when applied to the small quantities required by home darkroom artists. Provided you observe clean working methods and adopt a modicum of protection, the risk is very low. The risk increases for those particularly susceptible to allergic reactions or who have asthma, and of course to children and pets who tend to put things in their mouths.

There are different types of chemicals, but the ones to think about are chemical grade, photo grade and food grade. You need to be aware of what you are buying for safety and storage. For example, hydrogen peroxide as a chemical grade usually comes as a 30% concentration while hydrogen peroxide that you buy in the pharmacy to use as a disinfectant, or to brush your teeth with, is a 3% solution. The 30% solution is dangerous to keep in your home and can explode, while the 3% solution can be bought on pharmacy and grocery store shelves and is perfectly safe to use. In other words, stronger is not better. Food grade and photo grade is what you use in photography. While we are not using "chemical grade products," you still need to be chemical smart.

Another example is from Dr. Mike Ware who states: "ammonium dichromate (or the corresponding potassium or sodium salts) has long been used on a large commercial scale in the printing industry, and for tanning of leather, occasionally giving rise to documented cases of occupational illness. It is also employed in large amounts for the Gum Bichromate and Carbon printing processes." The very small quantity used in the sensitizers described in this book does not represent a serious risk if the chemical is handled sensibly and proper precautions are taken. You can always leave this chemical out of your tool box and avoid it altogether.

Chemicals can enter your body in three ways: breathing in powders (or inhaling toxic fumes), absorbing them through your skin, and digesting them. This is equally true for household cleansers and artists' materials.

Learn as much as possible about each chemical you purchase and make sure to learn how to use each chemical safely, particularly in relation to everything else in your darkroom. Know the antidote for any chemical you are using in case of accidental spills, splashes, or ingestion. All chemical supply companies are required by law to include MSDS (material safety data sheets) with purchases. Keep these in a notebook for easy access, just as required by schools. (MSDS forms are also called SDS.) SDS copies can be downloaded for free at: www.msds.com. The local poison control hotline is an important

01.2 My favorite apron with silver stains and various other chemical stains. Without wearing an apron, this would be on my clothes.

number to have. Write it next to your phone and in your cell phone for emergencies.

With all of that being said, SDS forms are not written by organic chemists, but are legal documents to protect schools and labs from being sued. There is a lot of misinformation on the chemicals we use. For instance, I learned that silver is a heavy metal and can be absorbed into your body if you get it on your skin. It is not a heavy metal, but a noble metal, as is platinum, palladium, and gold that are used by photographers. Noble metals resist oxidation and corrosion in moist air, which is why they are considered archival when processed correctly. The SDS form for silver is frightening. Reading the "Potential Acute Health Effects" you wouldn't go near silver. Then reading "Potential Chronic Health Effects," maybe not so bad. Then down further, if you get it on your skin: "Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention."

However, silver is used in creams to help burn victims. If it gets on your skin and you go out into the sun, it will turn a dark brown. It will cause what is called a "skin burn" and needs to wear off. According to Derek Lowe, an organic chemist in Cambridge, MA, silver is only absorbed into the outer layers of your skin. It binds with your skin and wears off with time. Your underlying skin will be new skin and might be sensitive until it toughens up, like your skin after a blister pops and heals, but there is no lasting danger.

Another example, look at the SDS form for LAKE SAND. It says that it "may cause cancer through inhalation and causes damage to lungs through prolonged or repeated exposure by inhalation. Personal protective equipment is required." So cover up when you go to the beach! This SDS form is for people working with tons of gravel and sand all day, and yes, inhaling too much dust is bad for you. But if you are using sand in an art project, should all of these precautions be taking place? Because that is what is happening in our schools! These forms are worst case scenarios. Just like you should lock up your household cleansers, and dishwasher soap pods, the take away is to use chemicals wisely and not drink any of the chemicals, wear gloves and wash your hands regularly, and have good, proper ventilation.

Of course, these metals are used in other ways besides photography. Silver is used as an antibacterial and also in making contacts and electrodes. Palladium is used in dentistry, watches, spark plugs and surgical instruments.[1]

My point is, chemicals, when used in a smart, respectful way, can be used in photography without being frightened that you are killing yourself with poisons. If you look up how long photographers live, it is very impressive. Ansel Adams lived from 1902–1984. Imogen Cunningham lived from

01.3 © Jill Enfield. Toned cyanotype photogram.

1883–1976. Just two examples of darkroom photographers who did not use all safety precautions, and lived well beyond the average life expectancy of the time. Most photographers in the early years did not use gloves or tongs, did not have good ventilation, and smoked and drank in the darkroom.

I did not include how to dispose of each chemical, as that depends on where you live and if you have a septic or sewer system. In the bibliography I have included links to many websites on the subject. Don't be scared off and don't be deterred from alternative processes! The most important aspect is to be smart and take proper precautions. Most of the warnings you will encounter are for high concentrations of chemicals. It is important to remember that we are using chemicals that are being diluted, and therefore cause a minimum risk to the environment and to ourselves.

According to Ilford Photo[2]

> Chemicals that may enter the sewer have to be judged concerning their biodegradability (ease of being destroyed or broken down in the environment) and toxicity (hazard posed to the environment). Fortunately, most photographic chemicals are non-toxic or easily biodegradable and many therefore pose no problem for the environment. Micro-organisms, growing in waste water treatment facilities or in rivers and lakes easily take care of them.

TAKING BASIC PRECAUTIONS

USE COMMON SENSE. Proper handling should negate any potential risk. Clearly label all chemicals and store in a safe, childproof place. Promptly mop up any spills. If any of these chemicals get on your skin, wash them off with soap and plenty of cold running water. At most hardware stores, You can buy a mask to wear while mixing dry chemicals. Dry, powdery solids present a greater risk than solutions, because the dust can be inadvertently inhaled. There are many sources listed in this book where you can buy already mixed chemistry kits if you are worried about mixing them yourself.

The following is a list of things to be aware of as you set up your work areas. Some points may seem like common sense, and others may be things you would never know without a chemistry class. But each of them is very important. Keep them in mind, and continue to pay attention to them. *To help, I will repeat them throughout the book.*

1. **Protect surfaces.** As in all darkrooms, designate one counter as the dry area and another counter as the wet area. This will help to minimize contamination of all surfaces and materials. I have a large piece of a thick plate-glass on top of my table for easy clean up.
2. **Protect clothing.** When mixing chemicals or working in the darkroom, wear an apron or smock to protect your clothing, or wear old clothes. Wear closed toed shoes, preferably waterproof (leather, vinyl, etc.), for wet darkroom work to prevent spills onto your feet. Long sleeve shirts or a smock and long pants can help prevent splashes on your arms and legs.
3. **Protect hands.** Nitrile gloves should be worn at all times and the use of tongs is recommended. Whether you are mixing powder or liquid chemicals, or are coating, washing or drying your paper, your skin should be protected from coming into contact with any of the chemicals. Sometimes darkroom chemicals cause people to break out. Allergies and sensitivity to chemicals sometimes don't affect you until years later. Other chemicals can build up in your system over time and years later may cause skin and/or breathing problems.

   Many art-supply stores carry reusable neoprene protective gloves. (People who are sensitive to latex should be aware that neoprene is made with latex.) Regular household latex gloves also work and are readily available at supermarkets and home-related stores, but they tend to be a little bulky. Pharmacies and medical-supply stores have latex and nitrile examination gloves that are thin and easy to use. Because they easily puncture, these disposable gloves need to be changed often. Even if you are wearing gloves when working with chemicals, always wash your hands before you leave the darkroom to avoid contaminating any other part of your work or home space. If any staining occurs on your skin, it will go away with repeated washings over time.

4. **Protect eyes.** Goggles should be worn over your glasses, and if you wear contact lenses, it is really important to wear goggles. If you do splash chemicals in your eyes, make sure to flush your eyes out immediately with fresh water, **and** then call your doctor. Contacts **do not** help with added eye protection! In fact, it's just the opposite. Be especially careful not to touch your hands to your eyes. If chemicals get behind the contact lens it can be very dangerous. The lens holds the chemical in contact with the eye, thus obstructing the eye's ability to clean itself. In extreme cases, the contact lens can fuse to the eye.
5. **Protect lungs and nasal passages.** Either wear a dust mask when mixing powders into liquids, or have very good ventilation. Never use turpentine without a mask. The mask will help keep your lungs clean. People who are particularly sensitive to chemicals or who have had health problems such as pneumonia may want to wear a mask at all times. You can purchase masks at art-supply, hardware or automotive stores. You can use the white masks sold at drug stores, but not for powdered chemicals. The best mask is a purifying respirator mask with two filters, one on each side. The filters will help protect you from organic vapors and dust. Some people use their mask only when they are mixing chemicals, while others use it all the time as an added safety precaution. To prolong the life of the filters, you can store them in an airtight container when you're not using the mask, and remember to replace the filters every few months.

   According to the Daniel Smith art-supply catalog, pregnant women should not use this type of mask as it may reduce their oxygen intake and harm the fetus. Generally, men with facial hair cannot get a good fit with a filtered mask and should wear a simple dust mask.

   Particulate masks should have "NIOSH" and at least "N95" labeled on them. This means they have passed a quality standard. Many "dust masks," including one from 3M, says for household dust use only, not for potentially hazardous particulates or aerosols, including not for painters.

   For VOC (volatile organic compounds, such as Turpentine) you need a NIOSH approved half face mask with a NIOSH approved OVC (organic vapor cartridge). The double-strapped N95 are much better than single straps. The Welders N95 mask has an exhale valve that makes breathing much easier and avoids fogging your glasses, and feels less claustrophobic.
6. **Provide good ventilation.** If you don't have a mixing hood, make sure you have proper ventilation in your darkroom. (See Ventilating your Workspace.)
7. **Avoid Aerosol Spray Cans** (paint, adhesive, etc.) unless used in a dedicated spray booth with evacuated air and a filter to collect particles, or outdoors with wind blowing on your back.
8. **Be careful when cleaning up spills.** Avoid air blowers, broom sweeping, or shaking of dried towels to prevent dusts and aerosols. Use wet mops, wet rags, and wash the mop or rags promptly after use to prevent a dust issue when they dry.

SUGGESTIONS ON BUYING, MIXING, AND STORING CHEMICALS

- Even though it may be cheaper to buy chemicals in large quantities, I suggest buying smaller amounts as you require them, thus avoiding storage issues that can also lead to accidents as well as insuring you have fresh chemicals each time you mix.

- Always pour acids into water, never water into acids. This will help prevent splashing accidents.
- Always use a funnel when pouring chemicals into bottles.
- Always use a cup, dish or filter when weighing chemicals out on a scale. This will keep the scale clean and prevent contamination. Make sure you "zero" out the weight of the container, so that you are only weighing your chemical. (Digital scales call this "tare".) Wipe down the area before you start weighing, and again when you have finished. Wipe spills continually with a wet rag so that the powder does not become *airborne*.
- Store each chemical in a bottle that is specified for that chemical alone. Use bottles that are equipped with plastic caps because some chemicals corrode metal caps. Cover or close all solutions when not in use to suppress toxic vapors. Make sure all bottles are well labeled, kept away from children, pets and food. Store all chemicals out of the sun in subdued light and a cool, dry environment.
- Designate a different tray for each chemical. This will avoid contamination. Make sure you clearly label each tray.
- A good method for mixing solid chemicals, as suggested by Steve Anchell in *The Darkroom Cookbook*, and originally by chemist, Dr. Richard Henry, is to wear gloves and dip a container of the powder into water instead of pouring the powder into the water. This will keep the powder dust from becoming airborne.
- If you are not disposing of your chemicals after a darkroom session, cover the clearly labeled trays with another tray or a piece of plexiglass.
- If you are not sure how to dispose of the chemicals, call your local fire department. Ask for the HazMat (hazardous waste) department. Get their advice or find out with whom you need to speak.
- If you need poison control, call (800) 222–1222. There is someone there 24/7.
- If someone has inadvertently swallowed a chemical, call 911 and DO NOT induce vomiting or drink anything until you speak to an expert.

CHEMICALS FROM GROCERY STORES AND OTHER SUPPLIERS

Some chemicals can be bought at a grocery store or pool supply because they are not just used for photography. I put this in the Safety chapter as another point towards any chemical that can be used safely and can be found everywhere you shop. You will need to do a price check to see if it is cheaper to get them from your photography supplier or from a store near you. This is not a full list for substitutions but it is a good start.

Jim Patterson wrote out some chemicals that can be substituted for every day store bought items:

Grocery store items

Ammonia
Baking soda = sodium bicarbonate
Borax
Cream of tartar = potassium bitartrate
Coffee (for toning)
Tea (for toning)
Washing soda = sodium carbonate

Pharmacy items

Isopropyl alcohol (70% and 91%)
Hydrogen peroxide (3%)

Health food store or vitamin shop

Citric acid and other vitamins that can be used for toning
Iron = ferric oxalate

Beauty supply store

Hydrogen peroxide = 10 volume = 3%, 20 volume = 6%, and 40 volume = 12%
Liquid hair dyes can be used to tone the Cuprotype and other processes

Hardware stores

Muriatic acid (used to clean mortar stains) = hydrochloric acid
Stronger ammonia
Roach powder = 99% boric acid

Pool supply store

Clarifiers can be used to keep cyanotypes from bleeding too much
Stain removers can be used to remove iron stains from paper
Sodium bisulfate labeled dry acid or pH minus
Sodium carbonate = pH plus

Pond or garden store

Copper sulfate = an algaecide for green ponds

01.4 © Jill Enfield. INCORRECT ventilation in a darkroom. The ventilation system for this sink is on the ceiling and in the middle of the sink area. This type of hood creates a lot of noise and not much else. It is actually pulling the chemical vapors into the respiratory system of the printers who are working over the sink.

01.5 © Jill Enfield. CORRECT ventilation in my home darkroom. The ventilation system is in the back of the sink, close to the tray level. This will pull the vapors away from the front of the sink where I stand.

VENTILATING YOUR WORKSPACE

Most of the techniques listed in this book can be successfully performed in subdued light, i.e., not the usual darkroom safelights, but regular 40-watt “white light” bulbs. With this said, many people are under the impression that having a window open with the shades drawn is adequate for light, which is **true**, as well as for ventilation, which is **not true**. Adequate ventilation is as essential for alternative photographic techniques as it is for conventional darkrooms. The recommended ventilation method is to have 10 full air changes per hour. You can find this information from the manufacturers of the ventilation system you buy. The room size is listed next to the fan size information.

As I stated before, a darkroom should consist of two sides. One is used as a “dry” side, where your paper, enlarger, ultraviolet light box, timers and negatives can be stored safely. The other is a “wet” side, where all your trays and chemicals can be kept. In a best-case scenario, the wet side would include a large sink where you can mix *chemicals*, coat your supports and wash everything. To reduce the possibility of contamination, each side should be used for one purpose only. In other words, your negatives should never be left in the sink and no chemicals should ever be placed on the dry-side table.

The ventilation system needs to be placed in the sink area, as its purpose is to remove toxic fumes. *Remember*, the sink area will be the location of most of your toxins. Specifically, the system should be positioned toward the back of the sink, near the back edge of your trays (as in Figure 1.5). This positioning is crucial, as the system will produce a draft that goes across the surface of the trays and consistently pulls chemical-laden air away from your face as you work. Darkrooms in the 1970s had ventilation hoods above the sinks (as in Figure 1.4) which carried the fumes over your face and out. Not really the best-case scenario. Ideally ventilation will be achieved with a long, narrow hood or box called an intake, which runs from one end of the sink to the other. This intake can be built into a box, or "plenum," which helps pull the intake of air out of the room. The plenum should be connected to a tube that has an exhaust fan pulling the air up and out of the room, preferably leading to the outside of the building.

Since the ventilation system will be taking so much contaminated air out of the darkroom, you also need to make sure you are putting good air back in. You can do this by installing light-tight grills in your darkroom door. These are available from most large photography stores and on-line. You can test your ventilation system by burning incense and watching where the smoke goes. If it goes up and out, then you can assume the fumes are doing the same. However, building ventilation systems can be tricky. If you are not comfortable with setting up your own ventilation system, consult a ventilation expert. (Such as Jon Edwards, contact information is in Sources).

DISPOSING OF MATERIALS

Darkroom safety involves using your chemicals wisely, and also disposing of them wisely. Unless you are doing a tremendous amount of printing, the Environmental Protection Agency (EPA) usually does not provide special containers to dispose of your chemical waste. However, it is important to be aware of what these chemicals may do to the environment over time, and be eco-smart about your own disposal.

The best method of disposal will depend both on where you live and on the type of sewage or septic system you have. Most municipalities do not let you put any photographic waste into septic systems because it can adversely affect sources of underground drinking water. Check with your local EPA office to find out the recommendations for your area. A list of regional offices is featured on the EPA website (www.epa.gov). Most cities and towns have waste and recycling centers. Check where you live to learn how to bring in small quantities of chemicals (paints, household cleansers, garden chemicals, etc).

Some chemical disposal is the same no matter where you live and easy to dispose of safely:

- Some chemicals can be set outside and evaporated, such as ether. If you are on a sewer system, black and white darkroom chemistry can be put together by putting stop into the fix, and then adding the developer. The mixture can be flushed down a sink with plenty of water.
- Silver recovery is not as difficult as it once was. You need a container that has steel wool in the bottom that the silver will stick to. Once the silver binds to the steel wool, the liquid can be emptied down the drain. There are companies that you can use to send containers back and forth as

they fill up, or you can make one yourself and then locate a company that will collect the silver from you. Do a search for photographic silver recovery and make a few calls to find out what works best for you and your location.

- Acetic acid, used as a stop bath (28% solution) in a black and white darkroom and used with collodion developer, can cause nasal irritation. Make sure the bottle is closed immediately after use. You can flush used acetic acid down the sink using very large quantities of water if you have a sewer system. If you have a septic system, you must dispose of it in a hazardous waste container with a proper label. The collodion process uses a 99% solution and at this strength it is a poison.
- Hypo clearing agent or perma-wash is used with black and white printing, Van Dyke brown, Kallitypes and sometimes platinum and palladium printing. It is an oxidizer and should be kept away from heat sources and flammable or combustible substances. Check labels to see if it can be flushed down the drain or needs to be stored in a hazardous waste container and picked up.
- Silver nitrate (which is used to make Van Dyke brown prints and collodion) is highly caustic and can cause skin burns. It is also an oxidizer, which means it can supply oxygen to a fire. Clean up any spilled solid silver nitrate with water to liquefy it and dispose of any excess in your silver recovery unit. Never dispose of solid silver nitrate in a wastepaper basket.
- When I am ready to dispose of collodion or ether, I put the bottles outside so that the chemicals evaporate into the air. Be sure to cover the top with saran wrap and poke a hole in it so the ether evaporates and the bottle is covered so no animals can be harmed. If it spills, a fire can be set and it is hard to see the flame. It is very dangerous and can spread out of control easily.
- Dichromates, hydrochloric acid, potassium cyanide, are considered carcinogens. They are also toxic and can kill you if you ingest them, even in small doses. They can be used as intensifiers in a black and white darkroom as well as with gum printing, sometimes cyanotypes, platinum, palladium, and collodion. Thoroughly wash in a sink with running water all utensils that come into contact with these chemicals. Make sure you wear eye protection, gloves and a mask when mixing from the powder form. Hydrochloric acid is corrosive and cyanide can produce toxic cyanide gas if mixed with acids.
- Potassium ferricyanide and iodine are two chemicals used as reducers in the black and white darkroom, used with Van Dyke brown and cyanotype printing as well as collodion. Some sources say to flush with a lot of water down a sewer drain, never a septic, while others say to put it into cat litter, which will neutralize it and then you can dispose of it in the garbage, and a third source says to put it into a hazardous waste container. I would check with your city and state regulations.

Remember that a lot of photographers have lived very, very, long lives! Most of them had no idea about the dangerous nature of darkroom chemicals and never wore gloves or masks, happily eating, smoking and drinking as they worked. You may hear about illnesses photographers have contracted such as Parkinson's disease (Edward Weston, 1886–1958, diagnosed with Parkinson's disease about 1947), but there is no proof that the chemicals caused these issues. Furthermore, there is not a larger population of photographers having these diseases, which can be found in people in all walks of life. This is an old wives tail that needs to stop spreading.

Out of 12 of my own "photo heroes," 5 lived into their nineties and the rest well into their eighties. That is better than my own family tree by far!

To be smart is to be safe. And, I repeat, proper handling should negate any potential risk. Most chemicals are hazardous when ingested in large quantities. The amount you need to ingest is not a splash of something in your mouth, but several grams at a time. However, it is still not OK to mix chemicals in a kitchen. A separate space for chemicals is important to have in any home darkroom. Good ventilation and good habits are very important. Keep working wisely and enjoying the magic of the darkroom.

NOTES

1. https://www.thoughtco.com/introduction-to-noble-metals-608444
2. ilfordphoto.com/health-and-safety?___store=ilford_brochure

01.06 © Basil Tahan. Basil printed this digital image on Revere paper using the Malde-Ware platinum/palladium technique.

01.07 © Jill Enfield. This image is part of a series photographed using a smart phone. A digital negative was made and printed on Revere paper using the Malde-Ware technique.

Two

A GUIDE TO MATERIALS AND TECHNIQUES

02.1 © Jill Enfield. Medellin, Colombia. Hand painted silver gelatin print. This image was photographed using Kodak infrared film, which is unfortunately no longer available.

A lot of the materials needed for alternative processes are similar to those of a regular black -and-white darkroom. However, in this day and age, many people have either never stepped foot in a darkroom, or it has been years since they last saw the inside of one. Even if you do use your darkroom regularly, not everything is the same in the world of historic process. This chapter provides an overview of the materials that will be required, as well as the techniques that should be mastered in becoming an alternative process printer.

This first section spells out what is involved with setting up your darkroom for alternative printing processes. This includes an extensive checklist of the basic equipment. While you may find that you already have some of these supplies, light requirements are totally different for alternative printing than for silver printing; so this section also discusses the pros and cons of the numerous ultraviolet light sources that can be used. Another difference between standard and alternative printing is that with the latter you have tremendous leeway in choosing your base support – whether it be glass, rubber, metal, paper, or wood, etc. Choice of support is one of the biggest factors that determine the look of your end product. Since most alternative process printers elect to work with paper, a large part of this section outlines the many different options that are available, including how to tell them apart and how to make educated decisions about which ones you might want to try.

The second section covers the basic techniques that are shared by many of these processes. Unlike standard silver printing, historical process printing involves preparing your base support, which often includes sizing, sensitizing and drying. While sensitizing chemicals varies from process to process, the basic techniques for preparing and putting these sensitizers on your support remain the same; thus I explain them in depth in this chapter. Every printer has his or her own tried-and-true suggestion for how to apply the sensitizer to the chosen support. I have explained all of the techniques I could think of so that there are no mysteries. Try the ones that interest you, and make your own decision as to which one works best for you. Of course, it goes without saying that experimenting is a key factor in getting across your own vision and style. So once you have the basic techniques under your belt, feel free to play around and use them to their best advantage. One of the main rules of art is to learn the rules, and then learn to break them in your own unique fashion.

02.2 I found spoons in England that have both millimeters and teaspoon measurements, which makes life a little easier for right-brain people.

STOCK UP YOUR DARKROOM

First, you need to set up your darkroom. I used to have a window in my darkroom and I loved it! I put Rubylith on the window so that when the sun shone through, the room was a bright red – bright enough to read. When I developed film, did silver gelatin printing, or worked with liquid emulsion, I had a blackout shade that I pulled down. I also have a 40-watt yellow bug light that I can have on when I need more light, as well as regular safelights. When I was teaching at the Maine Media Workshops, I noticed they had strung up white string lights. Not only was the room bright, but the lights added a really nice festive feel and did not fog sensitized materials. I have since put them up in my darkroom, too. When I am ready to coat a support, I put trays upside down in the sink and cover them with a large sheet of plate glass so that the surface is even and easily cleaned. This also provides a strong straight area that I can coat my support on and not worry about anything that could cause an uneven application of sensitizers.

If you are making a darkroom out of an area not normally used for this purpose, think safety: good ventilation is really, really important. Before I had my NYC apartment darkroom (which, by the way, was only 6 × 9 feet), I used really makeshift spaces. My first two darkrooms were a garage corner and a closet with no water. Now that I do wet-plate collodion, I have portable darkrooms. One is a copy of something that was used in the 1800s, a box with a curtain, and the other is a three-person ice-fishing tent. As long as the ventilation is good, you can work anywhere.

I put my ventilation system together with a fan I bought online called a Vortex Power Fan and a trip to a hardware store to buy duct work. Holes were drilled in the bottom so that the air can move back, up and out. The only downside of my new darkroom is that I no longer have a window. Otherwise, this is the biggest darkroom I have ever had and it is a dream to work in.

The next important step is to make sure you have room for everything. Each sink sits on a base that has shelves underneath, and we hung up as much as possible. Anything that goes on the floor, such as my drying racks and flat files, are on wheels so that they can be moved easily out of the way.

MATERIALS NEEDED

This is an extensive list, and covers everything in this book. Unless you are doing all of the processes, you will not need all of these materials. Each chapter has a section on materials so that you can see what you need for each process you have chosen.

- **Brushes:** People can be very opinionated about what they think is the correct brush to use for coating purposes. There is no "correct" brush. The best advice is to try a few and see which you like best. To begin with, get one brush for each process. The differences in brushes are explained in Sensitizing Techniques.
- **Cheesecloth:** This is used to filter precipitates or mold from your stock solutions, particularly if it is old or is stored in humid conditions. Cheesecloth is also the best way to filter albumen (egg whites).
- **Cleansers:** If you are using glass, plexiglass, wood or metal, as a support, you need to clean the surface before it will accept a sizing solution. Vinegar, isopropyl rubbing alcohol, or stop bath can be used for this purpose. Then the material should be washed with washing soda (sodium carbonate or Bon Ami cleanser) to remove the protective wax or oily surface.
- **Clothesline:** Hanging a clothesline in your darkroom or in another area that is as dust free as possible provides a place to hang film, paper, or fabrics to dry.
- **Clothespins:** These can be used to attach your wet support to the clothesline.
- **Coffee filters:** These come in very handy. They can be used (as an alternative to wax paper) to protect your darkroom scale from contamination when you are measuring your dry chemicals. Coffee filters are also useful for filtering your liquefied chemicals if there is unwanted sediment.

- **Collodion supplies:** I have not listed them all here, because you need a lot of materials for this process. While a lot of collodion materials are used in other processes, I think it makes more sense to contain everything in the collodion chapter (Chapter 9).
- **Contact print frame:** Make sure your contact print frame has a hinged back which allows you to open half the back at a time to check your exposure without disturbing your registration.
- **Cooking pot:** Any type of pot is useful if you plan to make liquid emulsions, dry-plate tintypes and/or emulsion lifts. I place the water-filled pot on top of a hot plate and then place a Pyrex measuring cup inside the pot to hold the emulsion. This contraption acts like a double boiler and heats the emulsion evenly.
- **Cups and bowls:** You'll need to have plenty of paper or plastic cups and ceramic bowls on hand. I use them to hold the correct amount of sensitizer for each process. The size of the container will depend on how much sensitizer you will need for your work session, and the size of your brush. I try to use fewer paper goods as they need to be thrown away after each use. Ceramic bowls and glass containers can easily be washed out with hot water.
- **Darkroom thermometers:** Purchased at a photography store, darkroom thermometers help you make sure your chemicals are at the correct temperatures, whether you are mixing or applying them. All temperature requirements are listed with the chemicals in their respective chapters. Darkroom thermometers usually measure in both Celsius and Fahrenheit.
- **Distilled water:** Tap water often contains too much iron, as well as other possible contaminates. These can cause stains that may not show up until years later. Also, the chlorine in tap water can cause the chemicals to lose their potency. When distilled water was very expensive in Europe, we purchased "battery water" from an auto supply shop. It is the same as distilled water and much cheaper.
- **Drafting tape or blue painters tape:** This is wonderful to have in your darkroom, as it will not stick to your support and rip off the sensitizers. Some people use it to mark off the area of their negative and then put the sensitizer inside the tape. This makes a very clean look without brush marks outside the final image area. Drafting tape looks just like masking tape and can be found in good art-supply stores or online.
- **Drying screens:** These are used to dry photographs. You can buy them from most photography stores or make them yourself by securing fiberglass screening to a wooden frame. When drying prints made with the processes in this book, place prints face-up because all of the emulsions are very soft and will stick to the screens. You will see screen marks on the dried prints.
- **Easel:** Place an easel under the enlarger to hold your paper or support flat and in the proper place during an exposure using an enlarger (liquid emulsion). Depending on the price you want to pay, there are several types from which to choose. The best ones have four blades that can be moved to fit to the correct size of your final image.
- **Enlarger:** An enlarger uses a lens and bellows to project white light through a negative or positive onto paper or another support to make an enlargement. You will need an enlarger, timer and safelights if you want your end product to be larger than your negative when making liquid emulsion prints, dry plate tintypes, and contact wet plate collodions. You do not use an enlarger for any of the other techniques discussed in this book because the sensitizers all need to be exposed using

sunlight or special bulbs that emit ultraviolet light waves.

- **Eyedroppers:** These are required for precise measuring when doing Kallitypes and platinum or palladium printing. They are also used with other processes when using the glass rod method for applying sensitizer to your paper support. There are two things to remember when purchasing eyedroppers. First, it is important that all of your eyedroppers are the same size so that the proportions of your stock solutions are the same when you are mixing. Second, it is important to label your eyedroppers and only use one per solution. You may find it useful to purchase eyedroppers that come with small, brown glass bottles.
- **Glass:** A piece of glass can serve as a flat, smooth surface on which to place your paper while coating it with the various sensitizers. (You can also use a board or piece of plexiglass as a flat surface, as long as it is strong and smooth.) Whatever you use, it should be a few inches larger than the size of your largest sheet of printing paper. You only need one piece of glass, but make sure you keep it clean and chemical-free. If you have a second piece of plate glass, you can also use it as a contact printing frame.
- **Glass rod:** This is used in lieu of a brush for coating your paper or other materials with the sensitizer. You can wash the rod with hot water and reuse it for a number of processes. Using the glass rods takes practice, but many people prefer rods to brushes because they allow you to use about one third less chemistry.
- **Gloves:** Both household latex gloves and nitrile gloves are suitable for darkroom use. I prefer nitrile gloves largely because they are not as clumsy as kitchen-type latex gloves and can be thrown away after a few uses, which cuts down on contamination. If you use reusable gloves, make sure to allocate one pair of gloves for each process which should be clearly marked to avoid confusion and possible contamination.
- **Goggles:** Goggles should be worn whenever you are mixing chemicals to protect your eyes from splashes. They can be purchased at any hardware or art-supply store. It is especially important to wear goggles if you wear contact lenses. This is mentioned in the Safety chapter on p. 5.
- **Graduates:** You can buy graduated beakers and cylinders of different sizes at any darkroom or chemical-supply store, and more recently at home supply stores. If you use glass graduates, as long as you wash them out really well, you can share them across chemicals. Plastic cannot be cleaned well enough, so each chemical should have its own graduate. I mark the (plastic) graduates with a waterproof pen so that I do not mix them up.
- **Grain focuser:** A grain focuser is used to focus a negative when enlarging. The focuser magnifies the actual grain of the film for easier focusing. You only need a grain focuser if you are using an enlarger.
- **Hair dryer:** Most of the processes described in this book entail coating a surface with sensitizer, exposing it, and developing it. The sensitizer must be dry before you place your negative on top of your support and expose it to the ultraviolet light. A hair dryer will help dry the sensitizer quickly, but it needs to have a “cool” setting because the warmer settings can burn the sensitizer. Make sure your hair dryer does not emit light when turned on, because this can cause your sensitizer to fog. You can test it by turning off all of the lights and turning your hair dryer on. Look into the hair dryer to see if you see a dim, white light. If you do, get another hair dryer.

- **Hot plate:** This is a useful item in general, but it is crucial if you are going to be using liquid emulsion or making dry plate tintypes.
- **Hot plate/magnetic stirrer combination unit:** This is very nice to have. It not only stirs the chemistry for you, but can keep it warm as well.
- **Isopropyl rubbing alcohol:** This is available at pharmacies and grocery stores and is used to clean your glass or plexiglass surface before applying your sensitizer.
- **Light-tight containers:** These can be used to liquefy small amounts of liquid emulsion. Some people use opaque film canisters (if you can still find them!) for this purpose.
- **Mask:** A mask for organic chemicals is needed to ensure your safety when mixing your solutions. You can buy one at most hardware or art-supply stores. (For more information, look in Chapter 1, p. 5)
- **Mixing rod:** I use a glass rod for mixing the chemicals from powder into the working, liquid solutions. If it is washed well with hot water after each use, one rod should be sufficient for all mixing.
- **Negative sleeves:** You will need larger plastic sleeves to store and protect your enlarged negatives. Since I am using digital negatives with a shorter usage life than film, I don't worry about the sleeves being archival. I buy the cheaper page protectors at the office supply store.
- **Painter's masking tape:** This blue tape is made to remove easily from any surface and will not leave a sticky residue. I find it especially useful when I am making tiles and don't use an easel. I tape my enlarger's baseboard before I expose an image onto a tile, so that I can position the support precisely. I also use it if I want to be more precise with my coating when using a brush. I tape the area where I want to coat the sensitizer, dry the sensitizer and take the tape off before exposing it.
- **Paper safe:** A paper safe is a large, light-tight black box that is great for protecting coated supports. I tend to coat a lot of support materials when I am working with liquid emulsion, and then use a paper safe to store the sensitized materials for several days at a time. Most camera stores sell paper safes in different sizes. Larger supports can be stored in heavy-duty black garbage bags.
- **Paper towels:** It is always a good idea to keep paper towels in your darkroom for quick clean-ups. Be sure to get high quality towels to keep lint down. Blue car towels are great and are pretty cheap.
- **Pencils:** Stock your darkroom with plenty of #2 pencils. These are essential for marking the back of your support. For instance, when you cut watercolor paper down to a usable size, you may also cut off the original watermarks. The watermarks tell you which side is the printable side and which is the back side. Marking the back of the paper is an easy way for you to know which is the front side for coating. It is also good to get into the habit of writing down the type of paper, and details about the exposure, toner or any other information you find necessary in order to repeat a successful process.
- **Plastic spoons:** These are good to have on hand when measuring your chemicals. I use them to move chemicals on and off the scales. Plastic spoons contain no metal and are disposable, so you need not worry about contamination.
- **Pyrex measuring cup**: This is useful for making the "double boiler" described above, as well as for measuring darkroom liquids such as distilled water.
- **Ruler:** I rarely make a print that is as large as a full sheet of watercolor paper (i.e.,

about 22 × 30"), so a ruler is necessary to measure the paper to the desired size.

- **Safelights:** The size of your darkroom will determine how many safelights you will need. Safelights allow you to see in the darkroom without exposing conventional photographic paper to white light (regular room light), which causes it to fog. For most alternative processes you can use a safelight that has been equipped with a red or amber filter, or you can use a 40-watt, household bulb, in a lamp or ceiling fixture. Either one will illuminate the room without fogging your materials.
- **Scale:** As you will be using a scale to measure your chemicals, make sure to select one that displays weight in very small increments such as a few grams. Food scales work well, as do scales from chemical suppliers.
- **Scissors:** Good-quality scissors are essential in any darkroom.
- **Scotch Magic 811 removable tape:** This is a transparent tape that is great for holding negatives down for all the contact processes featured in this book. The tape will not show on the final print and it will not rip off sensitizers or ruin your negatives. It has both low adhesion and low acidity, and will not yellow over the years. It also can be written on with pen, pencil, or markers, and is more readily available than drafting tape.
- **Squeegee:** A darkroom squeegee (or windshield wiper) will help you remove excess water or sizing from your support material. Your squeegee should be larger than the support you are using.
- **Storage bottles:** The chemicals used for most of the techniques discussed in this book react adversely to metal. Therefore it is important to use dark-brown plastic or glass storage bottles with plastic (not metal) caps when storing chemicals. You will also need a separate bottle for each chemical. All of the necessary chemicals are listed in each chapter, as are the particulars for how many (and what size) storage bottles are needed.
- **Straightedge:** These are twice as strong as rulers and are wonderful to use for tearing paper. There are two different kinds of straightedges: one gives you a slightly torn edge, and the other creates an effect (called a deckled edge) that simulates a factory-made edge.
- **Syringes:** Small syringes (i.e., ones that hold 2ml of liquid) work well when using the rod method for applying sensitizer to the supports. The syringes hold the sensitizer and allow you to gently release it onto the rod before coating.
- **Timers:** You will need at least two timers: one for either the enlarger or the ultraviolet light source to time the exposure, and the other to time how long the coated support material is in each tray, as you develop, fix and wash.
- **Tongs:** These usually come in packs of three at photography stores, and should be used to move your paper in and out of the trays. You will need one tong per tray. Specific tray requirements are listed within each chapter. Bamboo tongs do not scratch the emulsion as much as plastic or stainless steel tongs. If you don't like using tongs, then make sure you have a lot of gloves on hand. Putting your bare hands in the trays is not recommended for your health and safety!
- **Towels:** Keep a few darkroom towels handy at all times. These help to keep your hands clean and dry, especially when you're working with liquids. If you opt for paper towels, make sure to spend the extra money to buy soft ones, as the cheap ones can scratch delicate surfaces. I also use diapers and torn-up flannel baby blankets to clean glass.

- **Trays:** All processes in this book require plastic trays. You will need to designate trays for each photographic process you undertake, noting that you need a separate tray for each chemical within each process. Each chapter notes how many trays you need for that particular technique. I label all of my trays with both the name of the technique and the name of the chemical so that I do not mix them up. Mixing up trays causes contamination.
- **Wax paper:** It is necessary to measure your dry chemicals. Because you will have only one darkroom scale (instead of a scale for each process), you should use wax paper, or coffee filters to protect the scale from contamination. The chemicals don't stick to wax paper so you are sure to get a proper weight.

LIGHT SOURCES

Because most of the historical processes involve using sensitizers that are activated by ultraviolet light, choosing the proper light source is an important factor when setting up your work area. If you live in a sunny location, you may choose to use sunlight (i.e., natural ultraviolet light) and not have an artificial light source in your studio. However, sunlight is not dependable. Rain or snow can quickly end your plans for a full day of printing. It is also nearly impossible to repeat printing conditions exactly, since the time of day, time of year, and weather conditions affect the strength and quality of the ultraviolet rays emitted. However, once you work with a process, over time, you should be able to tell with an experienced eye when your exposure is complete.

You can make your own ultraviolet exposure unit (also called a UV light box) using ballasts, a fan, and wood. Or, if you are like me, you can buy one ready-made. When I first started doing historical processes, I tried all of the different bulbs.

You should never look directly at any ultraviolet light source because it can damage your eyes. Wear protective eyewear that will block out UV A & B.

Black-light and aqua bulbs are both excellent options. Both emit the same amount of ultraviolet light, and work well with alternative photographic processes. The difference lies in price. For me, the black-light bulbs win out. Nevertheless, in the spirit of experimentation, I have listed all of the UV options. Jon Edwards now makes high output UV light boxes, which use bulbs that are twice as fast as the other bulbs listed here. Jon also has vacuum frame boxes that negate the need for a contact print frame.

- **Black-light bulbs:** These are often used to illuminate psychedelic posters or bug zappers. Many alternative-process photographers use these bulbs, which are referred to as either "ultraviolet fluorescent bulbs" or simply "UV bulbs." They can be bought at most bulb-supply stores, but make sure you buy "BL" (black light) and not "BLB" (black-light blue) bulbs. BL bulbs (F15T8/BL) have enough ultraviolet light to require relatively short exposures, whereas BLB bulbs emit less ultraviolet light and are also expensive. You can also get high output bulbs, which are even faster than BL bulbs.
- **Aqua bulbs:** Used in fish aquariums and reptile tanks, these emit adequate ultraviolet light. A lot of historic-process photographers like these bulbs, but they are less powerful than the BL bulbs.
- **Mercury vapor lamps:** These bulbs do not get hot, yet they emit a high amount of ultraviolet light, in addition to having a high wattage. Consequently, they can

02.3 © Pete Kolonia. This box will cover an 11 × 14" image and has a fan to keep the high-output bulbs cool. It was made by Jon Edwards (www.eepjon.com). Jon makes all kinds of equipment for darkrooms and is wonderful to work with.

02.4 © Pete Kolonia. The underside of the UV light box. The distance between each bulb is important to insure an even light

expose your images very quickly. However, mercury vapor lamps are also considerably more expensive than the alternatives. Printmakers typically use these lamps in vacuum frames.

- **Sunlamps:** While some people use sunlamps for alternative processes, I have found that they overheat and can be dangerous. I don't recommend them.

PAPER

Because there are so many kinds available, choosing paper can be daunting. However, this decision is critical because paper not

02.5 A home-made light box at Penland School of Craft. They also have several of Jon's UV boxes, but these were made a while ago and are still useful for larger work.

02.6 This light box is really too deep and we had to put our contact printers much closer to the lights to get good exposures. The aluminum foil helps to make the light brighter.

only plays an important role in the appearance of your final image, but also affects its permanence. The four major factors to consider when selecting paper are color, weight, surface, and pH.

The color of the paper will show through the highlights of your image, so the difference between a bright white or a warm white paper will affect the final product. Some papers come marbleized or in an array of colors. The type of dyes used will determine how archival the paper is. This information is available from the manufacturer, and is important to know if you are concerned with the life and the look of your images.

A paper's pH balance, or level of acidity, directly affects how many years the image will last. If a paper is acid free, it usually means that it has a basic pH (which is about 7). Most commercial printmaking paper produced today is acid-free. Sometimes, the chemicals actually need acid added to go into the surface of the paper evenly. You will be able to tell if you need to do this because you will see how uneven the coating is on the paper.

A 140lb paper is lighter than a 300lb paper, and therefore not as thick. Both will do well in all of the wet-tray processes, but it is worth noting that thinner papers sometimes curl. This can be prevented by attaching the paper to a board, or pressing the paper on a piece of glass during the developing process to keep it from curling.

Some mills use the measurement Gr/M^2, which means weight in grams of one square meter of paper (e.g., a 250 Gr/M^2 paper is equal to about a 140lb paper). After paper is made, it is either left alone, or pressed using a cold-press method or a hot-press method. Cold-press papers have been put through rollers with no heat, and, therefore, have texture. Hot-press papers have been pressed with heat, and, therefore, are generally smooth. Rough-textured papers have not been pressed at all. The finer the texture of your paper, the sharper your image will be.

Papers usually have a "right" side and a "wrong" side. If you are trying to make editions of a particular image, you will need to pay attention to this fact. Otherwise your prints will be inconsistent. Most papers have a watermark that will read correctly on the "right" side. Since most papers come in large sheets, you will likely want to cut them down into smaller pieces before you start printing. Before you start cutting, take note of the watermark. Then, using a pencil, make a small mark on the "wrong" side of each piece as you cut the paper down to its required size. This way, when you are ready to print, you will be able to consistently expose the "right" side of the paper. If you are sizing your paper, you don't have to worry about wrong and right side. I would still mark the paper so you know what type of paper it is.

Some paper mills have been around for hundreds of years. During a quick look through a paper catalog, I noticed a mill in Japan that has been in operation since about 702, and another in France, in business since 1326. Papers are listed by the mill name, and then the mill gives each paper another name and weight (either in pounds or grams). Your art-supply store will list which paper weights they carry and their color availability. Of course, you can purchase paper online, but because the feel of paper is very important to most artists, I suggest trying to see and feel a paper before purchasing it.

The choice of paper for these processes is virtually endless. Personally I have found my favorites by spending time at art-supply stores and touching everything available to determine which papers feel good. During each trip I would buy a few different kinds of paper, making sure I could either read the watermark applied by the manufacturer, or marking the back of the paper with a pencil before having it packed up for me. Once I got home, I would cut the paper down to size and try it out with different processes.

Papers are always changing due to water or pulp supplies, so if you are making an edition, I suggest you buy enough paper to get you through your project. If you want to learn more about paper, I would suggest getting some really good catalogs from your favorite paper suppliers. They have great information and history about various mills and papers that you probably won't find elsewhere.

02.7 © Baba Barnett. The Hake brush in this photo works fine, but the bristles are soft and when it gets too wet, it is harder to control. I prefer synthetic bristle brushes.

02.8 © Pete Kolonia. Using a syringe makes it easy to place the chemicals along the entire length of the glass rod. Using a glass rod instead of a brush allows you to use much less chemistry.

LEARNING THE BASIC TECHNIQUES

As a photographer, you make choices all the time. Deciding what kind of camera and lens to use; whether to employ traditional film or

02.9 © Baba Barnett. Once the rod has the chemicals covering it, you push the chemicals back and forth until the paper is coated well. If there is left over chemistry, use a paper towel to soak it up, otherwise the extra thick chemistry will flack off during development.

digital process; whether you want to produce your image in a darkroom or generate digital printouts; even the details of how to exhibit your work. All of these choices constitute facets of your unique style and technique. The choices involved with historical processes are similar to those involved with regular black-and-white and color processes, but they are even more pronounced. This is because for each alternative process you choose the base support (whether it be paper, glass or something entirely different), plus the type of sizing, sensitizer, coloring method, etc. This list goes on, and the options are seemingly infinite.

Each choice not only has a specific visual consequence, it also affects the other choices you make. What sort of "look" will a given sensitizer lend to a given support? The effect you get will depend on the support you have chosen. The technique you use to apply the sizing (or whether you choose to use sizing at all), and how you apply the sizing to your support makes a difference. So when you're thinking about coating techniques, and wondering whether you should use a Hake brush or a glass rod to apply your sensitizer, you should also be thinking about the other decisions that you have made (and are about to make) to create your image.

As always, I recommend that you experiment with all of the different techniques. This enables you to perfect your favorites, and to know what possibilities await the next time you are faced with a creative decision.

Many of the processes can be combined to create new, different, and unusual visual effects and color combinations (see Multiple Printing in Chapter 14).

Though my general tendency is not to enforce too many "rules" with any process, here are a few tips that will be helpful as you start to become familiar with the working methods of alternative photographic techniques:

- When washing prints, never put too many items in a tray at one time because they scratch easily when wet.
- Never let water run directly onto prints, because they are easily damaged.
- When transferring your print from one chemical bath to another, allow it to drain as much as possible before submerging it in the next bath. This will reduce contamination.
- Always make extra prints and save your mistakes (light or dark prints) so you will have plenty with which to experiment.
- If you are making multiple exposures on the same print, preshrink and size the paper before you start to work, or you will have trouble aligning your negatives as you put one exposure on top of another. I only preshrink and size the paper when I make multiple exposures; however, some people do it as a matter of habit with each print. Again, this is a matter of preference.
- Expose your paper soon after you have coated it with sensitizer and dried it. Most of the sensitizers lose their intensity as they sit around. However, paper that has been preshrunk and/or sized, but not sensitized, can be stored indefinitely. I write on the back of the paper what steps have been completed.
- You can cut masks for your negatives with Rubylith film to control your exposures. Rubylith is a red acetate that you can use to block light locally for each exposure.

PREPARING AND CLEANING GLASS AND OTHER SUPPORTS

Glass (plexi, egg shells, metal, etc.) should be prepared and cleaned before subbing and printing. Wear gloves, as the oils from your fingers will compromise the complete cleaning of your surface.

Whiting, which is calcium carbonate, and more commonly known as chalk, is used to clean surfaces. It is non-abrasive and biodegradable. You can get it online (see Sources), but if you don't have any and want to get started, you can also use powdered laundry or dishwasher detergent. Bon-Ami is a non-abrasive cleanser found in a lot of hardware and grocery stores. It has no bleach, is cheap and works well. Run the dirty materials under hot water. Do you see how the water beads up or does not run over certain areas? Once the surface is cleaned, water will run down the surface like a "sheet" or waterfall.

If you don't want to waste water, you can use the following: Using any kind of container (I use a condiment dispenser with a pointy top), combine the following (keep shaking the bottle as you combine them):

50% calcium carbonate
50% rubbing alcohol

Squeeze the mixture onto your surface and rub thoroughly with any flannel material. Then buff it with cotton material. Breathe on the surface. If your breath clears quickly, the surface is clean; if not, keep buffing! Make sure to get the edges of the glass clean, or peeling will occur.

ACIDIFYING PAPERS

If you really want to use buffered papers, you can acidify them first by soaking the paper in a 1% citric acid solution until the paper is well soaked. Air dry the paper and then use as usual.

SIZING FORMULAS

The terms "sizing" and "subbing" are interchangeable, and mean the same thing. However, when paper or canvas is the base support, "sizing" is the term most often used. When glass or ceramic is the base, "subbing" (which is short for "substratum") is most often used.

Early sizing solutions were made from animal glue, gelatin (also an animal product) or egg whites (albumen). If you do not want to use animal products, you can use any type of starch or synthetic material. Sizing is applied to the base support to control the level of absorption of the sensitizer, and to make the support moisture-resistant. Some papers come with an internal sizing, which means that the sizing solution is added to the wet pulp before forming the finished sheet of paper. Other papers are tub sized, which means the paper is passed through a vat of sizing solution, usually gelatin, after the paper-making process is completed. Still other papers are sized using both methods, and some papers aren't sized at all.

Despite being commercially sized, a lot of watercolor papers are still too absorbent, so home sizing might be necessary. Sizing is also necessary when using other types of materials, such as glass, plastic, metal or wood. For the sake of consistency I use the term "base support" to refer to the material on which you put the sizing and sensitizers, unless the technique differs.

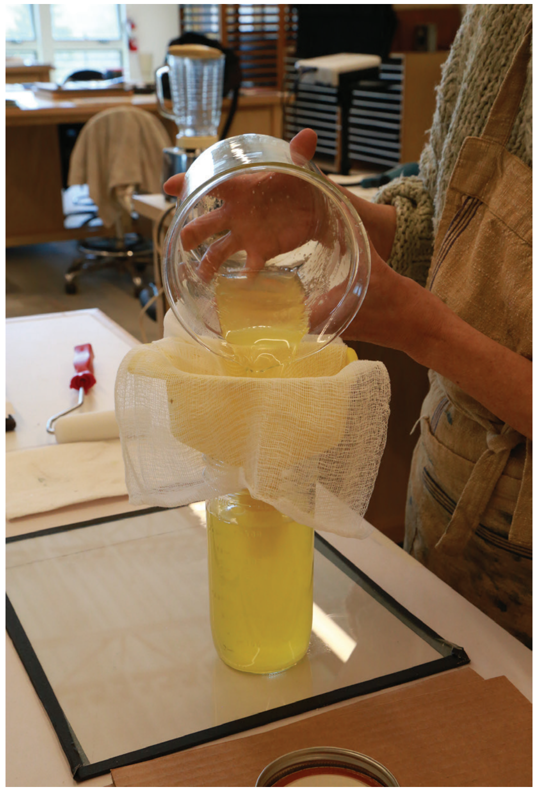
Whether or not you size your paper or fabric is a matter of choice. Some sources say that you must size before printing, others recommend it for certain papers and fabrics only. Different sizings can affect not only the color of a final print but also how smooth or sharp the image looks. If you are printing on fabric or canvas, always wash out the manufacturer's sizing in hot water (this may take washing the material two or three times), or you will get uneven absorption.

You can find many different sizing solutions in books and online. I have included what I feel are good, basic, all-purpose recipes. A word of caution: Gelatin tends to form air bubbles if you over-mix the solution. If this happens, try adding some defoamer, a product used to keep air bubbles to a minimum in washing machines. You used to be able to find defoamer in small quantities at most photography stores; however, now you have to buy it online and in larger quantities. Use one drop per 4oz of gelatin sizing before applying the sizing to your base support. As with the other aspects of these processes, I advise you to experiment – not just with the different recipes, but also with whether or not you want to size your support at all.

EGG-WHITE SIZE (ALBUMEN)

Fresh eggs work best, but you can also use containers of egg whites so that you can skip the separation step and not have to deal with

02.10 © Lynn Bierbaum. Once you beat the egg white and distilled water into a froth, it needs to sit to liquefy. You then can remove the foam with a spoon before filtering.



02.11 © Lynn Bierbaum. Filter the albumen through damp cheesecloth. This will keep for many months in a refrigerator. Even after it starts to smell.

the leftover egg yolks. You can also get powdered albumen, which is used in cooking and wine making. I put both recipes below. You can use albumen for sizing of paper as well as coating a piece of glass that you want to use for collodion.

Materials needed

1 egg
16 oz distilled water

To mix

1. Separate the egg white and decide what you want to do with the yolk (there are a lot of recipes that call for egg yolks).
2. Make sure that there is no yolk, shells, blood, or the white stringy things in with the egg whites.
3. In a large bowl or blender, beat the white until well mixed, but not stiff. Add the water and stir the mixture well.
4. Allow the mixture to sit and liquefy, with the foam going to the top.
5. Spoon off the foam.
6. Filter the mixture through cheesecloth; pour it into a clean jar. It is now ready for use.

Powdered albumen

Depending on where you live, this might be cheaper than fresh eggs and you can get them online if you can't find them in the grocery store.

3 teaspoons powdered albumen
1 liter distilled water

To mix

1. Mix to a froth, cover, and let sit overnight in the refrigerator.
2. Spoon off the foam
3. Filter the mixture through cheesecloth; pour it into a clean jar. It is now ready for use.

02.12 © Baba Barnett. In order to float paper in albumen, you need to fold the edges of the paper back to make a "boat." This way you have something to grab onto when lifting the paper up, out of the tray.

02.13 © Baba Barnett. Place the paper down so that the albumen does not get onto the back of the paper. You can pop any air bubbles with a toothpick.

Knox gelatin size

This size is easy to make, particularly because Knox gelatin is readily found in most grocery stores.

Materials needed

7 g (1 package) unflavored Knox gelatin
250 ml (1 cup) cool, distilled water

To mix

1. Place the gelatin in a pot and add the water.
2. Books suggest that you let the mixture stand until the gelatin "blooms" (swells). I find that this makes it harder to mix.
3. Stirring constantly, heat the mixture to about 140°F until the gelatin is dissolved (approximately 1–2 minutes).
4. Cool the solution to lukewarm; it is then ready for use.
5. You can re-warm this solution and discard it when it starts to smell.

GELATIN AND HARDENER SIZE

This recipe is adapted from the book *Silver Gelatin* by Martin Reed and Sarah Jones. Reed and Jones recommend using this particular sizing when making liquid emulsions. I have found that when using glass, metal or any other slippery surface, this recipe works well because of the added hardener (chrome alum). If you are using this with liquid emulsion, you need three thin coats. Dry in between with a hair dryer on the cool setting. The last coat should dry for **at least 24 hours**.

Materials needed

3 glass containers
mixing rod or spoons

125 ml distilled water
0.5 g chrome alum
0.5 g photo-grade gelatin, hard

Make a 2% chrome alum mixture

1. Pour 100ml of the distilled water into a pot and heat it to 100°F.

2. Transfer 25ml of the hot water to a small glass container. Add the chrome alum and stir until it is well dissolved, making a 2% solution.
3. Set aside.

Making the gelatin

In a second glass container, mix your gelatin solution by adding the remaining 75 ml of hot water to the gelatin.

Mixing them together

1. In a third glass container, mix 2ml of the 2% chrome alum solution into the gelatin. (The 2% chrome alum solution has a shelf life of only a few days. So unless you are going to make another batch of size immediately, discard the remaining solution.)
2. Add enough room-temperature distilled water to the gelatin/chrome alum container to equal 100ml.
3. The solution is now ready for use.

ARROWROOT STARCH SIZE

Arrowroot starch size generates a slightly unpleasant odor as it is being made, but it goes away as it dries on the base support. This is the vegan/vegetarian size!

Materials needed

1 liter distilled water
20 g arrowroot starch

To mix

1. Pour the distilled water into a pot and heat it to 100°F.
2. Place the starch in a 1-liter saucepan.
3. Add about 20 ml of the distilled water and keep it on low heat, stirring until the mixture is a thick cream. Mix until no lumps remain.
4. Add the remaining water, raise the heat and stir constantly until the mixture boils.
5. Boil the mixture for five minutes, then remove it from the heat and allow it to cool to room temperature.
6. Skim off any scum. Pour only the clear solution into a storage container.

AGAR SIZE

Agar (or agar agar) is also known as KANTEN. It comes from South East Asian seaweed and is for scientific purposes, for paper sizing, and as a clarifying agent in brewing. It can also be used as a laxative as it is 80% fiber, and as an appetite suppressant. It is a good vegetarian gelatin substitute. Agar comes in off white and colored. Make sure you get the off-white product.

For photography, a 2% solution is what is normally used. It is not as easy to mix up as the other sizings because you need to keep both the paper and the solution warm while using.

Materials needed

20 g agar (off white, not colored agar)
1 liter distilled water
.5% gelatin (optional)

To mix

1. Add the agar to the water and bring it to a boil.
2. Simmer for several minutes, until the agar has dissolved. Stir occasionally.
3. If you are using a gelatin print, then you need to add gelatin to the agar by adding gelatin to cool water and allowing it to swell (several minutes)
4. When the agar solution cools to 115°F, you can add the gelatin and dissolve it in the agar.

To use

If you are soaking your paper, a fish tank heater works well to keep the solution warm. If you are using a brush, then an old fashioned buffet warmer will keep the paper warm while you are coating. The agar solution needs to be kept warm as well.

If you are using a brush, coat horizontally, then vertically, then diagonally to make sure you have a very good coat.

MORE VEGAN/VEGETARIAN FRIENDLY CHOICES

1. If using glass, metal or plexi with liquid emulsion, a few coats of polyurethane work better than anything else (spray or liquid, but the spray is easier). Gloss polyurethane is better than matte and/or semigloss because the latter two have wax in their formulas. In a pinch, try any of them.
2. Spray starch (for ironing) can be substituted if you did not size enough base support and you want to do more printing.
3. Elmer's glue diluted with water 1:1.
4. Gesso diluted 1:1 with water.

Some artists use formalin or formaldehyde with their sizing, but I do not suggest this for health reasons. If there is a really important reason to use a toxic chemical, then by all means use it with care. But for sizing, there is just not a good enough reason to go there at all.

SIZING TECHNIQUES

Deciding whether or not to size your base support is an important part of the photographic process. If sizing is required and done properly, any unexposed sensitizer will wash easily out of the paper fibers, and the image will sit on the support's surface and have good contrast and sharpness. Some base supports must be sized before they can be sensitized, but others don't need it. Sometimes you can only know by testing. For example, one of my students had a great-looking piece of rubber that was very smooth, so, of course, we thought it would need to be sized. But after sizing the rubber, the liquid emulsion would not stick. It cracked, and the image did not look sharp. Everything that could go wrong did! Instead of giving up, we decided to sensitize the rubber without sizing it. And it worked beautifully! But the reverse can also be true. I once brought home some beautiful papers from Guatemala. Some of the papers made wonderful images and others sucked the sensitizers completely into the fibers. After sizing, the previously unsuccessful papers worked, but there was no way to know in advance because they were all handmade papers and felt pretty similar. The moral of the story is that if you like a material, try everything. Eventually you'll find a way to make it work for you.

If you are using glass, plexiglass, eggs, or metal as supports, you will need to clean off any oily or waxy protective surface before these materials will accept a sizing solution. A number of cleansers can be used, including vinegar, rubbing alcohol, or stop bath. After one of these solutions is used, the surface must then be washed with hot water and washing soda, as outlined below in the Pour Method.

Regardless of which method you use, you should allow the sizing to dry for at least four hours. The best-case scenario is to let the support dry overnight. If done correctly, once a support is sized, you should be able to store it indefinitely and use it as needed.

POUR METHOD

This method is primarily used for eggs, glass, and plexiglass. It is important to adequately prepare your support before you apply the sizing. If it is not prepared properly, then the emulsion will have nothing to adhere to and will slide right off. Below are instructions for preparing and sizing your support.

1. Using washing soda, make a strong solution with hot water.

2. Scrub the support with the solution and then rinse it with warm tap water until the water no longer beads up on the support.
3. Dry the support well.
4. Pour the sizing across the support. Drain off the excess sizing and allow the support to dry (or help it along by using a hair dryer).
5. Do a second coat and allow this to dry for at least four hours. It will then be ready to be coated with sensitizer.

TRAY METHOD

In general, the tray method is favored for paper, because it creates a more even coating and fewer air bubbles than the brush method. Paper is much less predictable than glass – sometimes it needs to be sized, but not always. Again, experimentation is the key. There are many ways to apply sizing to paper and other base supports. Problems can occur if the sizing is not put onto your support in the correct way, so it is important to pay close attention as you are coating. If too much sizing is used, the sensitizer will not adhere properly; if too little sizing is applied, the sensitizer can sink too far into the fibers and will not wash out properly, making your image appear flat and out of focus.

Whether you are using arrowroot starch or gelatin with or without chrome alum (hardener), the idea is the same. The sizing should be warm when you apply it, and you want a thin, even coat. While many people have their favorite way of applying sizing, there is no perfect method. Try one and if it works for you, stick to it. If you are not happy with the results, try another technique. Gelatin or arrowroot starch can be covered and stored in the refrigerator for a few days and can be liquefied by reheating. Repeated heating (or prolonged heating) will weaken the sizing solution, so keep this procedure down to one or two times, and then discard the remaining size. As with all of the chemical stages of historical photographic processes, it is important to use a tray that is dedicated to sizing only.

1. Warm the tray by rinsing it with warm water for a few minutes, and then wipe the excess water out. Placing the tray in a larger tray filled with hot water (which creates a double boiler) is also a good way to keep the size warm. You can also use a fish tank heater in the bottom tray to keep the water warm, or you can keep changing the water as it cools.
2. Pour the warm size into the warmed tray, and then place each sheet of paper (or other base support) into the solution, one at a time.
3. Leaf through the supports, pulling one from the bottom of the pile and placing it on top. Turn each support over at least once to be sure that both sides are covered and there are no air bubbles sticking to the surface. Wipe off any air bubbles you see.
4. Hold the paper up to the light, and if you can see areas that have different densities, the paper has not soaked up enough size, and you will not be able to get an even coating of sensitizer. Place it back into the tray for a little while longer so it can soak through.
5. After about ten minutes, carefully draw the front side of each sheet over the edge of the tray to remove excess size and air bubbles.
6. Place the backside of the support on a flat surface (such as plate glass) and squeegee the front side gently with a plastic rod. It is important to squeegee only the front side because as you lift the support up from the flat surface, some gelatin will lift off the back unevenly making it uneven and unusable.
7. If you are sizing paper or something that can be hung, hang the sheets by two corners to dry. Use clothespins, so the support is suspended straight down. Do not stack the supports together, as they will lift off the sizing unevenly from each other. Be careful when handling damp sheets because buckling will cause a permanent wrinkle in the paper.

8. Once the sheets are dry, they can be stacked and used as needed. There is no shelf life; they will last forever. I always mark the back so I don't mix up unsized and sized sheets.

BRUSH METHOD

In general, the brush method is preferred if you're working with glass, plexiglass, wood, tile, or rubber, though it can generate interesting effects with paper, too. The basic factors that were discussed in the introduction to the tray method also apply to the brush method. The major differences between these two techniques are the effects that are created – the tray method creates a more even surface, while the brush method creates a more textured surface. Prepare and store your size as described above; then apply it using the following process.

1. If possible, tape the base support to a piece of plate glass so you have a smooth surface on which to work.
2. Lightly dampen a disposable foam brush or a paint roller with distilled water.
3. Dip the brush into the solution and apply the size to the surface by brushing first across, and then up and down until the base support is completely wet.
4. Allow the support to dry by hanging it (as described above in the tray method section) or by keeping it taped to the glass.
5. If you are sizing a heavy piece of wood or tile, allow it to sit until it is completely dry. Do not stack it for at least 24 hours.

SENSITIZING TECHNIQUES

Hand-coating your paper with sensitizers is a fundamental part of historical photo processes. There are many different coating techniques. The most common coating techniques are:

1. Using a tray: (floating or submerging)
2. Using a brush
3. Using a glass rod.

Everyone has his or her favorite way of coating. Your coating technique will become a trademark of sorts, as each technique has a slightly different look.

TRAY METHOD

This method can be used for a range of (flat) support materials, including paper, fabric, glass, and plexiglass. Using a tray to coat your support requires the most sensitizer solution of the three techniques. The support material will be fully covered with sensitizer and the look will be very even. For example, if you were doing this technique when making a cyanotype on a white sheet of paper, the paper would look blue (where there was no negative) instead of white.

These are the basic steps for submerging your support in a tray:

Wearing gloves …

1. Pour your sensitizer into a plastic, flat-bottomed tray.
2. Carefully place your support into the sensitizer and slowly rock the tray back and forth, making sure that the support is totally submerged.
3. Agitate the tray continuously for about two minutes.
4. Wearing gloves, lift the support out of the tray and let the excess drain off each of the four corners.
5. If you are working with fabric, submerge the material into a tray (or a bucket if your support is large) filled with the sensitizing solution. While this uses up a lot more sensitizer, it will evenly coat the fabric on both sides. Squeeze out the excess sensitizer before hanging the fabric so that it not only will dry faster, but you will also waste less sensitizer.

These are the basic steps for floating your support in a tray:

1. Pour your sensitizer into a plastic, flat-bottomed tray.
2. Fold your paper about half an inch in from the edge on two sides. This will give you a "grip" with which to hold the paper flat in the liquid.
3. Wearing gloves, hold the paper just above the solution and drop the paper so that it floats on the surface. Start with the center and then slowly drop the paper down, all the while holding onto the edges.
4. Let the paper sit on the surface of the sensitizer for about three minutes. Try to gently move any air bubbles out from under the paper with your finger; otherwise there will be a spot on the paper where the air bubble blocked the chemicals from soaking into the support.
5. Gently lift the support out of the tray and lie it flat in a darkened room. Alternately you can dry it with a hair dryer on the cool setting.

The first few steps are the same for using a glass rod or a brush:

1. Your support should be larger than your image area. The margin serves both as a border and an area to handle the paper without contaminating the image area.
2. Using drafting tape, adhere your support to a piece of glass or other flat surface.
3. With a pencil, lightly mark the support where you will place your negative. This will be considered your "image area."

GLASS ROD METHOD

This method is best suited for paper. Working with a rod uses the least amount of sensitizer of the three processes described here, and therefore is a favorite among platinum printers. You can use about 5% less sensitizer on your image area than you would with a brush. Also, once you have practiced and become proficient, the glass rod method ensures an even, uniform coating, while the brush method occasionally produces thinner areas (where the sensitizer wasn't adequately applied). If you like the look of brush strokes at the edges of your image area, you can add them when you are finished coating by taking a brush and "painting" out from each edge.

You can purchase glass rods at any of the alternative chemical stores listed in Sources. Essentially you need a straight glass rod with no flaws (no bumps in the glass). It also does not matter how you hold onto the rod as long as it is comfortable in your hands. While it takes practice to learn to coat well with a rod, once you learn, you will never forget how to do it. The length of the rod determines the width of the coated area.

These are the basic steps for applying sensitizer with a glass rod:

1. Clean the rod with a cotton rag or lint-less tissue before starting the coating process.
2. Holding the rod with one hand, position it just above the image area. Fill a syringe with sensitizer, and then gently squeeze the syringe plunger, allowing the liquid to flow out onto the support all along the top of the image area. You can also use a shot glass, or anything that makes it easy for you to coat the length of the rod area.
3. With light pressure, draw the rod down into the solution, allowing the sensitizer to adhere to the rod (this may take a few seconds). Then, using very light pressure, steadily draw the wet (solution covered) rod down to the end of your image area.
4. When you get to the bottom, quickly run the rod back up to the top of the image area.
5. Repeat this down-and-up motion four or five times to make sure you have an even coating, and that all the sensitizer you first put down on your support has been absorbed. The first two passes should be made quickly to ensure complete coverage, and the last two or three passes

should be made more slowly to allow maximum absorption.

6. At the end of the final pass, lift the rod slowly off the paper and wipe off any excess sensitizer from the support with a lint-less paper towel or blotting paper.

BRUSH METHOD

This method is frequently used for paper and fabric, but it can also be used for most other possible supports, including rubber, tile, wood, metal, and glass or plexiglass. Using the brush technique to coat your paper wastes a bit of sensitizer, but it creates a distinctive "painterly" look. Photographers who use this technique are generally very fussy about their brushes; many find that each process warrants its own type of brush. Even if you don't use a different kind of brush for each process, you should use different brushes to avoid contamination. Make sure to label your brushes well so you do not mix them up. Even if you think you have washed the brushes well, mixing two different types of sensitizer can contaminate your image. Always wash your brush out thoroughly with hot water between uses. I have listed commonly used brushes:

- **Bristle brushes:** It is best not to use a brush with a metal ferrule for alternative processes, otherwise the brush can become contaminated as the metal starts to oxidize when wet over a period of time, and leak down the bristles. To block the metal, coat it two or three times with nail polish. Let the polish dry completely before using the brush. Also, use super glue to glue the bristles all the way around the base. Bristles tend to fall off and stick to the sensitizers; even the best brushes have loose bristles.
- **Foam paintbrushes:** Disposable foam paintbrushes come in a range of sizes from 0.25" to 2" wide. They are cheap, and readily available at hardware stores. Make sure to use foam brushes with wooden handles, as the plastic-handled ones do not have as much foam and can easily scratch your support. I have also noticed a difference in the quality of foam in the past few years. Lower quality foam is not as soft, does not absorb as well, and doesn't last as long, so you might want to try a brush or two out before settling on these.
- **Japanese Hake brushes:** These are especially popular for making platinum prints because they are soft and do not soak up a lot of the expensive sensitizer. I personally do not like them. I find that they get too flexible and are hard to handle after a few prints. I keep a few on hand and regularly switch brushes, as they lose their shape during a coating session. These brushes also need to be super glued around the base of the bristles.

Good brushes are worth the extra money. Go to an art supply store and spend time feeling the different textures of the brushes. Some are softer, harder, larger, smaller, etc. It really is a subjective choice, so buy two or three different kinds of brushes and try them out.

BASIC STEPS FOR APPLYING SENSITIZER WITH A BRUSH

1. Dip your brush in distilled water and squeeze the excess out. You want it to feel almost dry.
2. You can either pour the sensitizer onto the support or dip the brush into the sensitizer solution.
3. Begin coating your support with the brush at the top of the image area and work downward. Brush first horizontally and then vertically to cover the image area evenly with the sensitizer. If you are using the dip method, you may have

to re-dip your brush into the sensitizer at some point as you are coating. As you practice, you will sense when your brush is too dry, but this is really a matter of choice. Some people prefer to apply very little sensitizer (using a dry brush) on the support so that the brush strokes are more apparent and the image becomes more abstract. Others prefer to use a large amount of sensitizer on their brush to get a more even coating.

Two ml should be enough to cover an 8 × 10" image on hot press paper. Cold press paper will need slightly more for an even coating.

There are no rules. It is a matter of choice and discretion as to how you want your end result to look. However, brushing more than necessary may cause streaks and will abrade the surface of the support.

DRYING TECHNIQUES

Drying techniques come into play at two stages: first, after you have sensitized your support; and second, after you have exposed, developed and washed your finished print. Drying your sensitized support is almost as important as applying the sensitizer. If the support is not dried correctly, you can get burn marks (which show up as discolored areas) on your final image, or the sensitizer can puddle in different places on the support and crack off once developed. It is also important to be aware of the light sensitivity of the particular sensitizer that you are using and adjust your light source accordingly.

One way to dry your sensitized support is to use a hair dryer. It is best to let the support air dry in subdued light for a few minutes before accelerating the drying process with the hair dryer. If you have used the tray method to apply your sensitizer, you should allow your support to air-dry for one hour in total darkness before using a hair dryer.

The hair dryer should always be on the "cool" setting and needs to be moved back and forth over the support so it does not get burned. If you want to check to see if the sensitizer is fully dry, feel the back of the paper. If it is cool, the paper is dry. If you are using another material, then you will have to touch the edges (with gloves on) to double-check for dryness.

If you do not want to use a hair dryer, place your support, sensitizer-side up, in total darkness for a few hours. Do not stack your supports if the sensitizer is still wet, as they will stick together and the sensitizer will lift off. Supports with moist sensitizer will ruin your negative, so make certain that the sensitizer is fully dry before exposing your negative. For quicker drying times, you can turn on a fan.

If you are using fabric as your base support, you may want to use a combination of these methods. First, place the fabric onto a piece of Plexiglas, keeping it flat and in position with clothespins or drafting tape. Let the fabric air-dry (or use a fan) for about one hour, preferably in total darkness; then use the hair dryer. Avoiding immediate use of the hair dryer will help avoid streaking.

Whichever materials and drying method you choose, try not to sensitize your support during very hot or humid weather. These conditions contribute to the chance of fogging that may occur during the drying process. It is also worth noting that thinner papers sometimes curl. To prevent your images from curling, tape the paper down with drafting tape to a piece of glass, or plexiglass. Apply the sensitizer and allow the paper to dry (in total darkness) naturally on the stiff surface. Once the paper is dry, you can remove it from the backing and it will stay pretty flat.

After exposing, developing, and washing, your finished prints can be dried in a number of ways. If you have used paper (or smaller pieces or fabric) as your support, the images can be hung to dry, pressed in a blotter book, or placed on screens. However, if you use screens, do not put your prints face down or they will develop screen marks (as all of these sensitizers are very soft until they are fully dry). Larger pieces of fabric can be laid flat on a table, or hung on a clothesline, and left to air dry.

Using a brush to coat fabric

1. Place the pieces of fabric on top of each other.
2. Using a brush, coat the top piece of fabric. As you coat, the sensitizer will soak through onto the next piece.
3. Remove the top piece and re-coat the next one to make sure it is coated evenly.
4. Continue until all of your pieces are coated. Before exposing your support, allow it to dry fully.

PROTECTING FINISHED IMAGES

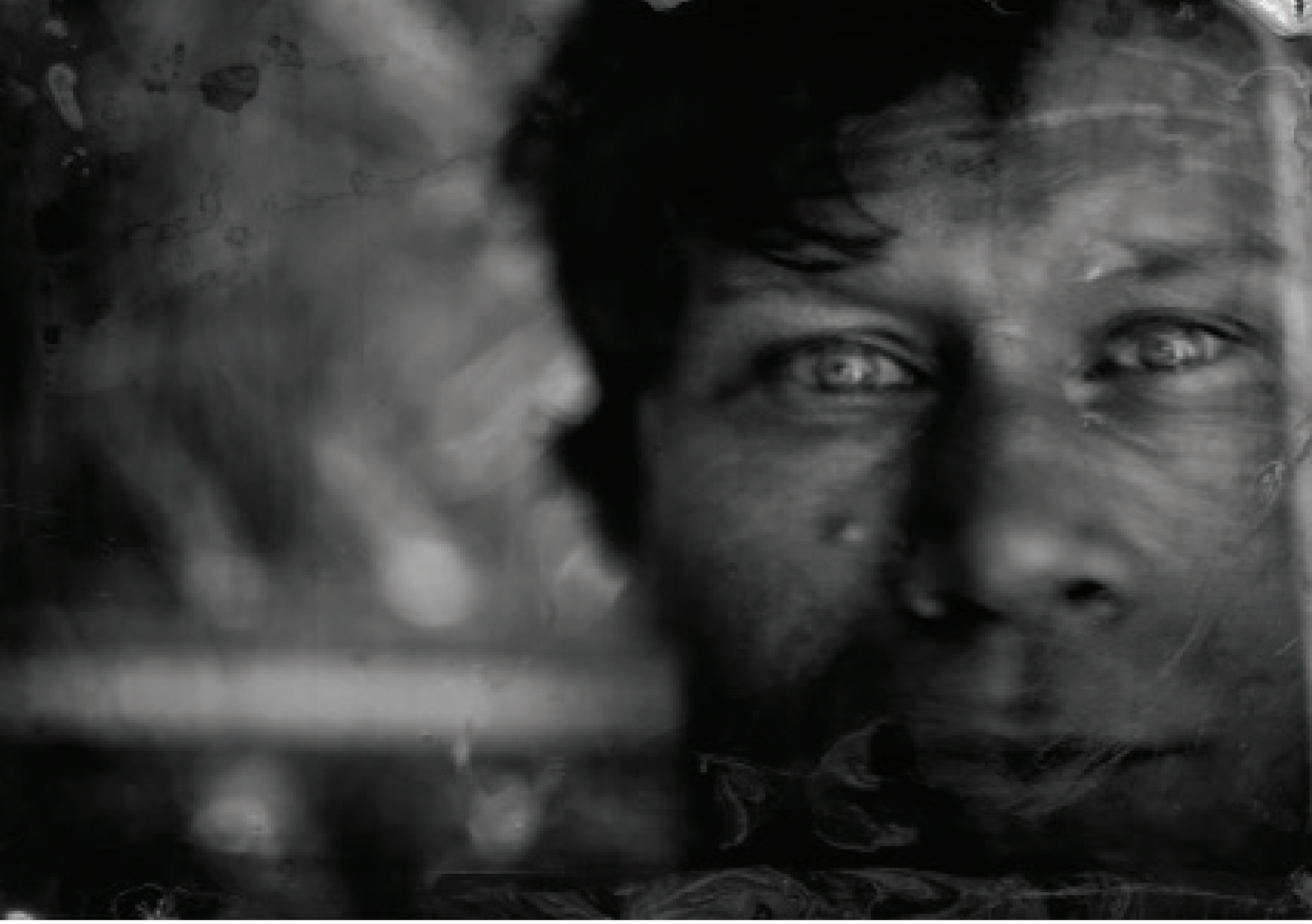
You don't really have to do anything to protect developed prints. However, you can spray them with a UV-protective aerosol or apply a wax finish to them. The wax will add a little contrast, dimension and added protection.

To apply the wax, use a flannel cloth or cotton ball – any soft material that is lint free is fine. Work in a circular motion and try to make the coating as even as possible. Like everything else, there is no single way to do this step. Below is a list of different types of wax and methods that are commonly used.

1. Melt beeswax with a little oil of lavender to give it the consistency of lip balm. Beeswax does not really dry completely, but a lot of artists like it anyway. The oil of lavender helps it to smooth out onto the paper.
2. Renaissance Wax is another favorite. I think it has a foul smell that eventually goes away, but is not pleasant to work with.
3. Dorland's Wax Medium dries and seems to go on very nicely.
4. Gamblin Cold Wax Medium has a melted consistency that applies very nicely.

Whichever you choose, use a hot hair dryer in a circular motion until the wax is dry and even, all the while, buffing with a small piece of flannel cloth.

02.14 © Jill Enfield. "Ellis Island". This was originally a wet plate collodion negative that was then made into an albumen print on Hahnemühle paper.



Three

THE DIGITAL NEGATIVE PROCESS: AND OTHER APPROACHES TO MAKING AND PRINTING NEGATIVES

03.1 © Jill Enfield. “Rene.” Part of my “New American” series. Originally a wet plate collodion ambrotype, scanned in and a digital negative was made.

Historical processes are very slow and cannot be exposed using an enlarger. They are contact print processes, meaning that in order to make a print, you need a negative the size of what you want your finished product to be. UV light, either from the sun or a UV light source, is needed to expose the image properly. A regular enlarger bulb does not work.

"Back in the day" you either needed to use a large-format camera or make inter-negatives in the darkroom. Inter-negatives meant that you needed to first make a positive by exposing an image on film, develop, wash and dry it, and then try to attract as little dust as possible as you used the positive to contact print (or enlarge) to another piece of film in order to make your negative. Up until the 1990s there was also film called "direct positive film" with which a photographer could go directly to an enlarged negative without the positive step.

Working with film had its issues – it was time-consuming, dusty and the added contrast and scratches were stressful obstacles. Of course you can still use a large-format camera and you can still find film to make enlarged negatives in the darkroom, but this is when I say *digitize*. I love working in the darkroom, but I never want to go back to darkroom enlarged negatives. Once you learn how to use your software of choice, you will be able to work quickly and easily to make great negatives. This does not mean you won't have to make test prints and go back to "tweak" your negatives, it just means you will be able to do it cheaper, faster, and with no dust.

03.2 © Russell Bush. Russell used an acrylic medium paper negative to make this cyanotype on mulberry paper. The image was printed onto regular copy paper stock, coated with 8 coats of gel medium and dried overnight. The paper backing was then taken off with the ink sticking to the gel medium, thus becoming a paper negative.

THE PROCESS

There are so many instructions available to you on the web that it is important to decide which is the best way to work *for you*. I have struggled for years to figure out which way works for me. My learning curve with Photoshop took me on a long journey. The process in this book has been tested over and over and updated by myself, and my students. If you feel you need to use a densitometer and be more scientific, then be my guest and look at books that are written solely on making digital negatives. You can be as technical as you want, or not. There are books on digital negatives listed in the Sources chapter.

Also included in this chapter are other techniques for making negatives using the Piezography® digital negative system as well as paper negatives using oil, wax, contact print paper, acrylic gel medium, and packing tape. Each technique will give you a unique outcome.

03.3 © Asher Katz. Asher made a paper negative by printing out an image on regular copy paper stock.

REASONS FOR DOING DIFFERENT TYPES OF NEGATIVES

You can:

- Change the scale of your work.
- Add stitching (sewing right on your negative and you don't feel like you are ruining a unique piece of art).
- Print on cloth or paper.
- Print on both sides of the transparency film – paint with water color and use this as your finished piece.
- Make a wall hanging, quilt, soft sculpture, or mixed-media piece; transfer onto wood or other surfaces.
- There are endless possibilities!

03.4 © Mark Nelson. "Bog Bean." Mark has a website (listed in the Sources) that enables you to learn how to make negatives like him, as he has made a science of making digital negatives to achieve these subtle tones.

03.5 © Mark Nelson. Platinum and palladium print made from the negative.

GETTING STARTED

You should have a good scan of your film, or a large image capture from a digital camera. You can choose to work with:

- Digital images from camera capture.
- Scans from negatives.
- Flat-bed scans from photos or objects – use your scanner as a light source to make photograms (scanning multiple layers and delicate objects will reveal intricate detail that conventional photograms may not capture. To protect your scanner, use clear acetate between glass and object.)

MATERIALS NEEDED

For Digital Negatives

- Photoshop or another image program that enables you to edit your pictures.
- Images that are scanned in or shot digitally.
- Transparency film (such as Arista, Inkpress, Pictorico or Uline).
- Inkjet printer.

For Paper Negatives

- Acrylic gloss or matte gel medium
- Chartpak blending stick for transfers
- Contact paper (sticky on one side, used as drawer liners)
- Cotton balls
- Hand towel that you don't mind ruining
- Hot water
- Inkjet printer
- Laser printer
- Laser prints of negatives or positives on regular white computer paper
- Mineral oil or baby oil
- Packing tape – the wider the better!
- Paper towels
- Pencils
- Scissors or paper cutters
- Turpentine.

INSTRUCTIONS

DIGITAL NEGATIVES

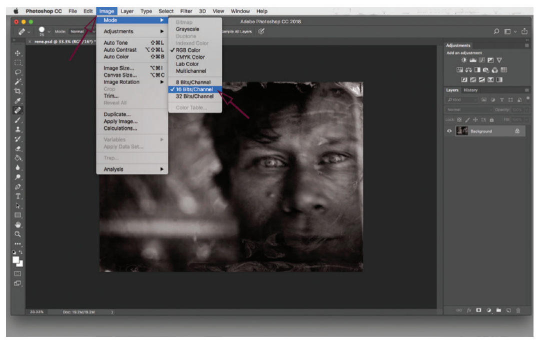
I work in Photoshop, and on an Apple computer, so these instructions are for that

03.6 © Dan Burkholder. "Speckled Vulture in Pine Forest." I believe Dan was the first one to start teaching how to make digital negatives. He has several books on the subject and wonderful videos. This is a platinum and palladium image from a digital negative.

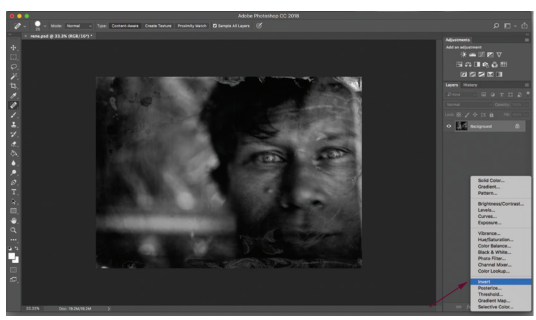
program and computer. You don't have to use Photoshop, you can use whatever program you are used to using as long as you can reach your goal of making an excellent negative.

1. Open the image you are going to work on and immediately save it as a Photoshop file (.psd): File > Save as > Photoshop.

   This is so you know the difference between the original file and the layered file you are working on. Working with layers will allow you to go back and forth as you need to "tweak" the negative while printing. I save each version so I can go back to the negatives instead of having to go back to the original and start over. For example, I will make a negative and keep the image name but add _NEG1.psd. I will then do a test and if it needs a little more contrast or some other type of adjustment, it will be named _NEG2.psd. This way I can look at the prints I have made along with the negatives and tell what I have done. When I am happy with the print, I will rename the negative _NEG_FINAL.psd and delete all of the intermediate files. My layers are saved, so I will still be able to go back and see all of my work, only the duplicate files are gone. The name will also include the type of print I am making.
2. Change this new file to 16-bit and RGB: (Image > Mode > RGB color; 16 Bits/Channel). (See Figure 03.7.) This means the image will have a bigger palette of pixels to work with.
3. At the bottom of the layers palette, choose the icon that looks like a black-and-white cookie: Create a new adjustment layer > black/white. This will automatically change your image to black and white, while keeping your file at RGB. (See Figure 03.8.)
4. Invert the image by going back to the black-and-white cookie icon and choose invert. Check how the negative looks and make changes as needed. This will come with practice and you might have to make a print and then tweak the negative again. Several times! Your negative might need more or less contrast, or you might have to bring out highlights or tone them down. This is all "to taste."
5. Each process requires a slightly different type of negative. For example, palladium, platinum, and salt prints require a somewhat contrasty negative (more ink) while a gum dichromate and cyanotype require a negative with fairly low contrast (less ink). Therefore, the final renamed image also has to include the type of process I will use the negative for. For example: ItalyView_NEG_FINAL_PT.psd means that this negative will be used for making a platinum print. (See Figure 03.9.)



03.7 Open the image you want to work on and go to Image>Mode and change your image to 16 bits/channel. This will give you a larger color space in your file.



03.8 In adjustments, invert your image. I work on my negatives by eye and as a film photographer, I know how to read negatives very well. No matter how you go about making your digital negatives, testing your negative with your chosen process is very important. I make my adjustments with layers and save the file as a PSD file, alerting me to the fact that this image was tweaked. This way, I can go back to the file after my test was done and further tweak the file if needed, without starting over.

03.9 Notice the layers on this negative. Every time I make an adjustment, I do it on a separate layer. Also notice the name: Rene NEG1.psd. This tells me that this is my first negative and I will now take it and make a test. If I like what I get, then I will rename it NEG_Final. If I think I might have to tweak it some more, then the next file will be named Rene NEG2. I will not get rid of any of the files until I get what I want and then will name it as a FINAL negative, along with the process I am using the negative for. Ex: Rene_final Neg_pt.psd.

PRINTING YOUR NEGATIVE

There are several kinds of transparency films that come in many sizes, including rolls. Depending on which film you have bought, you will use glossy or matte ink. A good selection of transparency film is available at most photography stores or online. As with all papers, you should have the correct ICC profile for each film and should follow directions on their websites. Go to their site and then to *Products ICC Profiles*. Find the transparency film profiles to download.

ICC profiles ensure that your image will print out as close as possible to what you see on your screen. Follow the directions for your type of computer, printer, and chosen transparency film. You also need to follow instructions for proper printing methods for your equipment.

1. I have found that most monitors are brighter than they should be for printing. Turn your brightness down 50% before printing. There is a button on your keyboard that you use to darken or brighten your computer screen.
2. Go to ADVANCED COLOR SETTINGS in the print dialog box. The default setting is “0.” Set the MAX OPTICAL DENSITY slider to -12
3. Now go to the second slider, which is called COLOR DENSITY SLIDER. You get to it by clicking on the Printer Settings and opening the ADVANCED MEDIA CONTROL dialog. The default setting for the Color Density slider is “0” and will be good for when you need a low contrast negative (gum & cyanotype). This will tell the printer to lay down less ink.
4. If you need a higher contrast negative (platinum, palladium, salt prints) then move the Color Density slider towards +50%. (+30% to +40%). This will tell the printer to lay down more ink.
5. Media type should be set so that if you have an ICC profile, choose that. Otherwise, choose Premium Luster Photo Paper so that the printer will use Photo Black instead of Matte Black ink. The difference is minimal (Photo Black has a weaker UV absorber than Matte Black), so if you don’t want to change inks (because it uses up the inks to do this), then leave it to Matte Black. You are doing a test and can tweak your negative and printing if you need to after the test is done.
6. Your output resolution should be the highest you can go. At the time of this printing the maximum was 2880dpi.
7. Make sure that high speed is unchecked so that the ink will not smear.
8. Print with the intent at Perceptual (this is the default setting for most printers) and check the black point compensation.
9. Sometimes printers have a hard time realizing there is transparency film loaded and you will get an error message saying that there is no paper in the printer. If this happens, put a plain sheet of computer paper behind the transparency film to fool the computer. It should then print just fine.
10. Put transparency film in the printer, and print out the digital negative. The sticky side is the side to print on. Now choose what type of process you will use and make a test print.
11. Let your negative dry for about 30 minutes, and then look to see if you have proper shadow and highlight detail. If you do, make your first test print. If not go back to your file and tweak it and print it out again.

Ron Reeder and Christina Z. Anderson also suggest this step before printing: Click on Advanced Color Settings. A window opens with a blond woman off to one side and various sliders next to her. There is a box labeled VERTICAL near the color circle. Type the number 75 into this box. This will cause the printer to print the maximum amount of yellow ink into the image. Yellow is the strongest UV absorber after Photo Black and by increasing the yellow, it makes the UV more dense and negatives more contrasty. Again, this is for a more contrasty negative and might not be necessary. Do a test, and see what you like better for your workflow and outcome.

CURVES

The curves tool in Photoshop affects tones and contrast of an image in a similar way as the levels tool, but with more options. Levels only has black, white and midpoint controls, while curves can have up to 16 anchor points for more controls.

A lot of people feel that you can use curves made by others for specific processes. Ready-made curves are a good starting point, but tweaking your negative will still be a part of the process. If you are using a ready-made curve that you can get online, then you need to know how to import the curve. I will put instructions below, but let me emphasize that everyone's work-station is different. So while one curve works for the person that made it, if you are not working on their computer with their monitor and their printer, you will have to tweak the curve in the same way you are tweaking the negative that you are making from scratch. I feel it is important to know how to control your images. But then, I was always the one in the darkroom, even when I had a commercial job and could have hired someone in a lab. It might be a good way for you to start; it is not the end to working in Photoshop or making tests. You can get curves from many sources, but if you go to www.alternativephotography.com, you can download free curves.

If you download a curve from the site:

- Save the linked file to "downloads."
- Open your downloads folder.
- Open your applications folder in another window.
- Go to Photoshop > presets > curves.
- Drag the curve from the download file into this curve folder.

MAKING SEPARATION NEGATIVES FOR GUM PRINTING

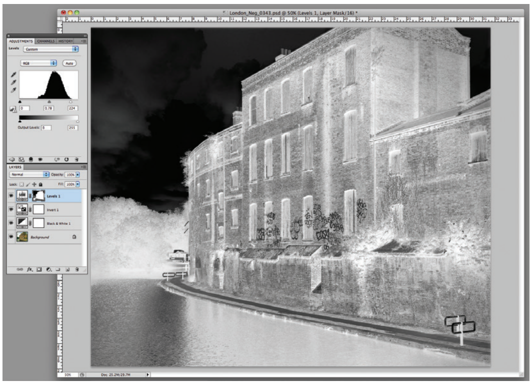
1. Starting with an image in RGB mode, and using the black and white cookie icon, change it to black and white.
2. Invert your image so it looks like a negative and do whatever tweaking you need to do to make it look good. (Exactly the same way you did the "normal" digital negative.)
3. Make the canvas bigger so you can put the proper negative type in the border before it is printed. The negatives do not look much different, and it is very easy to mix them up. Use the crop tool and extend the area you want to enlarge, in this case I make it bigger on the bottom and a little all the way around. The background (canvas size) will get bigger. (See Figures 03.10–03.14.)

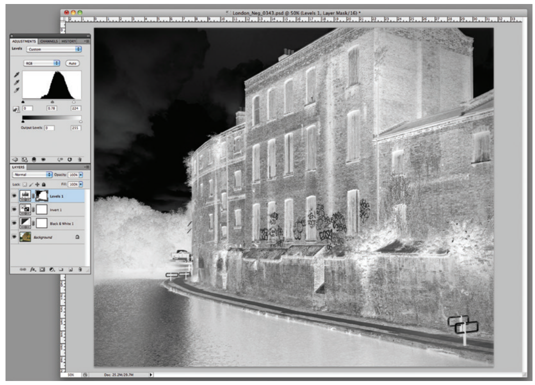
   CMYK negatives are used with their correct letters. In other words "C" prints cyan, "M" is for magenta, "Y" is yellow. "K" is for black but can also be used for a palladium layer.

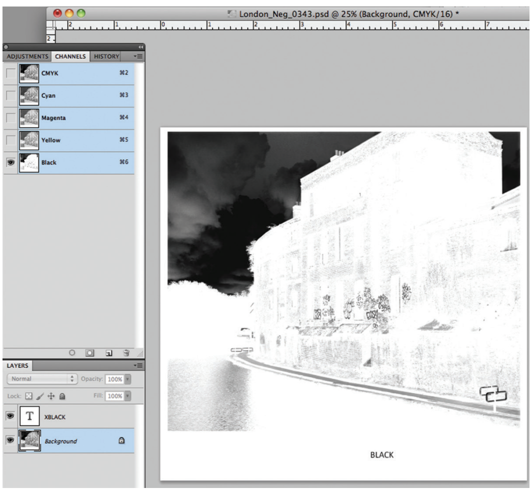
You can also do this in RGB:

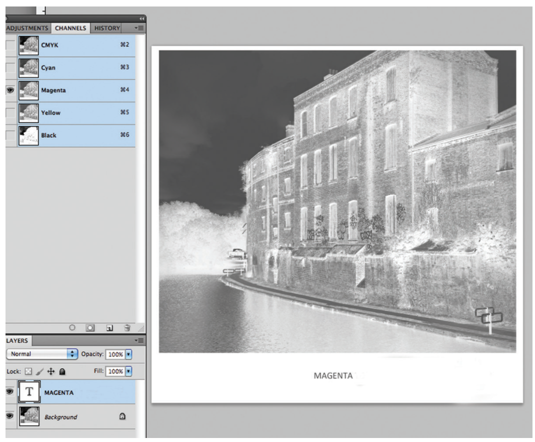
"R" channel negative prints the cyan or any blue.
"G" prints magenta or any red.
"B" channel prints any yellow.

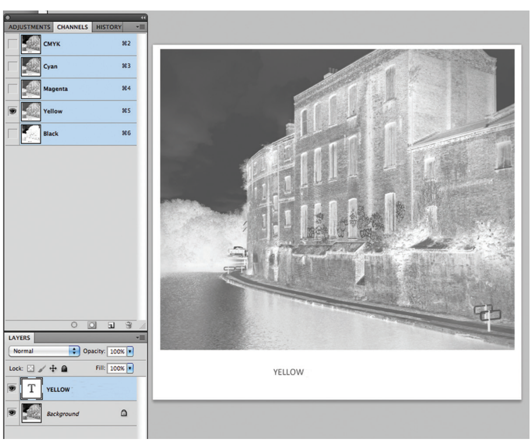
4. Flatten your image (Image > flatten) and change it to CMYK profile (Edit > Convert to Profile).
5. Make sure the “channels” window is open so you can carry out the next steps. Go to the channel mixer adjustment layer. You are going to print three or four negatives: not everyone prints out the K (black), it is up to you. You can try to use the “K” layer for a palladium, which would go underneath the gum!











03.10, 03.11, 03.12, 03.13, 03.14 For separation negatives, name each file right on the negative because they are very easy to mix up! The black layer can be used for black or platinum/palladium.

I had never used a lab to make negatives or prints for me. I have always insisted on doing it myself. This is really out of being stubborn. I was recently lucky enough to take a workshop with Jon Cone in Vermont (his information is in Sources). The images were stunning, with a tonal range that I had never seen. You can have his lab do the negatives for you, or you can have your printers changed over to use his Piezography® inks. The downside is that once you change over to these inks, your printer is a black and white printer only. The upside is you have the ability to make beautiful black and white images, both positives and negatives.

The Piezography® digital negative system was designed to overcome the limitations of digital negatives systems that are made with conventional Epson color inks. By replacing the color ink set with six or more gradated shades of Piezography carbon black ink, tens of thousands of gray separations can be produced in comparison to the hundreds produced when using color inks. Because Piezography carbon inks have a consistent UV sensitivity across each shade, the user does not have to perform any sensitivity tests for their chosen alternative process. The Piezography ink set produces film that is compatible with any alternative process.

The main benefits of the Piezography digital negative system are increased acuity (sharpness), smoother tonal separations, greater levels of micro-contrast across the entire tonal range, significantly higher amounts of detail in both shadows and highlights, and an absence of digital artifacts often referred to as the venetian blind effect that can happen with color inks. Piezography digital negatives have the ability to resolve significantly more detail and tone than traditional camera based negatives.

The Piezography system uses either the QuadTone RIP or the Piezography Printer Driver in place of the Epson printer driver.

03.15 © Jon Cone. This platinum and palladium print was made from a digital negative that Jon makes from his own inks called Piezography®. You can read about his inks at inkjetmall.com, and take workshops with him. His inks can be used for digital negatives as well as beautiful digital prints.

PiezoDN or Piezography PRO software is used to create "media profiles" for the user's choice of alternative process.

The profiling system is an easy three step process:

1. A 256 step target is printed on film and contact printed, processed and dried.
2. The resultant print is measured with a spectrophotometer or densitometer and the data put into the PiezoDN software.
3. PiezoDN produces a QTR curve for the Piezography ink set that separates 256 steps of tone for that process that produces a print that matches the user's display.

The Piezography curves automatically invert the image if a negative is required and auto-masking is an option. This means that you can work on your positive and then the curve will invert the image for you.

OTHER APPROACHES TO MAKING AND PRINTING NEGATIVES

Of course, photogram materials can be used, as well as positive images. If you want to make easy negatives that will render textures and not such sharp images, follow the instructions below.

03.16 © Jill Enfield. I took a small digital image, printed it using a laser printer and used packing tape on the front. I then soaked it in warm water and rubbed the back off with my finger. I did not take all of the paper off so that you could see the difference between the paper backing and just ink and tape. You can then use the transparency as a negative.

PAPER NEGATIVES

There are many ways to make paper negatives, but these are my favorites. When you are printing onto computer printing paper, print as you would any word file. After it prints, make sure you have detail in the areas where you want it to be. The quality is not going to be perfect with paper negatives. You will have less detail and more texture.

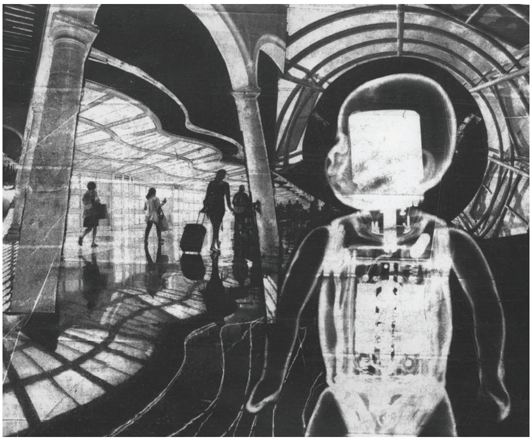
Packing tape or *contact paper* – laser prints only, *not* inkjet

- You can do this with any type of carbon-based copy, but not ink-based.
- This means you can use not just your images, but newspapers and magazines as well.
- Use clear packing tape and tape as neatly as possible, unless you want wrinkles, on the *front* side of the image.
- Overlap the tape so the paper will not tear as the backing is removed.
- Rub off the back of the paper with warm water as with the gel medium negative.
- Apply a layer of tape or contact paper to the back, as any white areas will have no ink and will be sticky.
- This can now be used as a negative.

Acrylic medium – laser copies only, *not* inkjet

Acrylic gloss or matte medium can be used – any brand.

03.17 © Kate Donohoe Belleville. Kate used a paper negative to make this liquid emulsion contact print.



03.18 © Nicole Croy. This image was created by printing digital images on copy paper from a laser printer. They were then collaged together and covered with strips of packing tape. Nicole burnished the tape with a wooden spoon to ensure that the ink from the laser copy had adhered to the tape. The taped image is then placed in a tray of warm water where the copy paper will start to deteriorate. Once all of the paper has been removed from the tape, the image is taken into the darkroom and contact printed as a paper negative on photographic paper.

- Print your negative image on regular copy paper.
- Using a cheap foam brush, coat the *front* of the image. Apply thin coats, alternating one horizontal and then the next vertical, repeating about eight times so that each coat of the medium is thin and is dry before the next coat is applied.
- You can help it along with a hair dryer.
- Let it dry overnight after the last coat to make sure all the layers are totally dry. The drier, the better.
- Put the paper in a flat-bottomed tray and add a small amount of warm water.
- Carefully rub the paper off the back using a towel or sponge. You can use your finger, but it might get uncomfortable after a while.
- The paper fibers come off and the ink stays in the medium.
- You might have to let it dry, see where you missed rubbing the backing off and then re-wet the paper.
- Some people choose not to take all the paper off, which will add density to that area.
- The strokes from the medium add texture.
- This can now be used as a negative.
- Some artists use this method to produce art pieces instead of negatives. You can do this with positives or with color, glue them onto 3D pieces, anything you can think of. They call this technique making a "skin."

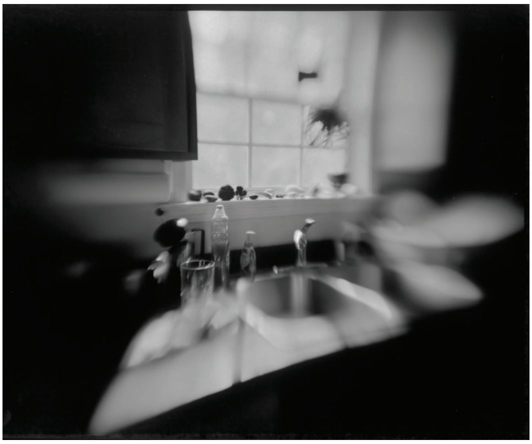
Oil – laser or inkjet prints will work

- The thinner the paper, the better.
- Use baby oil or mineral oil, and coat the *back* of the paper with a small amount of oil, applying it with cotton or paper towels.
- The oil takes a long time to dry.
- Use a hair dryer, hang it to dry overnight or use a piece of acetate in between the sensitized paper and the negative so the oil does not transfer onto the print.
- In order to use the same negative after several months, you might have to re-oil or make a new one.
- If vegetable oil was used, the paper will yellow (and smell rancid very shortly).
- This can now be used as a negative.

TROUBLESHOOTING

Digital negatives – the following are some things to take note of:

- If the image was scanned in, do a thorough job of retouching where needed.
- Think about contrast and make sure there is detail in all areas of your image.
- If your image is too flat, then add contrast to your negative, re-print and do another test.
- If your image is too flat, you can also print with a piece of acetate (you can use



03.19 © Sam Wang. Sam made an 8 × 10" paper negative for this silver gelatin contact print.

a clean piece of the transparency film) between your negative and paper. It will help add density.

- If your image is too contrasting, you will have to make a new negative with lower contrast.
- If the ink on the transparency film does not dry or it smears, you printed on the wrong side. Depending on the process you are using, you can also control contrast with the chemicals – check those instructions as well.

PAPER NEGATIVE TROUBLESHOOTING

- If the ink comes off in warm water you probably used an inkjet printer instead of a laser printer.
- If the backing comes off as well as the ink you might be rubbing too hard.
- If you are using gel medium and the paper seems heavy, or the gel looks thick, or you cannot see your image through the gel, it is too thick. You should be using very thin layers.

03.20 © Jill Enfield. "Celestin Coulibaly" part of the series called "The New Americans", this was first an ambrotype, then a digital negative, then a platinum/palladium print on Hahnemühle paper.

03.21 © Jill Enfield. This image went through lot of changes over the years. I shot it on 120 film at night. Then I made a digital positive so that I could make a wet plate collodion ambrotype. It was then scanned in and made a digital negative to that I could make this cyanotype on glass

Four

FUGITIVE (IMPERMANENT) AND NOT-SO-FUGITIVE PRINTING: ANTHOTYPES, PHOTOSYNTHESIS, AND LUMEN PRINTS

04.1 © Jill Enfield 2008. This chemigram is from a wet plate collodion ambrotype that did not work out. I keep my bad ambrotypes in the sink until I am ready to clean the glass off to reuse, and one day I noticed how beautiful the crystallized fix looked and decided to scan it in. I then wash off the plates and make large prints from the scans. They remind me of the images you see of earth from outer space.

Vegetarian and vegan friendly, this chapter will explain how to make non-toxic, slightly unstable images. Fortunately, scanning images is a wonderful option. While a digital print is not considered "original," in this case it is. Your negative is the anthotype, which will change over time. In order for it to stay the way you want it to look, you can scan it into the computer and make your prints. A lumen print can be fixed, but the colors will change. In other words, if you want to keep the nice blues and purples, it is best to scan in the lumen prints as well.

The anthotype process uses the juice of plants. Photosynthesis printing, on the other hand, is made by placing objects *on* plants or fruits and over time (a long time!) an image will appear. Lumen prints are made by using outdated photo papers and exposing them to sunlight or with a UV box. Each paper and each process will give you different colors. Lumen prints can be fixed and can be permanent, depending on how they are processed. However, you will notice that the colors look very beautiful before fixing and change to a not so appealing, light purplish-pink upon fixing.

Fugitive prints are usually made with natural light and plant matter, and are not considered permanent. However, images from the 1800s made with fugitive materials can still be seen today in museums. Protected from light, they are faded, but still visible. And besides, when was the last time you saw sculptures in Italy or Greece that had retained their original color vibrancy? I was shocked when I learned these ancient sculptures used to be brightly painted.

Fugitive prints are fun to make, and scanning is an option for keeping the original image forever. In fact, if you keep the prints and watch them over time, you can scan them as they change color. Scanned fugitive images lend themselves wonderfully to mixed media. Try combining images together, making a time-lapse movie, or printing on top of a fugitive print with another process altogether. The possibilities for experimentation are endless.

04.2 © Binh Danh. Photosynthesis image on blades of grass. Binh uses a positive image to make his photosynthesis images on leaves or blades of grass, exposing from a day to a week, depending on the weather, type of leaf, and type of image. He then casts them in resin to make them more permanent.

SOME HISTORY

Anthos is the Greek word for flower. Photosynthesis comes from the Greek word for "light," and synthesis means "putting together." Thus photosynthesis means "making things with light" and is the process used by plants to capture the sun's energy.

Photosynthesis has been used by non-artists since the 1700s to decorate tables and homes by placing stencils on fruits and leaving them in the sun for a few days to a few weeks. The stencils would then be removed and the images would be bleached onto the fruit, creating personalized decoration. Of course, vegetable and fruit juices had been used for centuries as dyes for rugs and clothing, and are still in use today. When you see special cleaning instructions on rugs that warn of their tendency to fade, you are encountering natural dyes that are not "color-fast."

As early as 1816, Henri August Vogel noticed that plants were sensitive to light and would bleach out in different ways, depending on the color of the bottle they were in, and the percentages of the alcohol to water dilution used. Later in the century, around 1842, Mrs. Mary Somerville sent her findings on the action of the sun's rays on vegetable juices to Sir John Herschel, who published the research with the Royal Society of London. Somerville could not publish her findings herself, because she was a woman. Herschel wanted to make sure her research could be seen, so he published it.

Nevertheless the anthotype process was soon considered impractical and forgotten. Because the images were not fixed or stabilized, the prints were put into what were referred to as "night albums," albums that were not exposed to any sunlight so that the images would be protected and last longer. Night albums would be enjoyed by candlelight. Today, you can see some anthotypes from the 1800s in museums and galleries that specialize in historical images. Most are protected in albums or, when put on display, shown with a black cloth that the viewer must lift up in order to see the image.

04.3 © Carol Panaro-Smith and James Hajicek "Arc of Departure." Photogenic drawing (anthotype) over toned cyanotype on silk tissue.

The website www.alternativephotography.com, edited by Malin Fabbri, has an extensive history of the anthotype and a wonderful book on the subject. www.photojojo.com has published articles on the subject as well.

ANTHOTYPES

MATERIALS NEEDED

- Apron
- Bowl for mixing
- Brushes, foam or bristle, but marked for each color to avoid contamination
- Coffee filters or cheesecloth
- Contact printing frame
- Denatured alcohol
- Distilled water
- Gloves
- Jars for storage
- Mortar and pestle, or blender
- Petals, berries, leaves, any organic material you would like to try
- The sun
- Watercolor paper or any other natural material such as silk, wood, etc.

IMAGES NEEDED

For this process you work from *positives*, and not negatives. However, you create your positives the same way you make your negatives. In other words, you can make them digitally, use paper negatives, photogram materials, stencils, *anything*! *Just remember that a positive transparency will give you a positive image and a negative transparency will give you a negative image.*

PLANTS

The color of the plant or petals is not necessarily the color you will obtain in your final print. Most plants retain their original color, but you might find that brown is the end color for a lot of bright-looking petals. This is due to oxidation as the petals dry out. The best way to proceed is to make a list of fruits, vegetables, spices, leaves, and flowers that have given someone who has already tried the process the result you are looking for, and move on from there. Once you get started playing around with vegetation, you will get the hang of it and your attempts at getting that bright color, only to see it turn brown, will become part of the inherent charm of your piece. I have included a list of plants after the Process section directly below.

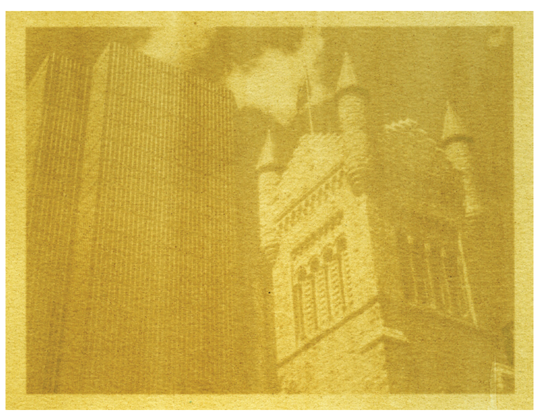
THE PROCESS

1. Pick your plant of choice – literally!
2. Place the leaves in a mortar or pestle bowl or in a blender. A blender seems to be better at grinding up plant peels that tend to have a lot of pigment.
3. Add a splash of alcohol or water, if needed. The consistency should be like a creamy, thick soup.
4. Blend until the mixture looks juicy.
5. Strain the mixture into a bowl using a coffee filter or cheesecloth. Any leftover bits of plant matter will create spots on your image. You might like this look in the end, so it is up to you how to deal with bits of plant matter.
6. Using a dampened brush so that it will not soak up all of your pigment, coat your support with this solution. One or more coats, with drying in between, will give you brighter, stronger colors.

   You can also soak your paper in a tray, but this will use up more liquid. Soak for a few minutes and let the paper drain until the dripping stops.
7. Dry in the dark or with a hair dryer.
8. When you are ready to print, use a contact print frame you will not need for a while, or use two pieces of glass with clips holding your positive and paper together in tight contact.
9. Print! For days, weeks, or months – depending on your location and season.
10. That's it! What you see is what you're going to get – no washing needed. You can keep checking your images, by lifting up the top of the contact-printing frame. When you like the look of your images, they are done.
11. To finish up:
    - Put your anthotypes somewhere in the dark.
    - Scan them.
    - Or hang them up and watch them fade.
    - Use old images that have faded and re-print by coating again with a juice and exposing in the sun. The old image will fade further, but there might be a slight "ghosting" effect of the print's past.

PLANTS TO TRY IN THE ANTHOTYPE PROCESS

I have put this list together by looking at several books and searching online to see what has been successfully used. This is *not*



04.4 © Malin Fabbri. Malin made the emulsion for this anthotype with stinging nettles.

04.5 © Nettie Edwards. "Cynthia." 2015. Nettie used a digital negative and a flower called coreopsis to make this anthotype.

04.6 © Sarah van Keuren. Pokeberry juice anthotype on a cotton handkerchief of a pokeberry plant.

a complete list. Experiment, have fun and use whatever you can pick from the garden.

Any berry, but blackberry and elderberry seem to be the favorites. Most of this list comes from Malin Fabbri's wonderful *Anthotype* book. They are listed in alphabetical order:

- Anemone
- Azalea
- Beetroot
- Begonia
- Blackcurrants
- Broccoli
- Butterfly pea flower (beautiful blue color, but I think it turns to a brown when using it as a dye)
- Cabbage leaves: red
- Camellia, pink or red
- Carrrots got a poor rating from Malin Fabbri and that would have been top on my list.
- Chard
- Clematis (so-so – went from purple to brown)
- Coreopsis
- Crepe myrtle
- Daisies: red and pink
- Dandelion honeysuckle iris
- Dill
- Fuchsia
- Geranium
- Grasses
- Laurel
- Lavender
- Lilac
- Lupin
- Marigold
- Nasturtium leaves
- Onion skins
- Peonies
- Purple Dutch iris
- Red poppies
- Spinach
- Tulip
- Violets

TROUBLESHOOTING

- Blotchy print: The emulsion pooled from too heavy an application of emulsion.

- Spots on the print: The mixture was not filtered well enough, or you used leftover pigment without filtering it again. The sediment has gone into the support.
- Image too faint: The exposure was not long enough, or you used very old pigment that weakened over time. You can only keep pigment in a brown bottle for a few days.
- Faded color after washing: That's what happens. You can't wash these prints.

MORE INFORMATION

- You can store unused paper in the dark for a year or two.
- You can keep unused emulsion in a dark brown bottle in the dark. I have heard it keeps from a few days to a few months, so test it out before you dump it.
- Always filter the emulsion before using, or you will get blotches.

04.7 © Binh Danh. Binh explores his Vietnamese heritage by placing images on living matter and then preserves them in blocks of resin.

- It is fair to assume that the longer it takes to expose, the longer it will take to fade. Unless, of course, you put it in direct sunlight!
- Food dye, citrus juices, wine, teas, and coffee have always been a favorite of black and white printers, and can be used for anthotypes.
- Some vegetables, such as beetroot, work by pulverizing; others, such as onion skins, work by boiling and using the water. Experiment! Basically, you want the plant matter to produce a liquid dye.
- Fixative, the aerosol fixative used by pastel chalk artists, may help prolong the time it takes for the image to fade.
- Resin can also be used over your image which will provide a UV protective coating.

PHOTOSYNTHESIS

Positives positioned on living vegetation and placed in sunlight will make images. As I stated at the beginning of this chapter, people have been doing this since the early 1700s to make decorations for their homes and tables. As artists, you can take this a step further and use stencils, images, or photogram materials to make something more than a decorative piece. Like the anthotype, not everything on which you choose to print will work. Take good notes and keep trying different plant life. You never know what will work and what won't until you try it.

MATERIALS NEEDED

- Blotter book or newsprint paper to dry out your plant materials
- Contact print frame or two pieces of glass and clips to create tight contact between the glass and your developing image
- Photogram materials (objects of varying translucency)

- *Positive* transparencies (some artists print two and tape them together to add density)
- Resin to provide a UV protective coating
- Stencils
- Vegetables, leaves, fruits, grasses – anything that is alive.

THE PROCESS

1. Choose your plant material.
2. Place your positive transparency on top of it.
3. If the leaf is thicker in one area than another, build up the back with thin sheets of cardboard so that when you put it in the contact print frame or between the two pieces of glass, you have even pressure. This insures that your image will be sharp in all areas.
4. Expose in full sunlight for a day to a month. Exposure length depends on where you are located and what type of leaf you are using.
5. Check every few days to see how your image looks.
6. Carefully remove the leaf and press it between blotter paper or newsprint to dry.
7. Follow instructions in "More Information" for anthotypes, on p. 56. Both types of images are unfixed and will slowly fade with time if left in the light.
8. If you are using a piece of fruit, such as an apple, tape the stencil on really well so that your image will be as sharp as possible.
9. If you are printing in the winter, you can expose your leaf or fruit in a bright window.

04.8 © Su Hendeles. "Ye on a leaf." This image took two weeks to expose in bright New Zealand light.

LUMEN PRINTS

Lumen prints are created by taking sheets of unexposed black and white photo paper and placing objects or negatives on top as if you were going to make a photogram. Instead of using an enlarger and developing the image, simply place the paper in the sun or under a UV light box. The results will vary due to exposure times, the density of the photogram or negative, the quality of light and, most importantly, the type of paper. Each paper will have a different color, depending on the manufacturer, whether it was old or new, fiber or RC (resin coated paper which is like a plastic). According to an article by Jerry Burchfield (on www.freestylebiz.com), exposures can vary from half an hour to days and sometimes even months.

Fix will change the colors and so not everyone fixes their prints. Once you put the paper into the fix, the color might turn yellow or brown.

For processing, these are put directly into a fix bath. No developer and no stop bath are used. Surprisingly, the resulting tones are delicate pinks and lavenders! There is a second fix, a clearing bath, and a final archival wash.

04.9 © Amanda Means. Amanda alters the paper's surface and then exposes it at an angle to sunlight sometimes for an hour or two, sometimes longer. She manipulates the surface by folding and crushing it in many different directions. Since the paper is folded and crushed in such a wide range of directions, its surface becomes a myriad of little hills and valleys. As the sunlight falls over these it hits the paper with more or less intensity. The tops of the hills receive more light. The valleys less. This causes a lovely array of tonal values in the final print.

04.10 ©Amy Kanka Valadarsky. "Incorrigible (Peppers no. 1 & 2)." Amy makes lumen prints with vegetables she has around and then scans in the prints. Sometimes she will partially fix a print, and other times simply scan them in as is. Amy then creates collages in Photoshop by layering photographs she has in her files.

MATERIALS NEEDED

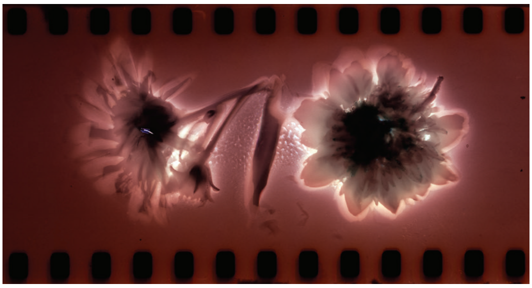
- Any photo paper or film, preferably out-of-date. Color or black and white will do.
- Photogram materials or plants
- Negatives or positives
- Contact-printing frame or two pieces of glass with clips
- The sun or UV light
- Gloves and/or tongs

DARKROOM SET-UP

- Tray for fix
- Tray for wash
- Tray for hypo clear
- Optional: tray for running water if you are toning the print
- Optional: tray for toners – favorites seem to be gold or platinum, but any normal black and white toners will work.

THE PROCESS

1. Decide on a composition and set up your image before going outside.
2. Place the paper or film, shiny side up and then place your choice of photogram material or negatives in a contact-printing frame.
3. Take the frame outside to expose the image using the sun. The exposure time depends on the materials and location; some people expose for 30 minutes, others for as long as a few hours, and still others for several weeks. It depends on the strength of the sun, time of year, location, humidity, and how you want your image to look.
4. There is no developing after the exposure.
5. Bring your paper back into the darkroom.
6. You can either:
   - Scan the image to keep the colors.
   - Fix the print using normal paper fix.
   - Or tone the image by placing the print in water first so that the toner is absorbed evenly. Then



04.11 © Ky Lewis. Ky uses film instead of paper to make lumen prints. Ky says that the advantages are that the color and saturation is better with film than with paper. The film is then scanned so that prints can be made.

place it into the tray of toner; or apply the toner with a brush to get a split tone effect.

- Wash the print to archival specifications: RC based paper for 5 minutes, and fiber based paper for 30–60 minutes. Chlorine in the water may bleach your image, so be sure to pay attention to the quality of water you are using, and don't wash for as long if you live where a lot of chlorine is used.

COOL AND DIFFERENT

I really am not a big web-surfer and spend as little time as possible on a computer. I would much rather be photographing or working in my darkroom. However, sometimes I get sucked in. Freestyle www.freestylephoto.biz is not your normal photography store. Articles in their catalogs are always interesting, and for an initial foray, I recommend anything by Jerry Burchfield or Theresa Airey. The same goes for Malin Fabbri's alternative photography website at www.alternativephotography.com, where I found an article by Fabio Giorgi.

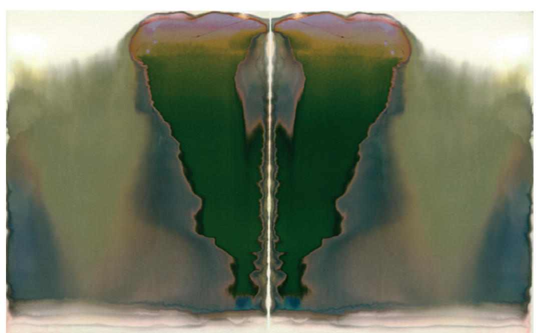
Giorgi wanted to figure out a way to make duplicates of his lumen prints without having to scan them, and decided to try making lumen prints on film. Brilliant when you think of it. Once again, we're taking old techniques a step further than our predecessors.

THE PROCESS

1. Giorgi cut a border out of opaque black cardboard.
2. Using Kodacolor 200 film, he placed the cardboard on top of the film.
3. He then put plants inside the masked area (on top of the film) and put it into a contact print frame before taking it out into the sun for 25 minutes.
4. He fixed it in black and white paper fix.
5. He washed the film and hung it to dry.
6. Giorgi then took the film to a commercial lab for printing. Scanning the film is also an option if you want to make digital prints.

There is no reason not to try this process with other films. Or try to use the lumen prints as paper negatives with other processes. You can even scan lumen prints and make digital negatives. In other words, keep going until you find the right place to stop.

The possibilities of experimentation are endless. Experiment with different light sources, papers, and films. Photographic materials start changing in all different kinds of light. What you are doing with your images can depend on how you want to expose them. For example, any time you place an object



04.12 © Saul Robbins. Saul takes sheets of exposed and/or unexposed color photographic papers and places them face to face, then loads them into an RA-4 color processor with traditional chemistry. Traces of un-fixed and unwashed chemistry remain and any changes in color and density over time are intentional.

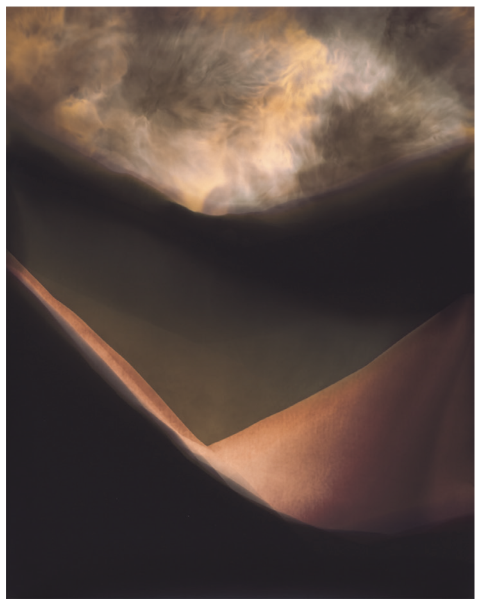
04.13 © Ellen Carey. Ellen has been working with the Polariod 20 × 24"camera for many years. This image is part of a series where she puts the film through the processor and then pulls the positive and negative apart to make an abstract image.

04.14 © Anne Arden McDonald. "Bouyancy, 2011." A contact print of bags of water and raw eggs, Anne uses chemicals, different light sources and resists to make her series of giant images meant to represent planets and atoms.

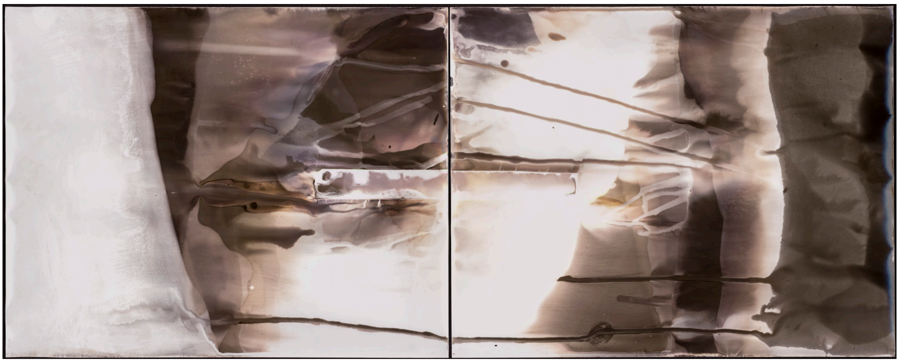
on paper or film, the object will leave that impression. You might want to expose your object by moonlight instead of UV light. Or even street lamps or candlelight.

CHEMICAL EXPERIMENTS

Many people are trying out different ways of making chemigrams – taking paper or film and not dunking them into trays, but spraying chemicals on or using wet paper and folding it, whatever anyone can think of to make abstract images with photographic materials. There are no rules that cannot be broken.



04.15 © Chuck Kelton. Chuck creates images using traditional black and white light sensitive photographic materials. Chuck states that they exist in his imagination but are constructed from memories of landscapes he has witnessed.



04.16 and 04.17 © Amy Theiss Giese. "UNTITLED CHEMICAL PAINTING." Amy did a series of lens-less, camera-less chemical paintings using traditional black and white darkroom chemistry and the chromoskedasic sabatier process on silver gelatin (black and white) paper. The chromo process is a non-historical process that alters the shape and size of the grains of silver in the paper to refract colored light instead of white light, creating the range of colors in what is normally monochromatic paper. The order that the chemicals are applied determines the specific color as well as the tonal values. Amy primarily works with developer, the activator and the stabilizer and each image takes about 45 minutes to an hour to create, with a traditional fix and wash at the end. She has experimented with pouring, dripping, spraying, sponging on the chemicals to create the layers and patterns. She most frequently uses foam brushes of different sizes as they hold the most chemistry but still allow for careful application. Her resists range from cooking spray to tape. Because the chromo process is activated by white light, most of her time in the darkroom is with the white lights on. For this reason, fogged or expired paper does not necessarily affect the outcomes.

Five

CYANOTYPES: OLD AND NEW APPROACHES, PLUS THE CUPROTYPE (COPPER) PROCESS

05.1 © Jill Enfield. Palm Springs, CA. Cyanotype on Hahnemühle Platinum Rag paper. While teaching a workshop, I photographed using my smartphone and then used this image to show my students how to make a digital negative. I then used the New Cyanotype chemicals to make this print.

The cyanotype, a blue monochrome image applied to any background, is also known as the ferroprussiate or blue print process. It was invented and named by Sir John Herschel in 1842. It has been practiced essentially unchanged ever since. Then in 1995, Mike Ware came up with the “New Cyanotype,” which is explained on p. 71.

Anna Atkins, one of a handful of women working in photography in the mid-1800s, created images for the first book using photographic illustrations, and used the cyanotype method. The book, entitled *Photographs of British Algae: Cyanotype Impressions*. *Cyanotypes of British and Foreign Flowering Plants and Ferns*, was published in installments from 1843–54.

Another version of the **blue print** process is employed by architects and engineers. They use pre-coated paper or vellum to expose technical drawings, which are then processed in a machine that develops them with ammonia fumes. This machine can produce blue or brown colors. However, unlike normal cyanotypes, the use of ammonia causes architectural drawings to fade with time.

Cyanotypes are produced with Prussian blue, a synthetically made color invented (in error) in 1704 by Johann Jacob Diesbach in Berlin. Diesbach’s original intent was to create a red pigment. But the potash in his mixture was contaminated, resulting in the first-ever synthetic blue pigment. By 1750 Prussian blue was used all across Europe.

Cyanotype has gotten a bum rap over the years, with critics blasting the use of blue. Do you think Picasso was treated this way during his Blue Period? Even though cyanotype is treated less favorably than other processes, it has gained popularity over the years. Many teachers, including myself, feel that cyanotype is a perfect way to introduce students to a non-silver technique. Cyanotype is a very versatile, simple, and inexpensive process, and the prints can be toned different colors with a variety of non-toxic materials. Besides, I like blue.

Cyanotype is also easy to use with children and science projects. There are several kits available of already mixed chemicals, but even better there are fabrics and paper that are already coated. Sources are listed in the Source chapter.

05.2 © Ann Mitchell. Ann explores the idea of family, memory, and identity through mixed media incorporating cyanotypes that are toned or bleached and vintage images from family albums. Fabriano Artistico 140-lb soft press paper was used for this series.

05.3 © Barbara Brommer. Barbara went low-tech while combining the digital age with a nineteenth-century technique. Using her iPhone camera she then made a digital negative. Barbara’s paper was coated twice, drying in between, with traditional cyanotype chemistry and exposed in the Tuscan sun for about 25 minutes.

THE PROCESS

The original cyanotype process was made by combining two chemicals–**ferric ammonium citrate**, a light sensitive chemical, and **potassium ferricyanide**, which adds color. The mixture sensitizes paper or natural fibers such as cotton, silk, and canvas. Cyanotypes can also be made on glass, wood, or ceramics. For ceramics, the cyanotype is developed during kiln firing. The blue color changes when it is fired, and several coatings can make the cyanotype look similar to a gum print, which can also be fired. A third chemical, potassium dichromate,* can be added for contrast. Cyanotype is a contact printing process, which means that the negative needs to be the same size as the final image. The image is exposed with UV light for 10—45 minutes, or even longer with a dense negative. After exposure, the cyanotype is washed in water.

A cyanotype can be light in color or changed to a deep blue by treating it in hydrogen peroxide. Other chemicals, such as tannic acid, sodium carbonate, gallic acid, and others listed in the toning section of this chapter, can be applied to change the blue to brown or violet. The cyanotype print can also be used in conjunction with a variety of processes such as platinum and palladium, gum printing, hand painting, and others. Except for a tendency toward slight fading and an inability to be washed with harsh detergents (hand washing is fine), fabrics printed with cyanotype chemistry are permanent. If a print fades, you can re-tone it with hydrogen peroxide to bring back the deep blue color, or place it in the dark where it will re-oxidize back to blue in a few weeks.

The cyanotype darkroom can be called a "dim room" as it does not have to be dark or even lit with red or amber. A general rule of thumb is that darkroom lights can be bright enough to read by. The chemistry is sensitive to UV light, so any type of subdued white light, such as 40-watt white bulbs, yellow bug lights, or white string lights, can be used in your darkroom. As long as the lights are about 3 feet away from your coating area, they will not fog the emulsion or coated paper. Fluorescent lights emit a small amount of UV light, so I suggest not working with them.

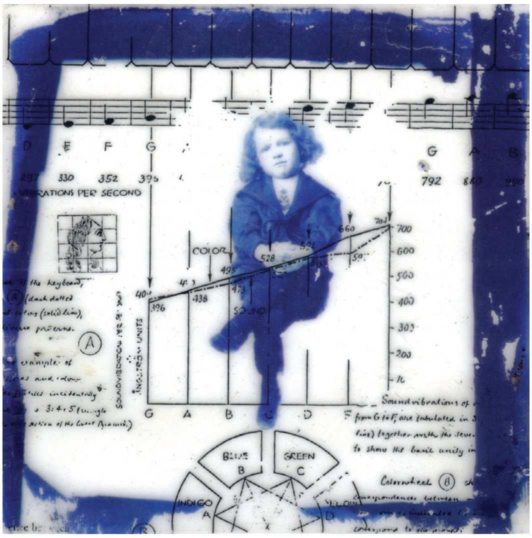
MATERIALS NEEDED

Many of the items required to make cyanotypes are standard darkroom materials. The major difference is that the chemicals used for the cyanotype process can react negatively with metals, causing oxidation and staining. Thus, it is important that your darkroom is equipped with non-metallic utensils, bottles and trays.

Before you get started, make sure you have the following items on hand:

- Apron
- Brushes or coating rod
- Contact printing frame with a hinge back
- Cups and bowls
- Distilled water
- Drafting tape
- Drying screens or blotter book
- Eye droppers
- Glass
- Gloves
- Graduated beakers or cylinders
- Hair dryer with a cool setting
- Mixing rod
- Negatives (see below)
- Pencils

* Potassium dichromate is classified as a carcinogen. However, we are using it in such a diluted form that unless you are really sloppy, you will be fine. Make sure to wear a mask, gloves, and goggles when handling it and have good ventilation.



05.4 © Anna Tomczak. "Blue Boy." Anna combined a laser transfer, cyanotype, and wax.

- Plastic spoons
- Scale
- Storage bottles
- Trays
- Running water
- 3M Magic Tape #811

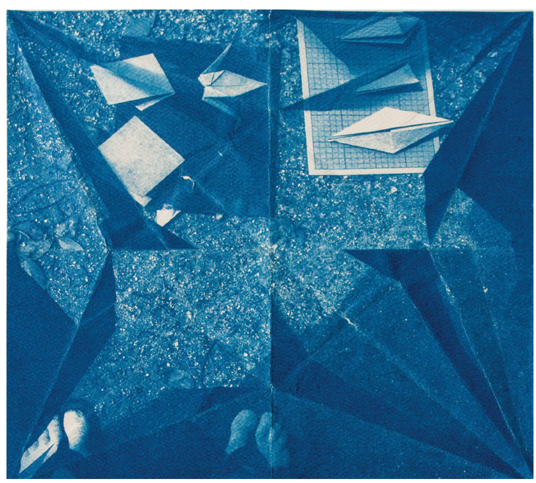
NEGATIVES

Cyanotype is a contact printing process that requires negatives the same size as the finished image area. Cyanotypes do not have as broad a tonal range as black-and-white prints or most other alternative processes. This means that some details may be lost. The negative should not be overly dense because the exposures will be too long. While many photographers use enlarged negatives for contact printing processes, photograms are a great way to go. You can experiment with both 3D objects and flat items. Try laying objects flat, while others, like a bottle, can stand. You can also use glass shelves to have objects at different distances from the paper to change the effects as well. The light spreads around and under objects for some beautiful results.

05.5 © Diane Farris. "Girl with Dove." Diane used the classic cyanotype formula on Rives BFK paper.

PAPER

Virtually any paper, except for alkaline-buffered papers, can be used for cyanotype printing. Papers that have good wet strength, such as etching and watercolor papers, work



05.6 © Shari Diamond. Shari spent some time at a residency in Japan and became fascinated with the symbolism of hope for peace using paper cranes. Shari feels that by using the cyanotype process, the images "incorporate process, time, reflection and contemplation."

best. One of my students made some great prints using subway maps and take-out menus, coffee filters, paper bags, and paper towels. Just remember that paper with a high acid content will not be of archival quality. Scanning and digital printing is a great option.

FABRIC

Any 100% cotton material will work. If a fabric contains any synthetic fibers, the blue tones will register as a weak blue. Remember that cotton fabrics are sent to stores with sizing to prevent wrinkling. In order to get a good, even coat of solution, fabrics should be washed in hot water, dried, and then ironed before being coated with cyanotype solution.

These life-sized self-portraits were made in the Odyssey Workshops for combat veterans. These photography workshops, founded by Brendan Bannon, give veterans tools to explore and explain their return home from war.

05.7 © Michael Shanley. "A Warrior's Transition." 2019. Shanley, a US Army veteran and tank crew member, was deployed to Tikrit, Iraq from 2003–2004. "This self portrait is about leaving the fight and embracing the flight," Shanley explained. The gun represents his battle training; the ring represents flight through Ninja Warrior competitions, his current passion.

05.8 © Rob Healy. "Gravity." 2019. Healy explained the self- portrait, "PTSD is like Gravity. Its presence and influence are a fact. We either accept it and operate within the reality it defines or we become crushed by its weight." While serving in Iraq, the base Healy was stationed at was extensively mortared. For this piece he worked with Lucas, his 5-year-old son. The image is also a portrait of parenthood. It shows a father both elevating and catching his child.

Healy was part of the Odyssey Workshops, a photography program for returning combat veterans founded by Brendan Bannon to give veterans tools to explore and explain their return home from war.

CANVAS

Any canvas can be used without preparation unless it has gesso on it. The gesso acts like

05.9 © Daniel Marlos. "My delightful winter garden." Printing on different color cotton with plants from the garden, Daniel was then able to make a wonderful quilt.

a resist, and the cyanotype coating will wash right off a lot of the canvas, making the image look like they were spray painted. This actually can look very interesting depending on the image.

GLASS

Glass can be very difficult to work with, but with practice, it does work. Look on p. 70 for how to work with glass.

WOOD AND CLAY

Any type of wood works well, but the lighter woods will be easier to print on. Depending on your choice of wood, you might want to experiment with gelatin on the wood first. If it is a soft wood, the cyanotype may slowly sink into the wood and the image will disappear. This may be cool to watch, but not quite what you had in mind! Make sure your wood has been well washed in advance of coating. I recommend applying five coats of gelatin and one or two good coats of cyanotype. If the wood will be outside, then several coats of clear UV protective polyurethane should be applied after drying.

Cyanotype chemicals can also be put on clay and fired. Keep this in mind. You can find the instructions in Chapter 15.

05.10 © Robert A. Schaefer Jr. Robert uses digital negatives to make his cyanotypes on glass. He mixes the classic cyanotype chemistry and puts the chemicals together 1:1. Robert then mixes 20grams of gelatin that has been mixed with 100ml of water. Once everything is mixed, he takes ⅓ of the cyanotype to ⅓ gelatin and adds it to ⅓ isopropyl alcohol. He will also add 10 drops of chrome alum as a hardener. (This was diluted 5grams of crystals to 100ml of water.) He heats the mixture up, and pours it on a heated piece of glass. He lets this dry for an hour and then repeats for another coat. Once dry, he exposes it for about 20 minutes and washes it with very slowly running water.

MIXING THE CHEMICALS FOR STOCK SOLUTIONS

Cyanotype chemicals can be purchased in many forms. You can buy the chemicals separately, pre-mixed or in kit form. It is usually cheaper to buy chemicals in bulk, but do a comparison before making your purchase. Kits are a no-fuss, no-mess way to go, but you might prefer working with do-it-yourself bulk chemicals, which will allow you to experiment with different recipes.

Something to remember when you are reading about alternative processes is that you can find many different recipes, but none of them is written in stone. If you understand the purpose of each chemical, then you can tinker and make your own recipes. The recipes in this book have been copied from old texts or other resources I have referenced. I have included more than one recipe at times, but feel free to try others.

The following tells you how to mix if you have bought bulk chemistry. These solutions should be mixed at least a day before use, and can be kept for about six months to a year.

05.11 © Chris Huestis and Jordan Smith. "Your Move." After a lot of rough starts to make a public art bench, Chris and Jordan bought poplar wood because it was relatively knot-free. They first sanded the wood and then coated it with two coats of cyanotype. They added a little white vinegar to the initial wash to aid with the contrast of the image. Developing in vinegar before the wash brings out the mid-tones on any support.

TRADITIONAL CYANOTYPE

Chemical A is the light sensitive agent:

90 g ferric ammonium citrate (green crystals)
250 ml distilled water

Chemical B is the color agent:

50 g potassium ferricyanide (orange crystals)
250 ml distilled water

Chemical C is a chemical that makes coating go a little smoother: THIS IS OPTIONAL

Tween 20™ dilute 1:1 with water and add 1 drop per 8 × 10" image.

Tween 20™ helps as a wetting solution and allows the emulsion to go on to your support smoothly. However, you need to make sure it is mixed well into the sensitizer before putting it onto the support. If not mixed well, it will cause a blotchy coating.

Chemical D is the contrast agent: THIS IS OPTIONAL

1 g potassium dichromate (orange crystals)
100 ml distilled water

If you are unsure about the quality of your water, then distilled water may be safer to use than tap water. Some cities, such as those in Florida, have a lot of chlorine in the water, and well water may have minerals that can interact negatively with some chemicals. Old city pipes can have a lot of rust and lead. However, some people like using tap water and find that it causes few issues. I have filtered water in my darkroom, which is another solution.

Store each solution in a separate dark glass bottle. Most references say that the stock solutions can be stored for about six months to a year. However, once the A and B solutions are mixed together, they are viable for less time. If the A solution forms mold after a few weeks, simply filter it off and use the solution as if nothing had happened.

05.12 © Allan Jenkins. "Garlic." Allan uses the traditional cyanotype process and Bergger 310 gsm paper (French watercolor paper). He then tones each print individually using tannic acid and pulls the paper out of the tray when it looks good to him.

I have been known to mix the solutions together and use them for over a year. The chemicals look dark, as if they are already exposed, but make beautiful, light blue ethereal images.

CHEMISTRY MIX FOR PRINTING ON GLASS

I have watched videos and read recipes in other books and tried several different ways of printing cyanotypes on glass. The recipe and instructions I am using is a combination of a few of them. Even though I have seen other artists' images where they mixed gelatin into their A & B solutions and heated it up, when I tried using cyanotype that was already mixed and then added gelatin to it, my image peeled off as soon as I put it into the water. Some other artists said the glass had to be subbed first and I found that the glass worked great with albumen. Gelatin subbing caused peeling unless it was a really, really thin coating. Albumen was easier for me as I am used to using it with collodion work.

When I did *not* put a subbing on the glass, it worked, but was easy to ruin. When it was in water for a while it peeled up, where the image on the subbed glass stayed on really well and also made it easier to tone without worrying the image would bubble off.

To mix

Albumen subbing

1 egg white
1 liter distilled water

To Mix Cyanotype Chemistry for Glass

This recipe is from Joseph McCallister and worked the best for me:

1. Measure out all of your chemicals into containers.
   300 ml distilled water
   40.8 g ferric ammonium citrate
   13.8 g potassium ferricyanide
   1.5 g oxalic acid
   39.4 g gelatin (either Knox gelatin or photo grade gelatin)
2. Slowly start to mix the chemicals in this order:
   - Distilled water
   - Oxalic acid
   - Potassium ferricyanide
   - Ferric ammonium citrate
   - Gelatin – mix slowly into the solution.

Mix everything in a stainless steel pot that you do not use for food, and then:

3. Once it is mixed well, put it on a hot plate or stove and heat on low (between 100°–120°F), with constant stirring. If there are any clumps on the

05.13 © Joseph McAllister. Joseph prints on glass and has a video on his technique online. Flowing the cyanotype on glass is very similar to flowing wet plate collodion and just takes practice.

bottom of the pot, the clumps can burn and ruin the emulsion.

4. Do not let it boil, and remove from the heat as soon as you see steam. Continue to stir until it is evenly heated and mixed thoroughly.
5. You can store the solution in an amber bottle in a refrigerator and slowly heat it up when ready to use by placing the bottle into water and letting it slowly heat up again as the chemicals go back into solution.

COATING THE GLASS

- The glass should be about the same temperature as the chemicals. I have a heating pad that I place the glass on, but you can also use a hair dryer to heat the glass.
- Don't let the solution boil and don't heat it up too quickly.
- Skim any bubbles that have formed on top of the chemicals before pouring on to your glass.
- Pour the emulsion into the center of the glass, covering a good portion of it, and slowly tip the glass until it is totally covered with emulsion (similar to pouring collodion).
- Pour the excess back into the container.
- Place the drip edge on a paper towel until it stops dripping down.
- Wipe off any emulsion that has gotten on the back with a wet cloth.
- Dry the glass vertically. Do not place flat until the glass is totally dry.
- The glass should dry so that it looks like there is no emulsion on it.
- If the emulsion is too thick, it will flake off.
- The glass can be dried with a cool hair dryer, or let it sit in a dark room until dry.

EXPOSING AND DEVELOPING THE PLATE

- Expose for twice as long as for paper.

05.14 © Kenneth Chau. Part of a larger body of work called "Luna Regnum." Kenneth used a large paper negative that he oiled and let dry and then oiled again to make the paper translucent. He then exposed the large Fabriano paper for about 45 minutes in direct sunlight. He soaked the paper in a hydrogen peroxide and table salt bath before giving it a final one-hour wash in fresh running water.

- Wash in cool water. The water should be barely on. If the pressure is too high, the emulsion will peel off.
- Soak the plate in distilled water while agitating for about 30 seconds to remove any hard water spots that might appear.

Cyanotype on glass can be toned and can also be scrubbed off and reused.

MIKE WARE'S "NEW CYANOTYPE"

Englishman Dr. Mike Ware has been studying and writing about cyanotypes for many years. His book, *Cyanotype: The History, Science and Art of Photographic Printing in Prussian Blue*, was first printed in 1999. He goes into depth on everything you would ever want to know about cyanotypes. The following recipe is a little more complicated than the traditional recipe, but it has several

05.15 and 05.16 © Mike Ware. Mike loves to experiment and work with old formulas to make them better. His "New Cyanotype" has been used by many artists because of the rich tonal range you get as well as a faster exposure time.

advantages. The emulsion has a longer shelf life and can be kept in one bottle once it has been mixed; the exposure time is shorter; and the blue can be deeper. The chemicals can be bought already mixed, in kits or in bulk. The negative needed for this recipe also varies from the traditional cyanotype. The negative needs to have a much longer exposure scale, similar to those for palladium and salt printing vs. traditional cyanotype or gum bichromate negatives.

RECIPE: A HOT PLATE IS NEEDED

10 g potassium ferricyanide
30 g ammonium iron (III) oxalate (ferric ammonium oxalate)
0.1 g ammonium dichromate (optional)
100 ml distilled water
0.25 cc Tween 20™ (optional)
2 g citric acid (optional)

To mix

1. In a Pyrex glass beaker, pour 20ml of distilled water and add the 10g of potassium ferricyanide. Heat the mixture to about 160°F, stirring well until the solid is dissolved. KEEP THE SOLUTION HOT.
2. In a second pyrex glass beaker, heat 30ml of distilled water to about 120°F. Add the 30g of ammonium iron oxalate and stir well until the solid is dissolved.
3. Add 0.1g of ammonium dichromate into the ammonium iron oxalate pyrex and let it dissolve. (You can omit this but the contrast and shelf life of the sensitizer will be diminished.)
4. Add the hot potassium ferricyanide solution (1st pyrex) to the ammonium iron (III) oxalate solution (2nd pyrex) and stir well. Set the mixture aside in a cool, dark room until it returns to room temperature. The solution will start to form crystals as it cools. This will take at least an hour or two and can be kept overnight.
5. Filter the solution to make sure all of the crystals are filtered out and you are left with just liquid, which should equal approximately 60 ml of liquid. Wearing gloves, the crystals should be rinsed off of the filter paper with hot water down a drain.
6. Add distilled water to bring the volume up to 100ml. Mix well.
7. You can also dilute the sensitizer to 200ml if you want more volume and a faster exposure time. But be aware that the blue will be less intense. Store the sensitizer in a brown, well-stoppered bottle. It should be mixed one or two days before use.

   The sensitizer solution is toxic *if ingested* and it will stain clothes and skin. If you store the bottle

05.17 and 05.18 © Jill Enfield. By over-exposing, using Mike Ware's New Cyanotype to get a rich blue, and placing the print in hydrogen peroxide after it had been washed (Figure 05.17), I was able to ensure the image would split-tone as I went back and forth between trays of tannic acid and sodium carbonate (Figure 05.18).

in a cool dark place, the shelf life will be at least a year.

8. Optional step: Chemical fogging of the coating due to paper impurities may often be prevented by adding citric acid to the sensitizer just before coating. Do not add citric acid to the stock solution as it will shorten the shelf life.

   Add one drop of a 40% solution of citric acid for each ml of sensitizer.

9. Optional step: Absorbent papers may require a wetting agent such as Tween 20™ to help with a more uniform coating. Do not add Tween 20™ to the stock sensitizer solution as it may cause mold to form in the stock solution.

   Add one drop of a 5% solution of Tween 20™ to each ml of sensitizer and mix well.

Now that you have chosen which formula to use …

PREPARE THE SUPPORT FOR SENSITIZING WITH EMULSION

How neat you want to be will affect how you sensitize the paper or other type of support. Here are three ways to prepare your support before coating with emulsion:

1. Place the negative on a light box and put the support on top. Mark the corners with a pencil so, when you are in the darkroom, you will be able to see where to coat the support.
2. Position the negative, and use 3M Magic Tape to hold it in place. Tape only one side. This way the negative can be flipped up and moved out of the way when you coat with sensitizer.
3. For neat edges and no brush strokes, use drafting tape to tape off an area a little smaller than the negative size. This way, after the emulsion is applied and the chemicals dried, the tape can be removed to reveal a very neat box of yellow emulsion on the support.

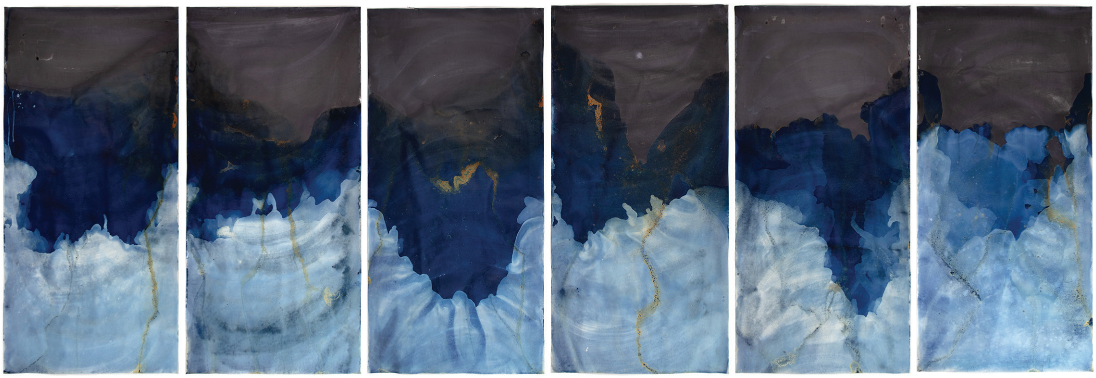
05.19 © Sarah Abrahamsen. Sarah was a student of mine at Parsons in NYC and used her drawing talents in combination with her photography. For every urban drawing, there is a rural cyanotype photo within it, and vice versa. She first drew a light outline on cold press watercolor paper. Using a small sponge brush, she coated the paper only where she wanted the photo to develop. Once the cyanotypes were developed and dried, she made the outlines darker with a thin archival pen.

MIXING THE STOCK SOLUTIONS TO MAKE THE SENSITIZER FOR TRADITIONAL CYANOTYPE

If you are using the traditional recipe, then mix part A with part B 1:1. For a faster solution, mix two to three times part A to part B. Or for a more brilliant blue, but slower exposure time, mix one part A to two parts B.

You can mix the sensitizer to almost any dilution, but at some point you will sacrifice the range of mid-tones and get a poor blue. Run tests to determine which dilution works best for your esthetic, negative, and support choice. For more contrast, add about 6 drops of the working solution of the potassium dichromate to 2ml of sensitizer.

The amount of sensitizer needed per print is determined by size, support, paper type (hot press or cold press) and how you are coating. For example, for an 8 × 10" print, measure out 2ml of the sensitizer or count



05.20 © Meghann Riepenhoff. Meghann makes cameraless cynaotypes in collaboration with the environment. She explains that she focuses on water sources that are made vulnerable through human intervention. Meghann only partially processes her images so that they continue to respond to the environment over time. This image was made at the Great Salt Lake, which is experiencing record low water levels.

out approximately 48 drops. When using a glass rod, then only use approximately 30 drops. Cold press papers use more chemistry because of their texture. Hot press papers require less chemistry because they are smoother and less absorbent.

05.21 © Jesseca Ferguson. Jesseca uses cyanotype images that she makes with a pinhole camera to make one of a kind artist books. Sometimes they are only one page made on an old book cover or pages from a book put together in a new way.

COATING PAPER

You can use a coating rod or almost any type of brush you want. Some people apply just one coat, while others apply two. Dry between coatings with a hair dryer on the cool setting.

When using a foam paint brush, wet the brush first so that the chemicals do not soak into the sponge, making it hard to coat the paper evenly. Use a towel to dry the brush a little before dipping it into the sensitizer.

Both foam brushes and bristle brushes will show brush strokes on the outside of the image area. There is no right or wrong brush, but remember that any metal on the brush should be protected. Apply nail polish or paint to the metal to prevent rust from water or chemicals, which can ruin the bristles. You may also want to use super glue at the base of the bristles to prevent them from falling out onto the image area. Stray bristles cause white marks where you don't want them. Let the super glue dry for 24 hours before using the brush.

A coating rod requires less chemistry to coat the paper, but takes practice to use it properly. If you want the effect of brush strokes, you can apply a brush along the edges after you are done using the rod. Nobody will be able to tell!

CHECKING THE EXPOSURE

The easiest way to make a cyanotype is with a contact printing frame that opens on one side while holding the negative securely in place on the other side. Every five minutes or so you can turn off the UV lights and check your exposure. If you are exposing by sunlight, take your frame inside and check to see if your image is dark enough.

DETERMINING THE PROPER EXPOSURE

Exposure time is determined by the light source, the density of the negative, the paper, and the coating method. Looking at the cyanotype emulsion outside the image area will not help determine the correct exposure time. Unlatch one side of the contact print frame, lift up the negative and look at the **shadow areas, not at the highlights**. The longer the exposure, the darker the blues will be.

During exposure, the coated material will change from greenish yellow, to light green, to a bluish gray, and finally to a blue-green. Some papers may be more of a blue-gray, others will be olive green in the shadow areas. Look for solarized grays in the shadow areas where you want deep blues. The solarized areas will have a shimmering appearance. Just keep in mind that whatever is light blue will wash out to white. Whatever is yellow will end up as the color of your paper with no tone at all. The exposed image should look much darker than how you want your finished image to look.

WASHING THE PRINT

There is more than one way to wash a print. There is no developer in cyanotype. You wash your print in running water and dry your print, or tone it.

1. Wash in running water until the yellow is gone and no more blue is rinsing off. This should take about 30 minutes.

05.22 © Tasha Lewis. Tasha makes sculptures out of all kinds of materials from cardboard and bubble wrap to plaster-of-paris. Cyanotypes are made on cloth and sewn onto the sculptures. This image is a life size replica of a humpback whale tail.

2. To help bring out contrast, without adding potassium dichromate, you can use an acidic bath first, and then wash in running water. This will bring out the midtones.

You can use a few capfuls of vinegar, citric acid or acetic acid in a tray of water before washing a print. This should be changed after every 8–10 prints. Adding any more may create blue stains where you do not want them. The same holds true for the toning baths. The strength or weakness of the bath can be controlled with varying results. I would make a few prints, keeping one as a "control print." Then see which dilution you like best for the type of negative and paper you are using.

DRYING THE PRINT

Dry the print *face-up* on a drying rack. A wet cyanotype's surface is soft, and if you place it face down, you will end up with screen marks on the image. Cyanotype can also stain the screens, which in turn will stain other prints that might be dried later on those same screens. Hanging prints to dry is another option.

CHANGING THE COLOR FROM BLUE TO ...

You can tone the print the day it is made or many years later. As long as the paper is well-soaked in water first, the print will tone evenly. Pre-soak the print in water for about one minute before you tone.

Start with a print that is a little on the dark side. (The exception here is toning with hydrogen peroxide, which makes prints even darker.) Each ingredient (toner) needs its own tray. Add about **two tablespoons of toner to an 11 × 14" tray of water**. The ratio of toner to water is not critical.

Some people rinse in running water between each toner for about a minute. Rinsing will allow the second and third toners to stay stronger longer.

The more toner, the faster the reaction will be, and nothing will be harmed. Agitate the print in the tray, for at least 30 seconds and up to five minutes, to get the desired effect. You can do this in regular room light or outside. As you notice it taking longer to tone, or the color of the toner becomes dark, dump it out and use a fresh tray of toner. Again, there is nothing critical here. Just keep good notes so you can repeat the colors that you like as you make more prints.

The colors will vary with paper, exposure, how the sensitizer was mixed, temperature and humidity, and the toner itself. The suggestions below are just a few of the popular ones. There are many more ways to tone cyanotypes online.

These are not the only colors that cyanotypes can be changed to. However, some of the other toners are not as safe as the ones listed below.

05.24 © Serge Shvedenko. Serge got this wonderful tone by using 15 grams of yerba mate (a type of tea) and 1 gram of tannin to a liter of water.

05.23 © Karen Carson. Karen uses Canson Aquarelle 90-lb paper when she knows she is going to tone her images with the red-brown toner.

TO PRODUCE DIFFERENT COLORS

Red-brown

1. Tannic acid
2. Sodium carbonate

You will not see a change in the image until you put it into the second tray.

Brownish

1. Sodium carbonate
2. Tannic acid

Bleach your image in sodium carbonate until it looks very light. Then place into the tannic acid until you get your desired color.

Purplish-brown

1. Sodium carbonate
2. Tannic acid

Bleach your image until you just see your highlights and then put it into the second tray of tannic acid until you see your image come back and you get the desired color.

Deep purple

1. Pyrogallic acid
2. Hydrogen peroxide

You can go back and forth between these two solutions to get richer tones.

Violet

1. Gallic acid or borax
2. Tannic acid

Teal

1. Any kind of citrus juice or citric acid

This toner is not permanent. If the prints are left in the sun, the color will change back to the original blue.

Black

1. Tannic acid
2. Gallic acid

Leave the print in the gallic acid, agitating on and off until you see the blue turn black. This might take a half an hour or longer. Once you have the desired color, rinse the print.

For a slightly different purplish/brown you need ALL these ingredients, in four different trays, plus a wash tray:

1. Tannic acid
2. Pyrogallic acid
3. Kodak Dektol paper developer 1:3
4. Hydrogen peroxide

Purplish-black

1. Gallic acid
2. Tannic acid
3. Pyrogallic acid
4. Hydrogen peroxide

Black and green

1. instant coffee
2. 5% acetic acid or white vinegar

Dark brown

1. 28% ammonia
2. Tannic acid

Bleach the print in the first tray until the blue is almost gone. Rinse the print so that the bleach does not contaminate the tannic acid. Leave the print in the tannic acid until the desired color appears.

Another dark brown

1. Kodak Dektol paper developer 1:3 – bleach the print just half-way
2. Hydrogen peroxide
3. Pyrogallic acid

Yellow

1. Immerse a very dark cyanotype in a 5% bath of trisodium phosphate.
2. Agitate until you see the color that you want.
3. Rinse for 15 minutes.

To achieve split tones

Variation 1

1. Put the print in Dektol until the desired result is reached. The highlights will turn brown, while the shadows stay blue.
2. Rinse for 15 minutes.

Variation 2

1. Make a strong tea with any cheap black tea. (Lipton works well – about 8 tea bags to a quart of water.)

2. Let it cool.
3. When the tea is room temperature, agitate the cyanotype print in the tray for about 10 minutes, or until you reach the desired result.
4. Rinse for 15 minutes.
5. The tea will "stain" your paper, making your highlights appear a cream color while the blues will look richer and darker. It is better to pull the print just before you get to the desired color; this takes practice, but it is easy to learn. As the print dries, it gets slightly darker.

Variation 3

1. Take a very dark print and put it into sodium carbonate where it will bleach.
2. Then place it in a tray of tannic acid.
3. Place the print back in the tray of sodium carbonate.
4. Rinse for 15 minutes.

TIPS

- Rinsing the print in a tray in between each solution will prevent the toners from becoming contaminated, but be aware that the colors might not be as intense.
- You can also use a brush to tone specific areas of an image instead of the entire print. Apply rubber cement as a resist to cover up areas that you do not want to be affected by the toners. When the print is dry, you can rub off the rubber cement.
- Printing on colored paper or fabric will make the highlights appear the color of the chosen paper or fabric. The blue area will be blue, plus the color of the paper or fabric support. For example, red will turn purple, and orange will turn brown.
- Almost anything acidic, like vinegar, lemon, pineapple juice or hydrogen peroxide, splashed into one of the wash trays will create brighter blues. Try adding a few teaspoons of acidic liquid to a tray of water. Each paper will react differently. I personally prefer hydrogen peroxide. A few capfuls in a tray of water will bring out a nice, deep blue, making your print darker with added contrast.
- You may find yourself going back and forth between chemicals before you get the desired result. This takes practice, and the print may end up looking muddy. Make extra prints so you can play with toning effects, always making sure you write down what you have done. Even so, the repeat factor here will be slim. Overall, approach toning as making one-of-a-kind images.
- A second coat of emulsion after the first has dried adds density to the final print. Test this out according to the paper you are using.
- When we were cleaning up at Parsons, we threw all of the toners into one bucket. Some of the students decided to see what would happen if they put their prints into this muddy bath. The results were really lovely, and this has become an end-of-day practice before throwing the toners away.
- A resist, such as rubber cement or Vaseline, can be placed on the image area before coating with the sensitizer. I have seen this done with hand and face prints, but it can also be successfully achieved with photogram objects. These areas will remain white, while the surrounding areas turn blue. The rubber cement should be removed by rubbing it off before putting the paper back into water. The Vaseline can be removed by putting the paper into a tray with mild liquid detergent and water.

TROUBLESHOOTING

- A brownish-yellow color on unexposed paper means the sensitizer has been burned. This might be the result of drying the paper with a heat source that was too hot, or keeping the hair dryer in one spot for too long.

- If the blue totally washes out, the exposure was not long enough.
- If the paper starts to turn blue, green, or brown before you start to expose, the paper has been fogged. Unexposed paper should be a yellow-green, but use it anyway. You might like the results! This is the wonderful serendipity of alternative processes.
- If white spots appear throughout the image, it could be one of two things – air bubbles or lack of saturation. Most likely a portion of the paper fibers did not accept the chemistry.
- If strange lines appear on your image, check the back of your paper to see if there are similar marks. If so, the paper was most likely placed on a wet spot of sensitizer, contaminating the paper.
- If even lines appear throughout the image when using a digital negative, look closely at the negative to see if the lines are visible there. If so, the printer heads probably need cleaning.
- If the white areas turn blue while drying or the print is still a little yellow, you did not wash the print thoroughly.
- If some of the emulsion sticks to the negative, the emulsion was not dry before the negative was placed on the paper. Damp emulsion can adhere to the negative during exposure.
- If you got strange colors on your print, it could be from using a rinse bath between toners without running water. This turns the bath into another toner. If you mix prints (some that you toned without washing and others that were not toned) and put them into the same holding tray or wash, some of the toner will wash off and stain the other prints. Make sure your prints are well rinsed before putting them in a tray with other prints.
- Too little washing will leave soluble ferric salts on the print. This causes fading when the image is exposed to light. To return them to their original color, leave them in the dark or immerse them in a tray of water with hydrogen peroxide.
- Too much washing can lighten the image.
- If the negative is *very* contrasty, add a little water to the sensitizer to make it weaker. A weaker solution cuts the contrast of the image.
- If the negative is flat or the chemicals are old, add potassium dichromate to the sensitizer. Six drops per 2ml of working solution is a good starting point. Two ml of potassium dichromate is a good amount for an 8 × 10" hot press paper coating. More chemistry is needed for cold press and rough papers.
- You can coat the support twice. Some people insist you need to let the paper dry before adding another coat. Others insist that you do not need to dry the support between coats. Try both methods, write in pencil on the back of the paper what you have done, and see which works best for you. In any event, a double coat will add contrast and enhance the blues.
- If the paper has lavender-colored stains, the paper has been stored in humid conditions.

THE CUPROTYPE PROCESS

A VARIATION ON SOME OF THE CHEMISTRY USED WITH CYANOTYPES

Charles John Burnett (1820–1907) was a British photographer best known for his work using uranium salts. The term "Cuprotype" comes from Burnett's experiments with both uranium and copper during the 1860s. Cupro means copper in Latin. Jim Patterson, a doctor and chemist in New Orleans, looked up

05.25 © Jim Patterson. This is a plain cuprotype, with no extra toning

05.26 © Jim Patterson. This cuprotype has been toned with selenium sulfide.

05.27 © Jim Patterson. This cuprotype has been toned with a combination of catechol/pyrocatechol/pyrocatechin and can be bought commercially as Hanker-Yates Reagent. This is used as a tissue stain in pathology and is advertised as non-carcinogenic and safe. It is expensive but you can buy it at most chemical supply companies.

information from J.B. Obernetter's ferro-cupric process (1864) and started to experiment. The original chemicals did not get satisfactory results, so he switched it up a bit, using ferric ammonium citrate as the light sensitive agent and copper sulfate for the copper salt. He then developed and toned with the chemicals listed in Figures 05.25 to 05.27.

The Cuprotype uses iron salts as the light sensitive agent and a copper pigment, Copper II Ferrocyanide (known as Hatchett's brown pigment) to produce a print that ranges from brown to oranges. There are not many photographers at the moment who are doing this process, so I found it particularly interesting that it is so versatile and easy to use. However, you need to be very aware that some of these chemicals are hazardous and precaution must be taken. Wear protective clothing, closed toed shoes, goggles, gloves, and a mask.

Jim has been working with cuprotype for a few years and is wonderful at experimenting.

GETTING READY TO PRINT

CHOOSING THE SUPPORT

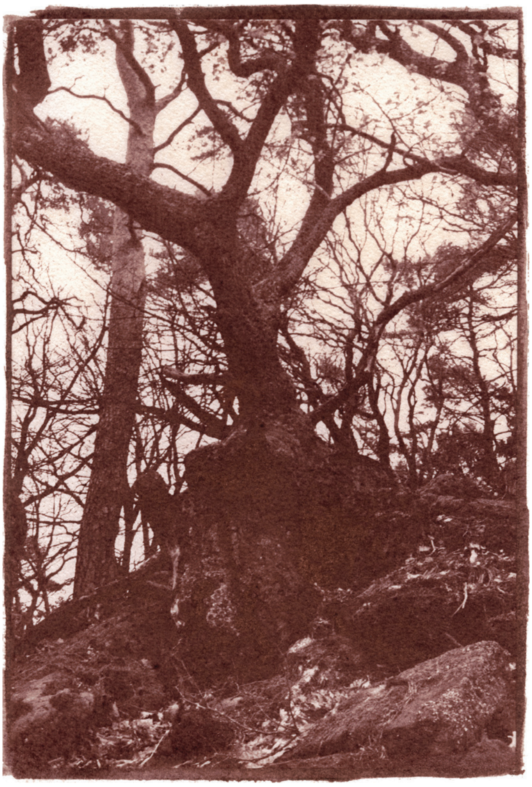
The room set up is the same for cuprotypes as with cyanotypes, dim white light to illuminate your working area is fine. The materials list is also the same, except for the changes in chemistry.

The paper should be hot press watercolor paper such as Arches Platine and Hahnemühle Platinum Rag. Cotton fabrics can also be used as can wood and other materials listed for cyanotypes.

Smooth or fibrous papers and surfaces such as glass, plastic, or metals, must be sized before being sensitized. You can use any of the sizing/subbing recipes found on p. 25–29 in Chapter 2.

Buffered papers interfere and may make the image look bleached. You can acidify the paper and you can find the simple instructions on p. 25 in Chapter 2.

The color varies depending on the emulsion, paper, sizing, and toning. In other words, it is important to take the time to do some tests, writing down on the back of your image or in a notebook exactly what you did so that you can repeat it.



05.28 © Günther Wilhelm. "Bergstein II." Original color is red violet on Hahnemühle paper. The color varies depending on the emulsion, paper, agar sizing. If you heat the print while drying it will also affect the color.

MIXING THE STOCK SOLUTIONS

Sensitizer

12 g ferric ammonium citrate
12 g copper sulfate penta-hydrate
80 ml distilled water

Once dissolved bring the volume up to 100ml by adding distilled water.

Store in a brown bottle in a cool place. The chemical mixture should be a beautiful emerald green color.

Developer

10 g ammonium thiocyanate (or potassium thiocyanate)
10 g citric acid (hydrous or anhydrous)
900 ml distilled water

Once dissolved bring the volume up to 1 liter by adding distilled water. Do not use the developer again. Put some in a tray and use it for one print and then throw it away.

Toner

20 g potassium ferricyanide
900 ml distilled water

Once dissolved bring the volume up to 1 liter by adding distilled water.

Clearing bath

250 ml developer of your choice (see below)
750 ml distilled water

Contrast agent (optional)

6 g ammonium dichromate*
25 ml distilled water

Once dissolved bring the volume up to 30ml by adding distilled water.

Store in a brown glass bottle with a dropper, as you will only use a few drops at a time.

The contrast control will increase contrast and help clear the highlights. It is not necessary to use, but you should try it to see if you like the results better than not using it.

05.29 © Günther Wilhelm. "Grill Meadow, Lindenhof." This image was developed with potassium permanganate. Cuprotypes are excellent for toning. The color palette ranges from ocher and brown to green and blue to black.

* Non-dichromate agents you can try are 10% ammonium persulfate, or 25% sodium chlorate. The solution is only stable one day after mixing, so mix only the amount you will be using in one sitting.

DIRECTIONS

- 2ml of sensitizer will cover an 8 × 10" image hot press watercolor paper. For each 2ml of sensitizer, you can add one drop of the (optional) contrast agent. You can also add one or two drops of photo-flo or Tween 20™ for easier coating
- Coat the paper with a brush or coating rod.
- Dry with a cool hair dryer, or in a dark room.
- Expose by contact printing in UV light for about 15–30 minutes.
- Develop for three minutes with continuous agitation. The shadows should clear off any orange color and should be a pale gray. The highlights may still have a slight orange tone to them.
- Wash in running water until the print has no visible, remaining orange tone. If any orange, which is iron, remains on the print, there will be a blue cyanotype stain that will show during toning.
- Tone the print until you see the desired color and density. This might take up to 20 minutes.
- Wash with running water for 20 minutes. Unless you are using an archival washer, it is a good idea to fill and dump every once in awhile during washing.

TONING OPTIONS FOR OTHER COLORS

Using a brush with a 5% ferric ammonium sulfate solution, you can selectively change the Hatchett's brown color to cyanotype blue.

OTHER TONING

Several old film developers bind with the Hatchett's brown pigment to change the colors. Some of the developers are hard to come by, but you can look up how to mix your own using recipes, including how to mix selenium, from Steve Anchell's *The Darkroom Cookbook* (3rd edition, Formula #164, p. 296). Steve thanked Judy Siegel who was a wonderful gum printer and teacher. Judy died at 86 in 2017. The Sepia Color toner below is this recipe minus the bleach. These powders can be very hazardous to your health. Wear a vapor mask and have good ventilation or mix outside. Wear gloves and an apron.

Sepia color

25 g Sodium sulfide
5 g Selenium powder
1 liter warm water

Warm in a water bath until the selenium toner is diluted. Store in a brown bottle. Dilute 1:20 when ready to use.

Purple-brown

2.5 g Amidol developer
2.5 g citric acid
1 liter water

Sepia

2.5 g Rodinal developer
2.5 g citric developer
1 liter water

Black: This will increase the density and contrast to your print.

Under-expose your print by about a stop if you want to use this formula.

2.5 g PPD para phenylene diamine (it is what makes black in black hair dye)
5 g Catechol (Pyro catechol developer and also in black hair dye)
2.5 g citric acid
1 liter water

05.30 © Cor Breukel. "Brug." Cor used Simili Japon paper and exposed it for 22 minutes. He used an Amidol toner. The paper was first sized with a 1% agar and then double coated. Cor wrote an article in April 2004 on Cuprotypes, that appeared in Issue 9 of *The World Journal of Post-Factory Photography*, which you can get online.

STEPS FOR TONING

- Use a flat bottom tray and put enough solution in the tray to cover your image.
- Agitate for one to two minutes.
- Wash for 20 minutes in running water (or you will get staining).*
- Air dry.
- The color develops by air oxidation. In other words, you will not see the resulting color until your paper is totally dry.

* If your tap water has iron in it, you will get a blue stain. If this is the case, than use distilled water by filling up a tray, agitate for a few minutes and dump the water out. Refill with fresh water and repeat about 5 times. Then wash in tap water for 15 minutes.

05.31 © Jill Enfield. “Ellis Island Morgue” This ambrotype was made into a digital negative and then a cyanotype on Mulberry paper.

Six

SALTED AND ALBUMEN PRINTS

06.1 © Jill Enfield. Italian Villa. I used a wet plate collodion negative to make a matte albumen print.

Parts of this chapter were excerpted with permission from *The Albumen & Salted Paper Book* (1980) by James M. Reilly, published by Light Impressions, which is available online at http://albumen.conservation-us.org/library/monographs/reilly. You can also find hard copies from used booksellers. Information has been gathered from the above-mentioned book, online resources, and by experimenting and keeping good notes. Two new books have been published and are also wonderful resources: Laura Blacklow's *New Dimensions in Photo Processes* and Christina Z. Anderson's book *Salted Paper Printing.* Christina's book goes into this process in depth and both books are must haves for alternative process photographers.

PHOTOGRAPHIC PRINTING BEFORE 1850

Henry Fox Talbot made the first successful silver-chloride photographic paper around 1834–5, and it has been the foundation for most of the printing papers used since. He called his process "photogenic drawing" and did not go public with its formulas until 1839, after Louis Daguerre had announced his own formulas for the daguerreotype.

Talbot prepared paper in two steps: (1) fine writing paper was immersed in a weak salt solution and dried; (2) a strong solution of silver nitrate was brushed onto the paper to make it light sensitive.

When exposed to sunlight the paper darkened, and could be stabilized temporarily by washing it in a strong salt solution. Sir John Herschel suggested that Talbot use sodium thiosulfate to permanently fix his prints. The prints became known as *plain salted paper* or *ordinary photographic paper*; this was used from 1840 to 1850. Talbot tried using this paper in the camera to make a negative, but the required exposures were impractically long, therefore Talbot's first images were photograms.

Talbot's prints were reddish-brown due to the gelatin sizing used by English paper companies. Apparently, French photographers did not get the same results, and it was not until two French scientists, Alphonse Davanne and Jules Girard, did tests that they realized the difference in color was due to the absence of gelatin as a sizing agent in French papers.

The invention of albumen paper as it was used in the nineteenth century is credited to Louis Désiré Blanquart-Evrard, a French photographer and innovator. Trying to improve upon Talbot's calotype process (the calotype is a paper negative made in a similar way to salt and albumen printing) in 1840 Blanquart-Evrard found a way to make beautiful positive prints. The original recipe was simple; egg whites beaten to a froth mixed with a salt solution, and allowed to settle overnight.

Albumen paper would last indefinitely. When it was time to print, the paper would be floated in a silver solution to make it light sensitive when ready to print. Since albumen was invented about the same time as Frederick Scott Archer's wet plate collodion negative technique, the two were often used together. Albumen was also popular with photographers who made *cartes de visite* and stereographs. Pre-salted albumen paper was even produced commercially and made in rolls up to 33 inches wide. Photographers would then sensitize it as needed with silver (sensitized papers do not keep well in storage, and it is best to sensitize them right before use). Toning was popular for changing color, as well as for archival permanence. Toning colors can range through browns, purples and blue-blacks. Printing can be done on any surface such as paper, fabric, leather, wood, and glass. Almost anything you can think of using.

06.2 © Michael Korol. Michael shot this on 11 × 14" film using a pinhole and a wooden camera. He then used part of the image to make a glossy albumen print.

Recipes for using the left-over egg yolks were readily available, and cheesecake and puddings, such as crème brûlée, became popular dishes. Just look up egg yolk recipes online for amazing things to use the yolks for. In an era when nothing was wasted, photographers often gave egg yolks to leather tanneries because they use the yolks to soften the hides.

The salted paper print was used from 1840 to about 1855 when albumen took over. Because salt prints were known to fade if not processed correctly, albumen prints account for approximately 85% of the total number of surviving nineteenth-century photographic prints.

Although the commercial production of glossy albumen continued until 1926 and matte albumen until 1929, by the turn of the century, the gelatin emulsion and collodion printing papers had become more popular. Thus the albumen method fell from favor and was replaced by the next generation of invention.

DIFFERENCES IN DILUTIONS

Pure albumen (just egg whites, no water added) produces glossy albumen paper. 1:1 albumen to water produces an in-between half-matte, half-glossy look. 1:6 albumen and water produces a matte surface that is almost identical to other salted papers.

06.3 © Christina Z. Anderson. 2016. "Beauty Rituals, from the Family of Origin" series, salted paper print on Hahnemühle Platinum Rag Paper, 15% silver nitrate, with a first coat of ammonium chloride/sodium citrate/casein size.

ORGANIC SIZING

Many organic materials, mainly proteins, and some carbohydrates, are used to bind silver salts onto paper and to confine the developed metallic silver to the print surface. The choice of matte or glossy is an aesthetic decision, as is the choice of the organic substance, as each substance produces slightly different tones. Even a 2% solution of albumen causes significant improvement in image depth and contrast over a paper that has no organic binder at all.

Albumen produces a slightly sharper look than a salt print and, along with gold chloride toning, helps make the image more stable. Gold chloride also cools the warm orange color, and can change the image to a sepia, soft purple, or even a near-neutral tone.

Salted paper and albumen prints are processed in the same way. Therefore, this chapter will first go through specific directions for mixing each formula. I will then give processing directions for both formulas.

Salted paper and albumen are called POP or printing-out-processes. This means you

06.4 © Quinn Jacobson. "Kyleigh's Dreadlocks." This is a gold-toned albumen from a wet plate collodion negative.

will see the image appear during the exposure and no developer is necessary. You just need to wash the print and fix it for permanence.

MATERIALS NEEDED

Many of the items required to make salt and/or albumen prints can be found in your kitchen; but you need to keep photography and cooking items separate. The blender I use in my darkroom never goes into my kitchen! Before you get started, make sure you have the following items on hand:

- Blender or hand mixer
- 1 liter graduate for measuring
- Blue painter's tape or drafting tape if you want your borders to be neat (optional)
- Brushes or glass rod
- Cheesecloth
- Contact print frame
- Fish tank heater (optional) – to keep your gelatin warm.
- Funnel
- Hair dryer (optional)
- High contrast negatives
- Jar for albumen (a large mayonnaise jar works well)
- Large bowl that can hold approximately 4 liters
- Large spoon
- Newspapers to protect your table surfaces from silver stains, or cover your table with a large piece of plate glass that is easy to clean.
- Pencils
- Pot, hot plate (or stove)
- Pyrex 1-liter measuring cup
- Safelights, any amber or red safelight is fine, as is a low wattage (40-watt) light bulb
- Scale for measuring chemicals
- Small brown bottle with an eye-dropper for the silver
- Trays for each chemical
- Two cups for cracking the eggs – one for the yolks and one for the egg whites. As you crack each egg, make sure there is no yolk in your egg whites. When you have finished, pour egg whites into a larger bowl.
- UV light source (a box or the sun)
- Watercolor paper.

WATERCOLOR PAPER CHOICES

While any 100% natural fiber paper can be used, remember that thin, smooth papers will give you a sharper image. There are a few universal favorites that you should try first, and then go from there to experiment. Some papers are very soft (such as Arches 88) and will "pill" if you use a brush to sensitize them. If that happens, you can use a dry brush to clear away the fibers before they

06.5 © Luther Gerlach. Luther made this albumen print from a 16 × 20" glass plate collodion negative.

dry. You can also use these soft papers for the floating method (described later) and won't need a brush at all.

Papers in alphabetical order:

- Arches Platine
- Bergger Cot 350
- Clearprint Drafting Vellum (or Bienfang Vellum)
- Cranes Kid Finish 32
- Fabriano Acquarelle
- Fabriano Bristol
- Hahnemühle Platinum Rag
- Parchment Wove #44
- Revere Platinum
- Strathmore Plate smooth finish drawing paper

Regarding contrast control in albumen prints, James Reilly writes: "A very intense light source lowers contrast in the print, while a weaker light tends to heighten print contrast slightly." He advises that dense negatives be printed in sunlight and thin, weak negatives be printed in the shade. A good plan is to try to make the negatives so they will stand up to full sunshine. Not only will the prints be more permanent, they will have a more pleasing tone and look richer and more brilliant.

Each recipe presented here is one that I have used. However, every book on the subject will have others to choose from. My "bibles" when I was in school were the Reilly book and *The Keepers of Light* by William Crawford. The Reilly book was used for this process and I used the Crawford book along with a few others for different processes. However, I thought it was interesting that Crawford writes of the formula in his book: "This formula is one of the simplest of the many salting formulas devised in the 19th century, and seems to be as good as any." In other words, if you don't like your results, try something else! Christina Z. Anderson's new book *Salted Paper Printing* is a wonderful resource for old and new printing methods.

PLAIN SALTED PAPER

Papers need to have an organic binder as a sizing before the silver solution is applied. This stops the silver from sinking too far into the paper fibers and renders the silver light sensitive. The sizing in papers (especially in the twenty-first century) is rarely sufficient. You can use what you have on hand for sizing (gelatin, albumen, or any type of starch).

The gelatin recipe below will keep for several weeks before it starts to decompose.

You can increase the amount of gelatin as long as you realize that the tone will change as you change your recipe. The more gelatin used, the cooler the image tone will be.

06.6 © Tom Persinger. "Every night in dreams I see you." Tom made this series inspired by Schumann's Dichterliebe. It is a salt print on Fabriano Artistico natural white.

06.7 © Adam Finkelston. "Ecstacy (After Bernini)." Salted paper print with cliché verre. The cliché verre technique was used with ink in combination with a photogram to create the soft cloud-like texture on Arches Platine paper. The negative was made by oiling copy paper.

SIZING PAPERS

SIZING WITH GELATIN

Materials needed

20 g sodium chloride (kosher salt)
2 g gelatin
20 g sodium citrate
1 liter distilled water

To mix

1. Add the gelatin to 250ml of cold water and let it sit until it swells (about 15–20 minutes).
2. Heat the rest of the water and dissolve the salt into it.
3. Mix the hot water and gelatin together and let the solution cool to around 80°F. It is now ready for use.

To apply

Use two trays: a large tray of warm water and a smaller tray for the gelatin. I use a fish tank heater to keep my water warm, which in turn keeps the gelatin warm so it does not solidify. People size papers in many ways. Some "float" the paper, others brush on the gelatin solution. I prefer to immerse the paper and make sure that it soaks through thoroughly.

SIZING WITH STARCH

Are you a vegan but still want to do these processes? Sizing with arrowroot or tapioca starch instead of gelatin allows you to work without using animal products. Arrowroot sized papers range from extreme matte to a dull gloss, depending on the amount of starch applied and the inherent smoothness of the paper. Arrowroot produces a longer density range than gelatin prints and preserves more delicate detail. The first starched papers were used in 1854 by De Brébisson, using tapioca instead of arrowroot. Starch prints were soon used for matte surface prints.

Materials needed

35g arrowroot or tapioca starch
cold distilled water to make a paste

To mix

Blend the ingredients together to make a paste, then add more cold water to make a "cream" (with no lumps) and keep stirring – it will separate if you don't keep mixing.

MAKING THE SALT SOLUTION (IN A SEPARATE CONTAINER)

Materials needed

35 g sodium chloride (kosher salt)
3 g citric acid
950 ml distilled water

To mix

1. Bring this mixture to a boil in a porcelain pot.
2. Add the arrowroot or tapioca mixture slowly while constantly stirring with a glass rod or wooden spoon.
3. Allow the mixture to gently boil for a few minutes, then remove from the heat. When the mixture is cooled, remove the skin that has formed on the top. The solution is then ready for use.

ABOUT KOSHER SALT AND SEA SALT

Kosher salt has a much larger grain size than regular table salt, and a more open granular structure. Like common table salt, kosher salt consists of the chemical compound sodium chloride. Unlike common table salt, kosher salt typically contains no additives (such as iodine and various anti-caking agents). Kosher salt gets its name not because it follows the guidelines for kosher foods as written in the Torah, but because of its use in making meats kosher by helping to extract blood from the meat. Because kosher salt grains are larger than regular table salt grains, when meats are coated in kosher salt, the salt does not dissolve readily. Instead the salt remains on the surface of the meat longer, allowing fluids to leach out.

A student asked why we couldn't use sea salt instead of kosher salt, so I started to do a little research. According to a few websites, there is no difference between "kosher" and "sea" salt. The chemical makeup is the same, but the shape and volume of the crystals might vary. This shape difference may cause a difference in the weight, so tests will have to be made to make sure you have the correct amount of sea salt. Since every company makes it differently, this might cause more of a headache than it is worth. Kosher salt should be easy to find either in your local grocery store or on line.

Salting can be done in normal daylight and salted paper will keep indefinitely. Without citric acid, these prints would look flat because starch is not an "active" organic substance. With citric acid and starch, the prints have a warm purple color after exposure, changing to a yellowish-brown after fixing. Because floating is difficult with starch, old manuals say to pin the paper down and first coat in one direction. Then let it sit for up to two minutes, squeegee off the excess, and coat in the other direction. Alternately, you can soak the paper in a tray filled with starch.

GLOSSY ALBUMEN

Albumen papers are known for their glossy look. To make glossy albumen, you need to mix the eggs to a froth, and let them sit and ferment for a few days to a week.

To make about thirty 8 × 10" prints requires 625ml of egg whites, which is about two dozen eggs. Of course, what determines how many eggs you need depends on your

06.8 © Tom LeGoff. “Horizon Cross, 1859–1862.” 2017.

Cabinet Cards: Gold toned Albumen prints on letterpress cardstock.

06.9 © Tom LeGoff. “Horizon Cross, 1859–1862.” 2017.

Cabinet Cards: Gold toned Albumen prints on letterpress cardstock.

egg size and how many you have to discard during separation.

Materials needed

15 g ammonium chloride (or kosher salt)
2 ml 28% glacial acetic acid
30 ml distilled water
625 ml albumen (about two dozen eggs)

To mix

1. Separate the eggs using small cups or bowls. After each egg is separated, pour the egg whites into the larger bowl. This way you are sure not to destroy more than one egg if you do not separate it well. You must separate the eggs so there is no yolk, stringy white stuff or blood, and the white is as clear as possible. Separate the eggs and avoid getting yolk, shells, or the stringy white stuff in the whites.
2. Add the ammonium chloride and beat the albumen into a froth (you can use a blender). The beating is necessary to break down the proteins and should take about three to five minutes. You do not want to make a thick meringue. Your aim is to make a light froth that peaks.
3. Cover the mixture and allow it to settle for 24 hours in the refrigerator.
4. Strain mixture through dampened cheesecloth. Cover and refrigerate for one week.
5. This mixture will be good for several weeks. As it ages, it smells, but it will still work.

MATTE ALBUMEN

Unlike gloss albumen, the matte albumen mixture does not have to be aged for a week, and can be used immediately after it has been made. If I am teaching a five-day workshop, this recipe is the one to use. Students can help make it and don’t have to wait the week to use it. Otherwise, the solution would have to be made ahead of time and students could not learn how to make it.

An Austrian, Baron Arthur von Hubl, first published a recipe for matte albumen printing in 1895, followed in 1896 by a complete book (which was never translated into English), *Silver Printing on Salted Paper*. An untoned matte albumen print is brownish-red, purplish-black with gold toning, or warm brown to black with the combination of gold and platinum toning. Matte albumen tones faster than glossy albumen, but all other developing times are the same.

Materials needed

To make about thirty 8 × 10" prints:

40 g sodium chloride (kosher salt)
40 g arrowroot or tapioca starch
3 g citric acid
1 liter distilled water

Approximately two dozen eggs

To mix

1. In a small bowl, mix the starch (arrowroot or tapioca) with very little water so it forms a paste. Make sure all lumps are dissolved.
2. In a pot, mix the salt and citric acid with the remaining water. Place the pot on a hot plate or stovetop. Make sure this mixture is dissolved.
3. Add the starch to the salt and citric acid solution, mixing constantly for about three minutes. Although books will tell you to mix until the solution no longer looks starchy, if you bring it to a boil too quickly, the starchy look will never dissipate. I have mixed for up to 10 minutes, never getting rid of the starchy, white look. Bring the mixture very slowly to a gentle boil. I have used the mixture while it still looks starchy and it has been fine.
4. Remove from the heat and allow the solution to cool a little.
5. Remove the skin from the surface.
6. Using cheesecloth, strain the solution twice.

While the starch solution cools

1. Separate the eggs and avoid getting yolk, shells, or the stringy white stuff in the whites.
2. Beat the egg whites into a froth. Then allow the froth to settle back into liquid form. You can refrigerate the egg whites or leave them at room temperature during this process.
3. Strain the egg whites through dampened cheesecloth.
4. Combine equal amounts of the egg white *and starch* solutions.
5. The mixture, now called matte albumen, can be used immediately.

Using powdered egg whites

If you don't want to deal with cracking eggs, you can get powdered egg whites. To make approximately 30 8 × 10" prints.

Mix together

150 g egg whites
15 g ammonium chloride (or kosher salt)
5 g sodium citrate
1 liter distilled water

The rest of the instructions can be followed no matter what sizing solution you've decided to use:

06.10 © Holden Richards. Holden uses X-ray film to make his negatives and says they are really durable, and slightly contrasty. He printed this salt print on Strathmore 500 series 300gsm paper.

APPLYING THE SALT OR ALBUMEN SOLUTION IN DAYLIGHT

Tray method

1. Place the salt or albumen mixture in a tray, and add one sheet at a time.
2. Shuffle the sheets of paper like cards – take the one from the bottom and place it on the top.
3. Repeat until all of the sheets are equally coated and soaked through.
4. Before hanging to dry, squeegee one side only of each sheet.
5. The coated paper will keep indefinitely.
6. If they are curled, put the sheets under weights to flatten them.
7. In pencil, I indicate on the back of my paper whether it is salt, or matte or glossy albumen.

Brush method

Using a cotton ball, a sponge paint roller or a brush as an applicator:

1. Place your support on a board or piece of glass and make sure it is clean.
2. Soak the applicator into the sizing solution (salt or albumen).
3. The applicator should be wet, but not dripping.
4. Apply the solution in one direction.
5. Turn your support ninety degrees.
6. Coat again.
7. Keep turning and coating your support until it is well saturated.
8. Let your support sit for about a minute.
9. Dry with a hair dryer or hang to dry.

Floating paper

I am including this method as it is said to be the "historically correct" method, but I find it too time consuming and arduous. You can place your tray on top of a light box so that you can see air bubbles through your paper and work them out. Photographs of how this is done are shown in Chapter 2, Figures 02.10–02.13.

1. Carefully pour the salt solution or albumen in a tray slightly larger than your support.
2. Mark the back with a pencil so you know which side is which, otherwise you will not be able to tell even after salting.
3. Fold the two opposite ends of the paper about ½ inch to use as handles.
4. Hold the handles up and carefully place the paper into the tray from the center outward. In other words, place the center into the liquid and then slowly put one side down and then the other. The idea is that you don't want air bubbles to lodge underneath the paper and you don't want the handles to go into the solution.
5. The paper might start to curl until it is well saturated. As it curls, gently hold down the ends, but avoid letting the paper go under the solution.
6. Float the paper for about two minutes from the time the paper stopped curling up.
7. Slowly lift the paper up and hang to dry.
8. Hang the sheets to dry by the two corners of the long edge. You can also put clothespins on the lower edges to reduce curling.
9. Use a hair dryer if you want the paper to dry faster.
10. You can stack the sized sheets and keep them for later use as they never go bad. If they are curled, put the sheets under weights to flatten them.

MAKING THE SILVER SOLUTION

A 12% silver solution can be mixed and kept in a bottle for use at any time. Although you can use anything from a 10–15% solution, the following recipe works very well. The silver solution is not light sensitive and can be mixed in daylight. Silver only becomes light sensitive after it has been in contact with an organic material, such as gelatin, starch, albumen, or cotton, etc. Coating the paper can be done in a dim room or a darkroom, just as I described when coating cyanotypes. I have fairy lights in my darkroom as well as very bright safe lights. The dim room can be bright enough to read in, as long as it is not

06.11 © Jacob McGuinness. These images are from a series titled "20 Minutes." They are portraits of Jacob's mother, father and self-portraits. Each image is from a pinhole camera and took 20 minutes to expose. The negatives were scanned in and printed to 16 × 20". The final images were double coated salt prints on Arches Platine paper. The final series consists of 21 images.

fluorescent lights or white light above 40-watt bulbs.

Materials needed

12 g silver nitrate
100 ml distilled water

If you are in a low-humidity area, use Photo-Flo or Tween 20™
1 drop: per dropper of silver*

SENSITIZING YOUR SUPPORT

After the paper is sensitized, it will only keep for about a week, depending on the humidity and temperature. Only coat your support as you use it. Each type of support will need a different amount of silver. Vellum uses the least amount, hot press papers next, cold press more and cotton or other fabrics even more. Do a test to find out which amount of silver will give you your desired effect, making sure you write down how many droppers or ml you used.

Silver will stain any organic substance it comes in contact with, which includes your skin. Make sure you wear gloves, protect your clothing and your eyes. I wear glasses or goggles when working with silver. Please re-read the safety chapter before you start using silver.

BRUSH METHOD

1. If you are coating a 4 × 5" or 5 × 7", use one eyedropper (approximately 3ml) for each coat. If you are making a print about 8 × 10", use about three eyedroppers for each coat.
2. Brush going in one direction and then the other, making sure you don't miss any spots.

* Do not add Photo-Flo or Tween20™ to your stock solution as it can grow mold. Only add it as needed when ready to coat your support.

3. After you coat your support, let it sit for about 30 seconds.
4. Then coat another full dropper of silver.
5. Let the paper sit for one minute.
6. Dry the paper with a cool hair dryer, hang to dry in a darkroom, or place one sheet at a time a light-tight box.
7. Use within a day of coating.

GLASS ROD METHOD

Glass rods take practice but once you learn how to use them, it is like riding a bike, you will never forget.

1. Tape your support onto a piece of plate glass so that you know your coating area is even and your support will not move.
2. Place the rod on the edge of your paper and use the eyedropper to pour the silver along the glass rod's edge.
3. Move the rod back and forth over the silver solution to make sure you can easily move the silver across your support.
4. Go back and forth until the solution has soaked into the paper.
5. If you have any puddles at the edge of your paper, that refuse to soak into your support, remove them by blotting the edges with a paper towel.
6. If you want brush strokes, but are using the glass rod method to save chemistry, you can use a brush when you have finished coating with the glass rod. This way you get the best of both worlds.

FLOATING METHOD

Floating is the historically correct method but there are disadvantages to using it. You will use a lot more chemistry and you might get air bubbles that are hard to remove. It is also harder to control, but with practice you will be able to do it. You can use a light box, covered with Rubylith (red cellophane). The Rubylith acts like a safe light and it will help you to see air bubbles through your paper.

These steps are the same as floating the support in the salting solution:

1. Slowly pour the solution into a tray to prevent the formation of foam; you want to avoid air bubbles in the tray.
2. Fold up opposite ends of the paper, raising them about ½ inch from the edge. These folds will serve as "handles."
3. Curve the paper downward, dipping a small portion of the center of the curved paper into the solution.
4. Slowly lower the rest of the center into the solution. Then slowly lower one side, followed by the other. Use the "handles" so that the paper is floating on top of the solution.
5. If the paper begins to curl up, gently hold down the ends a little, with gloved hands, so that the paper soaks up more of the solution and begins to lie flat.
6. Make sure you don't get any solution on the back of the paper because the stain will show through and compromise your image.
7. Check for air bubbles by slowly lifting up one side of the sheet at a time. If you see any air bubbles,

06.12 © Melitte Buchman. Melitte says that she likes really dense negatives when making salt prints. She creates a custom curve by using a 10-step wedge before starting her series of images. She then uses a traditional recipe enhanced by ammonia fuming before exposure, and sometimes gold toning during processing, before the fix.

pop them with a pin or toothpick. Air bubbles will cause white spots in your image.

8. When the paper is fully coated, slowly lift it out of the solution. Start at one side and lift in a steady motion.
9. Hang the paper to dry with clothespins and blot any drips on the edges of the paper.

NEGATIVES NEEDED

Even though silver is being used to make the support light sensitive as in black and white paper used in a darkroom, this is a contact print process similar to cyanotype. Negatives for the processes in this chapter need to be slightly different from the ones needed to make a good cyanotype. **These negatives need to be denser and of very high contrast**. Luckily with digital negatives, it is easily done! Chapter 3, The Digital Negative Process, will help you make the best negatives for each process.

EXPOSING YOUR PRINT

DARKROOM (DIM ROOM) SETUP

In yellow light or low-level white light (40-watt bulbs):

Chemicals needed

Two fix baths made with sodium thiosulfate:

15 g sodium thiosulfate
100 ml room temperature tap or distilled water

OR

Use black and white paper fix:

12 ml Kodak fix, Sprint, etc. The brand does not matter
48 ml Tap or distilled water at room temperature

combine and then add in a tray:

2 oz paper fix
500 ml room temperature tap or distilled water in a tray

Hypo clearing agent

1 g Sodium Sulfite
100 ml Tap or distilled water at room temperature

TRAY SETUP

1. **Wash: 15 minutes** under running water which will remove the unexposed silver. Otherwise black spots will appear when the print is fixed. Although the water looks milky at first, eventually it clears. When the rinse water is clear, you have washed enough.
2. **Tone** (see below): This is optional. You can tone before or after fixing, or not at all, but toning will determine the color. You can also tone later by making sure the paper has been soaked in water first, and then place it in the toner of your choice.
3. **Wash (only for toned prints): three–five minutes** in running water You must rinse the toner off before immersing the print in the fix, or its color will change.
4. **Fix: Fix for four minutes** in either a 15% sodium thiosulfate solution (15g of sodium thiosulfate to 100 ml of water), *or* you can use 2oz of paper fixer in a tray of water. If the fixer is too strong, it will bleach the print.
5. **Fix Again:** In another tray, by using the same dilution as the first fix, fix for four more minutes. Just as with archival black-and-white fiber printing, two fixing baths are better than one. You should always test your fix with hypo-check to determine its freshness. Assume that fix will be okay for about one dozen prints, and pay attention to its clarity. If it starts to look milky, make a new fix bath.
6. **Wash: two–four minutes** to remove some of the fix.
7. **Hypo-clear: three–four minutes**. Use 1% sodium sulfite solution or hypo clearing agent that is mixed according to directions on the package. This removes the excess fix.

06.13 © Terry Towery. This salt print was the first to go through the freshly made gold toner and left in for about 10 minutes. The print was waxed using beeswax and lavender oil after it was developed and dried.

06.14 © Terry Towery. These three images are all from a class that Terry took at Lacock Abbey through the George Eastman House.

06.15 © Terry Towery. The color shifts from warm red-brown to cool brown to purple-brown, depending on the density of the print, the length of time the print is left in the toner, as well as the strength of the toner. All toning was done by eye and not accurately timed.

The recipe for a 1% sodium sulfite solution is:

5g of sodium sulfite to 500ml of distilled water.

8. **Final wash: 30 minutes** under running water, or longer depending on how thick the paper is. The thicker the paper, the longer the wash needs to be.
9. **Dry** by hanging with clothespins or placing prints face up on drying racks. The silver is very soft so if you put your prints face down, you will contaminate your screens with silver and get screen marks on your prints.

TONING

Toning with gold changes reddish-brown to purple-brown and even blue-brown,

06.16 © Michael Korol. A salt print that has been gold toned.

depending on how you tone. Gold toning also acts as an archival treatment because gold is more stable then silver. If you are going to matte your print without the brush marks showing, cut off the dark edges of the paper before toning. This will save gold.

BORAX GOLD TONING

Materials needed

400 ml distilled water heated to about 100°F
600 ml distilled water at room temperature to mix
10 g borax (sodium borate)
40 ml gold chloride (1% solution = 1 g to 100 ml distilled water)

To mix

1. Dissolve the borax in the hot water (400ml), then add the gold chloride.
2. Prepare the solution about an hour before you are ready to use it. This allows the mixture to cool to about 70°F (room temperature). Store in a brown bottle.
   - Borax makes the toner alkaline and stabilizes the gold. The gold has to be replenished every so often. Each time you replenish the gold, you will need to let the toner sit for about an hour.
   - Toning time can be from 3 to15 minutes, depending upon the desired color, the type of paper, and the type of print (matte, glossy albumen, or salted). The longer you tone, the ***cooler*** the color. You will not be able to see the final color until the prints are dried. Tone each print separately to make sure the toning is even.
   - Albumen prints need a much stronger toning solution than do salted papers, and if the papers are not coated evenly, it will show in the toning stage.
   - Historically, glossy albumen papers were toned with gold, while salted papers and matte-albumen papers were toned with either gold or platinum, or a combination of the two.

PLATINUM TONING

Materials needed

50 ml potassium chloroplatinite, 1% solution
4 g citric acid
750 ml distilled water

To mix

- Dissolve the solutions in warm water and cool to room temperature before using. Store in a brown bottle.
- Platinum toning may cause yellowish high-lights if you tone the print for too long, or if the solution is too strong or too acidic. Make sure you have washed your prints very well before toning and before fixing, otherwise unwanted colors and stains may appear. The toner will also be ruined if any silver particles get into the toner tray.

Some people like to combine toners. Try toning the print first in the borax gold bath until you see a lilac color. Then tone it in the platinum bath until the color becomes almost neutral, close to a platinum print, but not quite.

06.17 © Kurt Enfield and Jill Enfield. “Jill at 4”. Photo that my Dad took of me and then I made into an albumen print. Notice the camera on the chair!

TROUBLESHOOTING

- If the shadow areas are weak, you have not supplied the paper with a sufficient amount of silver.
- If the image is weak and flat, there is not enough humidity in the air (too dry). A humidifier can help this situation.
- Blotches or white spots in dense areas (sometimes called "measles") are caused by insufficient sensitization. "Measles" can be caused by improper coating or floating, or by having too weak a silver solution.
- Paper-white spots with hard edges are caused by air bubbles floating in the silver solution.
- Light brownish spots with hard edges are caused by air bubbles in the salting stage. These spots eventually turn darker brown due to the silver staining the paper.
- If the temperature between the contact printing frame and the light source is too great, you may get ghosting around the edges of the image.
- If there are red stains on the negative, the paper was not dry and silver got onto the negative. (You can use a 1ml Mylar sheet between the negative and the paper to prevent this.)
- If you hold the paper up to the light, you can see if it has soaked up the sizing evenly. You can actually cause blotches or unevenness if you take the paper out too soon. It takes about three to five minutes to salt about 10–15 sheets of paper.
- If the gelatin is much warmer than the paper, the paper will curl.
- Paper becomes stiffer once salted. It will stay less brittle in humid conditions.
- Scratches and fingerprints on your image:
    - The silver is very, very soft, and if you are not careful you can easily damage the surface of your print.

06.18 © Jill Enfield. "Chickens." Matte albumen on Arches Platine paper.

- Do not stack too many prints together as you are developing, and do not place your fingers or tongs on the image area when agitating or moving from one tray to the next.

WHAT TO DO WITH THOSE LEFT OVER EGG YOLKS

Feed them to your pets or .... make something yummy. You don't have to use the yolks right away, but check online to get the exact instructions on how to freeze them correctly. Keep in mind that I am not saying you should be making these recipes. The cheesecake recipe says that the calorie count is about 220 per muffin cup. But worth every calorie.

06.19 Sally Enfield Rabinowitz.

Zabaglione

Ingredients:

8 large egg yolks
one cup confectioners (powdered) sugar
½ cup dry Marsala or Sherry

Directions

1. Place the egg yolks and the sugar in the top of a double boiler and place on top of the bottom of the boiler once the water is lightly boiling. The water should not reach the bottom of the top section.
2. Use a wire whisk and whip the mixture until it is foamy.
3. Then add the Marsala and continue to cook the mixture until it has doubled in volume.
4. Use a thermometer to see when the mixture has reached 140˚F.
5. Beat the mixture for an additional minute or two.
6. Serve immediately in long stemmed wine or parfait glasses. You can do a spoonful of the mixture, then a spoonful of berries until the glass is full.

Crème brûlée

Ingredients:
6 egg yolks
6 T sugar
½ t vanilla extract
1 ½ cups heavy cream
2 T brown sugar

Directions

1. Preheat oven to 300˚F (150˚C).
2. Beat egg yolks, four tablespoons of sugar and vanilla in a mixing bowl until thick and creamy.
3. Pour cream into a saucepan and stir over low heat until it almost comes to boil. Remove the cream from heat immediately. Stir cream into the egg yolk mixture; beat until combined.
4. Pour cream mixture into the top of a double boiler. Stir over simmering water until mixture lightly coats the back of a spoon; approximately three minutes. Remove mixture from heat immediately and pour into a shallow heat-proof dish.
5. Bake in preheated oven for 30 minutes. Remove from oven and cool to room temperature. Refrigerate for one hour, or overnight.
6. Preheat oven to broil.
7. In a small bowl combine remaining two table-spoons white sugar and brown sugar. Sift this mixture evenly over custard. Place dish under broiler until sugar melts, about two minutes. Watch carefully so as not to burn.
8. Remove from heat and allow to cool. Refrigerate until custard is set again.

Key lime pie

Ingredients

Pie filling

6 egg yolks
2 cans sweetened condensed milk

06.20 © Sally Enfield Rabinowitz.

⅔ cup FRESH Key lime (or lime) juice
Graham Cracker pie crust
¾ cup butter
2 cups graham cracker crumbs
3 T good grade cocoa
4 T granulated sugar
1½ t cinnamon (to taste)
⅔ cup pecans, finely chopped

Topping

2 cups heavy cream (Whipped for fresh whipped cream topping for key lime pie)
2 t sugar or to taste
2 t vanilla

Directions

Prepare Graham Cracker pie crust and set aside:

1. Preheat oven to 250°F.
2. Melt butter and mix with crumbs, cocoa, sugar, cinnamon, and pecans.
3. Press evenly into a 10"-deep dish pie pan and bake 8 to 10 minutes. Set aside to cool.

Preparation of key lime filling

1. Preheat oven to 250°F.
2. Beat egg yolks until very thick. Fold in condensed milk and Key lime juice. Mix thoroughly.
3. Pour into pre-baked graham cracker crust and bake 10 minutes.
4. Cool and refrigerate.
5. After pie is cold, pipe freshly whipped cream over entire top of pie (using pastry bag).
6. Pies can be frozen and barely thawed to thawed for consumption.

Miniature cheesecakes from Food.com

This actually uses the entire egg, not just the yolks, but everyone always asks for cheesecake to be made:

Ingredients

Graham Cracker Crust:

⅓ cup graham cracker crumbs
1 T sugar
1 T butter, melted

Cheese filling

one 8 oz package cream cheese, softened
¼ cup sugar
1 T vanilla
one egg
Preserves of your choice

Directions

1. Line a muffin tin for six muffins with paper baking cups
2. Combine crumbs, sugar and butter
3. Press a measuring tablespoon full of crumb mixture onto the bottom of each muffin cup
4. Bake at 325˚F for 5 minutes, remove from oven and allow to cool.
5. Combine: cream cheese, sugar, egg, and vanilla.
6. Mix with an electric mixer at medium speed until well blended.
7. Pour over cooled crust, filling each cup ¾ full.
8. Bake at 325˚F for 25 minutes.
9. Cool before removing from pan and chill.
10. The cheesecakes will settle a little.
11. Top with preserves just before serving.

06.21 © Borut Peterlin. Borut made this salt print from a wet plate collodion negative. He has wonderful videos on the YouTube channel under his name. He is a great sharer of information and does not hold back.

Seven

VAN DYKE BROWN, KALLITYPE, AND ARGYROTYPE PRINTS

07.1 © Jill Enfield. “Penland.” This image was taken with a Nikon digital camera and made into a digital negative. It was then printed on Hahnemühle Platinum Rag fine art paper to make this Van Dyke brown print.

In 1842, Sir John Herschel read his paper on cyanotypes to the Royal Photographic Society in England. Two months later, he added new or recently discovered information that ferrous salts (which are fundamental to the cyanotype process) can also reduce silver to its metallic state. Herschel called this iron–silver process the argentotype, and it is considered the technical beginning of the brown print or kallitype process. Dr. William Walker James Nicol, a lecturer on chemistry at Mason College in Birmingham, England, holds the 1889 patent and is considered the inventor of the kallitype process. Nicol originally developed the print in a silver nitrate bath, but later changed his method, using the silver as a sensitizer the same way we do today. The argyrotype was developed by Dr. Mike Ware in 1990 with a few changes to the original formula.

The kallitype technique was never as popular as platinum/palladium, and is often referred to as "the poor man's platinum." Today, kallitypes are a valued option for the experimental photographer. While the process is not as versatile as platinum, it is an economical way of achieving platinum-like print quality. Like platinum prints, kallitypes have a long tonal range. In addition, because the sensitizer is self-masking, they do not suffer loss of contrast in the deep shadows.

This chapter includes Van Dyke brown (which photographers generally shorten to "VDB"), kallitypes, and argyrotypes. While these techniques fall under the broader kallitype category and produce prints that are brown in tone, each is made with different chemicals. VDB and argyrotypes are made with ferric ammonium citrate (the light sensitive chemical used in cyanotypes) and silver nitrate; kallitypes are made with ferric oxalate (which is used for platinum/palladium prints) in combination with silver nitrate. Argyrotype chemistry is a little more complicated to mix, and while I will include the formula, I suggest buying it ready-made.

07.2 © Melanie Craven. This Van Dyke brown is on tissue paper to mimic the fragility of skin.

Each process has its own tonal range, but they are sometimes hard to tell apart. I have always gotten a nice rich tone with VDB sensitizer. With kallitypes, you can change the tones from reddish-brown to darker browns just by changing your developer. Argyrotype colors can shift easily by adjusting the humidity in the darkroom. All three can be toned to further shift the colors, and they can all be used in combination with other processes. As with the other processes discussed in this book, experimentation is key – but make sure you keep good notes as you go along so you can duplicate your successes.

CREATING VAN DYKE BROWN PRINTS

The VDB process is one of the simpler kallitype techniques and, when done correctly, can produce detailed, rich brown images worthy of its namesake, Anthony Van Dyke, the Baroque painter. The key is in the preparation of three solutions: ferric ammonium citrate, tartaric acid, and silver nitrate, which are mixed together to make the sensitizer. To achieve permanence with VDB printing, the photographer must adequately remove the ferric salts and the unexposed silver during processing. This is similar to silver gelatin printing in the traditional black-and-white darkroom. VDB images are created by a contact print process that involves an exposure time of 5–15 minutes to UV light. After exposure, the print needs to be processed with a wash, fix, another wash, hypo clear and a final wash. As with the other kallitype processes discussed in this chapter, VDB prints are made with silver metal, and therefore can be toned just like prints on regular black-and-white photographic paper (with polytoner, selenium, sepia, gold, and other toners) to produce purples, pinks, and blues. VDB prints can also be hand-painted or combined with other processes.

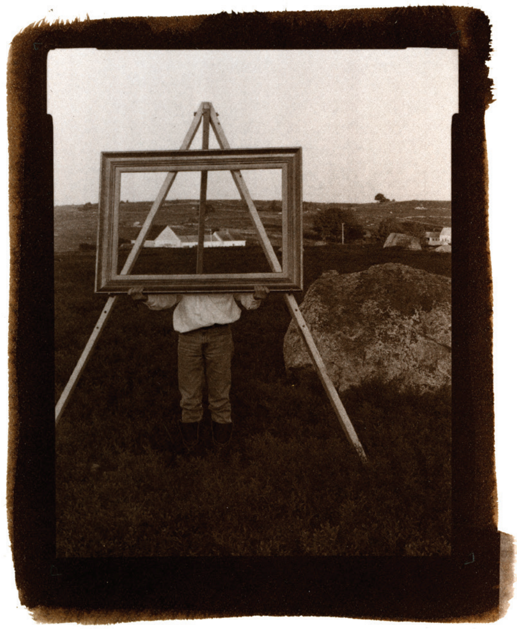
MATERIALS NEEDED

Many of the items required to make VDB prints are standard darkroom materials that were presented in Chapter 2. The major difference is that the sensitizer involved with the VDB process reacts with metals, which can cause oxidation and staining. Therefore it is important that your darkroom be equipped with non-metallic utensils, bottles, and trays. Before you get started, make sure you have the following items on hand:

- Brushes – any type of brush works well with VDB prints. If you are using a bristle brush, make sure that any metal on it has been coated with nail polish to prevent contamination. I suggest this because as the metal gets wet, it can rust and the rust moves down the bristles, ruining them bristles. The rusting may take awhile, so if you don't want to do this step, just realize that you might have to throw your brush away after a few uses.
- Contact print frame
- Cups – you will need three plastic cups, one for each of the stock solutions of the sensitizer.
- Developing trays – five plastic trays for developing, fixing, hypo clear, and washing your prints.
- Distilled water
- Eyedroppers – one eyedropper is needed for the potassium dichromate. If you are using a glass rod, then you need another eyedropper for the sensitizer.
- Filters
- Glass or plexiglass
- Glass rod – if you desire clean, straight edges, you can use a glass rod instead of a brush to sensitize your support.
- Gloves
- Graduates – three large graduates (to hold a liter): one for mixing the potassium dichromate; one for mixing the sodium thiosulfate (or rapid fixer) and one for the hypo clear.
- Hair dryer with a cool setting
- Mixing rod
- Scale
- Scotch Magic 811 Removable Tape
- Storage bottles – you will need one one-gallon bottle and two one-pint bottles. All three should be made of dark brown plastic or glass. The one-gallon container is for the fixer (sodium thiosulfate), and does not have to be a dark bottle; the two one-pint containers are for the potassium dichromate and the sensitizer (which is made up of ferric ammonium citrate, tartaric acid, and silver nitrate).
- Tongs
- Toning trays – six trays will give you plenty of toning options.

SUPPORTS

Virtually any paper with a good wet strength (i.e., etching and watercolor papers) can be used for VDB printing. Rice papers and most other 100% rag papers also work well. Any all-natural material will give you a good tonal quality (cotton, silk, etc.). If the support



07.3 © Niles Lund. "Perspective." Niles does all of his images in the camera, and plays around with long exposures. He then used Van Dyke brown on Arches Platine watercolor paper.

contains any synthetic fibers, the image will have a limited tonal range. Since the final color and contrast vary with each paper, it is best to experiment to discover what you like best.

Here are some good papers to start with, although this is far from a complete list:

- Arches Platine
- Bienfang 100% Rag Translucent Marker Paper Graphics 360
- Fabriano Artistico
- Hahnemühle Platinum Rag
- Kozo papers
- Mitsumata beautiful, thin rice paper
- Rising Drawing 2-ply Bristol
- Ruscombe Mill's Buxton paper
- Saunders Waterford hot pressed paper
- Stonehenge Rising

Canvas can be sensitized as is, unless it has gesso on it. Canvas coated with gesso should be sized (with either Knox gelatin size, or gelatin and hardener size) before it is sensitized. (See Sizing Formulas in Chapter 2,)

LIGHT SOURCES

When mixing VDB chemicals or coating the support, you can illuminate your workspace with subdued light, such as a 40-watt bulb. Christmas lights (fairy lights) also work well. However, it is always a good idea to pre-test your workspace. If you notice fogging, switch to a red or amber safelight instead of the white light. If you are not careful, your lights might be a bit strong and cause problems with your chemicals. If this happens, make your room as bright as you like – but with red or amber lights instead of white ones. Keep the lights at least 3 feet away from your sensitizer and supports.

EXPOSING

You can expose VDB prints in natural sunlight or in a UV lightbox. You can use black-light bulbs, aqua bulbs, anything that has a good UV output (see Light Sources in Chapter 2).

NEGATIVES

As stated before, making VDB prints involves a contact print process that requires negatives the same size as the finished product.

07.4 © Michelle and Melanie Craven. "Identical Otherness." The twins work together on an endless subject matter about their twinship. This Van Dyke brown is from their bird series on Fabriano Artistico paper.

Supports that have been sensitized with VDB chemicals respond similarly to soft photo paper, so you will achieve the best results by using negatives that lean toward the contrasty side. For example, negatives that would require a #1 filter for printing on regular silver gelatin paper would work well for the VDB process. On the other hand, thin negatives produce muddy prints. VDB prints can also be made without enlarged negatives. Photogram material – such as glasses, beakers, plates, fruit, lace, and leaves – can create wonderful images, as can drawings made with a wax pencil or charcoal on either tracing paper or acetate. Printing from a collage of smaller negatives is a third option.

MAKING YOUR STOCK SOLUTIONS

VDB chemicals can be purchased in many forms – in bulk in their crystalline form, as a kit, or pre-mixed (see Sources). These chemicals include three stock solutions: one solution to make the sensitizer, one solution for contrast control, and a final solution for the fixer. Other chemicals (which are listed later) can be used as toners to change the color of your print from black to reddish-brown.

SENSITIZER

VDB: The sensitizer is prepared in three separate containers, and then poured together to make the working solution. Let the mixed solution age for two to three days before using it (although I have been impatient and used it sooner).

Materials needed

CHEMICAL A: FERRIC AMMONIUM CITRATE

This is the light sensitive chemical.

33 ml distilled water
9 g ferric ammonium citrate

Stir until the crystals dissolve and set aside.

CHEMICAL B: TARTARIC ACID

This helps clear the highlights so they don't look muddy.

33 ml distilled water
1.5 g tartaric acid

Stir until the crystals dissolve, and set the solution aside.

CHEMICAL C: SILVER NITRATE

This is the silver salt that when developed turns into metallic silver.
It makes the images brown. Be aware that silver nitrate can cause blindness if you get the crystals in your eyes. Always wear gloves and goggles while mixing this solution.

33 ml distilled water
3.8 g silver nitrate

Stir until the crystals dissolve, and set the solution aside.

To mix

1. Pour solution A into a dark brown plastic or glass bottle.
2. Add solution B and stir with a glass rod. (Note: It is important to add B to A and not the other way around; otherwise the solution becomes cloudy and does not clear.)
3. While slowly stirring, add solution C into the AB mixture. Because silver nitrate tends to sink to the bottom of the container, make sure you stir the solution well – stirring both before you use it to sensitize your support and stirring periodically during use. Sometimes a precipitate will form, which means that solids will settle at the bottom of the container. You can either disregard the solids or remove them by straining the solution through wet cheesecloth. Most books tell you that, if stored properly, the working solution will last approximately three to six months. I have used much older sensitizer, and it has worked fine.

Another way to mix the solution is to keep it in two separate bottles: the A and B together

07.5 © Rachel Brace-Stille. "Brace-Stille Grounded." Rachel used Polaroid 4 × 5" positive/negative film (now discontinued) and then made Van Dyke brown prints on Arches hot pressed paper.

and the C, the silver, in a different bottle. Mix only as you are ready to use the solution. This approach keeps the silver from sinking to the bottom and eliminates the need to strain the solution as it ages.

CONTRAST CONTROL

Potassium dichromate can be added to the developer/water to enhance the contrast of the print. Although it is not required for VDB prints, it can produce more dramatic results. Because potassium dichromate can also be used to enhance cyanotypes, I like to keep a bottle of this stock solution on hand for both processes.The key difference is that with cyanotypes, the solution is added to the working sensitizer, while with VDB prints, it is used as a supplement during the development process. A potassium dichromate solution should be mixed at least a day before you use it.

Potassium dichromate is considered a carcinogen. Please make sure you wear gloves, a mask, and goggles. We are using very small amounts, but the powder is dangerous to breathe, so wearing a mask, especially when mixing the powder in to solution, is highly recommended.

Materials needed

50 ml distilled water
5 g Potassium dichromate

To mix

Stir with a mixing rod until all the crystals have dissolved. Pour the solution into a dark brown plastic or glass bottle. Because potassium dichromate is used for other processes, label this bottle "Potassium Dichromate Solution" and store the excess crystals. This solution will keep for about six months.

Color change

To many viewers, a color shift to a purplish-brown is very appealing. You can achieve this by adding 1% gold chloride to the sensitizer right before applying it.

Materials needed

100 ml distilled water
1 g 1% gold chloride

To mix

Stir with a mixing rod until all the crystals have dissolved. Pour the solution into a dark brown glass or plastic bottle. You will add one or two drops to the sensitizer right before use.

Fixer

VDB prints and kallitypes both require a fixer that is weaker than the usual solution. That said, a number of different kinds of fixer can be used.

Sodium thiosulfate is pure fixer; the instructions below show how to dilute it to the correct level for VDB prints. While sodium thiosulfate is the preferred choice, I have also used film/paper rapid fixer without the hardener (in other words, solution A without B added).

07.6 © Anne-Laure Autin. "Captive." VD brown on Rives BFK paper. This image is part of a series called "Locked-in" and is part of the collection at the Museum of Fine Arts in Houston.

Sodium thiosulfate

This solution provides a pure fixer that you can mix to the dilution you need for a given process.

2 liters distilled water
100 g sodium thiosulfate

Stir with a mixing rod until all the crystals have dissolved. Pour the solution into a dark brown glass or plastic bottle. Label this bottle "Sodium Thiosulfate/ VDB Fixer." This fixer will last for a year or so.

Alternatively, you can use:

Diluted rapid fixer

Rapid fixer comes in liquid form. Part A is the hypo (fixer) and part B is the hardener. This process only utilizes the hypo portion, Part A.

- Check the directions on the packaging for the amount of water required to dilute the product for paper. Every company has its own instructions.
- Pour tap water into a graduate or bucket, depending on the quantity you are making. Add the rapid fixer and stir with a mixing rod.
- Dilute the solution further by adding one liter of water for each 2oz of rapid fixer.
- Pour the solution into a dark brown glass or plastic bottle. Label this bottle "VDB/ Diluted Rapid Fixer." This fixer will last for about a year.

COATING AND DRYING YOUR BASE SUPPORT

Before you begin coating the base support, cover your workspace with newspaper to protect its surface, or work on top of a piece of plate glass which is easy to clean up and insures that you have a flat surface to work on. As you are coating the support, the sensitizer should be yellow. If it appears brown or grayish, it has either gone bad (from age or because it was not mixed well) or has been fogged at some point. If you are using paper as the base support, you can coat it by using either the glass rod method or the brush method. See Sensitizing Techniques in Chapter 2.

It is best to use paper that is bigger than the enlarged negative so that the sensitizer will not get on the back of the paper and cause a stain. A large sheet of paper also provides some holding room, which helps avoid leaving fingerprints in the sensitizer.

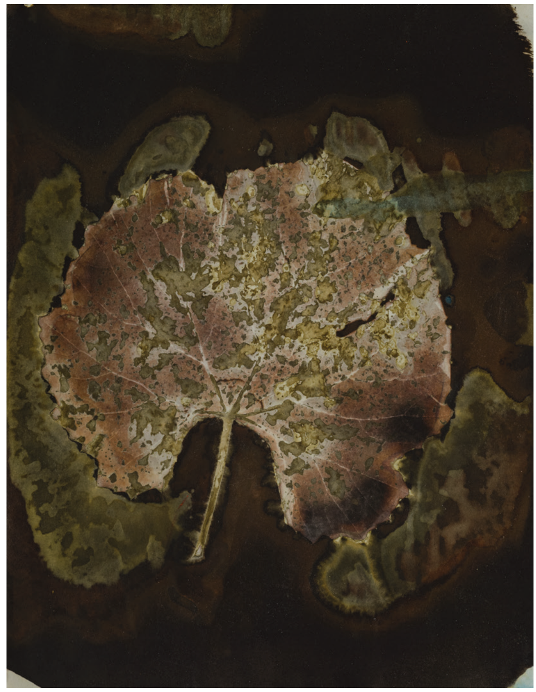
If you are using fabric as the base support, you must first remove all of the manufacturer's sizing by washing the material two or three times. Otherwise the remaining sizing will cause your sensitizer to coat unevenly. If you are going to use the fabric for multiple exposures, you might want to size it yourself. See Sizing Formulas and Sizing Techniques in Chapter 2.

When using the glass rod method to coat the support, apply the sensitizer evenly along

07.7 © Curran Broderick. Curran picks up paper that has been thrown out to use for his images. This Van Dyke brown was made using the inside paper from cigarette packages.

the length of the rod. Move the rod gently back and forth to spread the liquid evenly across the paper. There are several ways to coat a piece of fabric with sensitizer (see Sensitizing Techniques in Chapter 2). As you are sensitizing, be extra careful not to put your fingers on the surface of the coated support – even if you are wearing gloves (which you should be). Not only is the sensitizer bad for your skin, but touching the support increases the chances you will leave fingerprints on the surface of the VDB print. Always keep good notes while you are sensitizing and exposing the support. If you like the results, you can repeat them. If you don't like the results, you can figure out what to do to make the next print better.

If you are working with paper as a support, you can use a pencil to note these variables on the back: the solution, the type of paper, the exposure time, and the light source. If you are exposing outside, you should also write down the time of day and the season. Make sure you also note whether or not you used potassium dichromate to develop the image. After sensitizing the support, dry it thoroughly before exposing your image. If you decide to use a hair dryer, make sure it is on the cool setting because excessive heat can burn the sensitizer. The sensitizer should appear yellow once the support is fully dry. You will know you have burned the sensitizer if it looks grayish-brown instead of yellow.



07.8 © Susan Huber. This image is a photogram of a grape leaf by leaving it in the Western Canadian sun for three days. She then tones the paper with diluted selenium toner before fixing. The paper is Revere.

EXPOSING

The exposure time needed for VDB prints is much less than for cyanotypes. A typical exposure can be anywhere from 5 to 15 minutes. However, cloth may need about 50% more exposure time than paper. If you are using fabric, its size will determine whether it will fit into your contact print frame. If the fabric is too big or too bulky, use a piece of plate glass that is thick enough to create good contact between your negative and the fabric. Be sure to use Scotch Magic removable tape to secure the negative so you can check the exposure periodically without losing the registration. Black-light bulbs, aqua bulbs, mercury vapor lamps, and strong sunlight are the best light sources. Sunlamps are not recommended for VDB prints because they emit too much heat and can burn the sensitizer. The best way to make VDB prints is with a contact printing frame that opens on one side for viewing the print while still holding the negative in place on the other side. I recommend doing test strips when working with the VDB process because exposures and tones will vary with your choice of support. Using a small test support that you have coated at the same time as the larger support, make a test strip in two-minute intervals. It is better to experiment with a small support than to waste a lot of silver on a full print. If you are processing a test strip, you can skip the wash and simply rinse the support after fixing. Make sure to dry your test strip completely before deciding on the correct exposure time because VDB images tend to darken as they dry. To illustrate, a print that looks reddish-brown when it is wet often turns to a deeper brown as it dries. Every two to three minutes you can turn the UV lights off or take your contact printing frame into room light to check and see if the exposure is finished. At this point, you can turn off the safelights and turn on a 40-watt bulb to check your exposure. The sensitizer should not fog in the short period of time you are looking at the support. When the image has detail in the midtones and yellow-brown tones in the highlights, the exposure is done. A well-exposed VDB image should be a slight "cocoa" in color and look underexposed (light) because it will darken during processing and drying.

OTHER MATTERS TO THINK ABOUT BEFORE PROCESSING YOUR PRINT

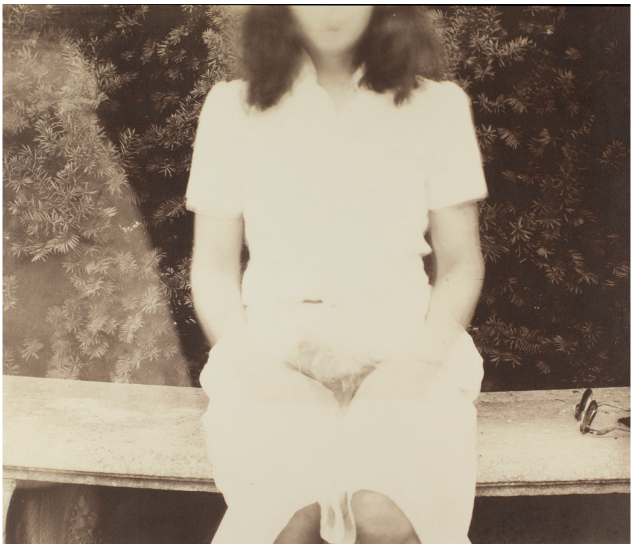
These final steps are very important to ensure permanent, beautiful prints. The excess iron and silver salts need to be removed at this point, or the print will fade. Make sure your trays are all properly labeled, and that you reserve each tray for a single step within this process. Doing so will help avoid contamination of future prints. As with normal black-and-white printing, prepare each tray of chemistry and wash ahead of time, allowing them to reach room temperature before proceeding.

You can increase the contrast of a print by adding a small amount of the potassium dichromate stock solution to the first wash tray. You will need to experiment with the exact amount, but a good starting point is to add nine or ten drops of potassium dichromate solution to 500ml of water. This will increase the contrast of your print by about one grade in silver halide paper terms (i.e. normal black and white silver printing paper).

Selenium toning is another option for VDB prints. It cools the browns and brings out the midtones. If you want to tone a print with selenium toner, place the print in the toner *after the second wash and before you transfer it to the fixer*. You can also tone after the final wash. To make a selenium toner bath, start with a solution that is diluted at a ratio of 1:20 and see if you like the effect. You can vary the dilution (from 1:3 to 1:50) until you get the desired effect. Toning happens rapidly and colors can shift quickly, so make sure you watch the process carefully. At the precise moment you see the color you want, remove the print from the toner. Then submerge it in a tray of running water to stop the toning. The correct moment to pull the print is sometimes hard to pinpoint because the changes are incremental. Therefore it is helpful to have an untoned print (called a match print) as a reference to help you see toning changes and know when to pull the print out of the toner. Now you can proceed as usual with fixer.

STEPS FOR PROCESSING THE PRINT

1. Place the print in a tray of running water or, if you are adding contrast to your image, a tray with potassium dichromate added. When using only water, wash the print for one minute or until the water runs clear. If you are using potassium dichromate, agitate the print constantly in this bath for one to two minutes, and then transfer it to a tray of running water. When you are washing the print under running water, start with the print side



07.9 and 07.10 © Joan Lyons from an ongoing series, "Domestic Accumulations." These are made from paper negatives in a pinhole camera made by Eric Renner. The Van Dyke brown prints were made on Arches hot pressed paper.

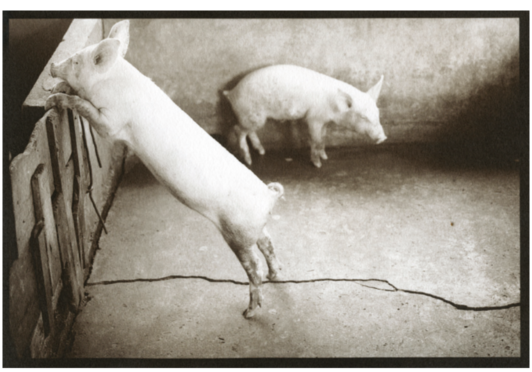
up, making sure it is covered with water. Then turn it over, face down. As the water runs through the tray, keep turning the print back and forth with tongs or gloved hands, being careful not to crimp it. The unexposed iron and silver salts will sink to the bottom of the tray. During this wash, the print will lighten and become yellowish.

2. If you do not have a lot of room in your sink, dump all of the water out and start timing for another three to five minutes. If you have a large sink, then transfer the print to a second tray of running water and wash in the same way you did in Step 1.
3. If you are toning the print, the next tray should be the toner. Otherwise, move on to the fix.
4. The fix tray should be filled with enough fixer to cover the paper, remembering that fixer needs to be discared after two or three prints. The sodium thiosulfate will remove the excess silver ions. Remember that VDB fixer is much more diluted than regular paper fixer which, at full strength, would etch the image away from the paper. Agitate the print continuously for one to four minutes as described in Step 1, first placing the print face up, then face down. During the fixer bath, the print will darken and become brown. However, if you leave the print in the fixer for longer than five minutes, the fixer will begin to bleach the image.
5. Transfer the print to a third tray of running water and allow it to wash for five minutes. This will remove most of the sodium thiosulfate.
6. Transfer the print to the hypo clearing agent or perma wash. Prepare this as you would for regular silver printing. Follow the mixing instructions on the bottle that you get from the supplier. Agitate constantly for two minutes.
7. Transfer the print to the fourth and final tray of running water, and wash it for 30 minutes.

07.11 © Sommer Wood, *Family Ties Series*, Van Dyke brown on Arches paper. Image captured on 35mm Transparency Slide Film, scanned, enlarged, and printed as a digital negative. Exposure created using a UV Lightbox.

CREATING KALLITYPES

Kallitype is a more traditional brown print process than VDB. However, because there are so many more choices of developers in making kallitypes, it can also become more complicated. These instructions will provide a good starting point and plenty of tips to produce handsome results. When kallitypes are made correctly, they are almost indistinguishable from platinum/palladium prints. They can range from a beautiful warm brown tone to a reddish-brown. Mixing the sensitizer correctly is the key to the success of this process. Once, when I was teaching a class at the International Center of Photography, my teaching assistant mixed the sensitizer incorrectly. Everything was working beautifully until we immersed the prints in the developer – and watched the images disappear. We made up a new batch of sensitizer and achieved wonderful results in the end. The instructions for making kallitype sensitizer are very similar to those for making platinum/palladium sensitizer. In particular, you will have three bottles of stock solution – labeled A, B and C – that make up the sensitizer. The moral of the story is to follow these instructions step by step.



07.12 © John Lockhart. John tones his kallitypes with platinum/palladium to bring out a beautiful rich color and make his images more permanent.

MATERIALS NEEDED

The basic utensils and equipment required to create VDB prints are also required for kallitypes. In addition, you will need the following items:

- Eyedroppers – three eyedroppers, one for each of the solutions for the sensitizer. (I use bottles that have eyedroppers as the tops so I don't mix them up or misplace them.)
- Graduates – you will need at least three large graduates, depending on how many different developers you use.
- Storage bottles – two one-gallon containers and three one-pint bottles – the two one-gallon containers are for EDTA (which is used as the clearing bath) and sodium thiosulfate (which is used as the fixer). The three one-pint bottles are used to store the following chemicals: ferric oxalate solution, potassium dichromate, and silver nitrate.
- Trays – you will need nine trays for developing prints, and as many as five more for toning them.

MAKING YOUR STOCK SOLUTIONS

The chemicals required to make traditional kallitypes are similar to those required for platinum and palladium printing. However, kallitypes are made with metallic silver instead of metallic platinum or palladium. The support used for kallitypes is coated with silver nitrate and ferric salts. Exposure to light reduces some of the ferric salts to a ferrous iron state. Once you immerse the print into a developer, the silver metal salts reduce to a metallic silver. The best thing about kallitypes is that you choose the developer according to the color you want for the final image.

There are many formulas for the kallitype sensitizer. I have included the two most common ones here. The first is the formula with which I learned the process years ago. Many photographers like this one-bottle recipe. The second formula (which involves three separate bottles) seems to be the best recipe for contrast control. But be aware that it uses potassium dichromate, a known carcinogen, and is no longer used in many photo programs that teach non-silver processes. As I stated when talking about VDB, these formulas call for such a small amount of potassium dichromate that the poison percentage is brought way down. However, you still need to be safe and it is highly recommended to wear gloves at all times (including in the water baths), and wear a mask as you are mixing the powder into liquid form. As with all of the processes described in this book, most photographers who work with kallitypes have strong opinions about the pros and cons of these sensitizers. Try them all and see what works best for you.

All of the sensitizers can be mixed in a "dim room":

07.13 © John Metoyer. John uses Arches 140-lb natural white to make his kallitypes.

SENSITIZER FORMULA 1

This is the one-bottle kallitype formula. Since this sensitizer doesn't contain potassium dichromate, you will want to control contrast during the development stage instead. This sensitizer should be prepared a day or two before you plan to use it, and allowed to ripen. The shelf life for this solution is said to be three to six months, but I have used sensitizer that is significantly older. Silver nitrate tends to sink to the bottom of the bottle, so make sure to stir the solution before you sensitize the support, as well as periodically during use. If a precipitate forms, filter the liquid through wet cheesecloth.

Chemicals needed

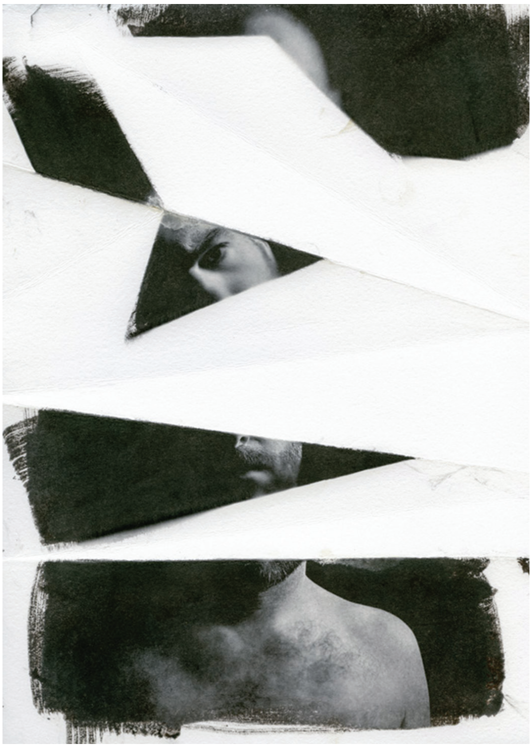
47 ml distilled water
0.5 g oxalic acid
7.8 g ferric oxalate
3.1 g silver nitrate

To mix

1. Pour the distilled water into a pot, heating it on a hot plate or stove to approximately 100°F.
2. Once it is heated, pour the water into a cup that will hold at least 100ml so that you have room to stir without spilling.
3. Add the oxalic acid and stir well with a mixing rod.
4. Add the ferric oxalate and stir well.
5. Add the silver nitrate and stir well.
6. Pour the solution into a dark brown glass or plastic bottle. Label this bottle "Working Sensitizer/ Kallitype."

SENSITIZER FORMULA 2

There are so many formulas in books and on the web that there's plenty of information out there for experimentation. The chance to experiment and tinker with your recipes captures the spirit of alternative photographic processes. This recipe incorporates elements



07.14 © Mark Edward Dawson. Mark explains that this self-portrait shows the fractured way in which we view the world. He made this kallitype on Arches Platine paper by selectively coating the paper.

from two popular formulas and works well for me.

It's also similar to the platinum and palladium technique because you keep each of the chemicals separate in small brown bottles, and use eyedroppers to make the working solution as you need it. I have found it helpful to label each of these stock solutions with its chemical name, as well as A, B, and C respectively. (It is also important to label your eyedroppers A, B, and C, and to use each eyedropper for only one chemical. Better still, is to use bottles that come with eyedroppers for caps.) The stock solutions have a shelf life of approximately three to six months.

Chemicals needed

CHEMICAL A: FERRIC OXALATE:

100 ml distilled water
20 g ferric oxalate

CHEMICAL B: POTASSIUM DICHROMATE:

100 ml distilled water
1 g potassium dichromate

CHEMICAL C: SILVER NITRATE:

100 ml distilled water
10 g silver nitrate

In a dim room to mix the stock solutions:

Chemical A: ferric oxalate

This is also one of the standard stock solutions for platinum/palladium printing. Though these directions are for mixing the chemistry from scratch, you can buy it in either crystal form or as a pre-mixed liquid. The pre-mixed liquid has a shelf life of three to six months. But if you keep the undissolved crystals in low humidity, they will last for years. If you are working from crystals, make your stock solution a day or two before you are going to use it, following these instructions:

To mix

1. Pour 100ml of distilled water into a pot and heat it to approximately 100°F.
2. Once it is heated, pour the water into a large cup.
3. Pour 20 g of ferric oxalate into the water while stirring with a mixing rod. Stir until all the crystals have dissolved.
4. Pour the solution into a dark brown glass or plastic bottle and label this bottle "Ferric Oxalate/ Kallitype A."

Chemical B: potassium dichromate

This chemical is a known carcinogen, so remember to use gloves, goggles or glasses, a mask, and an apron because potassium dichromate can be absorbed through the skin. I know I keep repeating this, but you need to remember to be mindful of the chemicals you are using.

Potassium dichromate increases the contrast of your prints. It is the same solution used to add contrast to cyanotypes, so if you have already prepared it for cyanotypes, you can use it here. Using potassium dichromate will slow down your exposure, so remember to increase your time.

If you don't want to use potassium dichromate in the sensitizer, but still want to increase the contrast of your prints, proceed this way: add 10–40 drops of potassium dichromate stock solution to one liter of developer, and use this solution during the development stage. The stock solution should be made a day or two before you plan to use it.

To mix

1. Pour 100ml of distilled water into a pot and heat it to approximately 100°F.
2. Once it is heated, pour the water into a large plastic cup.
3. Pour 1 g of potassium dichromate into the water while stirring with a mixing rod. Stir until all the crystals have dissolved.
4. Pour the solution into a dark brown glass or plastic bottle and label this bottle "Potassium Dichromate/Kallitype B."

Chemical C: silver nitrate

Wear goggles, gloves, a mask, and an apron when handling silver nitrate because if it splashes in your eyes, it can cause blindness. Silver nitrate turns brown on contact with any organic substance such as skin and cotton. Be aware that silver nitrate can react to the amount of humidity in your workspace, as well as to the support you are using. This is one of the reasons why silver nitrate has the reputation for being unstable and why it is sometimes difficult to replicate exact color results. Another reason for silver being thought of as unstable is human error. Be sure to follow directions on developing and fixing, or you will see a color change over the years.

This stock solution should be made a day or two before you plan to use it.

To mix

1. Pour 100ml of distilled water into a pot and heat it to approximately 100°F.
2. Once it is heated, pour the water into a large cup.
3. Pour 10g of silver nitrate into the water while stirring with a mixing rod. Stir until all the crystals have dissolved.

07.15 © Holden Richards. Holden printed this kallitype in double. The image on the right is the silver gelatin print and the one on the left is a kallitype. He uses X-ray film to make his negatives and prints on Strathmore 500 series 300gsm paper, toning with selenium toner.

4. Pour the solution into a dark brown glass or plastic bottle and label this bottle "Silver Nitrate/Kallitype C."

PREPARING YOUR SENSITIZER

Cover your working area with newspaper to protect the surface from silver stains, or use plate glass which makes for easy clean up. Before you start to mix the working solution, make sure your three eyedroppers are clearly marked "A," "B," and "C," and that all three droppers have the same-sized holes. I mix my working solution in either a plastic cup, a small plastic dish, or a small ceramic bowl – just make sure that if you are using a brush, it fits into your container of working solution. Using the eyedroppers, mix equal parts of A and C. To cover an 8 × 10" negative, you will need approximately 48 drops total (24 each). If you want to add the potassium dichromate to the sensitizer (as opposed to the developer), add one drop of B to the 48-drop A/C mixture. If your print is too contrasty, then do not use any potassium dichromate. If your image is too flat, then add one drop at a time, doing a test print until you get the results that you are happy with.

Stir the mixture slightly before you start to coat the support. If you are using fabric or another porous support, you might need to adjust the number of drops slightly. As you are coating the support, the sensitizer should be yellow. If the sensitizer looks brown, it has either gone bad from age, was not mixed well, or has been fogged. To rule out the latter, check your lights. If your bulb was too bright or too close to your paper, fogging will occur.

PREPARING AND EXPOSING YOUR BASE SUPPORT

Because of the similarities between these two processes, preparing the base support for the kallitype process is virtually identical to preparing it for the VDB process. Similarly the exposure processes are identical.

PREPARING YOUR DEVELOPER

As described earlier, there are two different points during the process when you can alter the tone of a kallitype. One is at the developing stage, and the other is at the toning stage (which comes immediately after the clearing bath and before the fixer). You can adjust the color of the print at either or both of these stages. The first decision you need to make is which of the following four developers you want to use.

Reddish-brown developer:

Developing time is about two minutes. A ready-made ammonium citrate developer used for platinum/palladium printing can be bought from most suppliers (see Sources). It is usually packaged as a dry chemical in a bottle. All you have to do is add distilled water, mix well, and pour the mixture into a tray. You can keep using this developer and top it off with fresh ammonium citrate as you lose some to spillage or general use. Make sure to label the bottle "Reddish brown Developer/Kallitype." Even though it is the same developer you may use for platinum/palladium prints, you should not use the same solution for both processes. They each involve different metals and should not be mixed.

If you are going to mix reddish-brown developer from scratch, mix as follows until the ammonium citrate is totally dissolved:

1 liter distilled water
200 g ammonium citrate

Brown-black developer

Developing time is about five minutes, with continuous agitation. This developer has a shelf life of up to six months. This developer works best when it's warm.

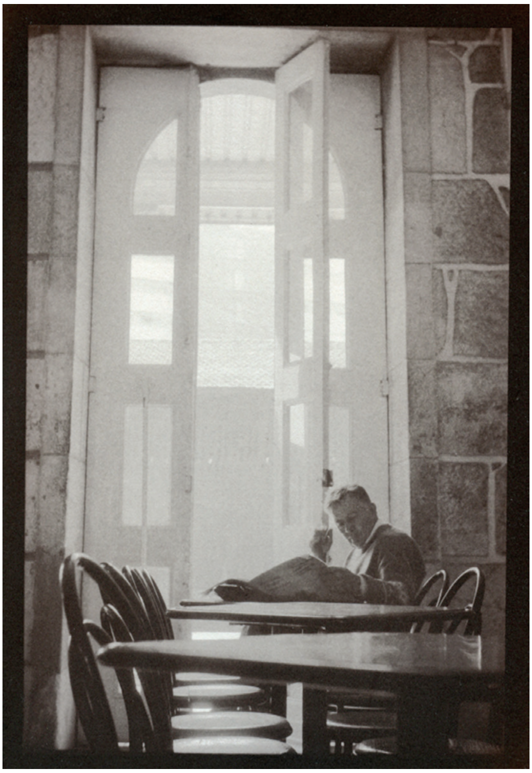
1 liter distilled water
96 g borax (sodium borate)
72 g Rochelle salts (sodium potassium tartrate)

To mix

1. Pour the distilled water into a pot and heat it to approximately 100°F.
2. Transfer the water to a large graduate. Slowly add the borax and stir with a mixing rod until dissolved.
3. Add the Rochelle salts and stir until dissolved.
4. Store in a dark brown glass or plastic bottle labeled "Brown-black Developer/Kallitype."

Warm brown developer

Developing time is about five minutes, with continuous agitation. This developer has a shelf life of up to six months. This developer works best when it's warm.



07.16 © John Lockhart. "Beja Station." Gold toned kallitype from a digital negative.

1 liter distilled water
48 g borax
96 g Rochelle salts

To mix

1. Pour the distilled water into a pot and heat it to approximately 100°F.
2. Transfer the water to a large graduate.
3. Slowly add the borax and stir with a mixing rod until dissolved.
4. Add the Rochelle salts and stir until dissolved.
5. Store in a dark brown glass or plastic bottle labeled "Warm Brown Developer/Kallitype."

Sepia developer

Because it contains no borax, sepia developer can be used at room temperature. However, the development time is longer – about ten minutes, with continuous agitation. This developer has a shelf life of up to six months.

1 liter distilled water
48 g Rochelle Salts

To mix

1. Pour the distilled water into a pot and heat it to approximately 100°F.
2. Transfer the water to a large graduate.
3. Slowly add the Rochelle salts and stir with a mixing rod until dissolved.
4. Store in a dark brown glass or plastic bottle labeled "Sepia Developer/Kallitype."

THIS CHART IS A REPEAT OF THE ABOVE FORMULAS AND DEVELOPING TIMES.

I have included it because it might make it easier to compare when it is written out another way.

DEVELOPERS TIMES	*DISTILLED WATER*	*BORAX*	*ROCHELLE SALTS*	*DEV.*
Brown-black	1 liter	96 G	72 G	5 MIN.
Warm brown	1 liter	48 G	96 G	5 MIN.
Sepia	1 liter	None	48 G	10 MIN.

DEVELOPING/WASHING YOUR PRINT

Make sure your trays are all properly labeled and that you reserve each of them for a single purpose only within this process. In addition, all of your chemicals should be prepared ahead of time and should be at approximately 68°F (with the exception of developers that contain borax, which should be at about 100°F for maximum effectiveness).

Proceed with the following steps.

1. In one continuous motion, immerse the print in a tray filled with the developer of your choice. Agitate continuously for the required time.
2. Transfer the print to a tray of running water and wash it for approximately one minute.
3. Prepare two identical trays of clearing solution. Each tray should be filled with a solution of one to two teaspoons of EDTA tetrasodium to one liter of water. Place the print in the first tray and agitate it for five minutes. Then place the print in the

07.17 © Debra Small. Debra made this kallitype and toned it in platinum, palladium and gold toners.

second tray and agitate it for five minutes. This process dissolves the iron in the emulsion, leaving only the silver.

4. If you want to tone the print, now is the time to do so (between the clearing bath and the fixer).
5. Prepare the fixer tray. Either sodium thiosulfate or diluted rapid fixer can be used (just as with VDB). Place your print in the tray and agitate for two minutes. The print will get much lighter during this stage. You cannot use regular paper fixer because it *will etch the image off the paper*. Do not let the print sit longer than five minutes in the fixer, or it will start to fade.
6. Transfer the print to a tray of running water and allow it to wash for five minutes.
7. Place the print in a tray of perma wash or hypo clearing agent and agitate for two minutes. Your hypo clearing bath should be **diluted to half the strength** that you would need for normal black-and-white silver printing. Follow mixing instructions on the container, and then dilute 1:1 with water.
8. Transfer the print to a third and final tray of running water and allow it to wash for 30 minutes.

FURTHER ALTERING THE COLOR OF YOUR PRINT

In addition to determining the color of the print through your choice of developer, you can also alter the color by toning. This stage occurs after the print has cleared and before it has been fixed. If you fix before toning, then you will see a reduction in print density and possibly some staining.

Some people recommend toning to increase the permanence of a kallitype. This is a recommendation that also applies to silver gelatin printing. Other people prefer the colors achieved during development and don't want to risk altering the color with toning. To tone or not to tone is a judgment call, and here you need to make an artistic decision. If you have decided to tone, hang a print that has not been toned above the toning tray. This will help you see the color change from the original color.

Make the base toner first. Then select, mix, and add one of the three enhancement formulas listed below. The enhanced toner needs at least a day to age before you use it. These toners should last for many years, depending on the conditions in your darkroom (a high humidity level exhausts toners faster). When you are ready to tone the print, place it in the toning solution, constantly agitating for about five minutes. You will begin to see changes in the highlights and shadow areas. After toning the print, proceed with the fixer, wash, perma wash, and final wash. If the print is not washed and cleared well before toning, you will get unwanted stains.

Selenium toner

This is the same selenium toner used with silver gelatin papers. For brown prints, you can mix it as a strong dilution. A weaker solution will render your images more gray. You should experiment, take notes, and discover which tones you prefer. Try different dilutions from 1:5 up to 1:50. Be sure to wear gloves while toning.

If you want to make a selenium toner from scratch, use the following formula from Dick Stevens' book, *Making Kallitypes: A Definitive Guide*:

1. Dissolve 100g of sodium sulfite in 100ml of approximately 100°F water.

07.18 © Holden Richards. Holden used X-ray film for the negative because it gives him a slightly contrastier image. Printed on Strathmore 500 series 300gsm paper and developed with sodium citrate developer and four drops of potassium dichromate.

2. Dissolve 10g of selenium powder in the sulfite solution.
3. Bottle and label the mixture as a stock solution.
4. To make a working solution, add 100ml of stock solution to 1 liter of water.

Base toner

This solution should be mixed first, then any one of the three enhancements can be added. The citric acid helps to clear the whites.

1 liter distilled water

5 g Citric Acid

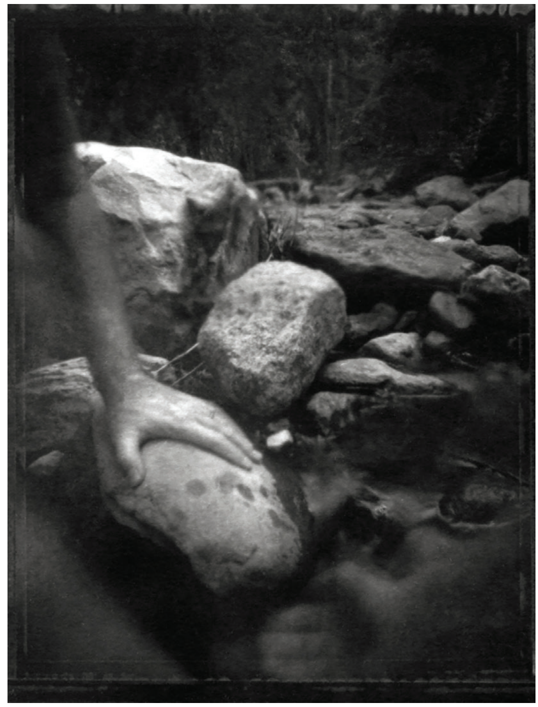
Pour the water into a dark brown glass or plastic bottle. Add the citric acid and mix well.

Toner enhancement Formula 1: gold toner

This toner creates the deepest browns of the three formulas listed.

5 ml 5% gold chloride

Add the 5% gold chloride to the base toner and mix well.



07.19 © Rachel Brace-Stille. "Wellspring." Rachel used Polaroid positive/negative film to make this series of images along with the argyrotype process.

Toner enhancement Formula 2: palladium toner

This toner creates a nice medium brown, and is made from the palladium metal used in the platinum/palladium process.

5 ml palladium solution

Add the palladium solution to the base toner and mix well.

Toner enhancement Formula 3: platinum toner

This toner creates the coolest browns of the three formulas listed. It is made from the platinum metal used in the platinum/palladium process.

5 ml platinum solution

Add the platinum solution to the base toner and mix well.

ARGYROTYPE PROCESS

In 1990, Mike Ware came up with the Argyrotype process as an easier alternative to achieve brown toned silver prints. Ware's agenda was also to find a way to make a similar brown print without the problems inherent in iron-based silver processes. Iron-based processes can oxidize and degrade the image with residual metallic iron. This means that if the print is not fixed and washed well, the image will not be archival (permanent).

Ware's idea is to change the silver that is normally used (silver nitrate) and use silver oxide instead, along with sulfamic acid. In this way the developer does not have to be pH regulated with borax, and the fading is kept to a minimum.

You can purchase Ware's Argyrotype formula already made (which I highly suggest) or mix it yourself using these instructions.

Materials needed

7 g sulfamic acid, also spelled sulphamic
7 g silver oxide
22 g ammonium iron (III) citrate, which is green in color
0.2 cc Tween 20 TM, which is a wetting agent and is optional
100 ml distilled water

To mix

Mixing should be carried out in a dim room (40-watt bulb, or Christmas lights). You should be wearing: apron, goggles and gloves!! I have an automatic combination stirrer and hot plate, which makes this much easier to mix:

1. Heat 70ml of the distilled water to between 120°F and 140°F.
2. Slowly add the 7g of silver oxide to the hot solution, stirring until it is all dissolved.
3. Slowly add the 22g ammonium iron (III) citrate, stirring until it is all dissolved.
4. Allow to cool.
5. Add the Tween 20TM and mix well. Depending on your paper, you might have to change the amount of Tween 20TM that you add; cold-press papers need more Tween 20TM than hot-press papers.
6. Add the rest of the (room-temperature) distilled water to make a final volume of 100ml.
7. Filter the solution using filter paper or a coffee filter and a glass funnel to remove any solid solution remaining (the solution should be a clear, deep, olive-green color).
8. Store in a brown bottle. The solution should keep for about a year. If a precipitate forms, filter it out with a filter and glass funnel.
9. ***Contrast control:*** Dissolve an extra 1g of sulfamic acid in 100ml of sensitizer.

07.20 © Mike Ware. "Glade, Stanton Moor." Ware made this argyrotype on Arches Platine paper using his formula for the process.

PRINTING

Considerations about negative choice, paper coating and the dry down effect are exactly the same for Argyrotypes as with the other kallitype methods.

As the image is exposed, you will notice details emerging in an orange-brown color on a yellow background. The color will darken to a rich brown in the fixer bath. You can change the color to a more neutral tone by humidifying the paper before exposure.

07.21 © Mike Ware. "Tudia." Mike uses Buxton 160gsm from the Ruscombe mill to make his argyrotype prints.

To humidify your paper, place your paper over a tray of hot water for about 30 minutes or place it near a humidifier. If you do humidify your paper, you will need to use a very thin sheet of polyester film between your paper and negative when you make the print, otherwise your negative will stick to the wet paper.

PROCESSING

You only need running water and a fixer. This is by far the easiest brown print to process!

Materials needed

20 g sodium thiosulfate
1 liter water (tap water is fine)
This makes a 2% solution and will last for about ten 8 × 10" prints. You can also use a diluted print fixer, as directed with the other kallitype processes.

The process

1. ***Optional:*** Before processing, you can humidify the paper for ten minutes to improve highlight detail. You can also breathe heavily on your print. I do this with darkroom silver printing to enhance highlight areas.
2. Wash the print for five minutes in room-temperature running water. The yellow unexposed sensitizer, which contains excess iron and silver salts, should be completely washed out.
3. Fix the print for three minutes. The color will shift from red to brown and the shadow areas will strengthen.
4. Wash the print in running water for 30 minutes, and air-dry at room temperature.

The image will dry down (get darker) by about 10%. If you use heat to dry the image, the color may shift to a more neutral, blackish-brown.

TROUBLESHOOTING

- If solarization occurs or the print has veiled highlights, the light source in your darkroom is too strong. Try dimming the lights or making the kallitype sensitizer under a red or amber safelight.

- If there is a line across the print, you may have developed the print unevenly. Make sure to fill your tray with enough developer to cover the print. Then slide the print into the developer in one sweeping motion.
- If the image is faded, you may have left it in the fixer too long.
- If you do not like the color of the final print, re-coat another support and repeat the process with a different developer or toner. The possibilities for kallitype printing are numerous.
- If you think the tonal range of the print is too cool, heat up the developer or first-wash tray to warm up the brown.
- If the sensitizer looks brown instead of yellow after you've coated the support, either the sensitizer was bad or the sensitized support has been fogged.
- If a really long exposure is required to produce an image, you may have coated the support with too much sensitizer. Try making another print with a support that was less saturated with sensitizer during coating.
- If the negative sticks to the coated support, either the support was not fully dry or the lights were too hot or too close to the contact printing frame. Or, if you humidified your paper, you should have used a piece of thin film, similar for outputting a digital negative, between your negative and your paper.
- If the print bleached during the wash cycle, you probably used a wash tray that had been used for other processes. Just as with the other trays, your wash trays need to be allocated just for VDB printing and should be labeled "VDB/Wash 1," "VDB/Wash 2," etc.
- If the print is uneven and blotchy, the paper's surface may be too soft. Either choose a different paper or try sizing the paper before applying the sensitizer. Using Tween 20 ™ in the sensitizing solution may also help. When a paper is too soft, the sensitizer sometimes soaks into the fibers too deeply and unevenly. The sizing should help to clear this up.
- If the sensitizer looks grayish-brown (instead of yellow) before it is exposed, it may have been contaminated. Make sure your brushes are clearly marked for each process, and that you thoroughly wash and dry any vessels you use to hold the sensitizer.
- If your shadows are not rich or dark enough in tone, then double-coat your paper with sensitizer, drying between the first and second coat with a hair dryer on a cool setting.
- If your darkroom is too small to accommodate many wash trays, or has no running water, fill one tray with distilled water and place the print in it, agitating for about 30 seconds. Dump the distilled water out, pour some more in, and agitate again for 30 seconds. Do this a total of 12 times and you should have a very clean print.
- Reddish-brown stains running out of the shadow areas of an image mean that more Tween 20™ may be needed, or it may be that the paper may not be suitable for this process.
- Reddish-brown staining can also be caused by hypo (fix) on your fingers or tongs. It will show up very strongly in the toning baths.

Eight

TRADITIONAL PLATINUM AND PALLADIUM PRINTS, THE MALDE – WARE TECHNIQUE AND THE ZIATYPE

08.1 © Jill Enfield. This image is part of a series on commuting. It was taken with a smart phone, made into a digital negative and a print was made using mostly palladium with a few drops of platinum, on Hahnemühle Platinum Rag paper.

The sensitivity of platinum salts to light was first noticed and recorded by Ferdinand Gehlen in 1804. Sir John Herschel and Robert Hunt experimented further with platinum, but in 1859 C.J. Burnett was the first to exhibit prints made with a platinum-based emulsion. In 1873 William Willis received the first patent for the platinum printing process, and in 1879 began to manufacture it under the commercial name of Platinotype. Soon, ready-made platinum papers were available throughout the world. The manufactured paper was very popular with the Pictorialists, members of the Linked Ring Society, and the Photo-Secessionists, which included such photographers as Paul Strand, Clarence White, and Alfred Stieglitz. These photographers valued ready-made platinum papers for their long scale and subtle richness of shadow areas. Edward Weston used Palladiotype, a commercial palladium paper manufactured by Willis and Clements, to print photographs he took in Mexico in 1923.

In 1887, an Austrian by the name of Giuseppe Pizzighelli patented a new way to process platinum/palladium images using a printing-out formula instead of Willis's developing-out process. This meant that instead of using a developer to bring out the image, the printing-out formula shows the image as it is exposed and just needs to wash out the unexposed metals in several wash baths.

In 1916, the First World War imposed a ban on this use of platinum, so Willis started to use palladium as a substitute. By 1920, Willis could use platinum again. In 1937, when the high cost of the metals made both platinum and palladium papers too expensive to produce, they were phased out in favor of cheaper silver bromide papers and Willis's company closed their doors. There was a revival in the 1970s, and many photographers continue to work with these processes today.

Other than the color difference, the processes of platinum and palladium printing are identical. Platinum images can range from a cool gray-black to split tones of brown. Palladium prints usually range from warm black to very warm brown. Many people mix the two metals to produce a warm brown, and to cut the cost of the more expensive platinum metal. Both techniques have superb tonal range and archival properties, and are said by some to be the highest-quality monochrome processes in photography.

Until the 1980s, photographers tended to work with Willis's developing out process. At that time, Professor Pradip Malde, in collaboration with Dr. Mike Ware, developed a printing-out method for printing in platinum/palladium. Dr. Ware published a paper in the *Journal of Photographic Science* in 1986 (September–December, 1986, Vol. 34), followed by a manual written by both Malde and Ware.

08.2 © Norma Smith. "Thistle & Moss." Norma used a combination of platinum/palladium to make this beautiful image.

Then, in the 1990s, Dick Sullivan (of Bostick and Sullivan) and Carl Weese developed a similar method, which they dubbed the Ziatype. According to the B&S website, the process is ever-evolving, so the reader should check back with them every so often to see what is new (see Sources).

Pt/Pd prints have long been associated with a beautiful rich brown color to a neutral gray. The Malde–Ware formula has taken it a step further and made it possible to obtain colors ranging from blue-black through neutral grays to rich sepias.

There is also a chemical known as Na2 that can replace the contrast control in palladium printing. Some printers are switching to Na2, thinking it has a smoother tonal range and does not add the grain you sometimes see in water or skies. You cannot use Na2 with platinum!

This chapter will cover the traditional platinum and palladium printing technique, the Malde–Ware technique, and the Ziatype. It is wonderful to see people today changing things up a bit. I have heard more than once that you have to do a process in the "historical, correct way." Just because a process has been applied the same way since its inception, does not mean there can be no improvement. If that was the case, then digital negatives would not be so widely used.

Like anything else, once learned and practiced, the controls are there. All you need to do is follow good practices:

- Keep good notes.
- Study your prints **after** they dry.
- Pay attention to the outcome and learn from your tests and errors.
- Make sure your negatives are good.

Then get to work! With practice, anyone can learn to make a beautiful print.

CREATING PLATINUM AND PALLADIUM PRINTS – THE DEVELOPING-OUT WAY

Platinum and palladium printing is similar to kallitype printing and other iron-sensitive processes, except that platinum and/or palladium salts are used instead of silver salts. Platinum/palladium salts become light sensitive when combined with iron salts. Sensitizing can take place in subdued white light.

Both platinum and palladium prints are created by a contact printing process (this means the negative is the same size as the finished product), that involves a relatively short exposure time (two to eight minutes) to ultraviolet light. When the image is developed, the unexposed platinum, palladium, and ferric/iron salts dissolve away. When the iron is removed in the clearing bath, what remains is an image that consists entirely of platinum and/or palladium metal.

Almost any paper or support can be used for platinum/palladium (which most photographers abbreviate as Pt/Pd) prints. However, to achieve a good tonal range, the paper must have some acidity. If you notice streaky, blotchy prints with no rich blacks,

08.3 © Andrea Modica. Andrea photographs using an 8 × 10" camera and then makes platinum prints for personal and commercial work.

08.4 © Craig J. Barber. "Echoes 2000." This image is from Craig's series entitled "Havana Passage" and was shot with a handmade 12 × 20" cardboard pinhole camera made with gaffer tape, brass shim stock, and black felt. He used Ilford HP5 film for a 15 minute exposure and then used the negative to make a platinum/palladium print.

then the first place to start is to add acid into the paper. To add the necessary acid, soak the paper in a 3% oxalic acid solution and then hang to dry. Or you can coat the area you are going to sensitize with oxalic acid, allow it to dry, and then coat the Pt/Pd over the prepared area.

Sizing is generally not required, but I suggest trying a print both with and without size. Paper companies are always changing their paper content without notice. Therefore, what may print beautifully one day might render unacceptable prints with the next batch of paper, although the papers are ostensibly identical. *Always do a test with a new batch of paper before coating a lot of sheets.* This caveat applies even if you're working with a paper that has been your dependable favorite for many years. But it's especially relevant for Pt/Pd because the sensitizer is so costly.

The decision to size paper is yours, and depends on the surface texture of your support and how you want the finished print to look. If you are using a particularly porous paper, such as Rives BFK or Arches 88, sizing will help keep most of the expensive platinum salts from sinking into the fibers of the paper. When choosing which sizing solution to use, be aware that starch size tends to produce warm tones in Pt/Pd prints, whereas gelatin size produces cool tones (see Sizing Formulas in Chapter 2). Pt/Pd prints are said to be the most archival of all photographic processes. However, if they are not treated correctly, they will stain or fade just as quickly as anything else. You must take care to clear your prints of all iron and unexposed Pt/Pd salts, and make sure they are thoroughly washed.

If you have white spots on your prints, they can be filled in with a soft pencil, black India ink diluted with water, or a watercolor pencil – anything that you find easy to use and that matches the colors of your prints. Make sure to use a test print to check that you have the proper tone before spotting

08.5 © Steve Goff. Steve uses view camera negatives and the traditional recipe when he prints on Arches Platine paper.

on a final print. Most art-supply stores have samplers you can use. Take a test print to the store and try out different materials and methods to see which one you like. This will also help in matching the tones.

GETTING STARTED

Many of the materials required to make Pt/Pd prints are standard darkroom items. The major difference is that the chemicals used in Pt/Pd processes react with metals, which can cause oxidation and staining. Therefore, it is important that your darkroom be equipped with non-metallic utensils, bottles, and trays. In addition, any tray that has been used for fix will stain the developer tray and cause contamination. It is good practice to keep your trays reserved solely for developer or fix, and to not switch them around.

MATERIALS REQUIRED

Before you get started, make sure you have the following:

- Contact printing frame
- Cups and bowls
- Distilled water
- Drafting tape
- Eyedroppers
- Gloves
- Goggles
- Hair dryer with a cool setting
- Hot plate (optional)
- Mixing rod
- Tongs

In addition, pay attention to the following elements:

- **Brushes:** Japanese Hake brushes are the brushes preferred by a large number of Pt/Pd printers because they are soft and produce lovely brush strokes. Personally, I don't really like Hake brushes. I think they are too soft and do not keep their shape, making them hard to use after they have been wet for a while. Sadly I have not been able to find my favorite brush in a few years, so have had to resort to using synthetic watercolor brushes. These keep their shape and don't lose bristles when wet. Sponge brushes soak up too much chemistry, so I don't recommend them. It is advisable to stay away from brushes with metal, but the only time I have had an issue with this type of brush was with an old brush that had been in and out of water. The metal had started to rust, making its way down into the bristles. At this point, it's time for a new brush! A way to stop this from happening is to coat the metal area with nail polish, which will stop the metal from rusting.

When using a brush, immerse in distilled water, and press between towels or rags to remove the excess water. This process ensures that the chemicals will not soak permanently into the brush.

- **Glass rods:** I prefer glass rods to brushes when applying Pt/Pd. They use less chemistry, and with practice, work very well. Glass rods can also be easily cleaned and used for different processes without contamination. If you like the look of brush strokes, you can first use a glass rod to apply the chemistry; then brush over the area to achieve the brushed effect you are looking for. Papers that have gelatin sizing do not coat as well with glass rods. If your favorite paper happens to have a gelatin sizing, use the glass rod to start. Then go over the printing area with a brush to work the sensitizer evenly into the paper. This approach will still use less chemistry than using the brush alone.

- **Fish tank heater:** I use a fish tank heater inside a large tray filled with water. Then I place my developer inside the water-filled tray to keep it warm.
- **Graduates:** If you are mixing the chemicals from scratch, you need six large graduates, one each for mixing the required chemicals: ferric oxalate, potassium chlorate, platinum, palladium formula 1, palladium formula 2, and one for whichever clearing bath you are using.
- **Humidifier/Dehumidifier:** When I was teaching in Maine, it rained every day and humidity levels in the darkroom were up to 75%. During the winter, the humidity level in the darkroom can drop to 45%. For Pt/Pd, the humidity level in your darkroom should be around 65%. Needing a humidifier or dehumidifier will depend on where you live and the season.
- **Hygrometer:** If your humidifier or dehumidifier does not have a monitor on it, then you will need a hygrometer to read the humidity level in the darkroom.
- **Mylar sheets (1–3 mm) or a piece of transparency film used to make digital negatives:** Use the clear sheet between your negative and the coated paper so they will not stick together. If you have a tight contact printing frame, you will not lose much sharpness. If you use the film used for making digital negatives, you will have to add time to your exposure because the film is not as clear as mylar.
- **Small ceramic dish, shot glass, or small graduate:** These are used for mixing your sensitizer drops together.
- **Storage bottles:** If you are mixing sensitizer from scratch, you will need three dark brown plastic or glass bottles. In addition, you will need three extra one-gallon containers for the clearing bath.
- **Trays:** You will need five plastic trays for developing, clearing, and washing prints. If you have a small sink area, you can use a one or two-tray process, where you switch out the clearing bath.

08.6 © David Brommer. "The Last Supper." David's take on the Last Supper was made by using friends as models and photographing them with a large-format camera. He then made a contact print using the traditional platinum/palladium formula.

BASE SUPPORTS

Although a wide range of base supports can be used for the Pt/Pd process, paper supports are generally preferred, since they don't soak up as much of the (expensive) sensitizer. Smooth or hot-press papers, such as Hahnemüle Platinum Rag, Crane's Platinotype, and Stonehenge, tend to provide a sharper image than rough, textured papers, like Arches Platine. Smooth papers also clear more easily than textured papers, adding to their value for these processes. Printmaking papers, watercolor papers, and most 100% rag papers work best. Papers that are too absorbent will dry too quickly as you are coating. Highly absorbent papers (such as Rives BFK) may soak up too much chemistry, which can make the coating look uneven. The color of the paper should also be considered, as it will affect the outcome of the print. Note that even white papers play a role in the tone of the print. Supports that are made entirely of all-natural fibers soak up a lot of sensitizer, so be prepared to spend more money! Some other favorite papers are: single-ply Strathmore 500 paper, Crane's White parchment 67 lb., Bienfang tracing paper, Reich CT vellum, Revere Platinum, Wyndstone Vellum, and Opaline Parchment.

Malde–Ware suggest that if buffered papers (papers alkaline-buffered with chalk) are preferred, then they should first be treated in a dilute acid (1–2% hydrochloric acid or 5–10% sulphamic acid) for 10–20 minutes before using. Then wash for 20 minutes and dry. Fabriano Artistico and Whatman Watercolor papers are two examples of papers that need to be treated first. Other papers have gelatin sizing, which also doesn't work well with this process. Ask at the store where you are buying papers to look up what is used by the paper mill.

CHEMICALS

If you want to mix the sensitizer yourself, you will need to buy ferric oxalate, potassium chlorate, potassium chloroplatinite, sodium chloropalladite, and either palladium chloride or sodium chloride.

To make the developer, you will need ***one*** of the following: potassium oxalate, ammonium citrate, sodium acetate, potassium citrate or sodium citrate. To make the clearing solution, you will need ***one*** of the following: EDTA tetrasodium, sodium sulfite, hydrochloric acid, or citric acid.

There are many sources from which you can buy ready-made kits, which is what I recommend and use myself, especially when teaching. Pre-made kits can be bought from many places (see Sources) and make approximately 30 8 × 10" prints per kit.

In kit form, the sensitizer comes premeasured. All you need to do is add distilled water and shake the bottles. However, I do not recommend buying kits that are already in liquid form. Ferric oxalate lasts about six months once it has been mixed with distilled water. And there is simply no way to know for sure how long the liquid chemistry has been sitting around.

08.7 © Barbara Dombach. Barbara photographs with a 4 × 5" or 2.25 × 2.25" camera. She then makes digital negatives and prints on Cranes parchment paper using a homemade UV box.

LIGHT SOURCES

When you are mixing platinum/palladium chemicals or coating the support, you can be in a dim room, not a darkroom. Your workspace should be illuminated with subdued "white light" (such as a normal 40-watt household bulb). Regular fluorescent bulbs should be turned off at this stage because they contain small amounts of UV light. You can dry your supports with a hair dryer on a cool setting under subdued light, or air-dry them in total darkness. You can expose platinum/palladium prints in sunlight or in a UV light box. Mercury vapor lamps, used by printmakers, are as fast as the high output UV bulbs. Sunlamps are not recommended for Pt/Pd printing because they are slow, get very hot, and create low contrast in your prints.

08.8 © Jon Cone. Jon is the man behind the Piezography® digital negative system which uses six or more shades of gray instead of color inks, and the amazing tonal range can be seen even in a book print. This image was made using 20% platinum to 80% palladium, sensitized with traditional ferric oxalate and printed with cool potassium oxalate developer to get the final color on Revere Platinum paper.

NEGATIVES

As mentioned above, making Pt/Pd prints involves a contact print process that requires negatives the same size as the finished product. Your negatives should have a good separation of detail in the shadows and a fairly long density range. The contrast of the paper can be controlled with the sensitizer, so most negatives can be successfully used for this process. However adding too much contrast control chemistry (potassium chlorate) adds grain, so it is important to make sure your negative has enough contrast to use as little of the "B" solution as possible. In other words, you want detail in your highlights and shadows, but you also want contrast.

Pt/Pd prints can also be made without enlarged negatives. Photogram materials – such as glasses, beakers, plates, fruit, lace, and leaves – can create wonderful images, as can drawings made with a wax pencil or charcoal on tracing paper or acetate.

MAKING YOUR WORKING SOLUTIONS FROM A KIT (CONSIDERED PREMIXED SOLUTIONS)

Pt/Pd sensitizer can be bought separately or premixed. I strongly suggest getting the premixed sensitizer for ease and safety. Below I am including instructions for both mixing the kit solution as well as stock solutions from scratch.

Sensitizer (partially premixed).

If you are buying the premixed sensitizer, the working solutions come in brown bottles with eyedroppers included. You just add distilled water and they are ready to use. These should be clearly labeled.

Ferric Oxalate. Kits come with two bottles of ferric oxalate. Use one of the pre-measured ferric oxalate bottles with distilled water. This should be marked: **"Ferric Oxalate/ Pt/Pd A"** and set aside. Once mixed with distilled water, the shelf life is about three to six months. It can last longer and I would do a small test print to check it before throwing it out. If the highlights look fogged or muddy, you need new ferric oxalate. If the highlights look clear, go ahead and use it a bit longer.

Potassium Chlorate. Potassium chlorate needs to be mixed with **the second bottle** of ferric oxalate as the contrast control. The bottle will have ferric oxalate already in it and a small package of the contrast control (potassium chlorate). Pour the potassium chlorate into the bottle, along with distilled water, and shake the solution well. Label it **"Potassium Chlorate/Pt/Pd B"** solution. The shelf life is three to six months.

Platinum. The platinum salt is available fully prepared; label it "**Platinum/Pt C.**" This solution does not go bad with age.

Palladium. The palladium salt is available fully prepared; label it "**Palladium/Pd C.**" This solution does not go bad with age.

Sensitizer (from scratch)

Do not forget safety when mixing these chemicals. Wear a mask, gloves, and goggles, and use clean cups and mixing rods for each chemical.

These stock solutions should be mixed with distilled water that is approximately 100°F (under the low-light conditions of a household 40-watt bulb). Each solution should then be left to ripen for a day or two before being used to make your working solution.

Ferric Oxalate. This solution is what makes the sensitizer light sensitive. It needs to be mixed at least 12 hours before it is used.

Materials needed

50 ml distilled water
1 g oxalic acid
13 g ferric oxalate
0.5 g potassium chlorate

To mix

1. Pour the distilled water into a pot and heat it to approximately 100°F.
2. Transfer water to a large graduate. Slowly pour the oxalic acid, then the ferric oxalate into the water.

08.9 © Jan Pietrzak. Jan photographs using a 120 Holga panoramic camera and makes contact prints that are 6 × 12cm. He mixes his platinum/palladium metals at 50:50 and keeps this consistent throughout his series.

3. Stir with a mixing rod until all the crystals have dissolved.
4. Pour the solution into a dark brown glass or plastic bottle. Label this bottle **"Ferric Oxalate/ Pt/Pd A."**

Ferric oxalate produces less image contrast as it ages, and some people actually prefer to use the older oxalate (before it really starts to fog) to tone down the contrast of their prints. But this approach makes it harder to get repeatable, consistent results as the oxalate ages. If you're working with older chemicals, make a test print to see if you are still satisfied with the tonal range.

Potassium Chlorate. This solution controls the contrast of the sensitizer. It needs to be mixed at least 12 hours before it can be used.

Materials needed

50 ml distilled water
1 g oxalic acid
13 g ferric oxalate
0.5 g potassium chlorate

To mix

1. Pour the distilled water into a pot and heat it to approximately 100°F.
2. Transfer water to a large graduate.
3. Slowly pour the oxalic acid, ferric oxalate, and potassium chlorate into the water.
4. Stir with a mixing rod until all the crystals have dissolved.
5. Pour the solution into a dark brown glass or plastic bottle. Label this bottle **"Potassium Chlorate/ Pt/Pd B."**

Platinum. This is the metal salt, and what makes this process so expensive and gives it color and tonal range. It needs to be mixed at least 12 hours before it is used.

Materials needed

60 ml distilled water
12 g potassium chloroplatinite (platinum salt)

To mix

1. Pour the distilled water into a pot and heat it to approximately 100°F.
2. Transfer it to a large graduate.
3. Slowly pour the potassium chloroplatinite (which forms the platinum) into the water.
4. Stir with a mixing rod until all the crystals have dissolved.
5. Pour the solution into a dark brown glass or plastic bottle. Label this bottle **"Platinum/Pt C."**

This solution keeps indefinitely. Some of the platinum may precipitate out of the solution when it sits at room temperature. Simply place the bottle of platinum in a warm water bath to re-dissolve it before use.

Palladium (formula 1). This is the other metal that forms the processed image. It is slightly less expensive than platinum metal salt and warmer in tone. It is what gives the solution its particular color and tonal range. It needs to be mixed at least 12 hours before it is used.

Materials needed

60 ml distilled water
9 g sodium chloropalladite (palladium salt)

To mix

1. Pour the distilled water into a pot and heat it to approximately 100°F.
2. Transfer water to a large graduate.
3. Slowly pour the sodium chloropalladite (which forms the palladium) into the water.
4. Stir with a mixing rod until all the crystals have dissolved.
5. Pour the solution into a dark brown glass or plastic bottle. Label this bottle **"Palladium/Pd C1."**

This solution keeps indefinitely.

Palladium formula 2. If sodium chloropalladite is not available, you can make a palladium solution with palladium chloride and sodium chloride instead.

Materials needed

40 ml distilled water
5 g palladium chloride
3.5 g sodium chloride

To mix

1. Pour the distilled water into a pot and heat it to 100°F.
2. Transfer it to a large graduate.
3. Slowly pour the palladium chloride and the sodium chloride into the water.
4. Stir with a mixing rod until all the crystals have dissolved.
5. Pour the solution into a dark brown glass or plastic bottle. Label this bottle **"Palladium/Pd C2."**

This solution keeps indefinitely.

PREPARING YOUR SENSITIZER AND GETTING READY TO PRINT

Mix the sensitizer under low light; a standard household lamp fitted with a 40-watt bulb is fine. To make the stock solutions into a working solution, the individual stock solutions need to be mixed in varying amounts and ratios. These factors depend on (1) the size and (2) the contrast of your negative (see Guide for preparing sensitizer, below).

Oxalic acid acts as a preservative in stock solutions. Ferric oxalate first forms the image in iron, and then platinum and palladium, while the potassium chlorate controls the contrast. By changing the proportions of the A and B solutions, you can achieve the desired contrast in your print. The C solution contains the metal salt, which controls the image's color.

To sensitize the paper, 22 drops of the A and B solutions combined are added to the 24 drops of the C solution in order to coat an 8 × 10" paper of average absorbency. In other words, in order to cover an 8 × 10" print when using a brush, the sum of the three solutions should always equal 46 drops. The table below lists the correct amount of drops for many other negative sizes and contrast variations.

Platinum and palladium metals can be mixed together or used separately. It is a matter of choice as to which metal you use, or the ratio of the two in combination. Remember that platinum is contrastier, and creates a colder image than palladium. Increasing the amount of palladium will warm the image color and reduce contrast.

Store the two metal solutions separately and combine them drop-by-drop when mixing the actual sensitizer. Vary the proportion as you see fit, but keep the total number of drops constant. Remember that the two metals together should equal 24 drops for an 8 × 10" print, but the ratio of the metals, which determines the tone of the print, is up to you.

08.10 © Ellie Young. "Broken Wishes." Ellie shoots with an 8 × 10" camera on FP4 film. She uses a combination of 25% platinum to 75% palladium.

Guide for preparing sensitizer

Combine the three solutions in a plastic, ceramic, or glass bowl, and mix well by swirling the sensitizers together. If you do not

08.11 © Elizabeth Siegfried. "Release." The platinum print was printed on Arches Platine paper using potassium oxalate developer and citric acid and EDTA for clearing.

want to count out so many drops, you can use the following conversion: 20 drops = 1ml. The amounts listed below are for the brush application method.

If you are using a glass rod to apply the sensitizer, reduce the amount by about one print size. For instance, if you are working with an 8 × 10" negative and are coating the surface using the glass rod method, try using the drop amount indicated for a 5 × 7" negative. You might have to play with the amounts because everybody works differently. You might need more or less than someone else making the same sized print. The paper also plays a part in the amount of sensitizer you will need. A smooth, hot-press paper will take a lot less sensitizer than a textured, cold-press paper.

Contrasty negative

	4 × 5"	5 × 7"	6 × 9"	8 × 10"	11 × 14"	16 × 20"	20 × 24"
A	7	11	16	22	33	88	132
B	0	0	0	0	0	0	0
C	8	12	18	24	36	96	144

Slightly contrasty negative

	4 × 5"	5 × 7"	6 × 9"	8 × 10"	11 × 14"	16 × 20"	20 × 24"
A	6	9	13	18	27	72	84
B	1	2	3	4	6	16	48
C	8	12	18	24	36	96	144

Average negative

	4 × 5"	5 × 7"	6 × 9"	8 × 10"	11 × 14"	16 × 20"	20 × 24"
A	4	7	10	14	21	56	84
B	3	4	6	8	12	32	48
C	8	12	18	24	36	96	144

Slightly flat negative

	4 × 5"	5 × 7"	6 × 9"	8 × 10"	11 × 14"	16 × 20"	20 × 24"
A	3	5	7	10	15	40	60
B	4	6	9	12	18	48	72
C	8	12	18	24	36	96	144

Flat negativeLAT NEGATIVE

	4 × 5"	5 × 7"	6 × 9"	8 × 10"	11 × 14"	16 × 20"	20 × 24"
A	0	0	0	0	0	0	0
B	7	11	16	22	33	88	132
C	8	12	18	24	36	96	144

08.12 © Ashley Czajkowiski. "Fallen." Platinum/palladium print on Arches Aquarelle.

Controlling the contrast of your print

In addition to changing the amounts of solutions A and B, there are other ways to control the contrast of your prints. For more contrast

08.13 © Anna Strickland. Anna uses Japanese gampi paper to print her platinum/palladium images. This paper is not for the faint of heart. While it is strong, it is very thin and it takes practice to coat it and place it in and out of the chemical trays. But, as you can see from Anna's image, it is worth it in the end.

control, you can use almost any type of dichromate or hydrogen peroxide instead of chlorate in solution B when mixing the working solution. However, too much will make your image grainy. This will become apparent in the highlight areas. Below are some suggestions for other ways of adjusting the contrast of the final image. Whatever method you use, make sure to keep good records on what mixing proportions you used, and how long you exposed your print. Such information is necessary if you want to repeat or correct a particular print. I write extensive notes on the back of each print so I know exactly how I achieved the result.

First of all, the most important practice is to get used to knowing that you may need to "tweak" your negative. The beauty of working with a digital negative is that it is so easy to control your negative. You can make a small version of your image and do a test. Make sure the print is totally dry and evaluate how you think it looks. If you need more information in your highlights or shadows, then change those areas accordingly (see Chapter 3 on Digital Negatives, for detailed instructions). If you still have unresolved issues, follow the suggestions below:

If a higher contrast is desired, do one or more of the following:

- Use a paper with a hard, smooth surface.
- Lower the temperature of the developer, but don't go below 60^0 F as it will add grain to the image.
- Double-coat your support before the initial exposure, drying between each coat.
- Make multiple exposures (after the first exposure has been processed and dried, recoat the paper and expose it again using the same negative). Careful registration is required if you do this step.
- With platinum prints, you can add potassium dichromate to your developer, about 20 drops per quart. You cannot use potassium dichromate with palladium printing as it will cause the image to bleach out in the clearing bath.

If a lower contrast is desired, do one or more of the following:

- Use a paper with a soft, rough surface.
- Increase the temperature of the developer. In addition to warming the tones of a print, heated developer reduces contrast. Be aware that this can also cause more streaks throughout the image, so be sure to slide your paper into the developer very evenly when using this method.
- Add a few drops of clearing bath to the developer. If you do this, do not save the developer for reuse.

Other important factors:

- Shadows are changed by printing time. **PRINT FOR THE SHADOWS.**

08.14 © Mark Nelson. "Homage to Steichen." Mark has a website (listed in the Sources) that enables you to learn how to make negatives like he does, as he has made a science of making digital negatives to achieve these subtle tones.

- Highlights are changed by contrast mixture. **CHANGE CONTRAST FOR THE HIGHLIGHTS.**
- When both shadows and highlights are too dark, **REDUCE PRINTING TIME.**
- When both shadows and highlights are too light, **INCREASE PRINTING TIME**.
- When shadows are good but the **HIGHLIGHTS** are too **dark**, shorten the scale by going to a **HIGHER contrast** mixture. Use approximately the **SAME exposure time.**
- When shadows are good but the **HIGHLIGHTS** are too **light**, lengthen the scale by going to a **LOWER contrast** mixture. Use approximately the **SAME exposure time.**
- When the **SHADOWS** are **dark**, and highlights are good, shorten the scale by going to a **HIGHER CONTRAST** mixture. Use **LESS exposure time**.
- When the **SHADOWS** are **light** and highlights are good, lengthen the scale by going to a **LOWER CONTRAST** mixture. Use **MORE exposure time**.

PREPARING YOUR DEVELOPING CHEMICALS

There are so many different opinions about the best method for developing and clearing Pt/Pd prints that choosing one method can be daunting. There is never just one right way. Any of the methods listed (and countless others) can work. Choose one, do a few test prints, and decide if you like your results or need to try something else. Whenever you are experimenting, it is wise to change one variable at a time, and as always, keep good notes.

Developer

Many different developers can be used when making Pt/Pd prints. I have listed the five most common types. The differences between some of the developers can be

08.15 © Jean-Claude Mougin. Jean has been making platinum/palladium prints since 1980, teaching himself from the Pizzighelli and Hubl book. He uses old papers that he has stocked since the 1980s and feels that this helps him with clearing easily. Jean Claude also gets beautiful velvety blacks and feels that is from the old formulas he is using.

subtle. The only sure thing is that you should use distilled water instead of tap water when mixing developers because tap water may contain too much iron. Store your developer in a tightly sealed bottle. If it is left in a tray for more than 24 hours, the water may evaporate and crystals will form. This is totally normal. If this happens, pour the remaining liquid through cheesecloth and place it in the storage bottle. Heat a little distilled water, and add it to the crystals that are left in the tray until they dissolve. Then add this solution to the rest of the developer and mix well. You can continue to use this developer as usual. While I advise the use of replenished developer, as always you have to be mindful of mixing chemicals. For instance, if you are making a pure platinum or palladium print, you should not use the same developer you used for a combination print. It can contaminate your image with the salts that remain from the previous process.

All of the developers are mixed the same way. If you are experimenting and trying out different developers, make sure to label your bottles with the correct name.

To mix

1. Heat distilled water to between 100°F and 120°F.
2. Pour the heated water into the bottle and shake it well until all the crystals have dissolved.
3. Label the bottle.
4. All of the developers will keep indefinitely. In fact, some say they improve with age and should never be thrown out. Add fresh developer to replenish as necessary.
5. Don't forget to have separate developers for pure platinum prints, pure palladium, and combination printing using both Pt/Pd.

Potassium oxalate. This was the traditional Pt/Pd developer, and is called cold bath developer if you order it from Bostick and Sullivan.

However, potassium oxalate/cold bath developer is an anticoagulant and a poison Most photographers have moved toward using the less hazardous ammonium citrate or sodium acetate formulas. But if you decide to use this developer, make sure you wear gloves when mixing the solution, and work in a well-ventilated area. You can purchase developers as crystals packaged in their own plastic bottles, used to store the working solution. In this form, you simply add distilled water to the crystals.

Materials needed

1.42 liters distilled water
454 g potassium oxalate

Ammonium citrate. When used to make palladium prints, this developer will give neutral gray tones, making your image look similar to platinum prints.

Materials needed

1.42 liters distilled water
454 g ammonium citrate

Sodium acetate. This developer produces prints that are contrastier than the potassium oxalate developer.

Materials needed

1.42 liters distilled water
454 g sodium acetate

Potassium citrate. This developer produces prints that are contrastier than the sodium acetate developer, and is relatively non-hazardous.

Materials needed

710 ml distilled water
454 g potassium citrate

Sodium citrate. This developer produces prints that are lower in contrast, and colder in tone than potassium citrate.

Materials needed

710 ml distilled water
454 g sodium citrate

Clearing baths

There was a symposium at the National Gallery of Art in 2014 made up of scientists, conservators, and a few printers. According to Pradip Malde who attended, the clearing bath sequence is very important in making sure the irons are washed out of the prints. Malde stated:

> The sequence of EDTA disodium as the "opener" is important in that its slightly acidic nature does a very effective job of chelating residual ferric iron compounds in the paper. The second, sodium sulfite bath reduces any remaining ferric iron compounds to ferrous compounds. The final, EDTA tetrasodium salt is alkaline, and more effective in chelating ferrous iron, while also bringing the paper to a near neutral pH state. If an EDTA tetrasodium bath is used as the first clearing bath (either right after exposure for print-out formulations or after development in the more traditional methods), it is too alkaline to turn the ferric iron compounds into a more soluble complex, and only hydrolyzes them instead. The result will be a steadily increasing yellow or brown stain over time, and a decaying print.

The chemicals needed are:

1. Disodium EDTA (ethylenediaminetetraacetic acid, disodium salt)
2. Kodak "Hypo-clear" powder or sodium metabisulfite (or sulphite)
3. Ethylenediaminetetraacetic acid tetrasodium salt, Na_4Edta

MAKING UP THE STOCK CLEARING SOLUTIONS

The wet-processing procedure requires reagents, which perform both the developing and clearing (chiefly the latter). These are solutions of the sodium salts of ethylenediaminetetraacetic acid – otherwise known as EDTA, for short.

Three separate clearing baths, each of strength about 5% w/v, are recommended.

The first bath is of Disodium EDTA, which should eliminate possible yellow iron stains. The capacity of a one-liter bath will be about 50 8 × 10" prints. Clearing of the residual iron compounds from the paper is improved by immersion in a bath of Kodak Hypo-clear Agent interposed between the two EDTA baths; alternatively, a solution of sodium sulfite can be used. The inorganic sulfite in this tends to reduce any residual iron (III) to iron (II), which is then removed in the final tetrasodium EDTA bath; the advantage is that these last two baths have a high pH (about 9), which is optimal for complexion of iron (II) and leaves the paper in a beneficial alkaline condition.

1. Disodium EDTA

50 g Disodium EDTA*
1 liter water at room temperature (does not have to be distilled)

2. Sodium disulphite

The second bath should be made up fresh for a day of printing. It should not be stored or reused.

* If disodium EDTA is not available, you can use tetrasodium EDTA and add16g of citric acid to each 50g of the tetrasodium EDTA. The citric acid helps with clearing.

25 g sodium metabisulfite
1 liter tap water

3. Tetrasodium EDTA

50 g tetrasodium EDTA
1 liter tap water

COATING AND DRYING YOUR BASE SUPPORT

First, I mark where the negative will go to make sure I don't waste chemicals by coating too large an area. You can place your negative down on top of the paper and mark all four edges lightly with a pencil. If you have a light box, place your negative down first and then your paper on top. The light box allows you to see where your negative will be placed and then you don't have to worry about touching the negative.

I work on a piece of plate glass, to protect the top of my table. The thick glass has an even surface, making it easy to coat paper. I tape the paper down so that it does not move as I am applying the sensitizer.

You can coat the paper under a dim room light (i.e., a lamp equipped with a 40-watt bulb) or a safelight, provided you are not near any windows or fluorescent lights. A sheet of paper larger than your negative provides some holding room, which helps to avoid getting fingerprints on the sensitizer.

There are several methods you can use:

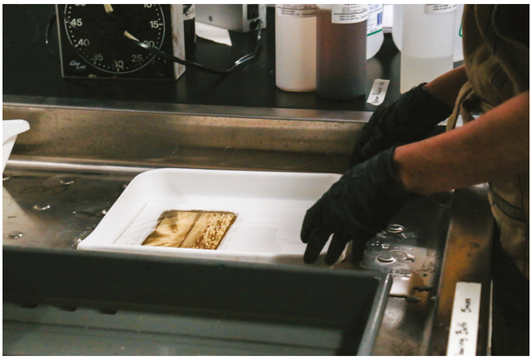
1. Dip your brush into a small bowl and make sure you use all of the sensitizer.
2. Pour the sensitizer onto your paper and start moving it around right away. If your paper is soft, it might leave a dark spot where you first poured it, so you have to be quick.
3. Use a syringe, shot glass, or very small beaker to pour the sensitizer along the length of a glass rod.

After sensitizing the support, let it sit for a minute or two, and then dry it with a hair dryer. If you keep the hair dryer moving, the temperature does not matter. But if you are not careful, a hot hair dryer can burn the emulsion/sensitizer and result in a dark area. If you tend toward the casual, keep the hair dryer on cool.

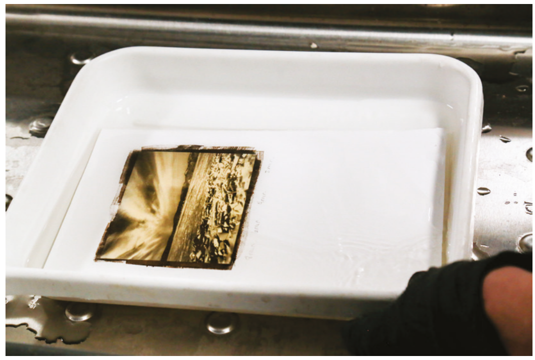
The dry sensitizer should have a nice orange-brown tone. If it is gray, it has been fogged. If it is dark brown, you may have burned the sensitizer by using a hair dryer that is too hot and moving it too slowly/casually across the paper. Keep good notes while you are sensitizing and exposing the support, so that if you like the results, you can repeat them If you don't like the results, you'll be a lot closer to figuring out what you have done incorrectly. On the back of the print, note the following in pencil: the solution, the type

08.16 © Baba Barnett. I like to make test prints at two-minute intervals, which saves me time and money.

08.17 © Baba Barnett. Notice the tray is tilted away from me so that I can slide the print into the tray.



08.18 © Baba Barnett. Tilt the tray back towards me to cover the paper in one swoop. Otherwise, you will be able to see a development line on the image. Some people pour the developer on top of their prints, but this works better for me.



08.19 The print stops developing at about two minutes, and will not over develop. You have to clear the print and dry it before you can analyze the correct exposure.

of support, the exposure time, and the light source. If you are exposing outdoors, also write down the time of day and the season.

EXPOSING YOUR BASE SUPPORT

If you do not expose the support immediately after coating, the highlights in the final print won't be as bright as they might have been. **A general rule of thumb is that palladium exposure time is shorter, by about half, than platinum exposure time.** Determining the correct exposure through the use of a test strip is a particularly good idea because platinum and palladium are far too expensive to waste on a full-sized test print. Using a small piece of support that was coated at the same time as the final support, do a test strip in two-minute intervals by sliding opaque black paper across the contact printing frame in small increments.

Before it is developed, an **exposed print will be very faint and will appear as a grayish-lavender image on a yellow background.** There should be detail in the highlights. Develop the print as soon as it is exposed, and make sure to clear and fully dry the support before determining the exposure for the final print. As with most photographic processes, Pt/Pd prints dry darker.

08.20 © Stuart Clook. "Sardines." Stuart uses Malde – Ware's Ammonium Iron process and Bergger's COT320 paper for his platinum and palladium prints. After coating and drying the paper, it is then re-humidified using a large plastic storage box filled with 68°F water and magnets to hold the coated paper to the underside of the lid facing the water. The length of time to humidify is determined by the color Stuart is interested in achieving with an image. The longer the time, the cooler the color will be. For this image. Stuart used vellum and adhered silver leaf on the back using gilders size.

EXPOSURE TIME DEPENDS ON THE FOLLOWING:

- The quality of the negative
- The combination of the working sensitizing solution – the more solution B (contrast control) used, the longer the exposure time will be; the more palladium used, the shorter the exposure time will be
- The source and quality of the light
- Your choice of support.

08.21 © Mercedes Jelinek. "If Birds Sank Ships." Mercedes uses NA2 when making palladium prints.

DEVELOPING AND WASHING YOUR PRINT

Pt/Pd prints can be developed in subdued room light (e.g., with a lamp equipped with a 40-watt bulb). As with all of the processes described in this book, you should wear gloves and/or use tongs when processing prints.

Heated developer warms the tones, reduces contrast, and increases the speed of the paper's response to light, so that less exposure time is required. However, heated developer can also cause streaks in the print, so be sure to slide the paper into the developer very evenly when using this method. Make sure the temperature stays constant between the test strip and the final print, or the results will not be the same. Developer can be heated up almost to its boiling point. To heat the developer, place a fish tank heater in a large tray of water; then put the developing tray inside the larger warming bath. You can use a thermometer in the developing tray to make sure the temperature stays consistent.

Processing a print: 2 Methods

Do not process more than one print at a time, because the wet paper is very fragile, and it can easily scratch until dried.

METHOD 1:

1. Fill the tray with two to four inches of developer. In one continuous motion, immerse the print face up in the developing tray. The image will pop up quickly, so any hesitation in immersing the print will cause a visible line across the surface. Guard against air bubbles by agitating the tray for one or two minutes. If you need to dislodge any bubbles by hand, make sure to wear gloves. There is no danger of overdeveloping the print, as the chemical reaction will stop of its own accord after two minutes.

METHOD 2:

1. Place the print in a tray and hold the tray at a slight angle.
2. Pour developer quickly and evenly over your print and start agitating so that the liquid stays on top of the print for two minutes to fully develop.

Clearing the print

YOU NEED 3 TRAYS PLUS ONE WASH TRAY:

Clear the print in three separate clearing baths, agitating lightly for about five minutes in each bath to remove the iron. If you don't completely remove the iron, your print will eventually darken. If the print still looks yellow when you think you have finished clearing, or if it looks yellow after it dries, put the print back into a clearing bath. Otherwise it will darken over time. The thicker the support, the longer the clearing time will be. After several prints, or when the clearing solution becomes yellow or cloudy, dump out the first bath, move the second tray into first position, the third into second, and pour a new bath for the third tray. This way the last bath will always remain the least contaminated, ensuring complete removal of iron

08.22 © Sal Taylor Kydd. "Hidden." Printed on Hahnemühle platinum rag paper. Sal pays close attention to the humidity in her dimroom while she is preparing her paper. In this print she used NA2 as her contrasting agent with the palladium. She also pours the developer over her paper instead of sweeping it into the tray.

from the image. The clearing solution will lighten the print slightly, but drying will darken it again.

Transfer the developed and cleared print to a tray of running water and wash it for 30 minutes. You can dry the print by hanging it, or placing it face up on a drying rack.

TROUBLESHOOTING

- The best way to troubleshoot with Pt/Pd printing is to keep good notes. Most of the problems you will encounter can be easily solved as long as you know what sensitizer combination you used, how you coated the paper, and how long the exposure was. The following section will explain a few of the most common problems people have as they learn this elegant printing process.
- *If you notice yellow stains in the highlights after you have processed the print*, the support may not be fully cleared. Textured papers such as Arches Platine are more difficult to clear than smooth papers. Clearing the image fully is very important; any yellow stains will darken over time. To finish clearing the support, wet the print for a few seconds in a tray of water, then place it back into a clearing bath. If you're using an EDTA clearing bath, it helps to add two to three tablespoons of sodium sulfite.
- *If the print developed unevenly*, you either (a) did not have enough developer in the tray, or (b) did not "swoop" the support into the developer. Make enough developer to fill the tray with at least two inches of developer, and make sure to submerge the support in the developer in one quick motion. Any hesitation will cause a dark streak.
- *If the paper curls while you are coating and/or drying it*, it is probably because you have used a single-weight or other delicate paper that needs special treatment. With drafting tape, secure the support onto a piece of glass during the coating and drying stages. Once it is partially dry, you can remove some of the tape and lift one side of the paper so the underside can dry. After it is dry, you can place the paper in a heat press on the lowest setting to flatten it before exposure.
- *If the highlights of the finished print are gray*, the ferric oxalate may have gone bad. Normally, ferric oxalate decomposes after three to six months. You can check your ferric oxalate by doing an easy fog test: (a) Mix enough emulsion to make a 4 × 5" print. (b) Coat the paper as you normally would. (c) Without exposing the paper, place it in the developer and clearing bath for the correct times. (d) The paper should have cleared. If you see a slight gray tone,

then the ferric oxalate is fogged. If it is yellowish, it has not been fully cleared.

- *If stains of any type or color appear on the print*, you may be working with contaminated utensils. Be sure to assign each utensil to a particular chemical and do not use the utensil for anything else. Also, if you have not washed your utensils (e.g., brushes, eyedroppers, bowls) fully between prints, whatever chemical might be left on the utensil can contaminate the new chemical. Keeping your equipment extremely clean is important when working with any process.
- *If your print is tonally weak*, you might try double exposing it. Your paper needs to be pre-shrunk by soaking it in hot water for a few minutes, and then dried. Sizing the paper can also be helpful, and you can follow the instructions for sizing in Chapter 2.

Make an exposure and run through the normal steps; then make another exposure over it to give the image a more dimensional feel. Make sure you register your negative carefully with the initial print. You can use drafting tape or Scotch Magic 811 removable tape to make sure the negative stays in exactly the same place for the second exposure. Neither of these tapes will strip off the emulsion. You can also buy registration marks from most art-supply stores.

08.23 © Ruth Adams. This palladium print is part of a project called "Per Noi: Conversations with the Ancestors." She uses NA2 on Hahnemühle Platinum Rag paper.

- Another reason for *a weak image may be the lack of humidity* in the air. Use a humidifier in your darkroom to strengthen the image. A lack of humidity can also cause solarization in the shadow areas. The dimroom area where you are coating should be close to a 65% humidity level.
- If your paper does not have the proper amount of acid in it, *your print may look streaky, blotchy, or have poor shadow detail.* Using a 3% oxalic acid solution, soak your paper or coat it with a brush. Let it dry completely before applying the sensitizer.
- Tween 20 ™ is a wetting agent, and one drop can be added into the emulsion before coating your paper. *Tween 20™ should allow the emulsion to go on more smoothly and evenly*. If you don't mix it into the emulsion well enough, you will see small marks where the emulsion soaked into the paper unevenly.
- *If part of your emulsion flaked off*, you probably did not let the emulsion soak in well enough before exposing. After coating your paper, let it sit for a minute or two before using a hair dryer on it. If you are letting it air dry, make sure the paper is drying in the dark.
- *If the developer becomes too thick*, filter it through cheesecloth (or a coffee filter) and add fresh developer to the remaining liquid. Never throw the developer away; just keep replenishing it with new developer. Top off the bottle after each session with fresh developer.
- Whatever you have filtered off can be liquefied again by dissolving it with hot distilled water.
- If you have made *a straight platinum print but it looks too warm*, you probably used developer that you previously

used to make a palladium print. Keep your developers separate. Have one for straight platinum, one for straight palladium, and one for when you combine the two.

- Palladium prints can solarize if the exposure is too long (or as stated above, the humidity level in your coating area is not at 65%). The effect is *a "bronzing" or reddish color in the shadows.* Either add platinum to your mixture, tweak your negative to add more contrast or humidify the paper. Your highlights should look less dense so that you can lower your exposure by about 20%.
- *If the exposure time is too long and you are unable to change your negative*, you can put your lights closer to your contact print frame.
- *You thought you registered your negative when you did a second exposure, but you still got a double image.* Pre-shrink your paper in hot water before you print if you plan to expose the image more than once. This is true for all techniques.
- *If your image looked good in the developer but looked faint when it was dry*, the paper was probably sized poorly by the manufacturer. Either pick another paper, or size the paper yourself before printing. You can also try adding acid into the paper (see #8 above).
- *Light spots on your image* can be caused by air bubbles in the developer. Make sure you agitate in the developing tray for the two minutes.
- *Dark spots* will show if the platinum or palladium salt particles did not dissolve completely. Dark spots can also be the result of your brush not being washed well in between prints.
- *If ferric oxalate is brown*, it is no longer good to use. If you put it in a refrigerator, it may last longer than the three- to six-month average shelf life.

08.24 © Brigitte Carnochan. "Rose Duet." Brigitte enlarges her images to fit on a 15 × 24" negative. She then uses a combination of platinum and palladium, using NA2 instead of ferric oxalate and pours hot potassium oxalate developer on the print to develop it.

- *Solarization in the shadow areas of your print* can be caused by over exposure as well as low humidity in your darkroom. You can use a humidifier to get your darkroom up to about 65% humidity or put a drop of Tween 20™ (mixed really well) into your sensitizer. Palladium tends to solarize more than platinum, so you can also change the drop ratio to have more platinum.

MALDE–WARE TECHNIQUE

Also known as Print-out Platinum-palladium Printing and/or The Ammonium Print-Out Method. This section is printed with permission from Pradip Malde and can be seen in full on his website listed in sources.

According to both Malde and Ware, the two worked together on a new formula for several reasons:

1. Ferric oxalate was hard to come by and is very expensive in the UK, where Dr.Ware is located. It also varies in quality and has a short (three to six months) shelf life once in solution.
2. Potassium chlorate as the contrast control (added to the ferric oxalate as solution B in the drop chart) causes grain when used in excess.

08.26 © Tillman Crane. "Banyan Tree, Guilin, Guanxi, China." Tillman prints on Weston Diploma parchment paper and uses the NA2 method with palladium and develops in potassium oxalate developer. He uses three clearing baths: Citric acid, tetra sodium EDTA and di sodium EDTA.

They have done the following:

- Exchanged ferric oxalate with ammonium iron (III) oxalate, which is easier to come by, cheaper, and consistently pure and keeps well in solution.
- The new method is a printing-out process, which requires no developer, but still requires several clearing baths and rinses.
- Contrast is controlled by humidity as well as printing out having a "self-masking" effect, meaning you can use a wide range of negatives.
- The following recipe is from Pradip Malde's website, with permission from the authors. You can go to the website (see Sources) for more information, as well as to order books and see more experiments.

08.25 © Tillman Crane. "Bucket, Rakushisha Cottage, Kyoto, Japan." Tillman prints on Weston Diploma parchment paper and uses the NA2 method with palladium and develops in potassium oxalate developer. He uses three clearing baths: citric acid, tetra sodium EDTA and di sodium EDTA.

This quantity mixed will make approximately 60 8 × 10" prints.

Chemicals required for the sensitizers are:

30 g ammonium iron (III) oxalate (AKA: ferric ammonium oxalate or ammonium ferrioxalate)

5 g ammonium tetrachloroplatinate (II)* (this is the platinum AKA: ammonium chloroplatinite)

5 g ammonium tetrachloropalladite (II)* (this is the palladium AKA: ammonium chloropalladite)

* You can use the platinum / palladium together, or just use one or the other.

100 ml distilled water

10 ml Tween 20™: Dilute to a 10% solution before using. You can also use a few drops more or less. (AKA: Polysorbate)

10 ml glycerin: Dilute to 10% solution before using. You can also use a few drops more or less. (AKA: glycerol)

GPR reagent grade is adequate in all cases.

08.28 © Beth Moon. "Odin's Cove #2." Beth uses Arches Platine watercolor paper and the NA2 method for making her palladium prints.

MIXING THE SENSITIZER SOLUTIONS

The sensitizer is prepared when required by mixing equal volumes of an iron solution with either a platinum solution or a palladium solution or, for a mixed-metal print, a combination of both. Once mixed into solution, and mixed together, the chemicals have a shelf life of about six months and should not be mixed in large quantities. The instructions given are to make about 60 8 × 10" Pt/Pd prints.

The iron solution (Fe) contains the complex salt ammonium iron (III) oxalate at a concentration of 60% w/v. This substance is also known as ammonium ferrioxalate, or as ammonium trisoxalatoferrate (III) trihydrate.

08.27 © Beth Moon. "Girl with Boar." Beth uses Arches Platine watercolor paper and the NA2 method for making her palladium prints.

To make it up, mix

27 g ammonium iron (III) oxalate

20 ml distilled water (warmed to help dissolve the oxalate)

1. Weigh out 27g of ammonium iron (III) oxalate into a small (100ml) Pyrex glass beaker.
2. Add exactly 20ml of pure water (from a measuring cylinder) and stir well to dissolve the solid.
3. The solution becomes cold, so gently warm the beaker in a bath of hot water (approximately 122°F) to assist with dissolving into solution.
4. The solid will dissolve to form an emerald-green solution within five minutes. Any tiny residue of remaining solid may be ignored.
5. Gently decant the solution into an accurate measuring flask, leaving any solids behind in the mixing flask. Bring the solution up to a final volume of 40ml by adding distilled water. If necessary, store in an airtight container at room temperature in

the dark: the shelf-life will be several years. (If, after a few days, some white needle-like crystals (probably of ammonium oxalate) have appeared, re-filter the solution to remove them. This solution is close to saturation; if cooled below 68ºF for any length of time, green crystals may appear: warm gently and swirl to re-dissolve these.)

The platinum solution (Pt) contains ammonium tetrachloroplatinate (II), at a concentration of 25% w/v. This substance is also called ammonium chloroplatinite.

To make it up, mix

5 g ammonium tetrachloroplatinate (II)
18 ml distilled water

1. Weigh out 5 g of ammonium tetrachloroplatinate (II) and transfer into a small (50 ml) measuring cylinder
2. Add 18 ml of distilled water to dissolve the solid by stirring at room temperature.
3. Make sure that the final volume is 20 ml, and if not, add more water to bring the volume up to the 20 ml.
4. Decant the solution directly into a brown glass storage bottle, labeled and dated.
   (Any small amount of yellow precipitate may be ignored.)
5. Allow the solution to stand for at least 24 hours before first use.
6. The solution should keep for a year or so.

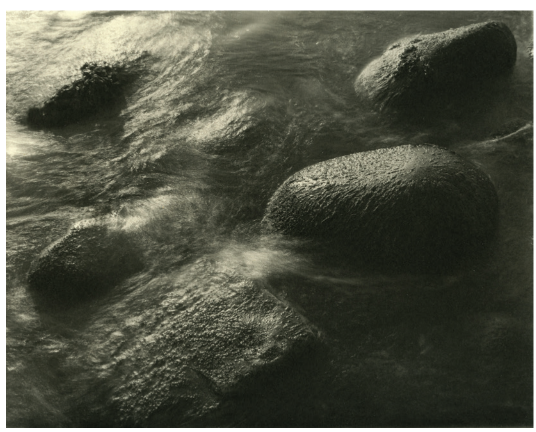
The palladium solution (Pd) contains ammonium tetrachloropalladate (II) at a concentration of 20% w/v.

To make it up, mix

5 g ammonium tetrachloropalladate (II)
25 ml distilled water

1. Weigh out 4 g of ammonium tetrachloropalladate (II) and transfer into a small (50 ml) measuring cylinder.
2. Add approximately 12 ml of distilled water to dissolve the solid by stirring at room temperature.
3. Make up the solution with distilled water to a final volume of exactly 20 ml in the measuring cylinder.
4. Decant the solution into an amber storage bottle, stopper and label it.

08.29 © Kirk Williams. Kirk uses digital negatives and Malde–Ware's formula to print on vellum. Vellum is pretty strong, but you still have to be careful with it so that it does not rip. It dries very wrinkly and needs to be flattened in a dry mount press once dry.



08.30 © Mike Ware. This palladium print was made after much experimentation along with Pradip Malde. You can find the recipe under the Malde–Ware technique in this chapter.

CHEMICALS REQUIRED FOR THE PROCESSING SOLUTIONS

Disodium EDTA

Kodak "Hypo-clear" powder or sodium metabisulfite (or sulphite)

Ethylenediaminetetraacetic acid tetrasodium salt, Na_4Edta

MAKING UP THE STOCK PROCESSING SOLUTIONS

The wet-processing procedure requires reagents, which perform both the developing and clearing (chiefly the latter). These are solutions of the sodium salts of ethylenediaminetetraacetic acid – otherwise known as EDTA, for short.

Three separate clearing baths, each of strength about 5% w/v, are recommended.

The first bath is of disodium EDTA, which should eliminate possible yellow iron stains. The capacity of a one-liter bath will be about 50 8 × 10" prints. Clearing of the residual iron compounds from the paper is improved by immersion in a bath of Kodak Hypo-clear Agent interposed between the two EDTA baths; alternatively, a solution of sodium sulfite can be used. The inorganic sulfite in this tends to reduce any residual iron (III) to iron (II), which is then removed in the final tetrasodium EDTA bath; the advantage is that these last two baths have a high pH (about 9), which is optimal for complexation of iron (II) and leaves the paper in a beneficial alkaline condition.

1. Disodium EDTA

50 g Disodium EDTA*
1 liter tap water at room temperature

2. Sodium metabisulphite (AKA: sodium pyrosulphite or sodium disulphite)

Alternatively, sodium sulphite or sodium hydrogen sulphite (sodium bisulphite) or Kodak "Hypoclear" powder may be used. This solution should be made up fresh for a day's printing, and should not be stored and reused.

25 g sodium metabisulphite
1 liter tap water

3. Ethylenediaminetetraacetic acid (EDTA) tetrasodium salt

AKA: diaminoethanetetraethanoic acid, tretrasodium salt, tetrasodium EDTA, tetrasodium edetate

50 g tetrasodium EDTA
1 liter tap water

MIXING THE SENSITIZER

Mixing should be done in subdued light and at room temperature. If you are using a glass rod, then the amount of sensitizer needed for a good coat would be the same as for all the other techniques: approximately 1.5ml per 8 × 10" print. If you are using a brush then use at least 2ml per 8 × 10" print.

The volume of the iron solution (Fe) must always equal the total volume of platinum (Pt) plus palladium (Pd) solutions.

Platinum print

1. Mix equal parts Fe (the iron solution) and Pt (the platinum solution).
2. Let the mixture stand for one hour in the dark at room temperature before coating.

Palladium print

1. Mix equal parts of Fe (iron) and Pd (the palladium solution).

* If disodium EDTA is not available, you can use tetrasodium EDTA and add16g of citric acid to each 50g of the tetrasodium EDTA. The citric acid helps with clearing.

2. Make sure you have mixed them well, and then you can use immediately.

Platinum/palladium print

1. Combine the Pt and the Pd in any ratio you like (remember that Pt is cooler than Pd). The iron (Fe) should be the same volume as the combination of Pt/Pd.
2. It is preferred to let this mixture sit for one hour in the dark before coating.

Just as in the original Pt/Pd technique, syringes come in handy for measuring small amounts. You can also use the small measuring cups that come with some liquid medications. Just make sure you use one cup per chemical – do not mix them. Label them correctly so you don't contaminate your stock solutions.

08.31 © Pradip Malde. "Passing by the Circle." Mbalawala, near Dodoma, Tanzania. Pradip made this Pt/Pd print from an 8 × 10" negative on Reich CT48 translucent paper. This photograph is from a series on female genital cutting and mutilation. All of the images were made with an 8 × 10" camera and Pradip says that "the prints are designed to bring and hold attention to a difficult matter."

ADDITION OF SURFACTANT AND HUMECTANT TO THE SENSITIZER

Some hard-sized or highly defibrillated papers, such as Arches Platine or Reich CT respectively, may yield a more uniform coating and smoother highlight tones by adding a humectant (Glycerin) or surfactant (Tween 20 ™) to the sensitizer.

Do not add these to the stock sensitizer solution: they foster bacterial growths, and the appropriate amount depends upon the paper. Tween 20™ may interact unfavorably with gelatin-sized papers. Tween 20™ also tends to promote a warm color with palladium-only sensitizers. Glycerin must be used with care because an excessive amount will cause the negative to stick to sensitized paper and get damaged. Tween 20™ and/or Glycerin should be added to the sensitizer solution just before coating. The following are suggested additives and amounts. Note that different productions of the same paper may require adjustments. The volumes are for coating an 8 × 10" area. Scale them up and down as necessary.

- Arches Platine: 1.4ml sensitizer add: .14ml of Glycerin 5%
- Reich CT vellum: 1.4ml sensitizer add: .02ml of Tween 20™ 6%
- Revere Platinum: 1.4ml sensitizer add: .07ml of Glycerin 10% plus .07ml of Tween 20™ 10%
- Wyndstone Vellum: 1.4ml sensitizer add: .02ml of Tween 20™ 6%

HUMIDIFYING

The key to the printing-out process lies in controlling the humidity of the sensitized paper just before exposure. I have a small humidifier in my darkroom along with a humidity reader (hygrometer) and keep the humidity between 50% and 80% while printing.

HUMIDITY PLAYS A PART IN COLOR CONTROL AS WELL: (RH = RELATIVE HUMIDITY)

5–20 minutes of humidification will yield a warm tone.

30–40 minutes will yield a colder image tone.

- The coated print must be humidified in the dark to avoid fog.
- More than an hour will result in over-humidified paper and may cause the image to show chemical fog, yellow staining as well as damaging the negative during contact printing (it will stick to the paper and stain).

DRYING

This is the same as with the original Pt/Pd. Let the paper rest for about one or two minutes, until the sensitizer appears non-reflective, then you can dry with a hair dryer on the cool setting.

The sensitized paper should be used within a few hours; otherwise, it must be stored in a light-tight, air-tight container, in the presence of a desiccant such as silica gel or anhydrous calcium chloride, below 10% RH, in order to prevent chemical fogging. Paper may be stored for six months in this way without loss of quality.

The key to the print-out process of platino/palladiotype lies in controlling the humidity of the sensitized paper just before exposure. The effect of ambient RH on the extent of print-out, color, and contrast is summarized in the table above, from which you will see that optimum results are obtained between 50% and 80% ambient RH. Below 50% RH there is only partial printout and considerable development; above 80% RH the maximum density of the image may tend to weaken because the sensitizer diffuses too deeply into the paper. There are three convenient methods for introducing a controlled amount of humidity into the sensitized paper, a process that we refer to as "hydration."

AMBIANT HYDRATION

If you have a hygrometer, you can simply make use of the prevailing RH (if suitable) to achieve a predictable result by hanging the paper in a dark place at room temperature (approximately 68°F) for an hour or two before exposure.

WATER TANK HYDRATION

Using a water-based hydration tank provides a more accurate method of humidifying. This may be easily made using a tray with close-fitting lid, in which the paper may be placed face down, over, but not in contact with, purified water at exactly the same temperature as the ambient temperature. Ideally, this should be at 68º to 70ºF. This will, within two to three minutes of closing the lid, generate an atmosphere of constant, known relative humidity close to RH 100%. Cat litter trays are ideal for this purpose; photographic dishes are too shallow and have a lip, which makes sealing difficult. The sheet of sensitized paper is held securely on the underside of the lid by two strips of self-adhesive magnetic tape and matching magnets, which is quick, clean, and does not mark the paper. Both a steady ambient temperature and the timing of the humidification are critical: from 5 to 15 minutes for a warm-toned result; a longer humidification of 30 to 40 minutes in the water vapor will yield fuller print-out and a colder image tone. Humidification at RH 100% for more than one hour may lead to weakening of the image density, and clearing problems. Over-humidified paper is also more likely to damage negatives during contact printing.

SALT HYDRATION

A hydration tank with a saturated aqueous solution, which provides an atmosphere of constant, known relative humidity, provides the greatest control. A setup similar to that described the Water Tank Hydration method is used, but water is substituted with a salt. Actual volumes will depend on the size of the hydration tray, but add just enough water to the solid salt so that after an hour or so, there should be excess solid salt in contact with its saturated solution. It is also important that the paper should be evenly exposed to the vapor. Ambient temperatures may vary and are not critical, but it is good practice to sustain a steady room temperature. The time of exposure in the humidifying tank should not be less than half an hour, to achieve evenness; the upper time limit is not critical and can be as much as two hours. The most useful saturated solutions are: ammonium chloride which will generate an atmosphere of RH 80%, common salt (sodium chloride) which will generate an atmosphere of RH 76%, and calcium nitrate tetra hydrate which will generate an atmosphere of RH 55%.

EXPOSING

Times vary depending on light source and the amount of palladium used – palladium is twice as fast as platinum. Exposures are usually between two to ten minutes. Expose until the image looks correct! The shadows will not block up like in developing-out papers because of self-masking. Wait until you have the desired detail in your highlights before developing your image.

PROCESSING

Tray process the exposed paper with intermittent agitation. Use tongs or gloves so the chemicals (and metals released from the prints) do not come into contact with your skin.

The following are processing timings. All chemicals should be at room temperature:

An optional step: Post exposure hydration for one to two minutes. This enhances the gradation in the high values, especially if printout is not complete. Use the Water Tank Hydration method, exposing the print surface uniformly to water vapor, or manually suspend the print over a tray of warm water at ca. 100°F/40°C. Once complete, continue with print processing as described below.

Promptly and fully immerse the print in the following: wet-processing baths – face down if the paper floats, face up if not – with intermittent agitation:

YOU WILL NEED FIVE TO SEVEN TRAYS, DEPENDING HOW LARGE YOUR SINK IS

Running water rinses should be between 65–75°F.

1. Disodium EDTA: Do not use tetrasodium EDTA. 10 minutes (this will turn yellow-brown as it gets exhausted). Constant, gentle agitation for the first one to two minutes, then occasional, gentle agitation.
2. Running water rinse: 30 seconds
3. Sodium metabisulphite (Hypo Clearing Agent or perma wash)*: 15 minutes (this will turn a light yellow when exhausted). Occasional, gentle agitation.

* Malde has mentioned that some hypo-clearing agents will render a slight graininess and loss of d-max with a palladium print. He suggests using KODAK hypo clear or sodium metabisulfite.

4. Running water rinse: 30 seconds
5. Tetrasodium EDTA: 15 minutes Occasional, gentle agitation.
6. Running water rinse: 20–40 minutes.
7. Drain on a sheet of plexiglass for ten minutes
8. Dry at room temperature on a horizontal fiberglass screen.

Some papers, such as Arches Platine and cold-pressed papers, may take longer to clear. You can also make a stronger solution of Disodium EDTA without harming the image.

HINTS AND TROUBLESHOOTING

- Fogging: You may have coated under bright daylight or you did not use the sensitized paper soon after you coated.
- Sensitizer crystallized: Room temperature was too low. Coat under normal conditions – not too hot, not too cold.
- Too much sensitizer soaked into the paper: The room was too hot.
- If you are in a dry climate: Humidify the paper before coating or your paper will also soak up too much sensitizer.
- If you have yellow staining of residual iron, lengthen the time in the tetrasodium EDTA clearing bath (step #5).

THE ZIATYPE

The Ziatype is a printing-out system similar to the Ware–Malde technique, although there is no platinum involved, only palladium. By varying the drops of chemicals, you can change the tones from various shades of brown and red-brown to purples and grays. This process should be done in a more dimly lit room than a normal Pt/Pd printing darkroom as it fogs more easily. A 40-watt bug light works well. Dick Sullivan from Bostick and Sullivan started experimenting with this in the 1990s in order to get other colors to print from using similar chemicals. He states that it is an ever-evolving process with new updates on their website, which is listed in the sources.

The small kit comes with the following chemicals:

Solution 1: 25ml ferric ammonium oxalate
Solution 2: 25ml ammonium dichromate
Solution 3: 25ml lithium palladium chloride
Solution 4: 25ml sodium tungstate (40% solution)
Solution 5: 25ml Tween 20™ (10% solution)
Solution 6: 250g citric acid clearing bath

You need to have five eyedroppers, one for each solution.

08.32 © Gabriel Biderman. “Quattro Fontane.” This image was printed on a single sheet of Arches Platine paper. Before Gabe printed, he had to test each image to figure out what the best combination of chemicals would be for this Ziatype image. The two images in the middle have less contrast and therefore became a bit warmer.

MIXING YOUR SENSITIZER

This is done the same way as the original technique. You use droppers measured out to get the desired effect. It is very important to keep notes on the drops and solutions you use because the solutions are what control the end color.

Be sure to follow this order of mixing or the mixture will be difficult to dissolve:

1. Start with 15 drops (about 1ml) of ferric ammonium oxalate (solution 1) for an 8 × 10" print.
2. If you want a warm brown tone, add one or more drops of sodium tungstate (solution 4). Three drops makes a very warm sepia print. The tungstate solution combined with the oxalate will form a precipitate. Swish the solution around and it will dissolve.
3. Add 15 drops of lithium palladium (solution 3). Solutions 1 and 3 are in equal parts.
4. If you want closer to a neutral gray, use only solution 3 and 1 in equal amounts.

CONTRAST CONTROL

Adjust contrast by adding one drop at a time of ammonium dichromate (solution 2). If one drop is too much, you can water it down with distilled water before use. Adding ammonium dichromate slows down the exposure time.

SIZING

Some papers might show spots and unevenness from coating. If that is the case, use one or more drops of the Tween 20™ with your sensitizer. Make sure you mix the Tween 20™ in well or that may cause spots as well. Tween 20™ can also be diluted with distilled water if necessary.

08.33 © Alexey Alexeev. Alexey made this Ziatype using a wet plate collodion negative. It was printed on Arches Platine paper and toned with gold.

COATING

There is no difference in coating. If you are using a brush, use about 2ml for an 8 × 10" print. If you are using a glass rod, use about 1.5ml. Dry the same way as well.

EXPOSING

Using the UV box or the sun, expose until your image looks correct. The highlights will be yellow, but the image will not dry down. I would check your image after the first two or three minutes to get an idea as to how fast/slow the process is in your workspace.

PROCESSING: YOU WILL NEED THREE TRAYS

1. Wash for two minutes in running water.
2. Soak in citric acid for five minutes (make this acid using one tablespoon to one quart of warm water).
3. Wash in running water for ten minutes.
4. Dry.

OTHER POSSIBILITIES

One of the advantages of the Ziatype is that Sullivan and Weese have experimented with changing the color of this process by mixing chemicals. By their own admission, they are far from being done with how many color variations there are. Experiment! But be careful and look up to see if the combinations you are thinking of are safe!

KNOWN COLOR IDEAS

1. Blue/black split tones:
   50% lithium palladium drops
   25% gold chloride drops (5% solution)
   25% sodium tungstate drops (16% solution)
2. Grays, blues and purple tones can be obtained by replacing any portion of the lithium palladium solution in the emulsion mix with a 5% gold chloride solution. Colors vary with paper, humidity level, and the amount you have replaced. As you add more gold chloride, the contrast increases.

08.34 © Basil Tahan. Basil printed these digital images on Revere paper using the Malde-Ware technique.

While the instructions say the Ziatype color and contrast is chemically controlled, it also states that "paper humidity can affect both color and contrast." Basically, all three of these variations are humidity sensitive, as are other processes such as collodion. It is a good idea to stock your darkroom with a hygrometer so you can keep tabs on the humidity level and note it in each printing session. There is a big difference in how papers and chemicals behave in the winter vs. the summer, on the west coast vs. the east coast and in high elevations vs. low elevations.

08.35 and 08.36 Sophie shoots in the studio and used the wet plate collodion process to make negatives. She then made a combination of platinum and palladium prints on Hahnemühle paper.

Nine

WET PLATE COLLODION

09.1 © Jill Enfield. “Dye Shed: Penland School of Crafts.” This image was taken on a Nikon digital camera and made into a digital positive. The positive was then used to make a contact wet plate collodion ambrotype.

Frederick Scott Archer, an English sculptor, introduced the wet collodion process for making glass negatives in 1851. Its sensitivity to light was 20 times greater than previous methods, and paper prints could be made from the glass plates, allowing many copies to be made from one original. The drawback was that the photographer had to sensitize the plate, expose it, and develop it before the plate dried. This meant that photographers had to carry all required chemicals, the glass, and a darkroom with them wherever they were photographing. Not exactly the easiest task! The introduction of the more convenient gelatin dry plate in the 1870s put an end to the wet plate as the process of choice for working photographers. Today, however, this process is seeing a huge resurgence in use. This chapter will cover wet collodion ambrotypes (positives on clear glass or colored glass), positives on aluminum or tin (usually called tintypes), and negatives on clear glass.

Today photographers are making darkrooms out of vans, shipping containers, cardboard boxes, and wood. Old army darkroom tents have been scarfed up by photographers, along with ice fishing tents, which work just as well as the old army tents, and are much cheaper and easier to find. Wet plate collodion is a little more daunting than most of the other techniques in this book. There is more chemistry involved, and more "stuff" needed. There is also more talk about what is correct and not correct, the end game being what you have to do to get a good plate. This chapter will give you a better understanding of how to succeed with this process. Keep in mind that you might also benefit from taking a workshop and watching the process, which enables you to work under the supervision of a practicing wet plate photographer. This is not to say you cannot learn on your own, but there are so many issues that can come up, I find students learn best when they have the teacher and each other as resources.

ONE PROCESS, MANY OUTCOMES

All within the wet plate process, you have choices on how your finished image will look. It is really amazing how versatile wet plate collodion is.

1. Ambrotypes can be made on clear glass and backed with black so that you can see the image as a positive. If it is not backed with anything, then it looks like a very underexposed negative, which is precisely what it is.
2. Ambrotypes were usually made on black glass so the positive image was seen without any further backing. Some photographers used different colored glass, such as brown (called chocolate ambrotypes), yellow, blue, white, or any other color the photographer or client would like.
3. Japanned tintypes are tintypes made on aluminum that has been blackened with asphaltom and exposed in the same way as an ambrotype. These were also known as ferrotypes.
4. Tintypes are also made on manufactured blackened aluminum and can be bought today ready to use. Suppliers are in the Sources.
5. Negatives are made on clear glass, and exposed and developed twice as long so the image gets very dense and can be used for contact printing as paper prints. This allowed the photographers to make multiple prints of the same image instead of one of a kind glass plates or tintypes positives. Albumen was invented at approximately the same time as wet plate and therefore was most often the process of choice. Today, photographers are making cyanotypes, platinum and palladium prints, as well as silver gelatin prints using the wet plate process.
6. With digital options today, I tend to over develop my ambrotypes by about 20%. This makes them

09.2 © Jill Enfield. Taking it on the road. The inside of my portable darkroom, made for me by Wayne Pierce. We measured my height, waist and leg length, and took into consideration that I would be going no bigger than 8 × 10" in the field.

09.3 © Jill Enfield. A student at the Santa Fe Photographic Workshops using a box inside the trunk of her car as a portable darkroom. We cut out windows and covered them with Rubylith, a red plastic material made for graphic artists. The red windows allowed light to come into the box so that she could see while developing her plates.

09.4 © Jill Enfield. I shot this picture of my ice fishing tent while on location in Italy. It went through baggage like a set of golf clubs and weighs half of what my wooden darkroom weighs. The only downside is that on a windy day, the tent can be blown away unless weights are used.

09.5 © Jill Enfield. Elisabeth Aanes of Nord Photography and Travis Hocutt getting ready to make a tintype using an ice-fishing tent as a portable darkroom. You can see the windows are covered in Rubylith, which acts like safe lights, a red plastic material made for graphic artists. We put two tables in the tent for more room to work.

09.6 © Mark Edward Dawson. Mark made this portable darkroom out of a plastic box. It is big enough so that all of the chemicals can be stored in the box for easy set up and tear down when he is in the field.

09.7 © Mark Edward Dawson. Mark's set up in the field. Just his arms and hands go inside of the box and he looks in from the top where he placed red filters so that he can see what he is doing. This takes some practice, but works well for him.

look slightly flat. They are denser than normal ambrotypes but not as dense as negatives. I then scan the glass plate and make large digital prints. You will hear photographers talk about whole plate or half plate collodions. If you want to stay true to how collodion was done in the 1800s, then you should know the proper historical sizes:

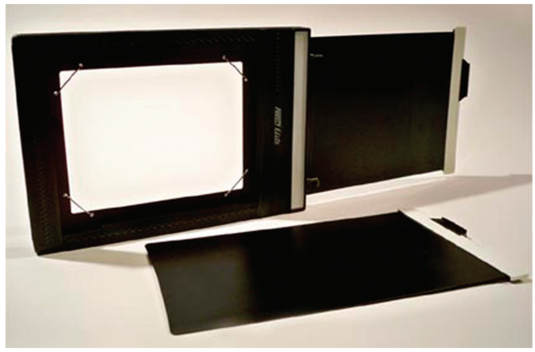
TRADITIONAL SIZES FOR WET PLATE

Whole plate:	6.5" × 8.5"
Half plate:	4.25" × 5.5"
Quarter plate:	3.25" × 4.25"
1/6th plate:	2.5" × 3"
1/9th plate:	2" × 2.5"
1/16th Plate:	1.625" × 2.125"
Gem:	0.5" × 1"

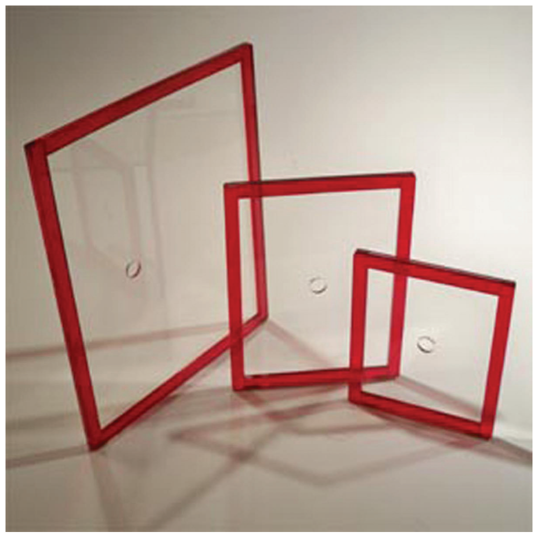
THE PROCESS

Decide if you are making a tintype, a glass negative, or an ambrotype. Then cut the glass or metal to size. Clean the glass or metal plate, and pour the collodion solution on it. When the collodion is tacky to the touch, and you can see a light fingerprint, place the plate into a silver nitrate bath until it is sensitized (1.5–5 minutes). The plate is then placed in a plate holder and exposed in a camera. To develop the image, go back into the darkroom and pour developer on the plate, and develop for about 20 seconds. The developing is stopped by pouring water onto the plate, and then fixed, washed, and dried. Varnish is poured onto the plate the same way the collodion is poured to protect the silver from tarnishing. Once dry, the plate is ready for framing, scanning, or if you made a negative, it is ready for printing.

I cannot repeat enough how important it is to keep good notes. This is the only way you will be able to tell how to go about correcting



09.8 © Niles Lund. Modern film holder conversions is what Niles started with, but he now makes beautiful ones from scratch as well as other equipment you will need to stock your wet plate darkroom (see Sources).



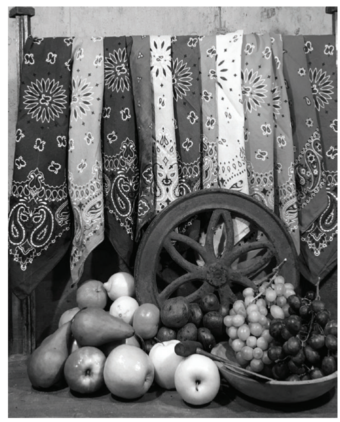
09.9 © Niles Lund. Niles made these helper trays after he saw how many people liked using them.

your mistakes. It is also important to think about how collodion reacts to color. Collodion is orthochromatic and sensitive only to UV or white light, which means it records blue and green as light tones, and anything toward the red, orange, or yellow end of the spectrum as dark, sometimes black tones. Yellows can be a light shade of gray. Take a portrait of someone with blue eyes and the lightening effect is haunting. If you have ever used infra-red film, you understand how mind-bending seeing colors in a different way can be. After you have used collodion for a while, you will get used to the change in tones, but the feeling that some kind of magic is happening will never subside.

Remember, if you want to photograph using wet plate, then you need to have your chemicals with you. Chemicals are not easy to get in every country. Suppliers in the USA can send some chemicals, but if you are going to take the process "on the road," then you need to plan way ahead of time. In some cases, you must find suppliers in your destination country. I once had to find someone with a still in Norway for alcohol! I had to buy silver in Poland and send it to Italy. Ether could not be found in Argentina. Even in the USA, 190% Proof alcohol is not legal in every state. You get the point. With the surge in wet plate popularity, it is much easier to get chemistry, but planning is still necessary when traveling.

As I previously said, this process is heavy on the "stuff" side. Be sure you have everything together before you proceed. Don't let this long list scare you. You probably have a lot of it already on hand, and the special qualities of this process make it well worth the effort.

09.10 © Niles Lund. Niles set up this shot to show the difference in how color is perceived when photographing using different techniques. This one is how the colors look naturally.



09.11 © Niles Lund. This one shows how colors look on panchromatic film.

09.12 © Niles Lund. This is how the colors shift on wet plate collodion. Notice how the collodion captures the blues on the lighter side and the reds are darker than they are when captured on panchromatic black and white film. Also look at the fruit and how it is recorded on the different mediums.

EQUIPMENT

CAMERA EQUIPMENT

- Camera with lens and cap – you can use any camera, including Brownies, Holgas, or Dianas. As long as you have space in the camera for the glass or metal plate, try to use it!
- Focusing cloth – for ground-glass focusing with large-format cameras.
- Focusing loop – to help focus.
- Plate holder – you can use a converted film holder or one that is made from scratch (suppliers are listed in the Sources). If you are using a smaller Brownie or plastic

camera, you can place the plate directly into the camera without a plate holder; just make sure you can close the camera tightly. Also make sure to take care of your plate holder by using beeswax or wood varnish, wherever the plate touches the holder. I use Pledge wipes at the end of the day to clean off any residue silver, and I also wipe out the holders between plates.

- Tripod – the exposures can be between one second and a few minutes, so a tripod is an essential piece of equipment.

IMPORTANT ITEMS TO HAVE BEFORE YOU START

- Apron – for all chemistry, especially silver, which stains and will eventually make holes in your clothing.
- Baking soda in case your silver turns red or needs boiling.
- Goggles – if you don't wear glasses, goggles will protect your eyes from splashes, especially silver.
- Litmus paper strips to check the ph of your silver.
- Nitrile gloves – these come in many sizes and should fit snugly on your hands.
- Scale – that can measure down to .5 grams.

09.13 © David Prifti. "Ophelia." David was quoted as saying that his "interest lies in the power of a photograph to describe my subject clearly and with power." I believe most collodion photographers would like to say that of their work.

EQUIPMENT FOR PREPARING GLASS AND METAL

- Alcohol – to help clean the glass, and combine with the calcium carbonate. This can be rubbing alcohol.
- Breaking pliers – once you cut the glass, this tool helps break the piece off that you want to use from the larger piece.
- Calcium carbonate – for cleaning glass. Most people use whiting, but Bon Ami, a cleanser without bleach, is another option. When I could not find either, I bought chalk (for use on blackboards), ground it up, and it worked fine.
- Cork-backed T-square – for measuring and holding the glass cutter straight.
- Cotton – for buffing the glass after cleaning. (I bought some cheap diapers and cut up some t-shirts.)
- Cutting oil – for the glass cutter.
- Flannel – for cleaning the glass with the whiting. (I cut up a baby blanket.)
- Glass cleaning vice – this is not essential, but is helpful to hold glass while cleaning.
- Glass cutter – a Toyo pistol grip glass cutter is easy to use and easy to find online.
- Metal shears or a large sheet-metal cutter – to help cut the aluminum to the correct size. (You can also use a matte cutter, but it will take a longer time to cut using a matt cutter rather than metal shears.).
- Plastic bottle – to mix and contain the whiting and alcohol.
- Sandpaper or whetstone/sharpening stone – to file the glass edges to prevent cuts. Sandpaper can be a little tedious compared to a whetstone or sharpening stone.

EQUIPMENT FOR MIXING CHEMICALS

- Filter paper, paper towel, or coffee filters
- A glass mixing rod or plastic spoons

- Four glass funnels for filtering silver, fixer, developer, and varnish
- Hydrometer, which is used to measure the silver. See sources for where to buy.
- One small medicine cup or a syringe suitable for measuring 5 ml or less
- Ring stand: this holds 3 funnels and helps make filtering silver and developer faster by stacking the funnels and filtering in one pour!
- Tall cylinder to put the silver in to measure its strength.
- Two glass beakers slightly larger than 500 ml.

EQUIPMENT FOR THE DARKROOM

- Silver bath holder (with a flat-bottomed tray under it to protect the sink from stains).
- A "00" brush for applying the colors, or Q-tips.
- A "dipper" for the fix and silver bath holders. This helps lower your plate and retrieve it from the liquid bath. A dipper comes with the bath holders if you are buying them from one of my sources listed in the Source section.
- Another tray for the collodion spillage (lined with paper towels for easy clean-up).
- Cotton balls.
- Drying racks: you can buy racks specifically for the wet plate process, or use dish-drying racks. You need at least two – one to dry and one for varnishing plates.
- Envelopes for storing finished plates.
- Fixer bath holder (or a tray).
- Flat-bottomed trays to accommodate the size glass or tintype you are using: one each for developer, fix, and wash.
- Headlight with a Rubylith over the light for extra light on your plate as you are developing.

09.14 and 09.15 © Kari Wehrs. Kari started using wet plate when she was the darkroom tech at Maine Media Workshops, and my teaching assistant, and has not stopped making beautiful tintypes since. The images from her series "Shot" were made in Arizona when she took photos of people doing target practice in the desert. She then asked them to shoot the tintypes she just made of them.

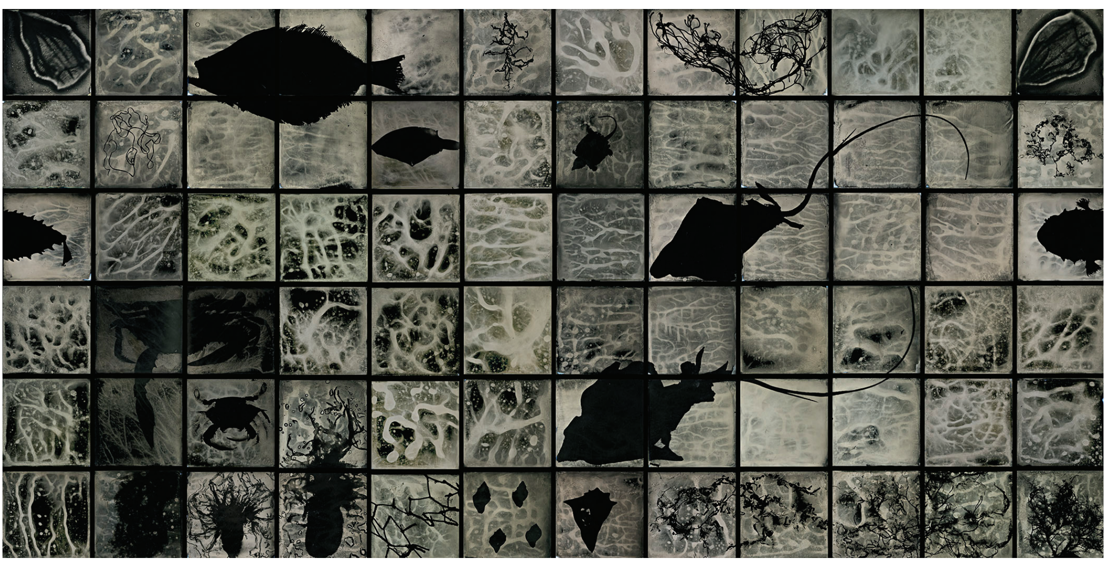
- Helper trays for developing. A helper tray is a piece of Plexiglass with raised edges. The raised edges prevent spillage and make it easier to keep the developer on top of the plate. There is a small hole in the middle of the tray that allows you to push the plate up for easy removal after developing. If you are just starting, these helper trays make it easier to learn to balance your plates. There is no reason to ever give them up, unless you want to feel you have accomplished something!
- Lamp oil – smokeless and unscented.
- Oil lamp – some photographers use an alcohol lamp, but I don't. If you get too close to the alcohol burner, your plate can crack. Oil lamps are easier to control.
- Pastel chalks (Windsor & Newton makes nice ones, but any company will do).
- Shot glass to hold 20ml of the developer.
- Silver bath holder (with a flat-bottomed tray under it to protect the sink from stains).
- Soft brush for brushing off the plate before coating with collodion.

MIXING CHEMISTRY

There are many recipes for collodion, so use these as a starting point only. Keep in mind that you will have to do a lot of troubleshooting based on how your plates are coming out. Evaluate your plate, and then decide whether you need to change your recipes. Humidity, temperature, air quality, and altitude all play an important role in how your chemistry will react. (If you look at the directions on a box of brownie mix, you will see suggestions for high-altitude cooking – it's the same thing with wet plate chemistry!)

COLLODION

The most common collodion recipe for ambrotypes (positive image on glass) needs to be mixed one week ahead of time. The solution will last several months.



09.16 © S. Gayle Stevens. Gayle tries more things than anyone I know. She uses both large and small format cameras, including her old Polaroid cameras as well as making multi-tiled tintype photograms. There is nothing she will not do and her work is always interesting.

There are many recipes to choose from, but all are basically the same and can be found in historical books. No matter which formula you start with, adjustments will have to be made depending on season, altitude, humidity, and what you prefer your plate to look like.

Chemicals needed

1.5 g cadmium bromide (this is a "salt" that when mixed in the collodion helps to give the image a long tonal range).

2 g potassium iodide (this is a "salt" for collodion that gives the sensitizer speed and contrast).

77 ml 160–190 proof alcohol (Everclear, or another type of grain alcohol, or medical grade alcohol; you cannot get Everclear in every state, but you might be able to get it shipped depending on your location). Denatured alcohol (poisonous to drink because of added chemicals) can be used if it is the only thing you can find. You can also improvise and grab some vodka for that matter!

120 ml collodion (non-flexible plain collodion USP [United States Pharmacopeia], not flexible collodion).

77 ml ethyl ether (this helps to stop ridging problems in heat). Some people are very sensitive to ether, so if you are one of those people, double up on the alcohol and don't use ether. It will make the collodion more fragile, but it still works.

To mix

1. Add the cadmium bromide to about 2ml of the alcohol. Cadmium bromide cakes up in water and is hard to dissolve, so I start dissolving it in alcohol where it dissolves quickly.
2. Add the potassium iodide and mix well.
3. Add the rest of the grain alcohol and stir well.
4. Add the collodion to a glass bottle that can hold slightly more than 500ml of liquid. Slowly add the ether into the collodion and stir while adding. If you see stringy white things in the mix, keep stirring or cap the bottle; then shake it.
5. Slowly add the cadmium bromide mixture into the bottle. Shake the bottle for a few minutes. The mixture changes from white to yellow and will look cloudy until it has ripened, which can take a few days to several weeks. The average time is about ten days. Once you set the bottle down, you don't want to shake it again. The solids need to fall out of the solution, and if you shake the bottle, you might have to start the process of letting the collodion clear all over again. Recently shaken collodion also causes black specks in your images.
6. Store in a cool dry place. If it is humid, add a few more drops of alcohol before use.

FOR FAST CLEARING COLLODION

If you want to mix your collodion and use it immediately (instead of waiting a week for it to clear), you can do one of the following:

- Instead of 2g of potassium iodide, add 2g of ammonium iodide.

09.17 © Stephen Berkman, Zohar Studios. "The Songbird and the Sharpshooter." Stephen has said that he "finds perplexing things to be engaging, and that is what I strive for in my images, too." He succeeded in this albumen print from a collodion negative.

- Add up to 50% of old collodion and let it sit for a day or two to ripen more quickly.
- Add a drop of tincture of iodine.

Pushing the clearing time will shorten the shelf life of the collodion. Ammonium iodide also makes the collodion more fragile, meaning that it will scratch or flake off the glass more easily than if you used potassium iodide. You will also have to use a stronger silver bath. Instead of the usual 8%, use 10%.

COLLODION WITHOUT ETHER: FOR AMBROTYPES

Ether can be hard to find in some countries. Some people are sensitive to ether, while others just don't like to use it because it makes you sleepy if you are not working in a really well ventilated area. When I was teaching in Norway, the wrong ether was sent. Mistakes happen, but you need to know how to fix your mistakes! Collodion has ether already in it, but adding ether makes the collodion stronger.

Chemicals needed

150 ml alcohol
3 g cadmium bromide
4 g ammonium iodide
250 ml collodion

To mix

1. Dissolve the salts (bromides and iodides) in alcohol.
2. Combine with the collodion, shake, and use immediately.

Developer

500 ml of developer will make enough for about 25 plates using 20ml a pour.

In any given collodion developer recipe, there are typically four parts:

1. A reactant, such as ferrous sulfate or pyrogallic acid, that is responsible for the chemical reaction that creates the image.
2. A restrainer, such as citric acid, acetic acid, or sugar, which prevents the reaction from happening too quickly.
3. Alcohol, added as needed to help the developer smoothly move over the plate without beading.

DEVELOPER FOR COLLODION WITH ETHER

Chemicals needed

10 g Ferrous sulfate. This is an iron salt and is the developer! It should be light green when you get it from your provider.
420 ml distilled water
20 ml Glacial acetic acid. This acts as a chemical restrainer, while sugar is an organic restrainer. It helps slow the developer and reduces fog.
20 ml Grain alcohol (in the USA, Everclear is a common brand).

DEVELOPER FOR NEGATIVES OR FOR COLLODION WITHOUT ETHER

When used to make glass-plate negatives, your developer needs to be weaker. It can also be used for a longer period of time. It contains less ferrous sulfate and more acetic acid. I also know several wet plate photographers who use the same developer no matter what they are making. The only variant is the developing time.

Chemicals needed

7 g ferrous sulfate
420 ml distilled water
28 ml glacial acetic acid
20 ml grain alcohol

This developer is also good for hot weather and in high altitudes. Because it uses less ferrous sulfate and more acetic acid, it will prevent fogging in the shadow areas. If the developer is still too fast, add a little water or sugar.

09.18 © Denis Roussel. Denis took a series of still-life compositions created from elements in his compost bin. He uses ether-free collodion and fixes in sodium thiosulfate. I love the juxtaposition of taking compost and making a delicate tintype.

Slow sugar developer recipe

700 ml distilled water
24 g ferrous sulfate
36 g sugar
20 ml glacial acetic acid
10 ml grain alcohol

No matter which developer you choose, they all have to be filtered two to three times before using to prevent fogging of your plates.

Silver

Make an 8% or 10% solution. The 8 × 10" tank that I use (made by Niles Lund, see Sources) holds 800ml. So I mix:
80 g silver
800 ml distilled water

Silver nitrate crystals are silver salts, and when mixed with the salts in collodion, they become light sensitive. Silver itself is not sensitive to light until it comes into contact with an organic substance, such as skin, paper, iodides, etc. As a wet plate photographer, you will undoubtedly get some brown staining on your hands and clothes. Silver is safely excreted from your body and is considered non-toxic to mammals. Like any chemical, if silver splashes into your eyes, it can cause blindness. So it is essential to wear glasses or goggles while working with silver.

1. Once your silver bath is made, there are several things that need to be done to take care of it. Silver has gotten expensive, and you do not want to waste money.
2. Once the silver is made, pour some into a tall cylinder (you can use the cylinder the hydrometer comes in).
3. Lower a hydrometer into the cylinder until it floats.
4. Looking at the hydrometer from the side (not above!), read the number that corresponds to the top of the silver. This is the number you will use when checking your silver to see if it is strong enough for use. Make sure to mark the side of the hydrometer with a sharpie, or write down this number where you will not lose it. Some of the collodion suppliers now have hydrometers made specifically for photography and they are marked by the percentage instead of these random numbers. More on this later. . . .
5. Before you use the silver, place a glass plate coated with collodion into the bath and let it sit overnight. This is called iodizing the silver. If you do not iodize the silver, then your first plate may end up with a lot of pinholes caused by the silver eating away at the first collodion plate.
6. The plate can be removed in the morning and scraped off, cleaned, and used to make a fresh plate.
7. Filter the silver at the end of every shooting day.

SUNNING YOUR SILVER

Taking care of the silver is really important. Not only because it is expensive, but because it can be the thorn in your side if you don't! Dirty silver can cause "comets" which are black specks with tails (hence the term) on your plates.

As the silver bath is used, the silver content is depleted, and alcohol, ether, and free iodides are left behind by the collodion. The silver bath should be cleared or "sunned" by pouring it into a clear glass container. Place the container on a sunny windowsill or a porch that gets good sunlight. I cover

09.19 © Christine Breslin. Sunning her silver. If you have not taken care of your silver, it may take a few days in the sun to get all of the participates to sink to the bottom so that your silver looks clear. Then you need to test it with a hydrometer to make sure it is the correct percentage of silver and the right acidic or alkalinity content.

09.20 © Lynn Bierbaum. After the silver is sunned, pour some of it into a tall cylinder and check to see what percentage it is. To add silver (if it is low) dilute it in with a small amount of the liquid silver and then mix it all together and check again. If the silver is too strong, add small amounts of distilled water to get it to come down to 9%.

the container top with a piece of saran wrap and then poke a small hole in it. You will see the silver get grey, then very dark, and then start to lighten as the organic material sinks to the bottom, and the ether and alcohol evaporate.

After sunning, filter the solution and measure with the hydrometer. If the hydrometer floats too high, add distilled water; if it sinks, add silver.

BOILING THE SILVER

If you notice a lot of black dots in your positives (white dots in negatives), then it is time to freshen your silver bath. These pinholes are caused by free iodides in the silver, in other words, contamination from putting too many plates into the silver. Sunning your silver usually takes care of these pinholes, but if not, then boiling it may be necessary. By boiling the silver, you will lose some of the silver bath solution, but it will be as if you have brand new silver, so really, you are saving money in the end.

The pH in a good working silver should be around 4. Before boiling, you need to bring the pH up to 6–7 by adding baking soda (sodium bicarbonate) a teaspoon at a time. The silver will start looking very cloudy, but it will be fine. Baking soda will raise the pH while nitric acid lowers it.

Follow these steps:

1. Add baking soda (sodium bicarbonate) a teaspoon at a time and keep checking the pH. Let it get to a Ph of 6.0.
2. Using a stainless steel pot and making sure you are in a room with good ventilation, boil the silver until it has boiled down 70–50%.
3. Add distilled water to bring the solution back up to your original amount and watch it even get cloudier.
4. Filter the solution several times.
5. Pour the silver into a glass jar and sun it for two to three days.
6. Filter the silver once or twice.
7. Using the hydrometer, measure your silver and make sure it is at 8– 9%.

09.21 © David Emitt Adams, courtesy of the Etherton Gallery. "Desert Combine #2." David has made a series of photographs on objects he found in the Sonoran Desert.

09.22 © David Emitt Adams. courtesy of the Etherton Gallery. Valero Bill Greehey Refinery No. 2, Corpus Christi, TX. David did a series on the American oil industry and its architecture by exposing 55-gallon steel oil drum lids in-camera. He first "Japanned" them, which means blackened, with asphaltum, urethane, and paint thinner and baked it on the metal. This should never be done inside.

8. Measure your pH and make sure it is between 3–5%. If you need to make it higher, you can add a little nitric acid to the solution. Only add a drop at a time. If your pH goes too low, then you will have to add the baking soda to it again and re-sun the silver.
9. The silver is now ready to use.

FIX

When collodion photographers first started, sodium thiosulfate was the fixer of choice. Soon, however, many photographers started to use cyanide because it clears twice as fast as sodium thiosulfate. Cyanide also creates cleaner black tones and brighter whites.

I don't use cyanide for fixing my plates for many reasons:

1. I have animals at home and my cats like the darkroom sink.
2. If you cut yourself and touch the cyanide, you are absorbing a poison. Make sure to always wear gloves, googles and an apron.
3. If you mix cyanide and acetic acid by mistake, it will form cyanide gas. Remember, there is acetic acid in collodion developer. Even though the working solution is very weak, at 1.5%, if you have not rinsed your plate well, you may inadvertently cause cyanide gas to form.
4. Cyanide is a deadly poison, and should be mixed and used in a well-ventilated area.

SODIUM THIOSULFATE

Thiosulfate is best if you are re-developing to make negatives. It is used to dissolve the unexposed silver from the plate and "fix" the image, just like you would do with film and paper. Sodium thiosulfate will give you a cooler tone than cyanide.

Use a 20% solution, made from:

500 ml distilled water
100 g sodium thiosulfate

OR

You can use rapid fix made by any company. Note that the tone will be much cooler than plates fixed in sodium thiosulfate.
800 ml distilled water
200 ml Rapid Fix

09.23 © Mark Zimmerman. "Fragile Existence" is a series that Mark did as he photographed his wife battling breast cancer and thyroid cancer. He made ambrotypes on glass mirrors to give the images more depth.

REDEVELOPMENT FOR NEGATIVES

Redevelopment is sometimes needed for negatives to make them dense enough to use for contact printing. Once your plate has been fixed and washed (but not dried – it needs to stay wet!), it can be redeveloped with pyro or an iron developer to add density. Make sure to have good ventilation and wear gloves. This is a two step process. Re-sensitize the silver with iodine and then building up the density with a pyro developer, with some added silver in it.

Part A: Iodine solution

This is a much stronger solution than you can get in the drugstore; you must buy it from a chemical supply store:

1.5 ml Tincture of Iodine, USP
50 ml tap water

Mix in a small glass cup. The color should be a deep red, similar to red wine.

Part B: Redeveloper

355 ml tap water
6 g citric acid
1 g pyrogallic acid

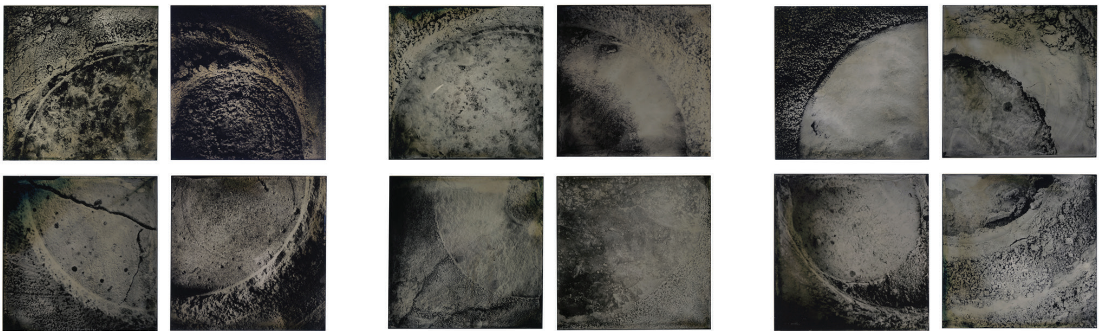
Part C: Silver from the silver bath.

2–5 ml Put in a dropper bottle to be used as needed.

Remember to do this in a well ventilated room or outside, wearing gloves, apron and goggles and after your image has been fixed and washed:

1. Pour Part A over your plate in the same way you developed the plate.
2. Rock the plate back and forth until you see the image get lighter and the iodine solution lose some of its red color.
3. Rinse in tap water until the water flows over the plate and does not bead up.
4. Expose the plate to daylight for 10 30 seconds.
5. Redevelop by using 40ml of Part B mixed with about 10 drops of silver (make sure it is mixed together well before pouring on the plate).
   - You can pour the developer back into the shot glass and check to see if your negative is dense enough to use. If not, pour the developer back on to the plate and keep going.
   - Keep checking the density and pouring the developer back over the plate. This could take several minutes.
   - How dense your negative should be will depend on what process you will be using.
   - This will take practice and trial and error before you know exactly how it should look.
6. Wash the plate for 20 minutes.
7. Dry
8. Varnish

You can use your regular developer (made with ferrous sulfate and adding a few drops of silver) instead of this pyrogallic formula. Keep in mind that pyrogallic acid can cause peeling, and is getting harder to buy in some countries.



09.24 © Travis Hocutt. "Circular Rock Abrasions." Travis works with all kinds of negatives and images but this particular one was made by enlarging positives on to the tintypes.

09.25 © Glenn Grafelman. Tintype photogram. Glenn's photograms are made using an enlarger light and handmade geometric shapes. The abstractness, or non-objectivity, of these works relate to theory surrounding Suprematist painting of the early twentieth century. He uses this photographic technique, not to present reality as it was intended, but to advance abstraction outside the framework of modernist and contemporary painting.

ALTERNATIVE TO REDEVELOPING WHEN MAKING NEGATIVES:

As stated before, in order to make a negative, your exposure time needs to be doubled. Develop your plate for about seven minutes until it is very dense.

VARNISH

All negatives, ambrotypes, and tintypes should be varnished to protect their surfaces. Collodion plates are very fragile and can be scratched just by removing them from storage envelopes. If left unprotected, the silver will tarnish, turning a blue, black color in a short period of time.

Chemicals needed

414 ml 190-proof alcohol
57 g gum sandarac
44 ml oil of lavender

Gum comes from an evergreen tree that grows in North America and Spain. Don't be surprised to find a little bark and bugs in the gum!

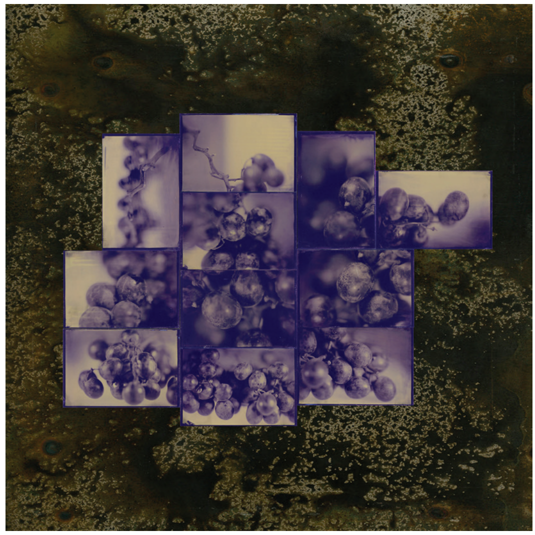
Oil of lavender keeps the gum flexible and smells great. It never goes bad.

To mix

1. Add all the ingredients together. Place the jar on a windowsill or outside until the gum dissolves. You can shake the jar every once in a while to help the process along. It takes a day or two for the gum to dissolve.
2. The bugs and bark will look like sludge on the bottom. Filter three times to get all the bugs out (literally!).

STEPS TO PREPARE YOUR PLATES

1. Cut your glass to size. This may take some practice, but it is difficult. There are also videos on YouTube showing you how to do it. I use the Toyo pistol grip glass cutter, but any glass cutter will do.
2. If you are using clear glass, draw the size you need on a piece of paper, place the glass on top, and using a T-square or straightedge, cut the glass to size. Remember that the blade of the cutter should be on top of your drawn edge. The ruler will be about 1/16" away from your drawn line.
3. If you are using black glass, you will not be able to see the paper template underneath. You can use a lead or wax pencil to draw out the size you need.
4. Placing the glass in a tray of water and making the whet stone wet, file the edges of both sides of the glass. The water will keep the dust from becoming airborn. Wipe off the glass to remove any excess dust.
5. Put gloves on so the oils from your fingers do not contaminate the glass.
6. Place the glass in a wooden vice, or hold it, whichever is easier for you.
7. Pour about a quarter (coin) size amount of the whiting mixture onto the plate and rub vigorously with a small piece of flannel in small circular motions. Be sure to cover the entire plate, especially the edges.
8. Turn the glass over, and repeat the process on the other side.
9. Take a clean piece of cotton and polish the glass, making sure all signs of the whiting are gone and your glass is clean.
10. Breathe on the glass. If your breath goes away quickly and you don't see any streaks, then your glass is clean. If you see streaks, then re-polish the glass.
11. Make sure you have cleaned your edges well!
12. Get enough glass cleaned and ready for the day's shoot. I place my glass in a box with paper between each piece of glass. Once I start shooting, I don't have to stop to clean glass.
13. If you are having trouble cleaning your glass properly so that the collodion does not flake off, put albumen on the entire plate and let it dry before you coat it with collodion. This step can also be done in advance. Store your glass in a box as in step 12.



09.26 © Jen Jansen. Jen used purple aluminum to make this tintype. She then mounts them on steel that she has welded and given a patina for the spackle coloring.

SET UP YOUR DARKROOM

The darkroom should be set up as follows:

1. The collodion bottle, placed next to a tray with paper towels to collect the spilled collodion (as you get to be better at pouring, you will spill much less or perhaps none at all!).
2. Silver bath
3. A place for your plate holder – I use an upside-down tray to make sure the area stays dry.
4. A shot glass for developer (you only use 20ml or less for a 5 × 7" plate) next to a tray and the larger bottle of developer
5. A container of water to stop the development
6. The fixer
7. A tray under a running water tap for washing.

POURING COLLODION

This will take you longer to read than to do! Pouring collodion can be done in daylight.

Before you start, clean your glass just once more with alcohol. Once that dries, use a natural bristle brush to remove any dust.

1. Hold the plate level in one hand. Place your thumb against the lower left corner and your index and middle fingers on the back of the plate. There are several ways to hold the glass, and it is a matter of which way you are more comfortable with. If your hands tend to be hot, then this is the best way for you to hold the glass in your hand. If you are very hot and are holding the glass from the back (called the waiter method), you might get finger prints on your glass from the heat of your hands.
2. Do not shake the bottle. Pour the collodion in a pool on the middle of the plate. It is better to pour out too much than too little because you cannot add more collodion after the initial pour.
3. Slowly tilt the glass so the collodion first moves to the lower left corner, toward your thumb. If the collodion touches your thumb, it will run down the back of the plate and down your arm! Tilt the plate slightly in the opposite direction, so the collodion travels to the upper left corner. Continue tilting the plate to cover the upper right corner and the right near corner.
4. At the right near corner, start pouring the excess collodion back into the bottle by leaving your plate slightly tilted. A 45° angle is good. While pouring the collodion back into the bottle, rock the plate from side to side to prevent ridges from forming.
5. While you are pouring off the collodion, slowly lift the plate from a horizontal to a vertical position.

Allow the collodion to sit before putting the plate into the silver bath. To check for readiness, pinch the corner of the plate. When the collodion is "tacky" and you can leave a fingerprint on it, it is ready to go into the silver. This will take a little longer in humid conditions. But if you wait too long, parts of

09.27 © Jill Enfield. This is a true marriage of digital and historical technique! I was photographing this group shot and they were in the midst of drinking and celebrating. The first plate had people missing. The second plate people moved around (yes, I told them to stay in position while I ran into the tent to plate the glass). I had to not only combine the two plates, but had to find the repeat heads and figure out a way to take them out. If you look closely I think there is still someone in the picture twice.

the collodion may dry and you will not have an image in the dry spots.

SENSITIZING THE PLATE

1. In the darkroom, under a red or amber safelight, place your plate onto the dipper. In one motion, "swoosh" the plate into the silver bath without stopping. If you hesitate, you will see a line on your image. If you move the plate around too much, you will create bubbles that will appear on your image.
2. Check the plate in one and a half to three minutes by gently lifting it out of the silver. If the solution beads up, then it is not ready. If the silver flows off the plate like a waterfall, it is ready to be taken out of the silver.
3. Blot one edge of the plate on a paper towel to stop the dripping.
4. Place the plate in your holder and wipe off any excess silver from the back.
5. Close the holder and expose your plate.

Knowing how long to leave the plate in the silver is done by eye. Make sure that the silver flows evenly off the plate. It should not bead up. Some people leave the plates in the silver by timing. I have had to leave my plate in the silver for up to an hour and it has been fine, but as a rule, a positive is left in the silver for one and a half to three minutes and a negative for five minutes.

EXPOSING THE PLATE

The UV light, on which your wet plate collodion image largely depends, cannot be measured with a regular photo light meter. Several people are now working to discover a way to use a light meter with wet plate collodion. Hopefully they will have an answer soon! For now, if you use the same camera and lens, you will get used to your equip-

09.28 and 09.29 © Angie Brockey. Angie Brockey makes pendants from collodion images shot onto the underside of domed glass (ambrotypes) and metal for tintypes, in her 5 × 7" camera. Sometimes she will put a photograph in front of her lens and shoot that, but most often, they are still lives that she sets up. She makes the settings from silver and gold and sells them on her website www.angiebrockey.com ment and be able to make an educated guess at exposure.

Ambrotypes and tintypes require about half the exposure as negatives. The ISO is between eight and one, slower than most silver papers. (If you have ever made an exposure to make a paper negative, you will understand how this works.)

Making a test exposure:

1. Niles Lund, the man who builds a lot of equipment for wet plate photographers, did something that makes a lot of sense. He makes a test for the exposure in-camera that works the same way as test strips in the darkroom! It sounds so simple, yet no one I know had ever done this before!
2. Pull the dark slide out about one-quarter of the way, and expose. The time depends on the lighting conditions, where you are located, your f/stop, etc. The test will help you come up with a starting point. For example, you can start at f/8 for two seconds when you are working in sunny conditions at 10:00 A.M. during the summer in Maine.
3. Pull the dark slide out again and expose for another two seconds.
4. Continue until you have four exposures.

Now you are ready to develop. Bring the plate holder back into the darkroom and remove the plate. If you have taken a really long time, or if you are in a dry climate, you can lower the plate quickly into the silver bath to give it one more coating of silver. This will allow the developer to flow across the wet plate more easily, enabling more even developing.

DEVELOPING THE PLATE

Developing can be done in a tray (the least favorable, but the easiest) by using a helper

09.30 © Alexey Alexeev. "Hatter's time." Ambrotype. Alexey lives in Russia, where there are not a lot of people working with wet plate. He says he uses artificial light to create a contrasting image and adds 2ml of acetone per 1ml of collodion to extend the shelf life (I have never tried this).

09.31 © Alexey Alexeev. "Witch." Ambrotype. Alxey uses used developer to new developer 1:3 to extend the dynamic range.

tray, or by holding it in your hand. Regardless of which method you choose, the most important part is to make sure you cover the plate all at once with one sweeping motion, using as little developer as possible.

Initiating development in one single stroke causes the developer to mix immediately with the free silver nitrate (unexposed silver) on the plate, and remain there, making the image stronger. It also develops the plate more evenly without causing ridges to form. If you were to pour the developer onto the middle of the plate the way you did with collodion, you would see only a black circle. This happens because the developer hits the image and scatters the silver away. (More troubleshooting advice is given at the end of the chapter.)

Normal development time is 15 to 20 seconds for ambrotypes and tintypes; 90 seconds up to seven minutes for negatives. If your image comes up faster than 15 seconds, you have over exposed it.

The most common mistake made by students is to mix up which side of the glass the collodion is on. Make sure to develop your image collodion side up!

09.32, 09.33 and 09.34 © Luther Gerlach. Luther uses color glass to make his perfect ambrotypes, which is the difference you are seeing in the color of these images.

TRAY METHOD

The tray method is not the method of choice because the developer does not stay on top of the plate. This results in a weak image.

1. Pour a small amount (approximately 20 ml, or half a shot glass, for a 5 × 7" plate) of developer into the tray.
2. Tilt the tray so that all the developer is at the long edge of the tray.
3. Remove your plate from the plate holder and place the plate, collodion side up, on the dry side of the tray.
4. In one swift motion, tilt the tray in the opposite direction so the developer flows evenly across the plate. Gently rock the tray, keeping the developer on top of the plate as much as possible.

HELPER TRAY METHOD

The raised edges of the helper tray prevent spillage and make it easier to keep the chemicals on top of the plate. When I am working in my portable darkroom with limited space, I like using the helper tray.

1. Place the plate, collodion side up, in the helper tray and cover the hole in the middle of the tray with your finger.
2. Pour a small amount (approximately 20ml, or half a shot glass, for a 5 × 7" plate) of developer along the long side of the plate.
3. Slowly tilt the tray so the developer covers the entire image as quickly as possible.
4. Gently rock the helper tray, taking care to keep the developer on top of the image area.
5. When the developing is finished, start pouring water over your image to stop development and then put your finger in the hole to push the plate out of the helper tray.

HAND-HELD METHOD

This takes practice! Hold the plate, collodion side up, in one hand and pour the same way as the helper tray method. Tilt the plate slightly and continuously to keep the developer moving across the surface, spilling as little as possible. You will eventually become proficient enough to do this with less developer. Less developer results in a stronger image.

TO STOP DEVELOPING

Regardless of the method used, developing should continue until:

1. For ambrotypes and tintypes, you see the highlights start to emerge.
2. For negatives, after you see the midtones come up.

To stop the development process, start pouring water over the plate until the developer stops beading up. The water should flow like a waterfall over the plate. You can now take the plate into the light to fix it. Then watch it clear. The plate will not fog, and it's true magic to watch your image emerge in the light.

09.35 © Christine Breslin. "Edison, Ecuador 2017." Chris uses both glass and tinytpes depending on her project. Edison is part of a series of 17 ambrotypes on black glass. Ever since Chris adopted her daughter, Mariah, from Columbia, she has been interested in the Latino community and photographed in both Connecticut and New York.

FIX

Fixing time should be twice as long as the clearing time. If you are using sodium thiosulfate, a 20% solution, the time should be about five minutes. Cyanide is much faster, at about two minutes.

WASHING

The length of washing depends on the fix you are using:

- Washing when you are using hypo (sodium thiosulfate) should be about 15 to 20 minutes in running water.
- Washing when you are using cyanide should be about five minutes in running water.
- You can keep your plate in the fix longer to clear a thick edge of collodion.

DRYING THE PLATE

You can use a drying rack and let your plates air-dry, unless you are having peeling issues. If a plate is peeling, it is best to dry it right away with heat. I use an oil lamp and keep the flame low. Keep the plate moving on top of the globe until the plate is totally dry. Dry the corners first to help stop peeling, and then go for the middle, drying as evenly as possible.

09.36 © Mark Edward Dawson. "Grand Canyon National Park." This image is part of a series on the National Parks in the USA. He calls it "The Great Tintype Adventure of 2018." They were made as 4 × 5" tintypes in the field with his darkbox that is pictured as Figures 09.6 and 09.7.

09.37 © Mark Edward Dawson. "Alstrom Point, Lake Powell, Utah." This image is part of a series on the National Parks in the USA. He calls it "The Great Tintype Adventure of 2018." They were made as 4 × 5" tintypes in the field with his darkbox that is pictured as Figures 09.6 and 09.7.

Although I have dried my plates over an oil lamp, I do not varnish them until they have sat overnight, at minimum. If the plates are not bone dry and you varnish them, moisture will be trapped between the image and the varnish, and your image will look fogged.

VARNISHING THE PLATE

If you are going to scan your images, I suggest you do so before varnishing. This will reduce the amount of dust recorded in your scan. No matter how much you filter the varnish before applying it, some dust will inevitably stick to your plate. Varnishing is a very important step. Until it has been protected by varnish, the simple action of taking a plate in and out of an envelope can scratch the emulsion.

Varnish is messy, and not everyone likes to work with it. You do not have to use this gum/oil mixture; you can try something else. People have used this recipe because it has been around for a long time and it has been proven to work. But no one will arrest you if you try something new!

As long as the plate and the varnish are the same temperature, the varnish will go on smoothly. A good rule of thumb is that both the plate and varnish should be body temperature.

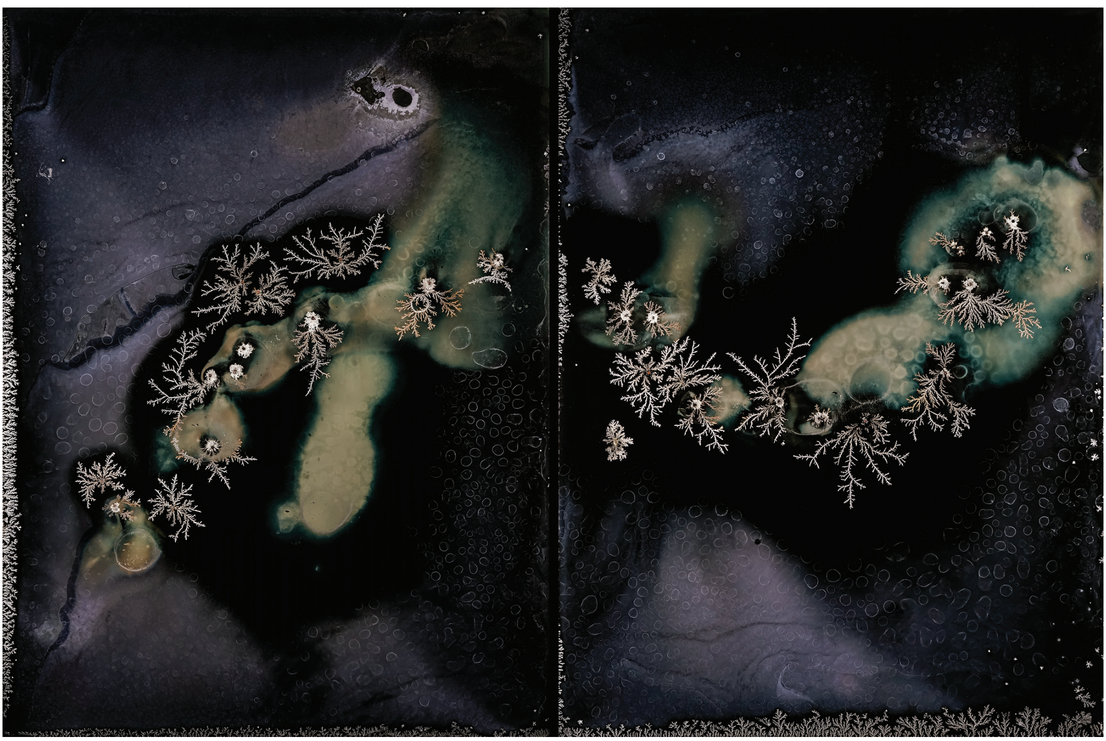
1. Heat the varnish by placing your pour bottle into a Pyrex glass filled with warm water. If you are coating more than one plate, you will need to keep the varnish warm for a longer period of time. I use a coffee cup warmer to keep it at the desired temperature.

2. Heat your plate by moving it on top of an oil lamp. Both the varnish and the plate should be close to your body temperature, maybe a little warmer (98 – 105°F). If the plate is too hot to touch, then it is too hot to varnish.
3. Slowly pour the varnish on top of the plate. The pour should be controlled and slow. Unlike pouring collodion, you can go back and forth to make sure you have covered the entire plate. If you have not applied enough varnish, you can pour on more.
4. Have a catch bottle (it can be your stock bottle, as long as you filter it before using again) next to you with a funnel stuffed with two or three cotton balls. Never pour back used varnish without filtering – you don't want any random bits and pieces floating in the varnish to be poured out onto a new plate.
5. Heat the plate and dry it so that it is not tacky; then place it on a rack to dry completely.
6. Try not to get any varnish on the back of the plate. But if you do, you can use a cotton ball dipped in alcohol to rub varnish off the back. Be careful not to get any alcohol on the front.
7. You might need to use whiting to clean off the back completely.

HELPFUL NOTES AND TROUBLESHOOTING

Please read this before you start working. It will help you understand what to look for in your results.

Artists sent me their images to publish in this book in good faith. If you carefully look at them, you will see a lot of "mistakes" in the printed images – including mine. I happen to love these "mistakes," and think of them as part of the wet plate process. The idea is that you know what causes them and can control your "mistakes" if and when you want.



09.38 © Michael Koerner courtesy of the Catherine Edelman Gallery. "DNA Diptych." Mike uses super active developers of his own formulation and mixes them with a resist to control exactly where development occurs on the plate surface. His resist choices include arrowroot or xantham gum and several other thickening agents. His developer formulations have to work hard to diffuse through the viscous nature of the resist, which allows him to slow down and control the developing process.

09.39 © Edison Arevalo. "Roots." Edison started this series making plates of small plants using a single plate, then when moved on to bigger plants he tried to use the same plate size but it wasn't working for him, even when using different lenses. So he decided to make the image in sections and then put all the plates together to make the final image. Edison uses two banks of CFL. One is 6500w the other one is 3000w and reflectors. The collodion is the Poe Boy Collodion and developer is mixed using FeSO4, sugar, acetic acid, grain alcohol, and potassium nitrate. He uses a 9% silver bath and sodium thiosulfate fixer.

Some of the following information is repetitive but it is good to re-read these notes so that the information will sink in and help you make better plates.

COLLODION

- Shaking the collodion can cause pinholes on your plate.
- At high temperatures, alcohol can be added to the collodion to extend the wet life. High temperatures also prevent peeling, but will make your image more fragile.
- Ether evaporates faster than alcohol.
- Denatured alcohol has more water and other additives than grain alcohol. However, denatured alcohol can be substituted for grain alcohol in an emergency.
- Iodides add speed to collodion.
- Bromide salts produce lower contrast with a finer gradation in the midtones.
- When collodion is first mixed, it is yellow/pale. As it ages, it gets darker, changing from straw yellow to red. Quick-clearing collodion is red from the beginning.
- As the potassium iodide ages in the collodion, the collodion becomes less sensitive. It also becomes thinner because there is less iodide to bond with the silver. The plate should look rich and creamy as it comes out of the silver.
- Older collodion will solarize. Because it is thinner on the plate, and the sun shining on bright objects will be very bright, it will over expose the highlights to such a degree that they look solarized.
- Alcohol to ether ratio is usually 50:50. The collodion has some ether already in it, so

you don't have to add it, although ether helps to make the collodion less fragile. If you don't want to use more ether in the collodion, take the regular formula, leave the ether out and add twice the amount of alcohol.

- You don't want to have too much ether. Ether is tough and leathery, and the silver will not stick to it. If your sensitizer has too much ether in the formula, the collodion will shrink (contract) and peel at the edges.
- Alcohol will stop the peeling, but the collodion also becomes spongier, more fragile, and can crumble off the plate.
- Collodion is the binder, and the iodides and bromides make the silver light-sensitive.
- There is not an exact time between coating the collodion and placing the plate into the silver bath. The collodion needs to be a little tacky. This happens very quickly in a dry climate and very slowly in a humid one. Humidity will cause the plate to have condensation and you will need to wait longer to put it into the silver.

09.40 © Elisabeth Aanes. "Pappa." Elisabeth runs NORDphotography in Norway and fell in love with tintypes during one of my workshops. She has since bought a container that has been turned into a wet plate darkroom for her creative center SAGA.

- Collodion, like film, can be pushed to increase contrast. A good starting point is to overexpose by a stop, and under develop by about half the time. Watch your image and stop developing when you see the image start to emerge. You will get detail in your highlights and a nice range of tones.
- If you are experiencing peeling, put albumen on the glass, or add alcohol to the collodion.

SILVER NITRATE

- You want the silver to run down the plate very smoothly. Rather than thinking about timing this, do it instead by inspection.
- When you make a new silver bath, be sure to mark the reading on the hydrometer. Mark this as the baseline.
- After you sun your silver bath, if the hydrometer floats too high, add water; if it sinks, add silver.
- Sunning the silver for too long can cause too much water to evaporate, making the solution too strong. You will need to add distilled water a little at a time, checking the hydrometer against your original reading.
- PH strips are good to have on hand. They will help you check the levels for both collodion positives and negatives. They also come in handy if you are having these issues.
- A more neutral bath is good for making negatives (pH 6); you can add (a pinch at a time) baking soda to make it more alkaline.
- A more acidic bath is better for positives (pH 4–5); you can add acetic acid (a drop at a time) to the silver if it is not acidic enough.
- Sunning the silver makes all the organic matter in the bath settle at the bottom, and causes the alcohol and ether to evaporate. Filtering after sunning is a must!

- If your plates are fogging and you have determined the cause is the silver bath, you can add a drop of nitric acid or glacial acetic acid to the silver. Then try another plate. This sometimes happens with new silver, especially if you have not yet iodized the silver by letting a plate with collodion sit in new silver overnight before using the silver bath.
- New silver can also cause black pinholes. If this happens, you probably did not iodize the silver by placing a plate with collodion in the silver bath for a few hours (or just leaving it there overnight) to ripen.
- The silver can turn red. The first time this happened, I had no clue as to why. I thought I would have to throw the silver out and was very upset. Luckily I unearthed the cause by searching through historical books. When too much organic material combines with the silver, it turns the silver red. You have to sun your silver more often, or sun it once you notice the red color. In the 1800s, if the daylight was too weak to sun the silver, photographers would treat the silver with kaolin, a white porcelain clay made from decomposed granite. Photographers would take a spoonful of kaolin, add it to the silver, agitate it a little, let the solution sit overnight, and then filter the solution. You can also add baking soda to the silver and get similar results.

EXPOSING

- Wipe off the back of the plate after you put the plate in the holder. The silver from the back can cause stains on the front of the plate.
- If there is a lot of wiggle room between the tin or glass and the holder, use a spring

09.41 © Jill Enfield. "Syzmon & Maciej." Part of my immigration series called "The New Americans," these men came from Poland and have their own electrical installation business. I knew I was going to scan the ambrotype into the computer so I could make a large print of it, so I underexposed and overdeveloped it a little for good tonal range.

to hold the plate in place. You can use a small piece of a plastic from a water bottle or yogurt container, or a small piece of the aluminum you use for tintypes.

- Make sure you mark your plate holder so you know which side faces the lens. Place the collodion side facing the lens when you put the plate in the camera.
- When taking a portrait, the sitter can blink but cannot move their eyes. Pick a spot for the sitter to focus on.
- If you have dark tintypes, you need more exposure time.
- If you have light tintypes, you need less exposure time.
- Overexposing and overdeveloping causes flatness in the plates. However, flat plates scan better than thin, contrasty ambrotypes.
- Develop ambrotypes and tintypes for about 20 seconds; if you need more time make another plate and expose for longer.
- Develop negatives for about 90 seconds if you are going to re-develop with the pyro solution; up to 7 minutes if you are not going to re-develop.
- You can do a test by slowly pulling the film holder out a little, exposing, and then pulling it out a little more and exposing, etc.,
- UV-protected glass has a coating, which makes knowing when the plate is truly clean impossible. However, I have used UV coated glass and it worked fine.
- Morning light is blue light, and evening light is more yellow. If you are exposing outside at 10 A.M. and get a good exposure, but at 5 P.M. you have nothing, it is because the evening light is more yellow.
- The light outside may look brighter, but the collodion does not "see" it. This is similar to the color spectrum: red = no light for collodion, so you have to go to green before it sees the subject (although our eyes can see green, collodion does not). On the blue-to-ultraviolet spectrum, we stop seeing around indigo.
- Flowers are UV-reflective (we cannot see UV light). That is why the colors of flowers change with collodion.
- Looking at your subject through a thick blue filter can simulate the effects of a collodion image: anything that is red, yellow or amber will photograph black; shiny objects will reflect light and photograph as white.

09.42 © Heather F. Wetzel. "Constructed Landscape No 19." Heather uses old coconut milk cans that she cuts open and flattens. She then japans them in her garage. To make the image, she intentionally hesitates several times as she immerses the plate into the silver bath to achieve those "power lines." Heather constructed a piece of glass with little feet on which to place the plant material, keeping the delicate collodion surface safe and unmarred. The landscape is made using scraps of handmade paper, sometimes dampened. She often overexposes and overdevelops so that she can manipulate the atmosphere. Heather also does some selective fixing.

09.43 © Tamara Schlesinger. "Tallulah: tintype." Tamara has been working as a commercial photographer for many years and has also been photographing her daughter in different ways since she was born.

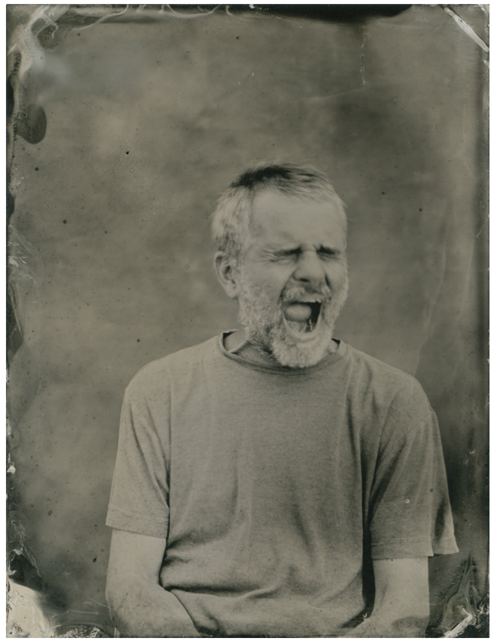
DEVELOPER

In any given developer recipe, there are typically four parts:

1. A reactant such as ferrous sulfate or pyrogallic acid, which is responsible for the chemical reaction that results in an image. Too much ferrous sulfate will cause the developer to fog the plates. It will also make the developer react very quickly causing you to most likely over develop your plates.
2. A restrainer such as citric acid, acetic acid, or sugar, which prevents the reaction from happening too quickly. Adding sugar will thicken the developer, so add a little at a time.
3. Alcohol, added according to need, to help the developer cover the plate evenly without beading up and causing streaks.
4. Water, in which the other three ingredients are dissolved. Water will also slow the developer down.

- Ferrous sulfate comes as clear blue-green powder. If it is a dull green powder, it has begun to oxidize, which can cause your plate to fog.
- Not filtering developers can cause fogging in the shadows. You should filter about three times before use.
- If your plate is drying before you start developing: quickly dip the plate into the silver. Then pour developer over it, and the plate will develop more evenly.
- If the image comes up too fast when developing, lessen the exposure time or use a weaker developer. A very fast developing time can cause the plate to fog.
- In high temperatures, use more restrainer (citric acid, sugar, or acetic acid). Add a small amount at a time, as too much sugar will make the developer too thick to use.
- Additions of acids and sugars will change the color of the image:
  - Sulfuric acid will create a silvery image.
  - Sugar will create a creamy brown color.
- Developer that acts too fast can be diluted with water.

- Adding water to the developer is one way to prevent fogged plates; water slows down the developer.
- A stronger developer is needed for ambrotypes and tintypes than for negatives. In other words, negatives require a weaker developer.
- Stop developing ambrotypes and tintypes before the shadow detail starts to appear. The highlights come up first, in just a second or two, then the midtones.
- If the developer does not cover an area, take your (gloved) fingers and help it along.
- Use the smallest amount of developer you can to get a good pour. This way the silver will stay on the plate and not drip off. You can use as little as 5ml for a plate slightly bigger than 4 × 5"
- For a negative, you can add a little bit of silver (one or two drops from the silver bath) and keep developing until the image gets stronger. You can repeat this process until you get an image you like. The plate can also be rinsed and then redeveloped if several drops of silver nitrate are added to the solution each time. The extra silver gets used up, or it comes off, so you add more and keep going until you're satisfied with your image.
- The plate continues to develop as you pour water on it. You need to make sure you quickly and smoothly keep pouring water on the plate so that you can stop the developer action at the point you choose.
- If you pour developer into the middle of the plate, it will push the silver right off, and you will not have an image in that spot.
- Less developer means less iron, which means a stronger and warmer image (coffee and cream color).
- Working in cold weather means that you have to adjust the developer. Adjust from the original recipe slowly by using less restrainer and more acid in the developer.



09.44 © John Faison. John made this tintype during a Maine Media Workshop class. It is part of a series of people screaming.

Remember to make small changes, take notes, and make a test. Once you have found a good recipe, write down the amounts and the temperature and humidity outside so that you can use it as a starting point next winter.

IF FERROUS SULFATE IS THE DEVELOPER, YOU CAN:

- Slow it down by adding a weak acid;
- Make it thicker by adding sugar;
- Make it faster by heating it with your breath while you are developing.

YOU CAN CONTROL CONTRAST:

- If your images are too contrasty, use tray developing. The silver floats off into the tray, causing the image to lose contrast.
- You can make new developer and mix it with filtered old developer. This will make your image more contrasty, because you are adding more silver.

- If the developer beads up, add more alcohol.
- In cold weather, you need more ferrous sulfate and less acid.
- In hot weather, you need less ferrous sulfate and more acid – or you can add water.
- All of this adding is done a little at a time: add a little, shoot a plate; change as needed.

FIXER

- Thiosulfate is best if you are planning to intensify the image.
- Cyanide is not good for negatives because it takes off too much silver.
- Put dark or ruby glass on the bottom of the tray so you can watch it clear.

WASH

- Wash for 15 minutes if using fix, five minutes if using cyanide.

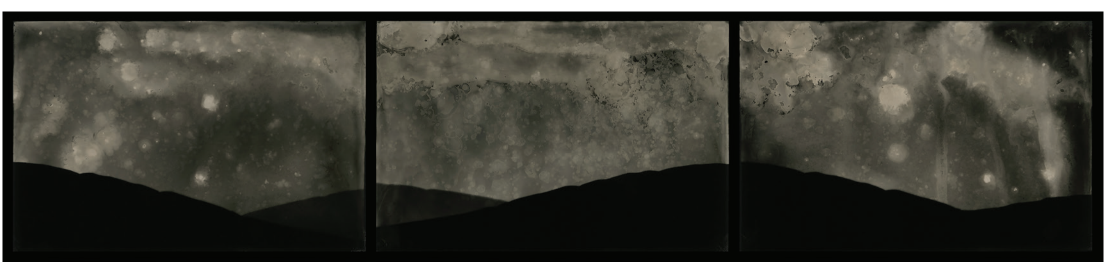
09.45 © Lindsey Beal. "The Venus Series: Figure #1." Lindsey created handmade paper sculptures and then made tintypes of her creations as a homage to the way the original Venus figurines were photographed when they were first discovered in the 1800s. She placed the figurines on top of a coated sheet of black aluminum and exposed them using an enlarger.

- If you wet your plate with distilled water after the wash, you will have a clean plate to varnish on. Otherwise, it might look like sandpaper on the surface due to minerals in the tap water. I get sand-papery looking plates in New York City from the tap water unless I rinse with distilled water. This has not been an issue in Maine.

VARNISH

- You do not have to mix varnish by shaking; you can let the gum, alcohol, and oil sit, and it will dissolve naturally.
- Gum can take several days to dissolve in the grain alcohol and lavender oil. Placing the jar by a window to be heated by the sun can speed things up.
- If the varnish is too strong and dissolves the image, add some water to the varnish, one drop at a time. Then filter it.
- The image will dissolve if the collodion is really old.
- Pour slowly – you can re-pour if necessary for a more even coat.
- If you are using an alcohol lamp to heat the plate before varnishing, make sure not to move it too close to the flame. The varnish can catch fire, or the plate might break. This is why I use an oil lamp instead of an alcohol lamp.
- Before varnishing, buffing the silver on ambrotypes and tintypes with a cotton ball makes the silver look brighter. You do not have to buff the entire image, but can selectively choose what you want to stand out. Be careful when doing this as you can scratch your image or rub off too much silver.
- If the plate is not really dry before you varnish, the image will fog over as it dries. This can happen in humid climates.

09.46 © Nadezda Nikolova-Kratzer and Kaden Kratzer. "Lacrimosa." This image consist of wet plate collodion photograms on black aluminum. The lyrical effects are achieved by manipulating exposure and development timing. The artists also spray chemistry on the wet emulsion to achieve artifacts and texture. The sprayed chemistry includes combinations of developer applied after exposure.



09.47 © Nadezda Nikolova-Kratzer. "Elemental Forms, Landscape no. 8." Courtesy of HackelBury Fine Art. Nadezda uses cut out paper to create camera-less silhouettes that walk the line between photography and painting. Using the wet plate collodion process, she experiments with the chemistry, exposure time, and processing to create artifacts suggestive of light fluctuations, atmospheric phenomena, meteorological events, conflagrations, etc., which she uses for emotional impact. The artist sprays, dabs, and brushes chemistry (e.g., developer, water, alcohol) on the emulsion after exposure to achieve certain desired effects.

A FEW OTHER THOUGHTS IN NO PARTICULAR CATEGORY

- Altitude and heat cause chemicals to act faster.
- "Oyster shell" stains, which look like swirls, are usually caused by dirt in the plate holder, and sometimes from the silver bath – dirt usually starts on the edges. Sometimes you can wipe stains off the plate with a wet cotton ball. Other times, stains will not budge.
- Albumen will prevent peeling. Follow the instructions for making albumen size, and either pour it over your glass as you would collodion, or use a Q-tip to coat a very thin amount all along the edges of the glass.
- If you just coat the edges with albumen, the density will be greater where the albumen is.
- If you added albumen to stop peeling and can't remember which side you put it on, breathe on the plate – albumen does not get a cloud.
- If you want to "bleach back" an image, you can make bleach by mixing equal parts potassium ferricyanide, fix, and water.

09.48 © Nora Nystuen. Nora has been shooting tintypes of her family and friends for the last few years. She has learned how to make mistakes work for her in her imagery. She threw the developer in the middle of the plate so that the sitter's head disappeared. Not intentional, but it works.

09.49 © Nora Nystuen. Nora's images always have a blue tint to them and lines from developing. It works very well with her mysterious images.

WHEN WORKING IN COLD WEATHER:

- You will need more ether in the collodion.
- You will have to sensitize for longer. Remember this is by eye, so there is not a rule here!
- You will need less restrainer and more acid in the developer.
- Getting a lot of blue on tintypes can happen in cold weather. If you are using glass, it would peel off. At first, we guessed there might be too much iron in the water. The next guess was that the pour of collodion was too thin. And then last we realized that the silver was too weak at 7% for fast clearing collodion and it should be at 9–10%. The other solutions: we waited about one to five minutes between collodion pour putting the plate into the silver and we then kept the plates in the silver longer even though it looked like the plate should come out of the silver, we timed it to between five and eight minutes.

- Coating the plate in honey or glycerin, and leaving it in a tray of water, will prevent the plate from drying. Fixing can be done at a later time.

EXPOSING A POSITIVE IMAGE WITH AN ENLARGER

- If you have old color slides or make a digital positive, you can expose it by enlarging it like you would a negative. You can make a contact print with an enlarger light.
- Exposures with a cold light enlarger can be from about 45 seconds to one minute. They will be about half the time using a condenser head enlarger.
- Close down a stop, because most lenses are sharper that way.
- The exposure is longer because enlarger light doesn't contain as much ultraviolet as natural light.

NEGATIVES VS. POSITIVES

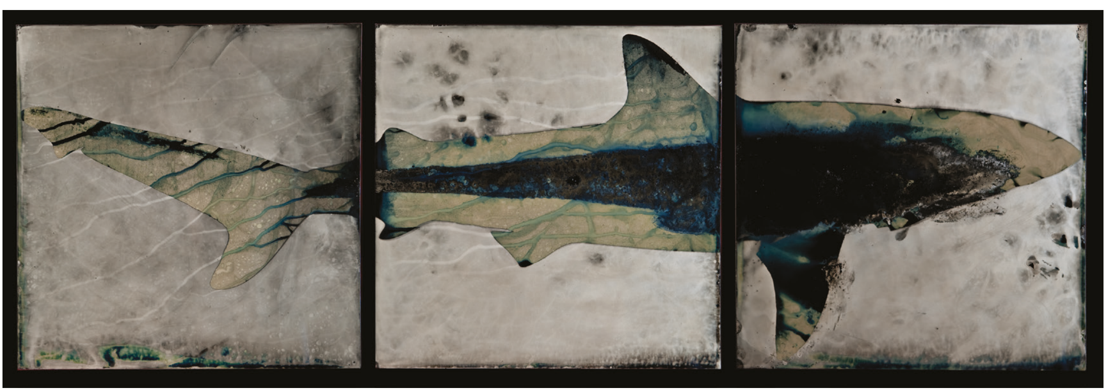
Students seem to get confused by the definition of negatives versus positives. So even though this information already appears in the text above, I think it's important enough to repeat here:

POSITIVES (AMBROTYPES)

- Collodion ambrotypes are just really thin negatives.
- Shorter exposures – short development (15 seconds) means stronger developer is needed.
- Positives are made on:
  - Ruby glass, black glass, regular glass or tin;
  - Some people are using plexiglass;
  - Milk glass – called an opaltype;
  - Orotone – toned and backed with gold (Edward Curtis did this).

NEGATIVES

- You print from negatives, so they need to be dense.
- Longer exposure means longer development to build the silver up; weaker developer means less iron and more acid.
- The exposure time for a negative has to be double that of a positive. Negatives also require a longer development time and some people re-develop.



09.50 © S. Gayle Stevens. "Shark." Tintype photogram. Gayle placed Sandy (the shark) directly onto the wet tintype and turned the overhead light bulb on for a two-second exposure. She then develops for 15 seconds and pours a very small amount of water on the plate and takes it outside to re-expose it for five seconds or more. This is all done by eye, and as she watches the plate change color, she then washes the tintypes thoroughly before fixing in a 1% KCN fix. She also watches the plates in the fix and will pull them when the color is what she wants. This color change generally takes place anywhere from one to five minutes, though she has left the plates in longer.

09.51 © Willie Osterman. "Chemo Toxic." Willie made this installation of images made while his wife was going through cancer treatments. He often photographed details of their lives, but never imagined this. At the same time he was learning the wet plate process. He says the images in this series reflect fear, hope, hard work, beauty, and transformation. Not only are his images beautiful to look at, but the combination of his installation allows the viewer to pass through and really take in the intense meaning behind the work.

FUN THINGS TO DO

As much as I would like, I cannot take the credit for these ideas:

- You can make a "faux" daguerreotype by using a front surface mirror.
- During an exposure, move aluminum foil around for ghost images, moving water or smoke effects.
- Put two Brownies together and expose them at the same time to create stereo tintypes.
- Paint signs backwards so the words will look correct on tintypes.

Ten

LIQUID EMULSION PRINTS AND DRY PLATE TINTYPES

10.1 © Jill Enfield. All of the images from Guatemala that I printed on this paper had brown spots. At first I thought it was the paper, but then I realized it was from using old emulsion that had fogged. I loved it! I now do it on purpose, turning the lights on and watching the image slowly change color until I get what I want and then quickly put it into the fix bath.

The commercial liquid emulsions available today are much the same as those used since the early beginnings of photography. According to Mark Osterman, the Process Historian at George Eastman House, the first experiments using gelatin-based silver halide emulsions were conducted as early as 1853 by Marc Gaudin. Gaudin was not successful, but his efforts piqued interest, kicking off other experiments using gelatin as a binder for light sensitive silver salts.

In 1873, Peter Mawdsley invented the first photographic paper with a gelatin emulsion. By 1885, colloid gelatin-based emulsions were being manufactured, and photography grew into the industry we have today.

In 1965 the Rockland Company made and manufactured one of the first "emulsions in a bottle" called Liquid Light. This liquid emulsion freed photographers from having to use manufactured paper and making their own gelatin emulsion. Liquid emulsion prints are made with silver-based sensitizers that are applied to a support. They are then exposed using an enlarger and processed with conventional chemicals. These are not prints in the traditional sense of the word because they have been made with liquid emulsion, instead of using pre-coated, factory-made photo paper as the support (as you would for traditional analog photo processes). With liquid emulsion, you can use an infinite range of papers and other surfaces, including canvas, china, concrete, glass, leather, various metals, paper, cloth, plastic, and wood, to create images. These varied surfaces become possible supports that can be developed in a standard black-and-white darkroom.

Since the 1960s a lot of liquid emulsions have come and gone, but you can still find several kinds in stores around the world. They can be a little tricky to use, but if you follow the directions in this chapter, you will be able to print on almost any material.

Liquid emulsion solutions are complete in one bottle; no additional chemicals are necessary to sensitize a support. The emulsion is solid at room temperature and must be warmed to become liquid. One pint of such material will cover approximately 16 square feet (which works out to approximately 24 prints if you're working in an 8 × 10" format).

Of course, you can learn how to make your own emulsion, and I recommend doing that if you love cooking or mixing chemistry. You can take classes or visit the websites listed in my Sources section to learn how to do this. In this book I've included only processes I have done myself, and mixing a liquid silver halide solution is one I have not yet tried. It's not for lack of desire, but for lack of time!

In general, if you are using watercolor paper, the liquid is applied to the surface and air dried or by using a cool hair dryer. A second application of the emulsion is applied to the paper and dried again. Then the paper is exposed with a normal black-and-white negative and enlarger, and processed using black-and-white paper developer and fix.

Some handmade papers need to be sized first, as does glass, plexiglass, and assorted other substrates; they may even need to be pre-coated with varnish or gelatin and hardener. Sizing recommendations will be made later in this chapter. Knowing when to size and what to size with takes some trial and error. For instance, I have found that if the paper has a high fiber content or if it is very soft, sizing with gelatin first will stop the sensitizer from soaking too deeply into the fibers of the paper. The only way to determine this is to do a test on a small piece of the paper you are using. If you have chosen another support, such as glass or wood, a sizing solution must be made and coated onto the surface before the emulsion can be applied and exposed. The base support is then developed and processed with standard black-and-white darkroom chemicals before being washed and dried. You

10.2 © Denise Ross. Denise makes her own emulsion so she can control her images and does not need to worry about her favorite products being discontinued. She makes her own film and paper. See Sources for her book on how to make your emulsions. Denise's website is in the sources under The Light Farm.

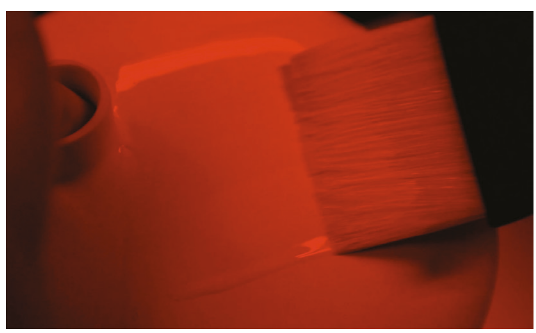
may need a deep tray or tank if you've applied the emulsion to an object. The finished prints can be hand colored or toned just like a photographic print on commercial paper. You can even apply the other processes in this book on top of them, or vice versa.

MATERIALS NEEDED

Many of the items required to make liquid emulsion prints are standard darkroom materials. Unlike other alternative processes, you can use an enlarger to expose your image onto your support. Therefore, you can use any size negatives that your enlarger will allow. Before you get started, make sure you have the following items on hand:

- Base support – paper, glass, etc.
- Black-and-white darkroom chemicals: developer, fix, perma wash (hypo clear). If you buy powdered chemicals instead of liquid chemicals, you will need brown bottles to store the solutions.
- Darkroom easel (the same type of easel used in an analog darkroom to hold paper under the enlarger)
- Darkroom thermometer
- Enlarger, lens, and timer
- Graduates for measuring your chemicals
- Hair dryer that has a cool setting and no internal light
- Hot plate big enough for the pot to sit on
- Painter's masking tape (blue tape), or drafting tape
- Paper safe, old photographic paper boxes or black light-tight bags
- Pencils
- Plastic cups
- Plastic spoons
- A pot big enough for the Pyrex cup to fit in
- A Pyrex measuring cup big enough for the bottle of emulsion to fit in
- Safelights – any amber or red safelight is fine, but they need to be dimmer than in a normal darkroom
- Trays for each chemical

10.3 © Pete Kolonia. After the emulsion has liquefied, which can take up to 45 minutes, pour carefully into a small container so no bubbles form.



10.4 © Shi Kai Tseng. Shi Kai had this photograph taken as he was brushing the emulsion onto his pot. You can also dip the pot into a bucket of emulsion, but that would use up more emulsion.

PREPARING YOUR BASE SUPPORT

Although most papers need no sizing, some handmade papers will not work unless they are sized in the same way as other porous materials. The only way to know for sure how a support is going to respond is to take a small sample of the material you want to use and try it out. The following is a starting point for most support materials.

- ***Most papers, cloth, unprimed canvas, and rubber*:** These materials generally do not require sizing. You can apply liquid emulsion directly onto these surfaces.
- ***Ceramics, stone, and wood*:** These materials should be sized in some way before the liquid emulsion is applied. Any oil-based (alkyd) primer can be used to add color to these materials and, at the same time, function as sizing. If you do not want color, then use two coats of spray gloss polyurethane (you can try the matte or semi-gloss versions, but these sometimes cause the liquid emulsion to flake). *Oil-based* polyurethane works better than water-based, so check the label.
- ***Glass, plexiglass, metal, and eggs*:** These materials should be washed using warm water and Bon Ami (a product similar to Ajax, but with no additives) to remove the protective wax or oily surface. You know these items are thoroughly clean when you see the water roll off in a sheet. You can also breathe on them; if your breath clears quickly, they are clean. They are then ready to be coated with a sizing solution. Bon Ami is *calcium carbonate*. Another name for calcium carbonate is *whiting*. You can also clean glass by mixing up a solution of half whiting (or Bon Ami) and half rubbing alcohol. Mix it well, and pour a small amount on the glass. Use a soft cloth such as flannel to buff the glass. Breathe on the glass to see if it is clean. When I was in Norway we could not find calcium carbonate, so we bought a box of regular blackboard chalk, crushed it, and mixed it with the alcohol and water – and it worked perfectly.
- ***Surfaces with water-based finishes*:** this is confusing … you are talking about water-based surfaces in the Preparing Your Support section … Liquid emulsion prints do not adhere well to water-based finishes, such as acrylic latex paints, or to lacquer, shellac, or liquid plastics. Primed canvas, which is often treated with water-based gesso, must be sized with oil-based (alkyd) primer before it is coated with liquid emulsion.

SIZING OPTIONS, MIXING AND HOW TO APPLY

- **Gloss polyurethane:** This works well on glass, mirrors, and almost any other material. Apply two thin coats and allow the emulsion to dry for 24 hours to make sure it is very hard and dry.

10.5 © Chris Patton. Chris comes up with his own recipes (and puts them on his website). He is called the Silver Ghost and is listed in Sources. He uses Monterey Bay seawater, gelatin, and silver nitrate to make his dry glass plate emulsions.

- **Gelatin:** You can get food-grade gelatin at most grocery stores (Knox unflavored), although photo-grade gelatin is preferable.
- ***Food-grade gelatin:*** Dissolve one package in one cup of boiling water. Cool the solution until lukewarm, and then pour or brush it over your cleaned surface. Three thin coats are better than one. Allow it to dry for 24 hours.
- ***Photo-grade gelatin:*** You can buy this online at most photo-chemical suppliers (listed in the Sources section).
- **Chrome alum:** This is a hardener that can be added to either food-grade or photo-grade gelatin for extra adhesion and durability.

First, mix the 2% chrome alum hardener to use with the gelatin

0.5 g chrome alum
25 ml distilled water

Mixing gelatin with hardener

75 ml hot distilled water
5g gelatin
20 ml 2% chrome alum solution*
100 ml distilled water

PREPARING THE LIQUID EMULSION

At room temperature, "liquid" emulsion is, in fact, a solid gel. It needs to be warmed up before it can be used. Otherwise it will be difficult to spread the emulsion on the support, and you will get a lot of air bubbles (that can cause the emulsion to flake off in the developer). As the emulsion cools and returns to a gelatinous state, it will get "lumpy" and be very difficult to spread. While there are a number of ways to liquefy emulsion, a few general rules apply to all of these methods. First, use containers and tools made only of plastic, rubber or glass; metals – such as steel or brass – may contaminate the emulsion.

10.6 © Ann Rosen. "Matt and Jude, Williamsburg." Ann works with liquid emulsion on 300lb rough, Arches watercolor paper. After she makes the 40 × 40" print, she then adds to it with oil pastel, charcoal, and pencils. She is inspired by gesture and location, and how they contribute to revealing family relationships. A history of the subjects' lives is recorded and written on the frames.

Second, ensure that both the temperature and the humidity in your darkroom are moderate in order to minimize drying time.

It is important to remember that liquid emulsion is just as light sensitive as the emulsion on store-bought photographic paper. Therefore, liquid emulsion cannot be opened in the light. You must be in the darkroom with the safelights on before opening the bottle to transfer the emulsion into smaller containers.

Liquid emulsion melts at 110°F, and it takes approximately 45 minutes to liquefy a full bottle. While your emulsion is warming, do not shake the bottle because bubbles may form. It is not necessary to melt the entire container at the same time. In fact, it is preferable to melt smaller quantities because repeated heating and cooling reduces the shelf life of the emulsion. You can liquefy small quantities of liquid emulsion in one of two ways.

Method 1: To liquefy small amounts of emulsion

Fill a large graduate with very hot water. Squeeze or spoon out the desired amount of emulsion into a small, light-tight container. Then place the container in the hot water. Black film canisters with press-on tops work well; they are both light-tight and watertight. These film canisters can hold about 30ml of emulsion. As the liquid emulsion warms up, the water will cool. Continue to replace the cool water with warm water until the emulsion reaches the desired consistency.

Method 2: To liquefy small amounts of emulsion

Place a pot filled with water on a hot plate. Put a Pyrex measuring cup in the water. This cup will act as a double boiler and protect the emulsion from overheating. Squeeze or spoon out the desired amount of liquid emulsion into a light-tight container. Place the container inside the Pyrex cup. Now add water to the Pyrex cup so the container holding the emulsion is sitting in water. Turn the hot plate on low so the emulsion heats up slowly and liquefies.

For both methods, I keep a darkroom thermometer in the water to make sure it doesn't get hotter than 110°F. The emulsion may fog at temperatures above 110°F.

10.7 © Tina Maas. For this series, Tina uses bought emulsion and enlarges onto wax. The wax is extremely fragile and beautiful. It tends to crack in unexpected ways with each image.

COATING YOUR BASE SUPPORT

GET YOUR DARKROOM READY

When working with liquid emulsion, you should illuminate your darkroom with a dark yellow, light amber, or red safelight. Your workspace should be slightly darker than a normal darkroom. As you're working, be aware of how long each piece of coated support is exposed to the safelight, especially if you are coating many pieces of support and/or are applying more than one coat.

Most store-bought photographic papers start to show signs of fogging after seven to ten minutes under a safelight. With the liquid emulsion process, the emulsion will be exposed to the safelight for much longer than seven minutes (between coating, drying, exposing, and developing), so fogging can easily occur. If you notice gray edges around your prints after developing, make your darkroom darker.

10.8 © Jill Enfield. I wanted a more free-flowing brush stroke with the paper texture showing through to go with the pants on my model. In order to achieve this, I did one light coating of emulsion on 300lb (heavy) cold-press paper.

METHODS FOR COATING THE SUPPORT

You can use anything you are comfortable with to apply the liquid emulsion to the support. Bristle brushes, sponge brushes, paint rollers, and spray guns all work. You can also simply pour the emulsion directly onto the support and drain off the excess. Like so many things in photography, this is a matter of personal choice. Each application process will yield a different result.

Brush method

If you decide to use a brush, you will need to transfer the liquefied emulsion into a graduate with an opening that is wide enough for your brush. This graduate needs to be able to float in hot water to keep your emulsion in a liquid state as you work.

1. Slowly pour the liquefied emulsion into the graduate. If you have ever tried to pour beer into a glass without causing excessive foam, you have the technique down! The idea is to pour the emulsion slowly and gently down the side of the graduate so that air bubbles and foam do not form.
2. Float the graduate of emulsion in a larger graduate filled with hot water. This method keeps the emulsion liquefied during the coating session. You might have to change the water several times to make sure it stays hot. Remember to keep the water temperature below 110˚F, or the emulsion will fog.
3. If I am coating a lot of supports, I keep two things on hand – a third graduate filled with hot tap water and one or two additional brushes. I use this third graduate to keep my brushes warm. This way the emulsion doesn't harden and scratch my support. As I put one brush into the hot water, I take the other one out. This method works well for me. However, make sure to squeeze out excess water before you dip your warmed brush back into the emulsion. For an even coating, brush the emulsion onto your support – first horizontally and then vertically. It's a very good idea to experiment with how you apply your emulsion since it plays an important role in the outcome of your image. How the emulsion is applied is just as important as your choice of support materials. Depending on the look you want, you may find that one coat does the trick. Other times you may find you want to apply multiple coats of emulsion to the support. As with paint, a thin coat will show streaks and brush strokes, an effect some people like. If you want a smooth, unified look, two thin coats are better than one thick coat. Apply the second coat after the first has become slightly dry and tacky.

Spray method

Liquid emulsion can also be sprayed onto the support with a small spray gun, provided the nozzle has no metal parts. Make sure you wear gloves, a mask, and goggles to protect yourself, and that the room is well ventilated. If the liquefied emulsion is too viscous for your spray gun, dilute it with a small amount of isopropyl rubbing alcohol. Be aware that this method takes practice. The distance at which you need to hold the spray gun from the support depends on how even a coating you want. To illustrate, begin with a large piece of metal. Place it at an angle against a wall (covered with newspaper for protection). Spray the metal by moving across its surface from left to right, moving down gradually until

10.9 © Jill Enfield. These tiles were made using liquid emulsion and chalks to add color. They have been varnished and embedded in the walls at the Friends School in Manhattan.

the entire area is covered. Every few minutes, stop spraying and look at the support from several angles. This allows you to see what the coating looks like and helps you decide how much more spraying is needed. Because spraying takes a while, especially if you are using a large support, a hair dryer is another good tool to have on hand. If you keep it on a slow, warm setting (a hot setting can burn the emulsion), you can keep the support warm, which in turn will keep the emulsion liquid as you work.

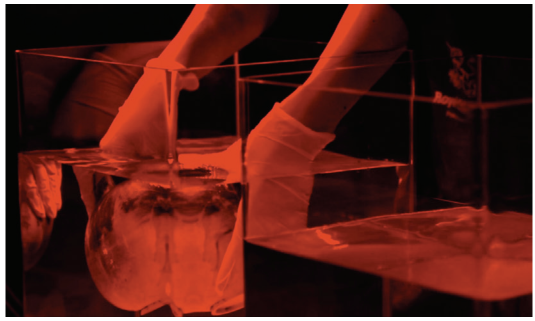
Pour method

Pouring liquefied emulsion over glass or any other large support is another popular method. As with the spray method, keeping the support warm plays an important role in producing an even coat. There are several variations to this method.

The first variation involves placing the support at an angle against a wall, with the base of the support in a tray. The tray serves as a basin to catch the unused emulsion, giving you the option of using it again. Keep the support warm by using a hair dryer on a low, warm setting. Then pour a liberal amount of emulsion slowly on the top part of the support. You can let the support sit until the extra emulsion has drained off into the tray; or you can turn the support so the emulsion drains from all corners.

The second variation involves using a tray that is slightly smaller than the support and filling it with hot water. Place the support on top of the water-filled tray, resting on its edges. Then let the support sit for a few minutes so that the hot water can warm the support. Pour a liberal amount of emulsion over the support; then lift and rotate it so that the extra emulsion drips off into a container (so it can be reused).

The third variation involves pouring the emulsion over the support and using a paint roller to move the emulsion across it. Instead



10.10 © Shi Kai Tseng. Shi has made these tanks so he can dunk his pottery in the tanks to get an even development. He used clear plexiglass so that he can see all sides of his pieces as he puts them in chemicals.

10.11 © Shi Kai Tseng. Shi puts emulsion on his ceramic pieces. Because silver cannot be fired, they are used as decorative objects.

of creating a smooth coating, the paint roller gives the emulsion some texture.

A fourth variation is similar to how you coat glass or tin when working with wet plate collodion. Pour a large amount of emulsion in the center of your non-porous support (not paper). Continuously tilt the support in all directions until the emulsion covers the entire support. Let the run-off drip into a container for reuse.

DRYING YOUR BASE SUPPORT

As mentioned earlier, most supports that have been coated with silver-based liquid emulsion start to show signs of fogging after being exposed to a safelight for as little as seven minutes. Therefore, it is best to keep your supports in total darkness throughout the drying process. Chilling the coated support will speed the setting-up time, while warming will retard it. For faster drying, use a fan or a hair dryer (set on "cool") after the emulsion has set up or become tacky.

While each company recommends a different drying requirement for their emulsion, I have had the best results when I have allowed my support to dry for 24 hours. The contrast is better, and I have had fewer problems with emulsion lifting off the support. While this may not always be possible, just be aware of the potential problems that may result from too little drying time.

The companies that manufacture liquid emulsion products also say that once coated and dried, base supports can be stored like ordinary black-and-white paper. I have found this to be not entirely true because older supports don't produce as much image contrast. Therefore, I recommend using the support within a week of coating. In any event, your supports must be stored in total darkness to prevent fogging. You can purchase a paper safe in many sizes. If your supports are too large or unwieldy to fit in a paper safe, you can enclose them in a few layers of industrial-strength black garbage bags.

EXPOSING YOUR BASE SUPPORT

Depending on the characteristics of the base support, you can expose the image either with an enlarger or by contact printing. Paper can be exposed using either method. With an enlarger, you can use an easel just as you would for normal black-and-white printing. The only tricky thing I have discovered with coated paper is that it tends to curl while the liquid emulsion is drying. This isn't worth fretting over, as it doesn't seem to affect the end product much. But a four bladed easel helps keep the paper flat during exposure.

When focusing the enlarger, do so on a piece of non-coated support. Focusing should always be done on the same type of material you are using to print. This also applies to papers because they are not always the same thickness and might require a different focus. If you're not using an enlarging easel, mark the desired position of the support, using blue painter's masking tape before you place your coated support under the enlarger. Exposing liquid emulsion is the same as exposing a piece of black-and-white photographic paper. The best way to start is with a test strip. Remember to use a support for the test strip that is identical to the support you are using for the final image. As I've already said, each material will respond differently to the emulsion.

The exposure time required is based on three factors; the kind of base support, the exposure method, and the type of liquid emulsion you are using. While experimentation is the key, there are a few general guidelines worth noting. For example, glass and other translucent supports need double the exposure time of opaque supports. If you are exposing rounded objects such as eggs or rocks, you should stop down the enlarger lens

10.12 © Kathleen Donohoe. Kathleen stressed her brush strokes when making this Black Magic liquid emulsion print. She uses Kitakata paper which is mainly used in printmaking, bookbinding and restoration.

10.13 © Kathleen Donohoe. This print was made in a similar way to 10.12, but notice the difference in brush strokes. They are not as pronounced so that the texture of the birds shows through. Kitakata paper is a translucent paper which has a naturally warm tone.

to f/16 or f/22 so the image will be in focus at different object distances.

INCREASING THE CONTRAST OF YOUR IMAGE

One of the advantages of working with liquid emulsion is that you can use a regular darkroom enlarger to project any size negative onto your support. Most of the companies that sell liquid emulsions have more than one product. For instance, there is one emulsion that has a single contrast level, and another that can be used with multi-contrast black-and-white printing filters. Filters of 1.5 and below decrease contrast, while filters of 2.5 and above increase contrast. Make sure you check the filter instructions for the liquid emulsion you are using.

In lieu of using filters, Rockland suggests adding a small, precisely measured amount of paper developer to the emulsion after you have liquefied it and before you have applied it to the support. The more developer you add, the more contrast your resulting image will have. I have found that you can do this with any of the liquid emulsions, not just Liquid Light. This slight adjustment provides maximum speed and contrast. But you need to be very careful with this method because if you add too much developer, the emulsion will fog. This will be immediately apparent because the emulsion will turn gray in the graduate. The emulsion needs to be used immediately after the developer has been added because the mixture has a shortened shelf life. If you wait too long to use the emulsion, your end product will look flat. Rather than having more contrast, it will be fogged.

Materials needed

29 ml black-and-white paper developer
227 ml single-contrast liquid emulsion in a small graduate
57 ml distilled water

To mix

1. Mix the developer with the distilled water to make the working solution.
2. Pour the liquid emulsion into a second small graduate.
3. Add 14ml of the working solution to the liquid emulsion.

10.14 © Ashley Czajkowski. This image is a detail of a larger piece made on fabric. Ashley coats the fabric with liquid emulsion and then places the found bird bodies on top. She exposes them in the sun for about an hour. They are then fixed and dried, so they are essentially lumen prints on hand applied emulsion.

4. Mix the solution well but slowly, being careful not to generate any air bubbles.

Within 24 hours, apply this mixture to the support. Throw away any unused mixture. Dry and expose the support as usual.

DEVELOPING YOUR PRINT

The process of developing a liquid emulsion print is similar to developing normal black-and-white paper. However, liquid emulsion prints are much more fragile than those printed on machine-made photographic paper, so extra care must be taken to ensure a successful end product. For instance, emulsion can scratch easily. While you can use any paper developer you like, you should not process liquid emulsion prints at the same time as conventional black-and-white papers. Make sure to use different trays, or you will have problems. Because emulsion is very fragile, pieces of emulsion can come off in the developer and stick to conventional black-and-white papers, ruining the prints. Temperature is also an important variable. It is important to let the liquid emulsion "set up" and harden onto the support. If your darkroom is hot or your chemicals are above 70°F, the emulsion can melt off the support in the tray. During the summer, I freeze water in film containers and drop them in my chemicals to keep them cool.

Presoaking is recommended for all liquid emulsion supports. However, this step is especially important for large supports that require the developer to be applied to only one portion of the support at a time. Wetting the emulsion with cool water prior to development will even out the action of the developer. If you have chosen to print your image on paper (or another flat surface), you can develop it like a normal analog print in a tray.

Keep all chemicals between 65° and 70°F. The chemical setup should be as follows:

- Prewash
- Developer
- Fixer
- Fixer
- Wash
- Perma wash (hypo clear)
- Final wash

If you have limited space in your darkroom, set up a "hold" tray with cool water that will serve as the first wash. When you are done printing for the day, set up the perma wash and final wash. This way you can get away with having fewer trays in use at one time.

Now comes the questionable part: every company recommends something different after the developer. Did you notice that I did not list stop bath? Stop bath is an acid and can etch through the soft emulsion if you are not careful. So why take the chance? I use a fix bath as a quick stop (30 seconds to one minute), which neutralizes the developer. This fixer will exhaust quickly, so I change it often. I use Hypo Check every two or three prints to see when the fixer is exhausted.

Next I use another fix tray and agitate it gently for ten minutes (if I'm using powdered fixer) or six minutes (if I'm using liquid, rapid fixer). The long fixing time is to limit the brown staining you can get if the emulsion has been thickly coated on the support. The chalky white pigment disappears as the image is properly fixed, leaving the highlights completely transparent. Then I turn on the lights to check my work.

Manufacturers sometimes recommend different fixers because if the fixer is too strong, it can do one of two things – etch the emulsion in the same way as a stop bath, or bleach the emulsion quickly. I have used hardening and non-hardening fix, rapid and powdered fix, and have not had problems with any of them. Fixing requires extra time, as does washing. Think about how much thicker

10.15 and 10.16 © Tom LeGoff. "Bottles, 2016." Agfa liquid emulsion was poured into the bottle and rolled around so that the bottle is covered as much as possible. Tom taped a digital negative to the outside of the bottle and then exposed the bottles under an enlarger. The image is not super sharp, but that is what Tom was going for. He poured the developer, stop, and fix one at a time, into the bottles. He said the success rate is low but when it works it is thrilling.

hand-applied emulsion is than machine-made paper. I suggest a ten-minute fix time, and at least an hour of wash time, even if you use perm -wash or hypo clear. Frequent agitation in all steps is also important.

If you are using larger materials as a support, there are several ways to develop the image. All require you to wear gloves, goggles, and a mask for protection against splashes and fumes. One method is not to use trays, but to place the object directly into the sink (if it is big enough) and gently pour the chemicals over it. Make sure to flush the sink well with water between chemicals. Another method is to stand the support up against a wall with the bottom resting in a tray. A spray bottle can be used for each chemical. Spray the image making sure to wash the tray for an extended period of time with another spray bottle or with a hose between chemical

10.17 © Robert Cone. Robert has now taken over Rockloid from his dad and is still making and distributing wonderful products. This liquid light emulsion was put onto a very thick paper, which had a good wet strength.

applications. A third method is to use a soft sponge or paper towel to repeatedly soak the support with each chemical. Use care as you touch the surface to prevent scratches.

Times will vary with these types of processing methods because they all involve a fair amount of guesswork and intuition. But these reminders are universal – make sure your image area has been covered as evenly as possible with developer, and make sure the fixer has cleared the highlights before you turn the lights on to check your work.

FINISHING YOUR SURFACE

Drying time depends on the type of support and air conditions in the room where the supports are drying. I would leave supports for at least 24 hours, and only then check for moisture by touching the edges. The color and texture of the base support will show through a liquid emulsion print. If you want additional or another color, the print can be toned with conventional toners, painted with artist's oil or acrylic paint, or any other artist's medium you would like to try. Most base supports will not require a protective coat. However, if your support is likely to encounter extremes of moisture, temperature, or abrasion, you may want to protect the surface. Any type of wax, varnish, lacquer, or acrylic can be used, including non-yellowing polyurethane. To dull the glossy surface of a varnished image, make sure the support is dry, and then apply a matte polyurethane spray.

It is also possible to remove a liquid emulsion image from its base support. Liquid emulsion prints that have not been hardened with fixer can be easily removed from their support with hot water. Prints that have been hardened with fixer can be dissolved with bleaching solutions such as Clorox diluted 1:1with tap water.

TROUBLESHOOTING

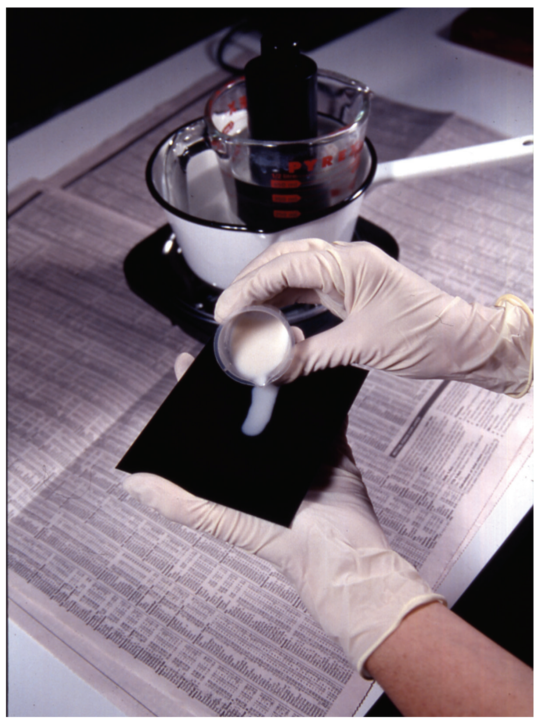
A lot of little things can go wrong with the liquid emulsion process, including problems while heating the emulsion, coating the support, or developing the image. Remember that not all problems are disastrous, and sometimes you can make "surprises" work to your advantage. Below I mention a few common problems. If more than one dilemma arises, remember to be patient. By working your way through various problems, you may even make lemonade from something you initially considered a lemon.

- **Emulsion turns gray during or after coating:**

  The coated paper was too close to a safelight and was fogged.

  You opened the bottle in daylight and fogged the contents.

  You waited too long to print after coating.



10.18 © Pete Kolonia. When making the dry plate tintypes, it is much easier to pour the liquid on top of the plate, but it is very messy and you should cover your worktop or work over a tray.

You added too much developer to the liquid emulsion.

You heated the emulsion for too long, or in water that was too hot.

- **Emulsion bubbles or peels during processing or washing:**

  Incorrect surface preparation caused poor adhesion.

  You used a stop bath or water wash before a hardening fixer.

  There was no hardener in the fixer.

  Fixing time was inadequate.

  Agitation was inadequate.

  The emulsion was applied too thickly.

- **Emulsion melts during processing or washing:**

  If the chemicals are too warm, the surface of the emulsion can smudge to the touch. This can happen at any stage along the way. In other words, every tray, not just the developer, should be kept at a cool temperature (between 65 – 70°F).

- **No image or weak image:**

  There was insufficient exposure, or you didn't leave it in the developer long enough.

- **Blacks not deep enough or streaked:**

  The emulsion was coated too thinly (two thin coats are better than one).

- **Spots or blotches of brown, yellow, or purple:**

  The fixing time was insufficient.

  Weak or stale fixer was used.

  Not enough agitation in the fix.

- **White or silvery spots throughout image:**

  You shook the bottle of emulsion and created lots of bubbles, which register as pinholes in a print. To prevent this, you can add a little Photo-Flo to the emulsion, or even a little heavy cream, which will help break down the air bubbles. If you add these ingredients to the emulsion, you cannot put the emulsion back into the container because it will not keep.

  Take a pin, dip it into the emulsion, and pop the bubbles with it. You have to dip the pin into the emulsion after every bubble. If you simply pop the bubbles with a bare pin, it will create a hole in your image.

10.19 © Eliot Dudik and Michael Draeger. Eliot and Michael worked on this piece together as part of an "Exquisite Corpse" fundraiser for the Maine Media Workshops. They used liquid emulsion on rawhide and exposed it as you would on paper. They then strung it on a board before it dried so that it would dry stretched on the board.

- **Uneven developing:**

  Try presoaking in cool water to soften the emulsion.

  Make sure you agitate the tray for each chemical process to insure even developing and fixing.

- **Other issues that may arise:**

  If the image fades over time, you may not have washed it sufficiently.

  If the print is out of focus, you may not have compensated for the thickness of the support. Each support has a different thickness. Don't forget to focus on the same type of surface that you will be printing on. If your support is a three-dimensional piece, make sure to keep your enlarging lens closed down to f/16 or f/22 for added sharpness.

The emulsion may harden too fast when coating glass or metal because these surfaces tend to stay cold. You can warm them up by using a hot hair dryer. I also use a heating pad, covered with paper, to protect the heating pad while warming and coating the glass or metal.

GELATIN DRY PLATE: GLASS AND TINTYPES

After wet plate came "dry plate" tintypes. They replaced collodion with gelatin for a safer, more convenient process. As with wet plate tintypes, dry plate tintypes are unique positive images on metal plates. According to Beaumont Newhall's *The History of Photography*, Hamilton Smith invented tintypes in the mid-1800s. You will find this fact challenged by different historians and photographers. But what is important is that at some point in the late 1870s the dry plate process was introduced, making the tintype popular and available to the general public. Street photographers used the dry plate process because tin plates were less expensive and easier to work with than the glass plate processes. Because each plate was reversed to create a one-off positive image, photographers used cameras equipped with multiple lenses to make small copies for the sitter, or to give as calling cards. Until the 1930s, photographers could buy coated dry plates by the box, made by up to 14 different companies. It's worth noting that most of the tintypes you see at flea markets or in museums were made with the wet plate collodion process, not the dry plate process.

The Lumière brothers, Auguste (1862–1954) and Louis (1864–1948), were first known for making the "blue label plates" (on glass) as they were called. From the 1880s to the early 1900s, the Lumière Dry Plates were sold in boxes and it was said that the company made over 15 million a year. This allowed the brothers ample time to work on discoveries that came later, such as the autochrome (color film) and the creation of movie pictures from still photographs. You can see their early movies on YouTube.

Because there has been renewed interest in making tintypes, I have included it in this chapter. As of 2017, ready made dry plates are back in production by at least one person, Jason Lane's company called ***Pictoriographica***. He is selling them through several camera stores and websites as well as his own website, www.pictoriographica.com. At the time of this printing, Jason has glass dry plates available and is working on getting tintypes distributed as well. The instructions come when you buy the plates, and are very simple to follow and use. Students get very excited when a new box of paper or glass arrives, but remember to open the box in safelight only!

METERING FOR BOTH LANE'S DRY PLATES AND THE DRY PLATE KITS THAT ARE EXPLAINED BELOW:

This metering method can also be used for wet plate. In the past few years a new company, www.lightmeasure.com, has developed a UV light meter. It is a little expensive, but for those that want to take the guess work out of exposing, they might find this very useful.

The ISO for Lane's plates, the kit plates, as well as wet plate collodion, is about ISO 1 or 2. UV levels vary over the course of the year, where you are located, and the air quality. Some people place a blue filter over their meters to help mimic the UV meter a bit more closely than a normal light meter. If you don't have a separate light meter, you can even do this with a smart phone meter app.

Lane suggests metering off of your main subject. On a perfectly exposed dry plate, the sky will be overexposed and the vegetation will look dark in the same way as a wet plate will respond to light. Plan to overexpose a clear sky by about two stops and an overcast sky by one stop. However, this is a starting point. Remember all the variables that come into play as well as the color renditions. The examples of color renditions on p. 167 in Chapter 9 are the same with dry plate emulsions.

Lane's dry glass plates can be developed in HC-110 (dilution B) developer, or most other film developers, which will make your life easier than the tintype developer. You develop in normal safelight conditions and follow the instructions on the box for approximate developing times. You can develop a little shorter or longer as needed. The important part of developing dry plates, as with any film, is to be consistent with the temperature of both your darkroom and your chemicals.

The dry plate tintype process is also available in a kit. One of these kits is distributed by the Rockland Company as AG Plus. You

10.20 © Alison Carey. Alison makes these creatures out of clay after she researches different periods of the Paleozoic era and what extinct vertebrates and invertebrates might have looked like.

10.21 © Alison Carey. Alison uses liquid emulsion on black glass to make dry plate ambrotypes. The organic nature of the emulsion on glass adds to the serendipitous appearance of bubbles, streaks, and obliterated areas of these watery scenes from the past.

can use any liquid emulsion and developer to make tintypes. However, emulsions with less silver than the AG Plus in their formulas will need a longer exposure time.

You can make tintypes by exposing a coated metal sheet directly in your camera, or by placing a transparent positive (either black-and-white or color) on top of the metal sheet to make a contact print. You can also enlarge a positive. Colors reproduce differently on metal than they do with normal black-and-white film: reds appear black, and blues appear slightly yellowish brown.

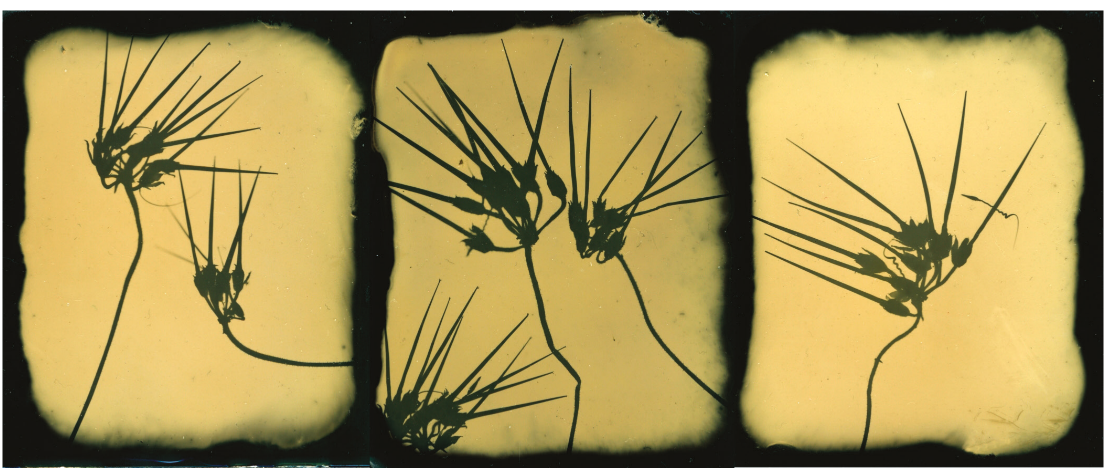
THE PROCESS

The tintype kit: The tintype process is similar to liquid emulsion in that it comes complete in one bottle. No additional chemicals are necessary. The emulsion is solid at room temperature and needs to be liquefied in hot water before being gently poured on a metal plate. Tintypes can be exposed in camera or by using an enlarger. The kit comes with its own developer, which is a positive reversal developer that allows you to obtain the positive image. However, I have included a recipe for making your own developer because it is easy to make and the developer goes bad very quickly, so a lot is needed. Regular fixer with hardener can be used to fix the plates.

You do not have to varnish dry plates to keep them from darkening, but a coat of varnish will protect your plate from scratches.

MATERIALS NEEDED

- A tintype kit, which comes with the emulsion, developer and fixer. Depending on the kit you purchase, you can get plates already prepared and ready to be coated. Alternately you can buy the emulsion and developer separately, and then obtain your own plates.
- A piece of plate glass for contact printing (instead of a contact printing frame)
- An enlarger, lens and timer
- Black *flat* spray enamel paint
- Darkroom thermometer
- Gloves
- Hair dryer with a cool setting
- Heat-resistant glass jar (Pyrex works) for inside of the pot
- Hot plate (not necessary but helpful)
- Light-tight box for metal sheets



10.22 © Martha Casanave. The wonderful colors people get from this process come from the way they are flowed on the plate. The bluish color is where the emulsion was thinner.

- Metal cut to size – you can buy litho plates used for offset printing from most art-supply stores (approximately $25 for a 20 × 24" sheet) (see Sources)
- Newspaper
- Pencil
- Pot for the top of the hot plate
- Shears to cut metal to the desired size.
- Sink set up for developing
- Three graduates – one to hold hot water; one to hold the emulsion; one to hold the brushes as you work

10.23 © Jill Enfield. This tintype was exposed in a Holga for 15 seconds on a cloudy day.

The Kit

To liquefy the emulsion: This process is identical to liquefying Liquid Emulsion for prints

The tintype emulsion is a solid gel at room temperature. Before use, put the bottle of emulsion into a container of hot water until it becomes liquid. Emulsion liquefies at about 110°F, and the process takes approximately 45 minutes. You can do this several ways:

- Have a container filled with very hot water, and float the bottle of liquid emulsion in the water. Make sure to check the water, changing it as it cools.
- On a hot plate, heat up a pot filled with water. Place another container (glass is best) also filled with water inside the pot. Water in the pot will heat faster than water in the container, which is why I like this "double boiler" system. Make sure you do not let the water heat to over 110°F, or it will fog the emulsion.

Do not shake the bottle of emulsion because shaking may create bubbles. Make sure to use containers and tools made only of plastic, rubber, or glass. Other metals, such as plain steel or brass, may contaminate the emulsion.

The developer

If you bought the AG Plus small kit, the developer comes in a bottle and you use it undiluted. It goes bad very quickly, so I suggest you buy extra developer, or make your own developer from the recipes below.

If you have bought a gallon package of developer, mix it according to the instructions. If the developer goes bad before you are finished with it, you can add a little Dektol to the bottle and mix well. It will work!

To make your own reversal developer (for one gallon)

1. Mix together and set aside:
   145 g Dektol (or your developer of choice)
   3 quarts warm distilled water
   298 g sodium sulfate, anhydrous (I had to buy this online – no one really uses it anymore and it might be hard to find)
2. To make a 50% solution of ammonium thiosulfate and ammonium thiocyanate, combine in a different container:
   62.5 g ammonium thiosulfate
   62.5 g ammonium thiocyanate
   150 ml distilled water

Then slowly add:
25 g sodium carbonate

3. Mix solutions 1 and 2 together, adding water to equal one gallon.

Another developer recipe

Steve Anchell's book, *The Darkroom Cookbook*, has a reversal developer called Formula 200:

500 ml distilled water at 125°F
2 g Metol
90 g sodium sulfite, anhydrous
8 g hydroquinone
52.5 g sodium carbonate
5 g potassium bromide
3 ml sodium thiocyanate (liquid) 51%

Add water to make a liter.

Varnish

Varnish is not included in the kit. You can use any kind of varnish. This recipe is used for wet plate, but works well for dry plate too:

Materials needed

57 g gum sandarac
414 ml 190-proof grain alcohol
44 ml oil of lavender
funnel
coffee filters

two glass bottles (one for mixing and one for storing varnish)

MIXING THE VARNISH

Place all the materials in a glass container and let them sit until the gum melts. Bugs and bark will settle at the bottom. You will need to filter the varnish through a coffee filter and funnel at least three times before it will be clean enough to use.

SURFACE PREPARATION

If you purchased commercial plates, they come prepared and ready to go.

However, you can also buy any kind of thin metal and cut your plates to size when making tintypes. As stated above, you can buy litho plates from most art-supply stores. When your plates are the desired size, spray the *dull* side with black *flat* enamel spray paint. Make sure the paint is dry before proceeding. I suggest buying ready made plates either buying extra

10.24 © Tina Maas. Tina painted this teapot and it took some time for the image to come out correctly. Luckily, she could take off the bad image and re-coat with AG-Plus and try again.

10.25 © Mary Dorsey Wanless. "Epiphany." Mary Dorsey uses her enlarger as the light source for her images. Most of the tintypes are about aging and are very moving.

from Rockloid or from the same sources for wet plate tintypes. Buying and painting your own plates may cause other problems. These are listed in the Troubleshooting section.

SAFELIGHT

Use an amber or red safelight slightly dimmer than in a normal darkroom. Keep in mind how long the material is exposed to the safelight, especially if you are coating many pieces of support. It is best to have *total darkness* during the drying time.

COATING YOUR SUPPORT

Not to scare you, but this can be difficult and takes practice to do correctly. I suggest trying it first with a "fake" emulsion that you can make up by mixing milk with a little flour to get the proper consistency. The mixture should be thinner than a paste, but not a runny liquid. By practicing with "fake" emulsion, you don't waste chemistry.

You should wear gloves because sometimes it is easier to use your fingers to help the emulsion coat thinly and evenly at each corner. The pour is similar to wet plate collodion, so if you can coat a plate with collodion, you can do this!

AFTER THE EMULSION IS LIQUEFIED:

1. Warm your plates using a heating pad or a warm hair dryer.
2. Pour a generous amount of emulsion into the center of the metal plate.
3. Working quickly, tilt the plate so the emulsion runs to one side. Then tilt the plate in the opposite direction until it coats the other side. Continue tilting until the plate is evenly coated. With wet plate, you cannot go back and forth over the coated area, but with dry plate you can keep moving the emulsion around until you have a good, even coat.
4. Some people use their fingers to help the emulsion along. You must practice and determine which method works best for you.
5. In either case, let the excess emulsion run back into the bottle from one corner. This will ensure a thin, even coat without wasting chemistry.

When properly coated, plates will appear off-white to light gray when they are dry.

DRYING THE PLATE

There are several ways to dry the plates. In each instance, make sure you store the plates carefully in a light-tight box (I use a paper safe). In order to avoid scratches, I put wax paper in between the plates or I do not stack them.

It is better not to dry the plates flat because the emulsion can "pool" in the center, giving you an uneven coating. I use a cool pack covered with newspaper, placing the coated pieces on top to quickly cool the emulsion down. Then:

Method 1

1. Place a piece of folded-over tape on the back of the plate so it will not flip off your surface as it dries.
2. Allow the plate to air-dry, or use a hair dryer with a cool setting.
3. Be careful if you are using a hair dryer. Emulsion is prone to collecting dust, and hairs, which will compromise the surface.

Method 2

1. First, place the plate onto a cool pack to help cool it down faster.
2. Then place the plate vertically, and leave it to dry. This allows most of the emulsion to evenly coat the plate; however, sometimes there will be a heavier coating on the bottom of the plate if you have placed it upright too soon after coating.

10.26 © Tina Maas. If the coating on the tintype is not perfectly even then you get different colors, which makes for a more interesting image most of the time.

EXPOSING A TINTYPE

You can expose a tintype using a variety of light sources. But it is always best to make a test print. This will also save you time and money. If you are contact printing, use a piece of plate glass to ensure good contact. Dry plate tintypes are equal to about ISO 1 or 2.

Using your camera to make one-of-a-kind tintypes

In the darkroom, using a safelight:

1. Put the plate in the camera with the emulsion-coated side toward the lens.
2. Check to make sure the plate is sitting firmly on the film plane of the camera.
3. Close the camera carefully, making sure not to damage the plate.
4. Take the camera outside and expose using these starting points:
   - Bright sun on subject: f/16 at half-second
   - Cloudy/bright: f/8 at half-second
   - Open shade: f/5.6 at half-second

If you are using a pinhole camera, the exposures will be much longer. Start at half an hour. The time will depend on how large the pinhole aperture is and the quality of light (how bright it is).

If you are shooting inside, the exposure will depend on your light source.

Using an enlarger as your light source

Contact printing: Start with the enlarger lens as wide-open as your lens goes (remember, that means the smaller numbers), with five-second intervals. Some slides may take up to five minutes. You can use almost any

10.27, 10.28 and 10.29 © Antonio Martinez. Antonio first used Luminos liquid emulsion, but when they stopped distributing the emulsion he switched to AG-Plus from Rockloid. He would spend his evenings coating about 200 plates at a time so that he could spend the next few nights printing as much as possible. Taking color slides during a performance would have cost too much, so he used a combination of positives from enlarged 35mm to ortho-lith film. Antonio made a stop action movie by putting all of these images together to make a stunning 6-minute video called "Near the Egress," which can be seen online.

positive: a "paper positive," color, or black-and-white film transparency. In all cases, the emulsion sides should be facing each other; emulsion to emulsion.

Projecting the transparency using an enlarger: Remember that the image is farther away than if you are contact printing it, so start with the lens wide open and expose in ten-second intervals. Color takes twice as long as black and white to expose.

DEVELOPING

The temperature of all of the chemicals should be between 65–70°F. At this temperature, the emulsion will not melt and float off the support.

- *Develop*: Place the tintype face-up in a tray for two minutes with frequent agitation. Portions of the plate might turn gray during development. Your image may look like it is disappearing, but it will come back!
- *Stop*: Do not use a photographic stop bath solution after developing. Instead, rinse in cool water for a few seconds before putting your plate into the fix.
- *Fix*: Use hardening fixer bath (Kodak's powder fix works well), not rapid fix, for two to three minutes with occasional agitation. The fix should harden the emulsion so it becomes tough and leathery to the touch.
- *Wash*: Rinse in running cool water for ten minutes, and dry face-up or on a vertical drying rack.

VARNISHING THE PLATE

As mentioned above, varnishing has to be done when the plate is completely dry. The entire plate must be coated as quickly as possible, otherwise you will create lines or streaks through the image. Coating is done

10.30 and 10.31 © Denise Ross. Denise makes her own film and paper. This is the negative and positive of the same image.

the same way you would coat the emulsion on the plate. However if you are using gum sandarac varnish, make sure you dry the plate vertically. If you let it lie flat, the varnish might pool in one area. You can use any type of varnish on dry plates. Varnishing is not necessary to save the image from darkening, but it will protect the plate from scratches and peeling.

OTHER SUGGESTIONS

After a test, run hot water to wash off the emulsion so you can reuse the metal. You can print on glass (keeping the exposure very light) and then put black material (paper, fabric, etc.) underneath, reversing your negative image to a positive. This process is called an ambrotype.

When working with glass, you need to first put a substrate on the glass as described on p. 26, and then follow the instructions for the tintypes.

TROUBLESHOOTING

- If the emulsion slides off the plate, you have coated the wrong side. Be sure the side coated with emulsion is solid black, with no shiny or silver areas showing.
- If you used glossy instead of flat black spray paint, the emulsion will slide off the plate.
- This stuff stains clothes, because it has silver in it – wear an apron!
- If the image looks solarized (partially reversed) then you fogged the emulsion.
- If you got a negative image instead of a positive, your developer might be too old or contaminated. Or maybe you have used regular paper developer instead of tintype developer.
- If your tintype is too light, with no blacks, you should **decrease** your exposure.
- If you get a bluish tint, the emulsion was coated too thinly or the developer was exhausted. I really like the blue and sometimes do this on purpose.
- If you have too many air bubbles on a freshly coated plate, you can spray it with

10.32 © Jason Lane. “Lake of the Clouds.” Jason started making dry plates and selling them in stores a few years ago. He runs tests before he starts selling each new batch.

10.33 © Jason Lane. “Lighthouse.” It is such fun to get a box of plates in the mail! The instructions are on the box and easy to use. Dry plates are still a slow ISO (Jason is working on faster emulsions), but wonderful to get these glass plate negatives to use.

alcohol to break up the bubbles. Do not leave bubbles on the plate because they will develop as black holes.

- If the liquid emulsion is too cool, it will coat unevenly. Emulsion becomes sticky and transparent as it starts to cool.
- It is better to cut plates to the desired size before coating them with emulsion. Otherwise the emulsion may crack as your cut your plate.
- Rockland says that even when the developer looks like dirt it will still work, unless it has turned all black. I have found this to be untrue. I get "pockmarks" throughout my plates with dirty developer. The coating looked perfect, no air bubbles, perfectly smooth, but once I put the plate into the developer, pockmarks started to emerge. It drove me crazy. I tested by using different types of emulsions and only got rid of the marks when I changed developers.

Eleven

GUM PRINTING

11.1 © Jill Enfield. My gum prints are exclusively on tiles. This one is handmade – my first. While you will see some beautiful work on paper in this chapter by other people, I love a clay surface the most.

Gum printing is also known as gum bichromate and gum dichromate. One person cannot take all the credit for this process, but it seems to have begun when Mongo Ponton discovered the light sensitivity of dichromates in 1838. Then Henry Fox Talbot played a role in the early 1850s when he noticed that soluble colloids mixed with a dichromate lost their solubility. The fun really began in 1855, when Alphonse Louis Poitevin added pigment to the colloid and made the first color images.

The gum process did not gain popularity for another 40 years. A. Rouillé-Ladevèze was first given credit for showing gum prints, in an exhibit at the Photo Club in Paris in 1884. Then, in 1897, Robert DeMachy (French) and Alfred Maskell (English) published a description entitled *Photo-Aquatint or the Gum-Bichromate Process, with Illustrations; A Practical Treatise on a New Method of Printing in Pigment, Especially Suited for Pictorial Workers*.

In 1898, the directions for multiple-exposure gum printing were first published by Hubl in Vienna. Thereafter, the single gum print was often referred to as the French method, and the multiple exposure gum as the Vienna method. The process could render images made to resemble pastels, chalk drawings, and paintings when printed on canvas. Its impressionistic quality moved George Bernard Shaw to dub the prints "fuzzy-graphs." Pictorialist photographers used gum in tandem with other processes as well as on its own, until documentary photography became popular during World War I and gum prints lost out to sharper, more "modern" images.

11.2 © Crystal Jackson. Before most gum printers get started, they do color swatch tests to see how much pigment to use and how long exposures will be on a given paper.

THE PROCESS

Gum printing is closely related to traditional non-photographic printmaking techniques. The artist mixes a solution of equal amounts of gum arabic, dichromate, and watercolor pigment. The emulsion is brushed onto the support of the artist's choice and dried. Once totally dried, a negative is laid on top of the sheet, put into a contact printing frame, and exposed to UV light. The exposures are short and the gum solution that was not exposed to light is washed away with several baths of cool running water. After the paper is dried, the artist can recoat it with the same color or a different color, and the process repeated as often as he or she likes.

The color combinations with gum printing are endless. You have the choice to use one negative, or a positive and negative combination, or many different negatives. Gum printing is permanent, contains no silver and can be combined with many other processes, including being fired in a kiln on ceramic pieces. Since it uses no metal salts, gum bichromate printing is one of the least expensive of any of the alternative processes.

Gum is not an easy process, but it can be very rewarding. I have included it because I fell in love with it, not for the usual way of printing using watercolor paper, but because I found it much easier to use on pottery. It would be naive to think that my explanation of the process would teach enough so that you could just walk into a pottery studio and start doing it, but you could work with people who know what they are doing in the pottery studio as I have done. So keep your mind open.

THINGS TO THINK ABOUT BEFORE YOU START

The process works best when certain conditions are met:

The print will develop better if the coating is thin and fairly even. If the coating is too thick, flaking may occur during development, leaving white spots in the print.

If the coating mixture contains too much pigment, the pigment will stain the paper. The gum itself acts as a sizing agent and keeps the pigment from catching in the paper fibers. Beyond a certain pigment-to-gum concentration, though, the paper will stain, and it will be nearly impossible to remove the color without harming the paper's surface.

Only a limited amount of image density can be created on the print in one exposure and development cycle. Therefore, gum prints that have been coated and printed only once usually have low contrast. If you want to print a rich tonal scale and deep shadows, you will have to recoat and reprint the image two or more times. With each printing the shadows will deepen and the overall contrast will increase. Multiple printing such as this takes time, and care must be taken to precisely register the image for each exposure.

Materials needed

- Apron
- Brushes: 1.5–3"-wide brushes
- Contact printing frame or two pieces of glass with clips
- Drying racks
- Fan blenders to help with developing
- Goggles
- Hair dryer with a cool setting
- Mask
- Negatives
- Nitrile gloves
- One tray, big enough for your paper
- Pencil
- Pigments – watercolor, gouache, or poster colors in tubes, or see the section for mixing your own pigments
- Small brown bottle with an eyedropper for dichromate
- Small ceramic bowl or cup
- Watercolor paper

OPTIONAL FOR SIZING

- Your choice of size (see section on sizing)
- Tray
- Drying racks

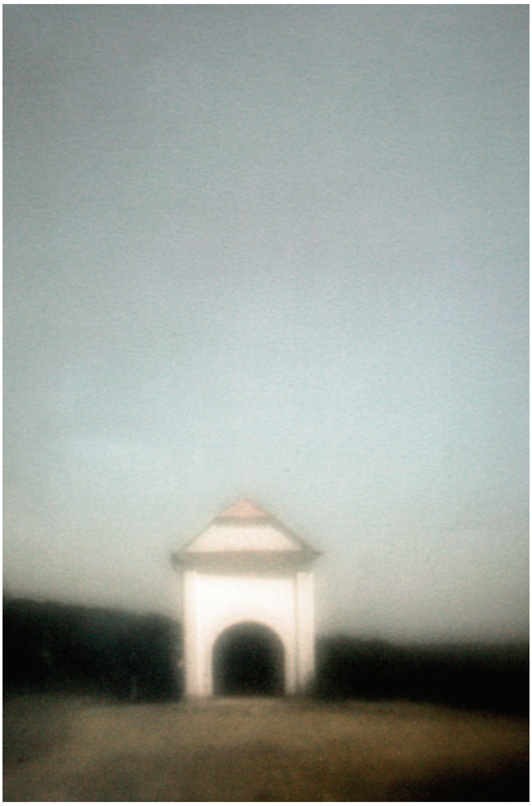
The darkroom can be illuminated with subdued white light, such as a 40-wattbulb or a 40-watt bug light.

THE NEGATIVES

Some sources indicate that a contrasty negative works better for gum printing, the next will say that "soft" negatives are best. I suggest you experiment. Your desired end result will dictate the "best" negative for you.

However, multiple printing requires one of these:

- A single negative that you will expose differently for the highlights, the halftones and the shadows (this is the hardest to work with)
- Color separation negatives
- Objects that you would typically use for photograms
- Posterization negatives:easiest to use three individual negatives with one exposed for highlights, one for midtones, and one for shadows.



11.3 © Diana Bloomfield. "Saint Sebastian on the Hill" was made with a zone plate cap on Diana's digital camera. She made three separation negatives (cyan, yellow, magenta) and printed on Fabriano soft-press paper. She did not size or preshrink her paper (many people would say that could not be done!). M. Graham watercolor pigments were used and a vacuum frame for a great contact.

11.4 © Brian Taylor. "Stevens Creek, California" 2000. Brian contact prints in sunlight, first exposing with cyanotype emulsion to obtain a rich Prussian Blue. He then uses gum bichromate along with green gouache. His third exposure is with a brown pigment and then his fourth and final exposure is with black.

To make three negatives for gum printing:

1. Following instructions for making a digital negative, choose the proper exposure for the highlights, one for the midtones, and one for the shadows.
2. Output all three of the negatives, leaving a margin so you can write which negative is which to avoid confusion while you are working. *Or*, to make three color separation negatives follow the instructions in Chapter 3 on p. 44.

PAPER

Paper for gum should be able to stand up to repeated soakings. Sizing helps to protect highlight areas from staining when doing multiple exposures. This is by no means a complete list of papers and there is no perfect paper to choose. Every gum printer has their own favorite, some of which are listed below as a good starting point:

- Arches Aquarelle
- Arches Cover
- Arches Hot-Press Watercolor (medium tooth)
- Fabriano Artistico
- Hahnemühle Platinum Rag
- Lanaquarelle Watercolor
- Rives BFK
- Saunders Waterford
- Strathmore Artist Drawing (medium surface)
- Strathmore Artist Watercolor hot press paper
- Whatman's Watercolor

SIZING

Sizing helps to reduce the possibility for staining. Not everybody sizes their paper, but you should know how to size in case you decide it will be better for your images and paper choice. Sizing can be done using the recipes in Chapter 2 or by simply using spray starch (normally used for ironing) before coating with a new color/sensitizer. Gesso, diluted 1:1 with water, can also be used, and also needs to be repeated in between coats. The recipe below for gum arabic and dichromate without the pigment is a favorite among gum printers:

1. Mix gum arabic and dichromate 1:1 (see dilutions below).
2. Brush onto the paper in the same way you would if pigment was also mixed in.
3. Expose for about five minutes under UV lights or one minute in bright sunlight.
4. Wash the paper until the water drips clear (the dichromate will add a little bit of color to the paper, but most of the orange should be rinsed out).
5. Hang the paper to dry.
6. If you are using a soft paper, such as BFK Rives, repeat one more time.

11.5 © Denise Ross. Denise makes her own emulsion, prints on watercolor paper. and then does a gum print on top.

BRUSHES

Two flat brushes are needed, one for applying and one for blending the sensitive coating.

The coating brush should be at least 2" wide and flexible, but without a tendency for the hairs to spread apart, which can cause streaks (the wide Japanese brushes are cheap and good).

The blending brush is used dry to smooth out the coating. A wide brush is best, 3" or more. For large prints you will want different widths in brushes. Every brush that comes into contact with the combined gum and dichromate solutions should be washed thoroughly after each use to keep it from becoming clotted with insoluble gum.

PIGMENTS

Three types of pigment can be used:

1. Transparent watercolors (favored)
2. Gouache (transparent color plus a white pigment, which means it is not as transparent as watercolors)
3. Tempera "poster colors"

Usable pigments are made by many companies. Stay away from cheap colors that come in cakes and also paints labeled "student grade." Tubes of colors are fine, but if you like to mix your own, you can also use powdered colors. Choose pigments that resist changes caused by exposure to light, moisture, or chemicals in the atmosphere (the more fugitive ones) and ones that will not react when mixed with the sensitizer or water.

The following is a list for a basic palette from *The Keepers of Light*:

- Alizarin crimson – red, close to magenta;
- Burnt sienna – brick red, going toward brown;

11.6 © Christina Z. Anderson. Christina printed a light cyanotype layer first and then tricolor gum. The cyanotype gives a very nice "first layer" that helps with registration, and then she ends with thalo blue.

- Burnt umber – redder, darker brown than raw umber.
- Cadmium yellow – pale or deep (deep, is toward the orange side; this color is more opaque than most watercolors);
- Lampblack – sometimes has a slightly blue cast that shifts to green when mixed with dichromate;
- Monastral blue, thalo blue, or Winsor blue – close to Prussian blue but twice as intense (Prussian blue is chemically incompatible with cadmiums or vermilions);
- Raw sienna – more yellow and less red than burnt sienna;
- Raw umber – yellowish brown;

Other colors more or less suited to conventional monochrome photographic tonality are:

- Sepia
- Ivory black
- Indian red
- Thalo green
- Hansa yellow.

Powdered colors

If you really want to go back in time, powdered pigments can be bought in bulk and can be cheaper. They are easier to weigh out, but harder to prepare. This is a recipe I found in my notes from the 1970s:

20 g white table sugar
10 ml hot (distilled) water
80 ml standard gum solution
8 drops Kodak Photo-Flo

1. Grind the powder into a paste with a small amount of gum, and mix thoroughly.
2. Use a mortar and pestle, or a palette knife and a sheet of glass to mix well.
3. Occasionally, powdered pigments will clump together and refuse to go into uniform suspension in the gum solution, which results in spots of color stain on the print (this can also be caused by the mineral salts in the water, which is why you should use distilled water).
4. Use just enough gum to grind the pigment, then add the bulk of the regular gum solution to make up the desired volume.

11.7 © Christina Z. Anderson. "Skiers." You can really see how Christina has worked this gum-over-cyanotype image. Even though a printer might use the same pigments, in the same order, they can still control the texture of the image by what they do during the development stage. Christina's great sense of humor comes through in most of her work.

THE SOLUTIONS

GUM SOLUTION

Gum arabic comes from the stems of the acacia Senegal plant (it is the tree that elephants rub their backs on). You can get a premixed commercial liquid solution used by lithographers which is an easier approach than mixing this from powder. The powder dissolves slowly and requires a highly toxic chemical, called mercuric chloride, to be added to prevent it from spoiling.

SENSITIZER

The sensitizer is a saturated solution of either potassium dichromate or ammonium dichromate. I always seem to have potassium dichromate for other processes, so that is what I use. Whichever one you use, store it in a brown bottle and it should keep indefinitely. Store at room temperature. If the chemical gets cold, a precipitate (crystals) may form. Simply warm the solution to dissolve the precipitate before use.

Dichromate

13 g potassium dichromate
100 ml warm distilled water

Mix the dichromate in the distilled water until thoroughly dissolved, and pour into a brown bottle. *Always wear rubber gloves.* If you do come into contact with the dichromates, wash your hands with carbolic soap and then rinse with hydrogen peroxide. Dichromates are a known carcinogen and you should handle them with care. Wear a mask and make sure you have good ventilation. Do not breathe in the powder!

Sensitizer

The proportions of the ingredients used in the sensitizer will depend on the effect you want and on your choice of pigment and paper. The humidity can also play a role in how the chemicals react with the paper.

Start with the formula given below:

20 ml gum arabic solutionpigment about 1" length out of the tube (light colors can be longer than dark colors) or if you made your own from powder, you can measure by grams and do between 1–4 grams for light colors and 1 gram for dark.

20 ml dichromate sensitizer – made with the above dilution.

You can mix stock solutions of the pigment and gum then store them and mix the dichromate in as needed. Once the dichromate is mixed in, the solution should be used that same day.

11.8 © Anna Strickland. Anna uses handmade gampi paper that is a little more difficult to deal with than watercolor papers, but worth the trouble. Anna first made a palladium print with gum on top. The development is face down, moving from tray to tray after about 15 minutes in each tray.

For measuring pigments: Some people use “between half and one” on a ruler of color instead of measuring by grams. Whichever way to measure you choose, take notes so you can see what you did to either fix an error or repeat what you like.

11.9 © Brenton Hamilton. Brenton used collage to combine not only images, but processes. He first laid down a layer of palladium and then three layers of gum.

DIRECTIONS

I know I have said this before, but it is important: Keep good notes! Even though you probably will not be able to make an exact duplicate of a print, you will at least have a starting point. Write down your paper, whether it is sized or not, what type of negative you used, the light source, pigment color, and the order in which you applied the colors, exposure time, and brush used. Making a test print is a good idea, however time consuming.

The first two steps can be done in advanced and used anytime.

1. Pre-soak the paper in hot water for 15 minutes and then hang to dry. When wet, paper expands as its fibers swell; and it contracts again as they dry. The first time a sheet of paper dries after soaking, it usually contracts to less than its previous dimensions. Thereafter, it will expand again each time it becomes wet and on drying return to about the same dimensions it reached when dried after the first soaking. For this reason, if you plan to make accurately registered multiple gum prints in image sizes larger than about 4×5", presoak the paper before sizing or coating. If you skip this step, you may not be able to register the second printing and may get an unsharp result.
2. Size your paper.
3. Mix the sensitizing solutions in a small glass or ceramic bowl that is just large enough to accommodate a 2" brush.
4. Mix one part stock gum/pigment solution with one part dichromate sensitizer (for one 8×10" print, use about 20 drops of each). The mixture has some sensitivity, so protect it from daylight and UV light. The solution will only keep for a few hours before it begins to lose quality, so mix just enough for one session.
5. In subdued light, coat the paper:
   Brush until the coating is fairly even and starts to get a little tacky.
   I don't do this, but a lot of gum printers do: Use a *dry* brush to blend the sensitizer by holding it perpendicular to the paper, and with gentle, long strokes, using just the tips of the hairs, smooth out the coating.
   Work quickly so that the gum does not begin to set before the coating is even. Keep in mind that the coating *should not be too thick*. Never brush the paper for longer than it takes for the coating to become reasonably smooth and surface-dry. The entire coating operation should not take more than about 45 seconds for an 8×10" print. Hang the paper to dry in the dark in front of a fan or dry it with a hair dryer set to its cool setting.
6. Combine the negative with the paper in a contact printing frame. Make sure, if you are going to want to register for multiple exposures, that you tape it down so it does not move. Use 3M Magic #811 scotch tape as it will not rip the paper fibers off (it is not very sticky). The tape will hardly show

when you print. You can also use a light table, working quickly, to see exactly where the negative needs to be placed. Wear gloves so you don't get fingerprints in the soft emulsion.

7. Expose to UV light. Start with: four minutes with a lightbox, 30 seconds in strong summer sunlight, and one minute in open shade or winter sunlight. Exposure time depends on the following:
    - The quality of light;
    - The density of the negative;
    - The proportion of sensitizer to gum – the more sensitizer, the faster the exposure;
    - The color of the pigment;
    - The thickness of the coating;
    - The amount of pigment in the coating solution;
    - The humidity – the higher the humidity, the shorter the exposure.
8. Develop the paper. The paper needs to be developed immediately after exposure because otherwise it will deteriorate:

11.10 © Bill Schwab. "Chrysler Building." 2007. This one began life as an 8 × 10" wet plate collodion image later scanned and turned into a digital negative. First printed as a palladium on Rives BFK treated in 3% oxalic acid solution, the print was then dried and sized with gelatin in preparation for the gum layers. First three layers were a magenta printed at a longer exposure than the original platinum layer with the goal of forcing the color into the higher values. A 10% solution of dichromate was used for a lower contrast. These were followed by a pair of blue layers with 30% dichromate and at shorter exposures to keep them higher contrast and only in the shadows to cool and darken them.

WEARING GLOVES:

- Slide the paper into a tray of water at room temperature emulsion side up.
- After the surface is covered, turn the print face down, carefully so that no bubbles are caught underneath. Let it float with *no agitation* for at least five minutes. Within a few minutes the tray will become clouded with pigment and stained orange by the sensitizer. If the print starts to sink to the bottom, gently turn it face-up without touching the emulsion surface.
- Transfer the print into a clean tray filled with fresh water. With occasional, gentle agitation, allow the soluble gum and pigment to soak out and settle to the bottom of the tray, which should take about 30 minutes. Remove and dry the print whenever it looks right; it can take as little as 15 minutes, although a negative that needs a longer development time usually has the advantage of giving the best reproduction of tones. At this point you can keep transferring the print into a fresh water bath (not running water, but clean water in a tray). Or you can "force develop" by using a brush, or spraying water on the image – read more about this later in this chapter.
- Lift the print carefully out of the water. The surface is very soft and anything that touches it will loosen the gum and abrade the image. The water draining off the print should not be noticeably discolored.

Even if a print is not perfectly exposed, do not throw it away. You can print over an underexposed print with successive layers of pigment, and you can force-develop an overexposed print. If a print has been overexposed or too much pigment has been used, raise the temperature of the water which will dissolve the gum.

FORCE DEVELOPMENT

When soaking in the water, the gum is very soft and easily worked with. It is this quality that drew Pictorialists to gum bichromate printing as a medium for the expression of their painterly images. A variety of effects, from a distinct overall grain pattern to the complete removal of parts of the image, are possible with different methods of forced development.

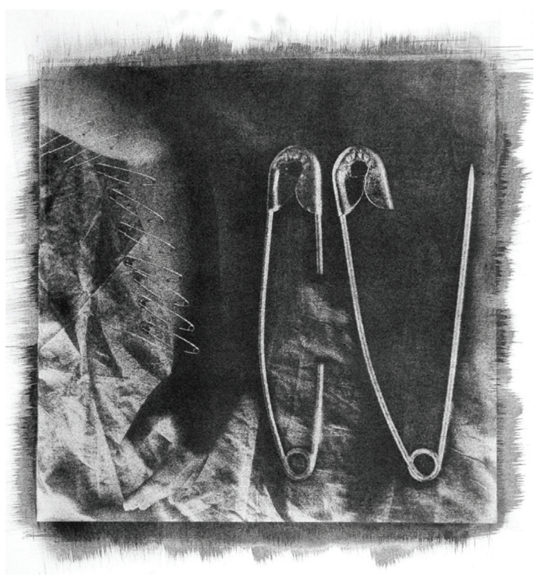
To force-develop the image, overexpose your print so that it leaves a slight stain at the end of a 15-minute development, creating a colored image to work with.

The following is a list of methods of forced development, ranging from the least abrasive to the most abrasive:

1. While the print is just under the surface of the water, pour a stream of water on it from a graduate. The closer the graduate to the print, the less force the stream of water has and the less abrasive the effect.
2. Support the print on a piece of glass standing out of the water at an angle, and pour cool water on the margins of the print, allowing the water to gently run over the image. This will lighten the overall image.
3. Support the print on a piece of glass and pour warm water over it.
4. Soak the print in a tray of warm water, which will soften the pigment, and then repeat any of the above steps.
5. Spray the print with a forceful atomizer at close range. This will produce an overall grain pattern.
6. Using a camel's hair or sable retouching brush, lightly brush over areas of the print while it is underwater. This will take off some of the emulsion and make the image lighter.
7. Go over the print with the brush while it is out of water, making sure you are gentle and that the brush is slightly wet.
8. Support the print on a piece of glass and direct a flow of water at it from the pinched end of a hose. This will lighten or remove a section or all of the image.
9. Use a stiff-bristled brush to remove part of the image.
10. With the print supported on a piece of glass, pour a mixture of water and fine sawdust over it. This will produce an overall grain effect.

MULTIPLE PRINTING

As each layer of pigment is added, contrast will increase, the shadows will deepen, the tonal scale will be lengthened, and the print will take on more depth. The following technique uses the same negative three times:



11.11 © Shahril Nawawi. Shahril is from Malaysia and has been experimenting with other types of starches beside gum arabic. He found sago, which is a starch obtained from a palm tree and is a staple in the tropics. He uses Fabriano no. 5 or Canson Montval papers – both are heavy at 300gsm. He also uses Chung Hwa Chinese inks, which are water-based. Each image has five to seven coats.

1. Expose the paper the first time to render the highlights.
2. Develop and dry.
3. Coat the paper again and dry.
4. Carefully place the negative in perfect register with the image in the print frame.
5. Expose for about half the time to render the midtones. Each exposure should be lessened by a little bit and this will take practice.
6. Develop and dry again.
7. Coat the support for a third time and dry.
8. Place the negative in perfect register.
9. Expose for a shorter time to render the shadows.

This sequence can be performed with either the same or different colored pigments for each coating.

The same sequence of printing steps can be followed using three separate negatives of the same image. Begin by exposing for the lighter tones and colors or densities, then for the progressively darker colors or densities. For example, the color sequence for a three-color print might be:

1. Cadmium yellow pale
2. Alizarin crimson
3. Winsor blue

11.12 © Sarah van Keuren. Sarah does not show her borders, but since this is a "how to" book, I have left them in. Sarah makes her images with CMYK separation negatives. She prints with lamp black first, then red and transparent yellow. Her last layer is a cyanotype.

CLEARING

Make a 5% solution of sodium bisulfite using:

50 g sodium bisulfite
1 liter tap water

- This sodium bisulfite solution will be usable until it turns a pale blue-green, then flush down the drain with running water, and then make a new tray.
- Clearing weakens the surface of the print, so some manuals suggest doing this step only if the print has a yellow or orange sensitizer stain.
- Clear prints one at a time or they may scratch.

For a multiple print, clear after the last printing and development.

Follow the clearing bath with a short wash in cold water (five to ten minutes).

Additional spot reduction can be done with a brush by working on the surface of the print in the clearing bath.

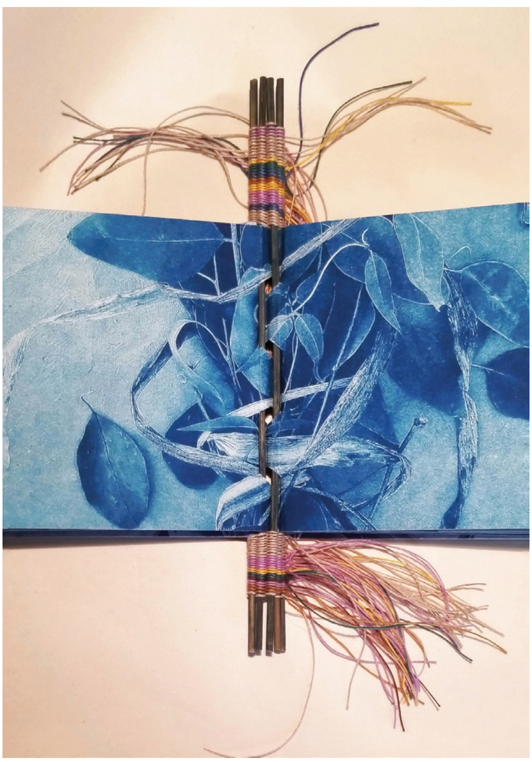
As the print dries, the coating will sink into the surface of the paper and the final, dry image will be quite tough.

11.13 © Brian Taylor. "Teepee, Santa Cruz Mountains" 2000. Brian states that he savors the tactile pleasure of making art by hand as he builds images with multiple layers of brush-applied emulsions. He uses the same order for most of his prints: cyanotype first, then green, brown, and black.

CONTRAST CONTROL

You can increase the shadow density without changing the image highlights by decreasing the exposure time so that only the shadows have a chance to become insoluble.

If you want to increase the density in the highlights without affecting the shadows, decrease the amount of pigment in the coating solution, and increase the exposure. Since the shadows already have density, adding a little more pigment to them will not make much of a visible difference, but even a small amount of pigment, exposed for a longer time, will make a difference in the light areas because almost no pigment was present there before.



11.14 and 11.15 © Diana Bloomfield. "Bound Eucalyptus." Diana used a piano hinge binding to make this beautiful one-of-a-kind book, which is now in the Norton Museum in West Palm Beach, Fl. The cover is one wash of gum bichromate, using indanthrone blue pigment. The interior pages are a mix of both gum bichromate, and also one wash of gum bichromate, using black pigment, over a base of cyanotype – so achieving different hues of blue. The cyanotype used was the traditional method.

TIPS AND TROUBLESHOOTING

- Increasing the amount of pigment gives a broader tonal scale but may degrade the whites and often produces a stain in the paper.
- Reducing the amount of pigment subdues the tinting strength of the emulsion.
- Increasing the amount of gum makes the solution difficult to coat and yields a higher-contrast image; it also frequently causes the emulsion to flake off during development.
- Reducing the amount of gum usually causes the emulsion to stain the paper. The pigment becomes so firmly embedded in the paper's fiber that it prevents proper clearing of the highlights.
- Increasing the amount of sensitizer increases the speed of the paper, but decreases the print's contrast, producing flat, sometimes lifeless prints.
- Reducing the amount of sensitizer makes the emulsion too adhesive and difficult to apply.
- Overexposed? Force develop.
- Underexposed? Make a multiple print.
- Between three and eight printings is normal. More layers add depth and contrast.
- You can: use less time with each printing, and less pigment; the same amount of pigment but less time; or do the same for each exposure.
- Each variation will give you a slightly different result.

- The first exposure should look a little "sick": pale, washed out, with flat shadows.
- Your paper should have enough texture to hold the emulsion. If it has too much, the emulsion will not spread evenly; it will also be too glossy and show the brush strokes.
- Sizing helps clear the paper in light areas and helps with tonal separation.
- If a print is too "hot" or bright, subdue it with a thin coat of gray or blue.
- It a print is too cold or dull, give it warmth by coating with a reddish color.
- If emulsion with black has so little pigment it looks gray, the deepest shadows will be gray.
- Blues and violets require less exposure time than reds, oranges, and yellows.
- You can use Maskoid as a resist; brush on the color and before the exposure take the color off undesired areas with a brush, blotting paper with water.
- Sarah Van Keuren suggests using gum as a resist instead of Maskoid, which seems to me to be brilliant. Brush gum arabic (with no pigment mixed in) into areas that you do not want color to be. This will protect the area in the same way the Maskoid does, but it will wash right off when developing so there is no extra step – easy.
- Laura Blacklow (her book is listed in the Sources) suggests a great way to see

11.16 © Sam Wang "The Chef." This is a three-color gum/cyanotype. Sam used a digital camera of a country chef in China, color separated on the computer and color gum layers were printed on one layer of cyanotype.

how your colors will turn out by mixing a dab of color with water and allowing it to dry. Once totally dry, you can put your second color on top and keep repeating with the colors you are choosing to use.

- Another suggestion by Laura is to follow these steps for easier registration:
  - Mark outside your image area, but within the area that you are coating on the front of your paper with a sharp pencil at one inch intervals and then eight inch intervals. Use a hot hair dryer, stopping to re-measure the pencil marks until they are back to their original length. Then change to a cool setting on your hair dryer to dry completely before re-registering your negative.
- Once the initial coat is applied, paint on color, and expose the print face down without a negative on it. The print acts as its own negative.
- Everyone has a different feeling about wet vs. dry brushes. I think they need to be dry (try both ways).
- Some prints are made using two or three coats of just black, others with reds and browns.
- White is usually not used by itself, but mixed with other colors as in the early watercolor paintings.

Most people seem to have trouble figuring out which color to use, and when. It seems to help to have a starting point. The following are color suggestions that I have collected

11.17 © Francis Baker. "My Character." Francis uses gum bichromate on traditional gesso on panel. The panel for this image is a hydrotech ¾" panel. He then uses rabbit skin glue to seal the panels and adhere muslin to the front. He then coats it with a traditional gesso which is made with the glue mixed with marble dust. This is a simplification for how he prepares his panels! He then chooses transparent colors and starts exposing.

11.18 © Mercedes Jelinek. "If Birds Sank Ships." Three-color layers of gum – red, blue, yellow on watercolor paper.

from various people and sources. Try these and see how it goes.

1. Red
   red and black
   burnt sienna and black
   cobalt blue
2. Red and raw sienna
   black and burnt sienna
   sepia brown and cobalt blue.
3. Raw umber
   alizarin crimson
   cobalt blue

It frequently works well to start with the brightest warm color and finish with a cold transparent one (maybe a blue). A lot of printers love starting with a cyanotype as the first layer, others like ending with a cyanotype. Try both!

Gum printing is said to be one of the most difficult alternative processes, which I agree with. It takes patience and planning. However, it is also very versatile. You can combine it with almost any other process and you can fire it in a kiln. (For kiln instructions see Chapter 15.)

The possibilities are endless and because of this it may prove frustrating. However, when you get a good print, you know you have earned it.

11.19 © Jodie Hooker. "Along the Road." Tri-color gum over cyanotype. Jodie makes color separation negatives and uses primary colors on top of a first layer of cyanotype to mimic natural color results.

11.20 © Kay Kenny. "I am a girl, almost 10." Kay comes from a painting background so gum printing comes naturally to her. She makes a negative for the shadows, another for the midtones and another one for the highlights. She pre-shrinks her paper and uses gelatin hardened with formalin as the subbing and sometimes uses gum arabic to mask over areas that she does not want to coat with other colors.

11.21 © Mary Donato. “Iceland Botanical.” Mary usually starts with a digital capture to then produce three digital negatives for blue, magenta, and yellow. She pre-shrinks Fabriano soft press 300lb (640gsm) watercolor paper. If she does not use a cyanotype as the first layer, then Mary will size the paper with dilute PVA.

11.22 © Christina Anderson. “Daughter and Father”. Christina uses her old family photos to make these wonderful gum prints.

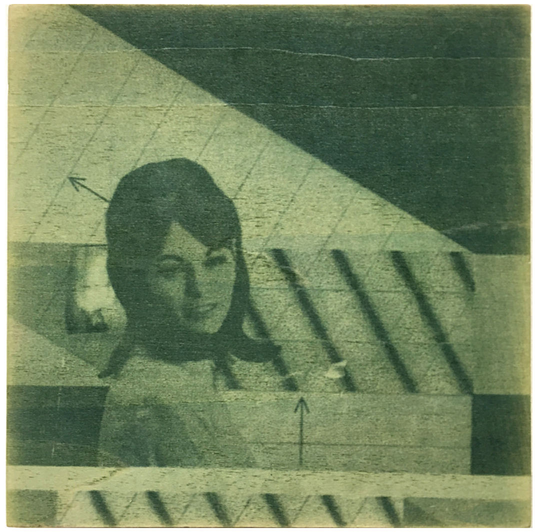
Twelve

TRANSFERS AND DECALS

12.1 © Jill Enfield. Transfer made on birch wood with Inkaid transfer film and Inkaid medium.

This chapter will encourage you to think outside the box and see what can be done with different materials and approaches, some of them available for the first time in the history of photography.

Ever since computers came on the scene, artists have been inventing different ways of incorporating digital techniques into what they have been doing all along. Every time I search for one technique, I find a few more. Don't stop with what I have written; there is a lot more that can be done! Experiment yourself and see what else you can discover.



12.2 © Asher Katz. Asher works with Solarfast and used it on wood for this image.

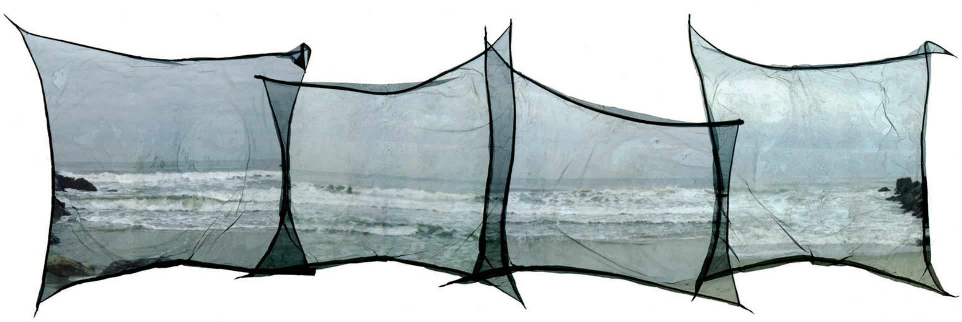
WAX PAPER OR PLASTIC SHEET TRANSFERS

Inkjet printers can be used to make transferable images by printing on a waxy paper such as computer label sheets or wax paper that you get in a grocery store. It's possible to also use plastic sheet covers that you use in a notebook to protect your papers, or specific transfer pages called clear transfer film.

After editing your image, adjust the image settings to print about 20% darker and 5% higher in contrast than normal. Then before you are ready to print, make sure you flip your image so that any words and numbers will read backwards on your transfer sheet, which ensures that all readable information will read properly when you do your final transfer onto the image support. The following procedure only requires plain water and a substrate such as receiving paper, canvas, wood, or glass, etc.

WHAT YOU NEED ON HAND, DEPENDING ON WHICH TECHNIQUE YOU ARE USING:

- Acrylic paint – if you want to use a color other than clear
- A brayer or credit card to rub the back of the image that you are transferring



12.3 © Cassie Basford. Cassie shot these images using Fuji Instant Film FP100-C, and cut down all the surrounding paper until just left with the image. The images were then placed into boiling hot water, and a paint brush was used to gently tease the image off the plastic backing. Usually, that is enough to get the image off, but if you need any additional help, moving it over to cold water should do it. They were then mounted onto plexiglass using medium gel gloss on a rubber roller brush typically used for printmaking. It's quite fragile in the back, so I recommend some type of support.

- Burnisher, or paint roller, or credit card to push the transfer into a substrate
- Clear transfer film
- Gel medium
- If you want to add colors you can use any type of paints, chalk or pencils
- Substrate to transfer on (paper, wood, glass, leather, etc.)
- Printer
- Tray of warm water for paper, or sponge warm water for other materials
- UV protective coat to spray on after it dries
- Wax paper.

PROCESS

1. The shiny side of the transfer paper is the correct printing side. Every printer has directions as to which way the print side should face, so make sure you put the paper in according to your printer's instructions.
   (a) If you are using label paper, remove all labels.
   (b) If you are using wax paper, put a piece of regular printing paper behind it to keep it sturdy as it feeds through your printer. You might need to tape it to the paper, but just tape the very top so that it can move through the printer evenly.
2. Briefly soak a piece of hot press (for a sharper image) printmaking or watercolor paper in a tray of water, remove it, and blot off excess moisture with a paper towel or cloth. If the paper is too wet, a dot pattern will result. Cold pressed papers will produce a softer effect. Of course, you do not have to use paper, and you also don't have to soak it, the dampened paper will just make your image sharper. You can use anything you want as a support including, glass, plastic, leather, metal, etc. If you think of it, you can try it.
3. Check the high-speed printing box before you start printing so the ink does not dry. The image will look very dull until you transfer it, so don't worry about how it looks on the waxy paper.
4. Immediately place the inkjet print face-down onto the dampened receiving surface. Hold firmly in place and gently rub the back of the transfer paper and then carefully lift it off.
5. A soft brush may be used to blend and manipulate the inks.
6. Watercolor paints or pencils can be applied on either a wet or dry print. Pastel chalks may be used on a dry print.
7. Dry the print with a hair dryer or face-up on any dust free surface.
8. After it has thoroughly dried, you can use fixative to protect the image from UV light and scratches.
9. Some artists also use a wax covering over their pieces. Encaustic, plain beeswax and the varnish used for collodion (see p. 193) are just three suggestions.

12.4 © Robyn Davis. "Tony and Ted." Transfer over chemigram. Robyn coats a laser print with at least six coats of gel medium and makes sure it is totally dry before soaking the print in water and rubbing off the paper. She is then able to transfer the ink onto another surface. In this case, she used a chemigram she had made on Foma warm 132 paper. The inevitable random colors, lines, and shapes from the chemigram underneath are visible through the transfer and mostly enhance the image.

FOR WOOD OR GLASS TRANSFERS

1. You can transfer directly on to wood or glass.
2. Place the printed sheet face down on to the wood or other substrate and rub the back of it until the image transfers. You can use a credit card or a paint roller, or a burnisher to make sure you have made good contact.
3. Lift a corner up to make sure the image has transferred, being very careful not to move the image

USING PAINT FIRST

1. Coat a wooden board or sheet of glass with acrylic gel medium, or acrylic paint. Do not let it dry.
2. Print an image on cheap glossy laser paper using the print settings for plain paper on high speed so that the ink does not stick to the paper.
3. Place the printed sheet face down on the coated substrate and rub the back of it until the image transfers into the paint.

12.5 © Barbara Ellison. InkAID Transferiez on tile. Barbara is the best at printing on any surface and transferring using any medium, but this is one of my favorites. Barbara first mixes inkAID's Transferiez with alcohol and agitates it here and there over the next four hours. She then prints the image on InkAID's transfer film and transferrs the emulsion with gentle pressure onto Italian tile.

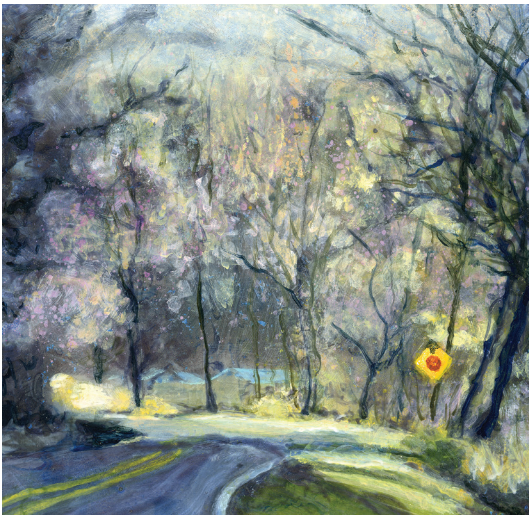
GEL MEDIUM TRANSFERS

Acrylic gel mediums come in glossy or matte and it is up to you to decide which you like better. Both will work. If used correctly, gel medium dries clear, but you can color the gel medium before or after the transfer by adding pigment into the gel medium before use. Transferring images can be done with photocopies, some magazine images, and inkjet or laser prints. There are essentially two ways to transfer images.

Method 1

1. Use a positive or negative image, either black and white or color, and print on to regular printing paper.
2. Coat the image with a thin coat of gel medium and let dry for a few hours or use a hair dryer.
3. Repeat this 8–12 times, making sure to dry in between each coat and making sure you coat both horizontally and vertically so as not to miss any spots.
4. Once all coats are done, let the image dry at least 24 hours to make sure all of the layers are totally dry.
5. Soak in warm water and remove the paper backing. Use your finger, a nylon scouring pad, or soft cloth and begin rubbing carefully to remove the paper but leave the image (ink) intact in the acrylic medium. The ink will stay on the gel medium making a "skin" which is a transparent plastic image.
6. You might think you have removed all of the paper, but wait until it is dry, as the paper fibers do not really reveal themselves until the transfer is totally dry.
7. Once the paper is removed from the back of the image, you can add color and then place the image onto another gel medium transfer, building up the image, or place the image(s) onto another surface using gel medium as the glue to make a collage.

It is common that the acrylic used will become milky again. This is because of the



12.6 © Beth Kokol. These mixed media pieces begin with a photo printed on printer-ready silk at the highest possible resolution and quality. Once removed from the printer paper, they are then mounted on frosted Mylar using glazing medium. Beth uses glazing medium because it is thinner than gel medium and she can brush it onto the Mylar. She then paints both sides, deciding later which side she likes better. The final steps include sanding the backside of the Mylar then mounting to a solid surface such as Masonite that has been gessoed.

water being re-introduced back into the medium. When the medium thoroughly dries, it should become clear again. The medium needs to fully dry before you are ready to use the transfer in artwork. However, even with that being said, if you have not fully dried between each layer of gel medium, the image will stay milky.

You can stretch these images by heating them with a hair dryer and slowly stretching them in different directions. Remember silly putty? If not, look it up – you can use the silly putty to transfer images, too!

Method 2

1. Use a positive or negative image, either black and white or color, and print onto regular printing paper.
2. Apply the acrylic gel or paint to the surface receiving the image.
3. While it is still wet, place the paper with the image face-down into the wet medium and allow to dry thoroughly; overnight is best, but you can use a hair dryer.
4. When the receiver and image sandwich is completely dry, dampen the paper with a wet sponge and give it a few minutes to allow the water to penetrate the paper pulp.
5. Use your finger, a nylon scouring pad, or soft cloth and begin rubbing carefully to remove the paper but leave the image (ink) intact in the acrylic medium.
6. You will probably have to dampen the paper a few times for a clean transfer. When the water evaporates, you will be able to see the areas that you missed. Of course, you do not have to remove all of the paper. It is up to you how transparent you want the final image to be.
7. If you are transferring your image onto wood or a surface that you want to put outside, I suggest coating the transfer with UV varnish to protect the image.

12.7 © Dana Melaver. Dana made this book for her final project in one of my classes. She chose screen shots from her computer along with city maps. Laser prints were then coated with up to eight coats of gel medium, dried overnight, and soaked in hot water to take the paper backing off.

SOLVENT TRANSFERS

Solvents are not particularly safe for you to use. I kept this in the chapter because it is still something people like to do. Just make sure you have very good ventilation, or better yet, work outside or in a garage with the doors open and a fan going, and wear a mask.

These used to be the easiest type of transfers to do. You would grab a magazine or copy a picture on a copy machine and use different types of solvents to transfer the images to any surface. Magazines were all coated stock – clay-coated paper and easily transferrable. Now, magazines are always changing their paper stock, so the best way to see if it will work is to try it out – you will not always be successful, but when you are, you might really find that you can make images like the collages made famous between the wars in Germany, or by Robert Rauschenberg in the 1970s in the US.

Chartpak blending sticks, turpentine, Citra Solv, wintergreen oil, oil of lavender, acetone, and lacquer thinner are the solvents that are most often used. However, sometimes you need so much pressure that it seems like nothing will transfer. If you can use a roller or a printing press, you might have better results.

When experimenting, try these techniques on hot-press paper, the smoother the better for sharp images. Once you get your technique down on paper, try any type of cloth or other material. When using cloth, first stretch the cloth and then spray it with starch for a better transfer.

MAGAZINE TRANSFERS

The following is the procedure for magazine transfers (and some wallpapers or printed papers from good paper stores).

1. Slick “clay-coated” magazines work best – and freshly printed, which can be hard to find!
2. Place the receiving paper (your final sheet) face-up on a hard surface.
3. Position the image to be transferred face-down on the sheet and use drafting tape to secure one edge only so you can lift up the paper without shifting the position.
4. Flip the magazine page over to expose the image side and generously apply solvent (such as Chartpak blending marker or turpentine) with a cotton ball or brush.
5. Flip the magazine image back over and begin applying hard and even pressure with a burnishing tool, side of a metal spoon or brayer to transfer the ink to the receiving paper.
6. Lift the magazine page up slowly to check the transfer. You can add more solvent if it dries before you have finished. This can take a while (up to 15 minutes, so be patient).

NEWSPAPER TRANSFERS

This is the same process as magazine transfers, but use a plain piece of paper and a cotton ball for pressure – the newspaper ink will not run too much. The image should transfer with your hand motion and the cotton ball; you should not need much pressure, but if you do, use a credit card or roller.

BLACK-AND-WHITE COPIER, INKJET PRINTS OR LASER PRINTS

Before printing, don’t forget to flip your image so that all numbers and words print backwards. This way when you place the paper down to make the transfer, everything will read correctly. A Chartpak blending marker or turpentine can be used on an image that has been freshly printed.

PURELL TRANSFERS

You can use other hand sanitizers, but because PURELL hand sanitizer has more alcohol in it. The main ingredient is ethyl alcohol, which makes it great for transferring images to any surface. Despite the fact that this product is used to put on your hands, you will need to use gloves because the oil from your

12.8 and 12.9 © Evy Cohen. Evy has been doing photography since she was an adolescent and when she started working with glass, felt that she could marry the two. With the "Heritage Album," Evy made a cardboard model. The paper-thin glass sheets were made with very fine frit (glass) fired in a kiln at a high temperature, around 800°C. Images, after digital process, were printed on high fire ceramic decals, transferred and fused to the glass sheets which were then shaped individually in the kiln at a temperature of 630°C. Putting the decal on glass is quite tricky as the decal is very fragile and all the water must be squeezed out before firing, otherwise the glass with the image fused will have many tiny bubbles.

12.10 © Diane Fenster. "Ain't Got No Home in This World Anymore". Diane made a series of images called "What We Leave Behind," using transfers onto Kozo paper. She feels that the imperfect image transfer process acts as a metaphor for the fragility of memory and aging.

hands will leave fingerprints in your image area.

1. Print your image on a transparency film making sure you have reversed the image so that the words will read correctly on your substrate.
2. Tape your substrate to your table so that it will not move.
3. You can tape your transparency onto your substrate and flip it up so that it makes it easier to place down once the Purell has been applied. Make sure that the ink side is facing your substrate.
4. Coat the substrate so that there is a "sheen" to it. Some people coat the front and then back of paper, and then the front again to make sure the Purell has soaked through.
5. Flip your image back over the wet substrate or place down gently.
6. Use a brayer or a roller and gently go from the middle out, making sure there are no air bubbles.

12.11 © Kim Bach. Kim uses magazine and newspaper transfers, and her own paintings, drawings, and photographs to make collages on wood, glass, and paper. She will then paint over them with gold leaf.

   If you press too hard, the ink will seep out the sides and smear the image.
7. Purell dries very quickly, so once the paper is saturated, you have to act quickly to lay your image down or the transfer will not work. With this in mind, check after 30 seconds by picking up one corner to see if the transfer was successful. If not, try again in a few seconds. If the transfer looks good in that one corner, continue to pick up the film smoothly from the substrate.
8. You can coat the image with a UV protective spray to protect the image from the sun and from scratching off.

TRANSFERIEZ – INKAID TRANSFER MEDIUM

There are plenty of ways to transfer images, but InkAid has been making products for a long time and seems to have some easy to use products, one of which is transferiez™. I took a one-day workshop to learn how to use these products and was very excited to see how easy it was. The gel medium method gives you many choices, but it takes a lot of time to take off the backing paper. I was able to transfer images onto wood, paper, metal, canvas, and glass, all in one afternoon. There is also a transfer product called DASS, but it is more expensive and in my opinion, not as easy to work with.

You will need a film to print on and transfer from. The best one I have found is made by Inkpress called Inkpress Clear Film. It is designed for overlays, and other printing needs that need perfect clarity. This is not the same as Inkpress Transparency Film which is designed for digital negatives and screen printing and has a milky surface which allows for a high DMAX and heavy inking. Both are great products and come in both rolls and packages cut to the standard printing sizes.

It is easier to work with smooth surfaces, so you might want to use sand paper on wood first. Without sanding, it just means you might have more air bubbles, which would need to be popped with a pin before lifting off the film.

TO MAKE A WORKING SOLUTION OF THE TRANSFERIEZ:

These instructions are on the bottle:

1 T transferiez

4 oz 91% alcohol (rubbing alcohol)

Directions

1. Place ingredients in a bottle that can be well capped and labeled.
2. Shake well and allow to sit for **four hours.**
3. Tape the substrate down on the worktable so it does not move around.
4. Print your image – flipping it so that it is mirrored so that when you lay it down the text will be the correct way. Make sure you are printing on the correct side of the film, which is the sticky side.
5. You can use tape around the image. Blue painter's tape or drafting tape work well and will give you a "Holga" like edge.
6. Place the film down where you want it on the substrate and then tape that in place on one side only.
7. Flip the film back so that it is out of the way as you coat your substrate with the transferiez.

12.12 © John Metoyer. John scanned a vintage image into the computer and slightly colorized it, broke it up into 20 small panels and printed it onto heat transfer paper. The panels were reassembled and ironed onto a large bed sheet. The sheet was then dyed, gold leaf was added and the image was then glued onto a plywood plank.

8. Coat with a brush when you are ready to transfer on aluminum, canvas, leather, wood, glass, or paper.
9. When the substrate is coated, you bring the film back into position and press into place. You can use a paint roller, lightly pressing, don't push, but keep going over it, pressing down for a few minutes so that the ink transfers.
10. When transferring on different substrates, leave the positive on the substrate for the following times:
    - metal and glass: (this has to be cleaned first with a dish washing soap and then rub with isopropyl alcohol) one to three minutes
    - fabric or paper: two to four minutes

12.13 © Beckwith Thompson. Beckwith used left-overs to make what she calls her "Floor Series." Packing tape transfers, acrylic paint, stamp ink, and embossing powder are some of what she used.

11. Pick up one end of the film to check to see if it transferred well. If not, put more pressure to make sure it sticks better and then roll back the film and take it off.
12. Seal with a UV protection fixative to protect it even further.

OTHER IDEAS FOR PRINTING

PHOTO BATIK

Photo batik prevents parts of the paper from being sensitized or processed, similar to a resist.

1. Thinly coat an object with Vaseline. You can use a body part such as your face or hands.
2. Press against a surface such as watercolor paper or photographic paper – A clear Vaseline impression will be left.

For photo paper

1. In the darkroom, press the object you coated with Vaseline onto photo paper.
2. Expose the paper to light, either with an enlarger, or just to room light.
3. You can put a negative into the enlarger and expose the paper that way. The image will not show where the Vaseline is.
4. Develop normally.
5. If there is still Vaseline on your paper after the final wash, you can put it in a tray of photo-flo and rub off the Vaseline.
6. After the photo-flo the paper will need to be washed in clean water for a few minutes.

For watercolor paper and alt. processes:

1. Press an object coated with Vaseline onto watercolor paper.
2. Follow the instructions for the process you want to use in the proper chapter in this book.

12.14 © Alida Fish. "Lupin."

12.16 © Alida Fish "Wisteria 2." Alida has always done amazing work, and now this new work is all transfers onto 24 × 20" aluminum sheets. They are so beautiful to look at in person.

12.15 © Alida Fish "Penland Pampas."

DIGITAL PRINTING DIRECTLY ONTO FABRIC

Some quilters suggest that the fabric should be washed first with fabric softeners to make the colors sink in better:

MATERIALS NEEDED

1. Fabric washed and cut to size
2. Freezer paper or wax paper
3. An edited image.

Preparing the fabric:

1. Soak the fabric for about 15 minutes in a solution of half water and half Downy Ultra Free Softener.
2. Rinse well, dry, and iron flat.
3. Trim the fabric to the exact size needed. Make sure all edges are clean and thread free so they cannot get caught in the printers. (These little threads will get stuck in the printer and cause snags.)
4. Iron the fabric to the glossy side of freezer or wax paper on medium heat until they are bonded. The freezer paper stabilizes the fabric, which can be too flexible to feed through a printer.
5. Make sure to increase the saturation of your image about 20% more than usual or else your image will look dull when printed. Of course, you should always consider this an estimate and do a test.
6. Print on the front of the fabric.

Some fabric stores and quilt stores have small patches already adhered to freezer paper called computer printer fabric, but they charge more, and you can do it yourself.

FIXING COLORS FROM INKJET PRINTERS ONTO FABRICS

There are many types of workable fixatives, but the two most popular are Grumbacher or Blair spray-fix. These sprays will make the fabric rough. More importantly, if you are not careful with the first spray, the colors can run.

1. Spray once lightly.
2. Let it dry.
3. Spray again.

12.17 © Debbie Adele Cooper. "Fragility of Memory." Debbie made several of these wax houses by first scanning images from her community. She printed them out onto good copy paper and encased them in layers of wax. She was then able to mold them into shape with a heat gun. Each house represents a different community, with lights in the center and iBeacons transmitting oral history and music recordings from each community.

After allowing the fixative to dry, heat set it by ironing.

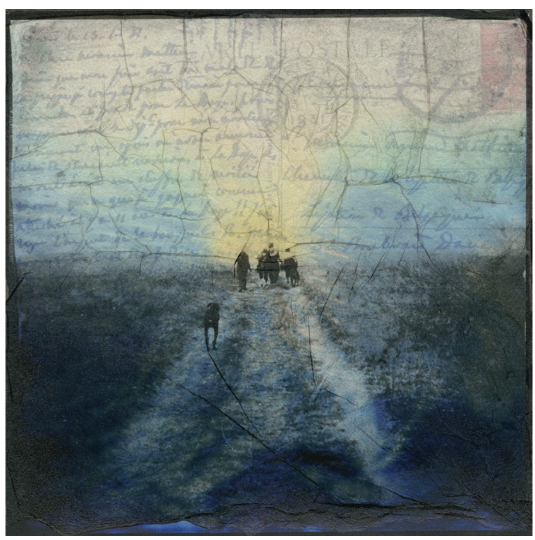
1. Place freezer paper with the dull side up onto a flat surface.
2. Place the fabric face-down on top of the freezer paper.
3. Iron the back until warm.

Other ideas for stabilizing colors can be found on the web by looking at the sites of quilters and transfer enthusiasts.

DECALS

Decals are also called waterslide decal paper, which describes how you use them. For the most part, either an inkjet or laser printer can be used as long as the inks are not water-soluble. Check the package of the decal you buy to make sure it is the correct type for your printer.

After the decal dries (usually within 30 minutes) you slip it into water and it curls up onto itself. As it soaks up the water, it will



12.18 © Janet Fine. "Stray." Janet uses a variety of substrates for her alcohol transfers, including braille paper, paint samples, or in this case, a digital collage of scans and images printed on Rives BFK printmaking paper. She uses various transparency films and isopropyl alcohol.

straighten out and separate from the backing. Each surface has to be treated a little differently; the instructions are below.

Lazertran (www.lazertran.com) is originally from England, but is easy to get online or check the craft and art-supply stores near you. There are ones for textiles, inkjet printers, stamping, metallic foils, silk, and laser printers; and they are always coming up with more. The downside to Lazertran is that the biggest you can get it is 11 × 17", it does not come in rolls.

Beldecal (http://www.decalpaper.com/Default.asp) is made in Florida and can be fired in a kiln onto clay or used in a similar fashion as Lazertran (see more in Chapter 13).

There are a lot of other decals available; search online and see which you like better for what you are going to use them for.

Materials needed

- Acrylic medium
- Brush
- Decal paper of choice
- Flat surface covered with paper
- Material of choice to place the image on
- Paper towels or a soft reusable towel
- Parchment paper or baking paper – not waxed
- Polyurethane
- Scissors
- Tray of water
- Turpentine.

Steps

Because you are most likely using turpentine, make sure you have good ventilation and wear a mask.

1. If you are transferring your image onto a translucent surface, add about 50% more saturation to the image or it will look too light. If you notice that the image is "bleeding," then it has too much ink; tone it down.
2. Print the image onto the shiny side of the decal paper, making sure you are using a printer that is compatible with the Lazertran or Beldecal you have bought. Also check to see which is the correct way to place the paper into the printer (some are face-down, some are face-up).
3. Let the decal dry for about 30 minutes and trim off the area you do not want on your surface.
4. Place the decal in a tray of water and watch it curl up into itself. As it soaks up water it will straighten out again. Leave it in the water for about one minute or until you see the decal starting to separate from the backing.
5. While the decal is soaking, prepare your surface (see instructions on the next page, depending on the material you are using).
6. Gently remove the decal from the water and place it face-down on a flat surface covered in paper (newspaper, brown paper, paper towels; it does not matter).
7. Pat the decal dry. This will help minimize how much water carries over to the surface of the material you're transferring it to, as well as minimize the air bubbles that can form between the decal and the substrate.
8. Place the decal onto the surface of your final material and gently remove the backing paper.
9. Make sure all air bubbles are removed from the back by applying a towel to it, gently rubbing from the middle outward.
10. Leave the print for five to ten minutes so that any residual water will evaporate.
11. Gently coat the back of the decal with turpentine.
12. You can layer decals on top of each other as well as paint on top. Each decal can be printed at different densities so you can see the images through one another.
13. Protect the finished image surface with two or more thin coats of acrylic medium or varnish.

DIRECTIONS FOR SPECIFIC SURFACES

I have found that even though instructions may say that you don't need to prepare the surface you are transferring to in any way, or that you can use rubbing alcohol as a solvent, that is far from the truth. Turpentine helps "melt" the decal into the surface; with other

12.19 © Leslie Jean-Bart. Leslie has an older carbon copier that she uses to make images with. She is then able to transfer the carbon onto Arches watercolor paper using Citrasolv. Citrasolv is a natural citrus solvent that when applied to the back of the paper, helps transfer the carbon to the receiver paper (in this case, Arches). Many people use a brayer to rub the back of the paper, but Leslie uses a press which really helps get all of the carbon to transfer from the weight of it. She will do this several times, registering a new carbon print each time, until she gets the tones she likes.

solvents a day later you may see the image peeling up, or breaking off.

Make sure your material's surface is free of dust before you start preparing it.

Canvas or paper

1. Prime the material with an acrylic medium, and let it dry.
2. While the decal is soaking in water, put a new, thin, fresh coat of medium on top of the material's surface and place the decal where you want it to go before the medium dries.
3. After the decal dries, more medium can be put on top to help the decal stay in place.

Wood, plaster, glass, plexiglass, eggs, or any other surface you can think of

The instructions that come with these decals say that you can use alcohol as a solvent. That is incorrect. After a few hours, the decal will lift off at the edges and you cannot get it to stay down. It is very frustrating!

1. Soak the object with turpentine – *not paint thinner, but real turpentine* (make sure you are outside or have very good ventilation and wear a mask).
2. Follow the directions above for the decal preparation and placement onto the object. Make sure all air or water bubbles are removed from in between it and your material's surface.
3. If any lifting occurs, put more turpentine on top.
4. Dry well.
5. Spray or paint on with polyurethane to protect the decal from chipping – two or three thin layers, letting it dry in between.

12.20 © Steven Berkowitz. "Crème Lotus, Kyoto, Japan." This is a series of photographs shot of lotus leaves floating in water. First made into cyanotypes, toned and then digitally printed, they were then transferred with gel medium onto plexiglass sheets. Each photo was then backed with gold leaf.

Tiles, or already fired plates, mugs, etc. to bake decals onto in an oven (not firing in a kiln)

1. Print your image as a mirror image, because as you will be placing the image face-down on your receiver material the words will then read correctly.
2. Let it dry for 24 hours. Cut the image out.
3. Arrange your tiles or other objects in an oven-proof tray and preheat your oven to the lowest temperature.
4. Put the printed Lazertran in a tray of water for about one minute.
5. Take it out of the water and flip it over on top of your material or object, so that any words or numbers read correctly.
6. Push all the bubbles to the side to remove them, making sure you have a clear surface.
7. Put the tray, with your tiles, into the oven for an hour.
8. After an hour, raise the temperature 50°F every 15 minutes. Do this about four times, checking to make sure you are not burning your image, although it is normal that the glue on the back will look brownish.
9. Take tiles out of the oven and let cool for two hours.
10. With a thin knife, start separating the tiles from one another so they do not stick to each other when they completely cool down. The cool-down period takes about five hours altogether.
11. Wash the ceramic pieces with dish soap and a soft sponge and cool water. If it is white, the ceramic piece is clean. Be careful not to rub too hard or you can scratch the image off.
12. Let the pieces dry totally and spray or brush on two or three thin coats of polyurethane, and allow to dry.

Silk, satin, or cloth

Make sure you use the correct product or your finished piece will be stiff. The decals that are made for cloth or silk are different and will actually dry smooth. Also, these decals are for a laser printer – not inkjet!

12.21 © Suda House. “Heir I Apparent”. This is part of a body of work that is called “Women Bleed.” Suda appropriates the images of global turmoil from the front pages of newspapers and transfers the suffering of women and children, as well as the perpetrators of their pain, to the most feminine of objects – the sanitary pad.

12.22 © Suda House. “Toma mi Mano (Hold my Hand) Tijuana, MX.” Suda gifts these works to collectors in exchange for donations to charities that benefit women and children throughout the world. Both of these images are made using the DASS transfer process.

1. Print your image as a mirror image because you will be placing the image down on your receiving material and the words will then read correctly.
2. Iron the material so it is flat.
3. Place the decal face-down onto the material.
4. Using a *cool* iron, carefully iron the *back* of the material until the decal is dry.
5. Turn the iron back to high and turn the material over.
6. Place a piece of parchment paper or (non-waxy) baking paper over the image.
7. Iron through the paper for one to four minutes, depending on the size of the image, and then allow to cool.
8. Peel the parchment paper off slowly.
9. You cannot wash the finished fabrics with other clothes. Turn the material inside out and hand wash in warm water with a very mild soap. Line dry.
10. Always protect the image with parchment paper when ironing.

ANOTHER WAY TO LAYER IMAGES:

Chine-collé – *what is chine collé?* A rough translation of this French term is "thin paper attached with glue." Chine refers to thin tissue paper, traditionally imported from China, Japan, and India. Collé refers to the glue or paste used to attach this thin tissue to heavier Western-made plate paper.

The idea is that a print is made on a thin piece of paper such as rice paper, and glued onto a thicker support. You can glue up to ten sheets of thin rice paper and still have it be translucent. The less glue used, the more transparent each layer will be.

Instructions

1. Use one to ten layers of "tissue" (a thin paper such as rice paper) that you have printed (different) images on.
2. Almost any type of glue can be used. Wheat paste glue (for book binding) can be mixed with water 1:8, or a pH-balanced glue or liquid glue (like Elmer's Glue) can be watered down to 1:1.
3. Whichever glue you use, make sure it is tacky when placed on the paper, but not too thick.
4. Something like wood blocks are good to use to press the paper down because a roller can tear the paper. But if you do use a roller, work from the middle out so that if the paper stretches, it stretches outward.

12.23 © Stephen Levey. Photo of my glass house at The Annenberg Center of Photography during Photoville 2019. The original images were all 5 × 7" wet plate collodion ambrotypes which were then scanned in and printed out onto lasertran transfer paper and put onto the old window glass. They were then sprayed with a UV protective coating. The idea of the immigrant faces was to have them staring back as people walked through and around the house and to hopefully have people realize that we are all immigrants and "those in glasshouses should not throw stones."

12.24 Connie Imboden and Jill Enfield Connie and I worked on the Exquisite Corpse fund raiser for the Maine Media Workshop. She made this portrait of me and then we made a transfer using gel medium and wax.

Thirteen

HAND PAINTING PHOTOGRAPHS: SILVER PRINTS, NON-SILVER AND INKJET PRINTS

13.1 © Jill Enfield. "Willa Cather's Bedroom, Red Cloud, NE." I captured this image on my favorite film that is, sadly, no longer made: Kodak HIE 35mm infrared film. It was printed on Kodak Ektalure G paper, also no longer made, and then painted with oil paints, pencils, and chalks.

The practice of hand painting photographs has been around since the beginning of photography. When daguerreotype studios first emerged in the 1800s people flocked to have realistic photographic portraits made of themselves and their loved ones. This put many portrait painters out of business, but just for a short time. Though daguerreotypes were immensely popular, people were not used to seeing their likenesses in shades of gray. They wanted color. Photographers soon hired the portrait painters to embellish daguerreotypes with dry powdered pigments, which they applied with camel-hair brushes, and thus the technique of hand painting photographs was born.

Hand painted images stayed popular throughout the nineteenth and early twentieth century, until the 1950s and 1960s when color film became cheap enough for the average consumer to purchase and use. At that point hand painting all but disappeared, but for a very short time. Soon artists began to use paint to enhance their images in interesting and unexpected ways instead of to mimic realistic color, as had been done in the past. Photographers who had colored their images started to use any medium that suited them from oil paints to acrylics to crayons, to name a few.

Anyone can learn to paint on a photograph. Even if you have never studied color before, you can learn the concept of putting paint on a photographic support. And then, like anything else, it is just a matter of practice to get to the point where you feel proficient and in control enough to create your own style.

CREATING HAND PAINTED PHOTOGRAPHS

The most frequently asked question about hand painting photographs is, “How long

13.2 © Barbara Bordnick. Barbara was a commercial photographer, but had studied painting. She never painted on her images until recently when she took acrylic paints to a few of her inkjet prints.

does it take to hand paint an image?" The answer depends on two things: (1) how large the image is and (2) how detailed you want to make it. Some people work quickly or do not do a lot of detailed work. They might be able to finish a print in a few hours. I try and finish a picture within two days. I will spend an entire day painting and then go back to it the next day to take a closer look and touch up any areas that I feel need to be redone.

You don't want to spread your work out over too long a time because after about a week or so the colors start to become permanently embedded in the emulsion and become difficult to manipulate. For instance, if you try to put a new color on top of an area that had been painted a while ago, the result may be very blotchy, and the same can happen if you try to remove a color that has had time to "set." So it is best to finish each print within a few days of starting it.

Just as painters find different materials to paint on and to paint with, so can photographers. While regular silver gelatin photographic paper may be among the easier supports to work with, any material that can be used as a base support for alternative processes can take some kind of painting medium. Think of your photograph as a sketch. Try different ways to put the color down on your image; a brush, cotton, your hands, anything that may free you up to start incorporating color into your image.

13.4 © Pete Kolonia. If it is rolled tightly, it will not come undone. Cotton balls are not as soft as rolled cotton and are harder to work with.

Throughout this book I talk about experimenting and being playful. Embellishing black and white or color photographs is a great place to start.

13.3 © Pete Kolonia. I prefer cotton-topped skewers instead of brushes to apply my paint. Take a small piece of rolled cotton and fold it in half over a skewer, then twirl it in your hand to create a tight swab.

GETTING STARTED

MATERIALS

Most of the materials required to make hand painted photographs are not standard darkroom materials, so before you get started, make sure you have the following items on hand.

- Brushes: Depending on which medium you choose, brushes may be used to either apply or blend your color. If you have never painted before, it may be easier to use a small bristle brush than a soft camel-hair brush, as the bristle brush is slightly stiffer and will give you more control.

- Cotton swabs: Cotton swabs are useful for applying and blending color. I like to make my own by adhering rolled cotton to the end of a skewer. Be careful to make your swabs so that they are thin enough to get into small areas, but not so thick that the skewer scratches the paper. I use different swabs for each color.
- Erasers: Many different kinds of erasers can be used to remove oil paint, pencil, and chalk from hand-painted photographs. I prefer the Eberhard Faber Peel-Off Magic Rub eraser (which looks like a white pencil).
- Extra Prints: Make sure you have a few "bad" photographs on hand before you start to paint. These are useful for trying out your colors.
- Fixative: This is used to protect chalks and charcoal once you are finished with your work. If you have used oil paints along with chalks, you need to let the print dry thoroughly before you spray it because the paint can soak up the fixative, causing bubbles to appear on the surface.
- Light source: It is important to have a good light source when making hand-painted photographs. A daylight correction lamp will give you true color. Stay away from fluorescent lamps as they generate a slightly green cast.
- Mat board: If you are working with oil-based colors, you will need two pieces of white mat board: one to serve as a palette, the other to use as a backing for the print. The palette mat board should be about 8 × 10" and should be pure white, which will allow you to see the true color of the paint. The backing mat board should be one size bigger than the print (i.e., for an 8 × 10" image, you'll need an 11 × 14" mat board) and should be fitted with photo corners to accommodate your works-in-progress. If you are working with water-based colors, you only need the backing mat board, as you will require a plastic palette to hold your medium.
- Palette paper: If you are working with oil-based colors, you will need either palette paper or wax paper to cover the mat board that you will be using as a palette.
- Photo corners: These not only keep your photograph in place on the mat board as you are working, they also keep your backing clean.
- Plastic palette or bowl: If you are working with water-based colors, you will need a round plastic palette to hold your medium.
- Resists: If you are working with watercolors or acrylics, resists can help mask areas of the print. Rubber cement, maskoid, and frisket all work well.
- Solvents: If you are using oils and pencils, I recommend using Turpenoid™, which is a healthier alternative to turpentine. You can also you P.M. Solution from Marshall's Photo Oils, which is turpentine and vegetable oil. Solvents have many uses. They can thin oil paints so the color will be less intense, remove oil paint, colored pencils, or chalks entirely, and clean up other areas, such as borders.
- Tape: if you are working with water-based media, keep a supply of drafting tape, painters tape, or Scotch Magic #811 removable tape on hand to serve in lieu of a resist. Unlike masking tape, these tapes will not remove the emulsion on the print. However, the tape will lift off oil-based media from the image, so watch how you use it.
- Wax paper: This less-expensive substitute can be used instead of palette paper to

13.5 © Pete Kolonia. Color pencils, oil paints, pastel chalks, crayons and oil sticks can be manipulated with turpentine, P.M. solution, or Turpenoid as well as erasers.

13.6 © Pete Kolonia. Watercolors (either solid, liquid, tube or pencil form), acrylic, and water-soluble markers can be manipulated with water.

cover up your mat board. Wax paper is only required if you are working with oil-based colors.

PAINTING MEDIUMS

The first demonstration I saw of hand painting photographs was with oil paints and colored pencils. I thought that was the only way color could be added to a photographic print. As I started really getting into the process, I realized that there was no reason other types of paints could not be used, and I began to experiment. I have to admit that my style has stayed mostly within the oil category, but every once in a while I take out some other materials and have fun.

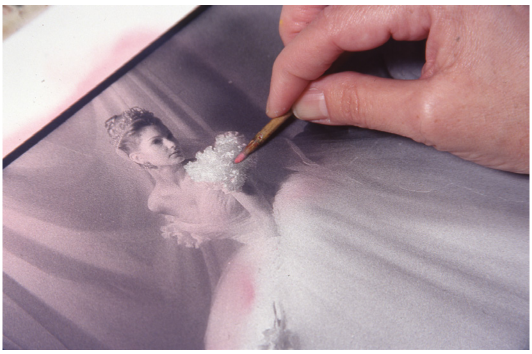
You can use anything to add color to a photograph. There are specific materials made for photographs such as Marshall's oil paints, colored pencils and dyes, Pebeo oil paints and colored pencils, Spot Pen Hand coloring Pens, Kodak dry dyes and wet dyes. However, you do not have to stop there. Crayons (I have found soybean crayons work best, but Crayola's are fine), Cray-pas (a combination of crayons and pastels), Pastel chalks, acrylic paints, watercolors, oil bars, any colored pencil such as Prismacolors. The list does not stop. Some of these may be more archival than others, but all can be used with good results. I like to walk around art-supply stores and pick out things that look interesting, bring them home and experiment.

Oil paints are the most permanent unless you buy "student grade" paint. Student grade

13.7 © Pete Kolonia. I start working on a "bad print" so that I can test the colors before I put them on the good print.

13.8 © Pete Kolonia. Because cotton would soak up most of the color that I need for this large area, I used a skewer with nothing on it to place my color down on the print.

13.9 © Pete Kolonia. I used cotton to blend the color evenly into the print. Then I used a little bit of Turpenoid on a skewer (with cotton) to remove unwanted color from the bride's dress.



13.10 © Pete Kolonia. A sharpened color pencil worked well to add color to some of the small areas.

is cheaper, but they do not have as much pigment in them, which means that the colors will not be as strong, and they are not as archival.

PAPERS

All of the images created by the alternative processes mentioned in this book can also be hand painted, so you may find yourself painting on a wide range of support materials. However, if you are printing traditional black-and-white photographs with the intention of hand painting them, then you will want to consider your paper choice before you make your prints.

Some people find that they have horrible problems with one paper, then try another one and cannot believe how much easier it is to work with. Since I frequently use oil paints to hand color my prints, I prefer fiber-based matte surface papers. Glossy papers tend to work well with watercolor paints, but oil paints do not soak in evenly, so that when you blend the colors together they rub off easily. This makes it hard to put colors on top of one another and difficult to get shades. Pencils can also scratch glossy papers.

Resin-coated papers also come with different surfaces and take paint well. RC paper is thinner than fiber and is sealed between layers of polyetherine, with the emulsion and super-coating on top. Since the paper is sealed in the resin layers, it doesn't absorb liquid as much as fiber paper and is much faster to process. However, because the layer of emulsion sits on top of the paper instead of soaking into the paper, the images do not have as great of a depth of tones as fiber.

Digital paper is tricky until you get used to how the paper will react to your chosen medium. While oil paints are easily manipulated on silver gelatin paper, they will stain digital paper. Some watercolors will dissolve the digital ink, so you need to do a test first to see if the paints are compatible with the paper. Chalks go on easily, as do pencils.

PAINTING ON NON-SILVER PRINTS

All of the processes in this book can be combined with hand painting. The difference between painting on a silver gelatin print, a digital print, and painting on images made with the alternative processes made on watercolor paper or other supports, has to do with how the support responds. Liquid emulsion prints can be painted in much the same way as normal silver gelatin prints, as the liquid emulsion itself acts like any silver-based

13.11 © Jill Enfield. I shot this image for *Bridal Guide* magazine in the 1990s with Kodak Infrared Film in a studio with strobe lighting. Using a combination of oil paints, pencils and chalks, I added color to most of the print.

gelatin. However, the base support (which in the case of liquid emulsion prints, may be paper, glass, ceramic, etc.) must also be taken into account. For instance, if you are using oil paints on a liquid emulsion print that was made on watercolor paper and you paint off the emulsion, the oil will go into the paper and permanently stain it. Watercolor paint might be a better choice.

Once you start painting on images done with some of the non-silver techniques, you will realize that the paper supports require the most attention. Since most watercolor papers stain if oil paints are applied directly to them, you might want to experiment with sizing. (See Sizing Techniques in Chapter 2.) This can be done before the image is printed onto the support or afterward, in much the same way as a painter may use gesso, which is used by artists to prime canvases before applying oil paint. Some people say you must size your paper if you are going to be using

13.12 © Adam Finkelston. "Giving and Taking." Adam made this archival pigment print from a wet plate collodion tintype and then used color pencil.

oil paints, but I disagree. It is a matter of how you want the final image to look. With practice and experimentation you will discover ways to work with alternative materials that suit your style.

PAINTING ON INKJET PRINTS

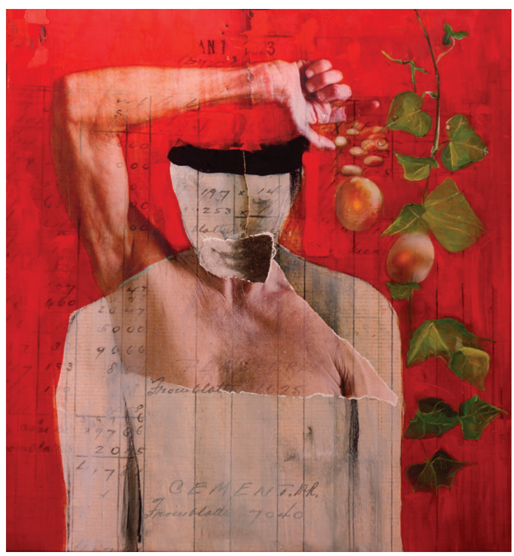
Digital papers have a coating on them similar to sizing, to make the ink sit on the paper instead of sinking into the fibers. Pastels and other paints don't really like the coating! They glop on and won't budge. Most hand painters print on regular watercolor paper. The same paper that you use for your non-silver prints. While you don't have an ICC profile to use, most printers will do just fine using the high quality paper or matte paper setting. This is something that you have to test with your printing system. Whenever I print digitally, whether it be for straight inkjet prints or using the image to paint on top of, I make a small test print so that I don't waste ink. Once I find a setting that works for the paper I am going to use, I write it down so that I will remember what I did and then make a larger print to use for painting on top of.

EVALUATING YOUR PRINT

One of the most important steps in creating a hand painted photograph is choosing a strong image. What makes a good picture is a debatable concept. People study for years to try to figure this out.

Seeing in black and white while you are shooting in a color saturated world is very different from shooting for straight color images. And shooting in black and white for the purposes of painting on the image is a whole new set of thoughts for some people. Personally, I try and balance the formal elements when I am photographing with the intent of painting the final image. I still "see" in black and white. I try not to get distracted by the colors, concentrating on the forms, shapes, and tones of the scene to keep my images as simple as possible. That way, when it is time to paint, I am able to focus on the main point of an image.

"The Shawl."



"Jack and the Beanstalk."

13.13 and 13.14 © Audrey Bernstein. Audrey prints digital images on canvas and then paints over them with oil paint and seals them with a matte varnish.

The photograph I choose must be just as interesting if kept black and white as it would be with color added. How many times have you heard that manipulating a bad photograph cannot make it better!? That point is indisputable. You cannot improve a boring print by adding color to it. The composition and subject matter must be interesting from the start.

Once you've selected your image, you need to decide whether to print the image yourself or have a lab print it for you. This is really up to you. Not everyone has the luxury of his or her own darkroom, but no matter what, make sure that you make extra prints of each image. When you begin to hand paint an image the worst feeling to have is to worry because you only have one shot at painting it perfectly. Having extra prints around (I usually print at least three) will allow you to relax and make mistakes. A lot of great accidents happen that way.

The prints need to have a good tonal range. In other words, your prints should have detail in the white areas and a lot of middle gray tones. Printing slightly lighter and flatter than you would for a normal black-and-white print will give you a larger painting area with which to work. However, don't go overboard with this. Make sure that your highlights have some details and that your gray tones are not muddy.

Once you start to paint, it helps to have a test print around to use as trial paper. It does not have to be the same image that you are painting, but it does have to be the same paper. Paints don't look the same on a palette as they do on a print. By putting your color on a test print first, you can see what the true color will be. For example, the color you have mixed might look like a dark blue, but when you rub it on a print, the pigment will spread out and it will look much lighter. A dark red will actually turn pink.

13.15 © Heather F. Wetzel. "No Running Please." This is from Heather's Notions series. They are layered and hand colored fumed salt prints made from iodine redeveloped wet plate collodion negatives.

PREPARING YOUR PRINT

There are two things to consider when preparing prints for hand coloring: not using hardener in the fixer when printing, and determining how (or if) to pre-coat your paper. The second decision is a matter of personal choice, but the first point is a given.

When making prints that you intend to hand color, do not use hardener in the fixer. Avoiding hardener in your fixer will allow the emulsion to stay a little softer, which will allow it to take the paint better. Liquid fixers come in two parts: hypo (part A) and hardener (part B). Mix your fixer as directed but leave out "part B." Some companies make powdered fixer without hardener, but you need to read the package carefully to make sure that you are purchasing the correct fixer. If you are using a lab, just tell them not to use hardener. These days, most labs print that way anyway because they are also offering their clients the use of toners that need to be added to unhardened prints. If the lab refuses, go to another one. There are many labs that accept your negatives and digital files. They will print for you and send you the finished prints within a time frame you both agree on.

13.16 © Joel Anderson. "Slave Dwelling." This gelatin silver print is a direct contact print from an 8 × 16" film negative and selectively bleached and toned using a fine brush. The image is from a project photographing former slave cabins around the country, altering them with bleach and toner to visually communicate the sense of fading away of the structures.

Another point to consider before you start to apply color to an image is whether or not to pre-coat or size your image before you start to paint. If you are using silver gelatin prints, there is no reason to coat your print first, especially if you are mixing media (oil paints along with water-color or other types of color) because water-based mediums will not adhere well to pre-coated prints. Pre-coating can create problems with dust. The oily surface becomes a dust magnet, so instead of making an easier surface on which to paint, pre-coating actually makes the process much messier. If you spray a glossy paper with a pre-coat spray and then work the area a lot by applying, and then removing paint repeatedly, it will give the paper the appearance of having a different surface texture from area to area.

MIXING COLORS

When you first sit down with a photograph you might feel similar to an artist with a blank canvas. Sometimes it is difficult to decide how you will approach adding color to an image. An idea that might help is to go through magazines and photo albums or go online, and pull out photographs or paintings that you like. They can be good sources of inspiration to get you started, and your imagination will take you further.

You can create an infinite number of colors from the primaries (red, yellow, blue) plus white and black, but it is fun to have lots of colors in front of you for inspiration. Color wheels are wonderful resources. They can show you what color will be created if two colors are mixed together. For example, if you are doing a garden scene and you need many different shades of green, you can start with one green and add different amounts of yellow. Then go back to the original green and add different amounts of red. Do the same with amounts of blue and you will end up with hundreds of shades of green. Adding a little white or a little black will change the colors again. However, if you mix the same percentage of each of the primary colors together, the resulting mixture will be brown.

People talk about "warm and cool" colors. A color wheel shows that warm colors are colors that fall from yellow to red-violet, with oranges and reds in between. Cool colors are

13.17 © Lynette Zeeng. "Hydrangeas." Lynette paints on silver gelatin prints using Marshall photo oils and other types of oils as well as pencils.

the colors that fall from yellow-green to violet, with greens and blues in between. There are two ways to overcome the problem of a color looking too bright. The first is to add a small amount of the complementary color to the mix. The second way is to put the complementary color next to it in another area. Complementary colors are colors that are opposite each other on the color wheel: yellow and violet, red and green, blue and orange, etc.

USING WATER-BASED COLORS

Water colors come in many different forms; tubes, cakes (which are what you probably used in grammar school), pencils, markers, liquid, and paper that you set into a water bath so that the water turns the color of the paper. If you have made a color in liquid form that you like, you can pour the liquid into jars, seal it, and save it for a later time. If your watercolor (either liquid or tube form) hardens, simply either add water directly to the substance or use a wetted brush to pick up the color.

Acrylic paints come in tubes and are great to use if you want to cover an area completely with an opaque color. For instance, dark shadow areas in prints do not reflect light. So when you paint over them with a transparent or translucent medium, they will look muddy. However, if you use acrylics, then it does not really matter, because they are opaque. While acrylics are quick to dry, it can take practice to get a smooth surface.

Watercolor and acrylic paints can be applied to both dry and wet prints. If you are using a wet print, tape the photograph onto a piece of plexiglass to keep it flat and still. If the print dries as you are working, rub a wet cotton ball over the area that you are painting. If you want to work on a dry print, you can position it on a mat board that has been fitted with photo corners. This will keep the print flat and at the same time keep the board under your photograph clean.

Try using both the wet and dry methods to see which is easier for you. When I teach hand-painting techniques, it is always interesting to watch people discover their own

13.18 © Willie Osterman. "Masking Portrait." Willie has a show of over 100 masks that were originally shot with the wet plate collodion technique. He then made prints and scratched into them making each print a one-of-a-kind. Willie states that his end goal is to "create a collection of ancient ritual through modern day representations of masks that collectively will create a contemporary vision of the power and universality of the concept of Masking."

style. At first people sitting next to each other tend to try the same things, but soon everybody is fine-tuning his or her own method. The best way to figure out which will turn into your style is by experimenting for a few days before you sit down to conquer a finished piece.

Watercolor pencils are fun to use because you can get so many different styles from one tool. You can use them to draw right on the print. You can leave the marks just as they are or wet them down and blend them. You can also add more color to make them brighter or add other types of paints on top of what you painted using pencil.

Retouching dyes and dry dyes that are made for color photographs can be used with water to make more subtle colors. Both of these dyes are permanent, so you need to build the colors up slowly.

Rubber cement, maskoid, and frisket (which are all called "resists") are great items to have around when working with water-based paints. Use one of these resists to cover up any areas (of a *dry* print) that you don't want to add color to. Then let the resist dry thoroughly before you apply paint. (I find that rubber cement can be a little unruly to put down, but it is much easier to take off than either maskoid or frisket.) Once you finish painting an area, and the paint is dry, rub the resist off with your fingers or take it off with tape. Any paint that is on top of your resist will come right off along with it. Your print can be placed in water but the area with the resist will repel the water. You can reapply a resist over a dry, painted portion of a print to protect it from other colors, provided that the paint is water based.

TRICKS FOR WORKING WITH WATER-BASED MEDIA:

- It is best to start with a light shade and slowly bring the color up to a darker shade

13.20 © Martha Casanave. Martha often uses a pinhole camera in her work. This was printed on silver gelatin paper in the darkroom and then painted with oil pastels.

13.19 © Michael Pointer. "Pasture Survey: the Yearling." This image is part of a series of gelatin silver mono print chemigrams with acrylic paint. Each negative is enlarged to around 20 × 70" and he selectively develops the print by soaking rags in developer and fixer as well as using spray bottles with chemistry. When the prints are washed and dried, Michael will then add acrylic paint.

- If you have made a mistake and want to start over, simply wash your print. Ninety-nine percent of the paint will come off.
- If the paint does not come off, you may have used hardener in the fixer or waited too long to wash the print.
- If the paper beads up while you are painting, don't worry about it. The paper will flatten back down once it is dry.

USING OIL-BASED COLORS

While not all of the materials that I discuss in this section are technically oil-based, I group them together because they can all be removed the same way: with turpentine, Turpenoid, P.M. solution, or erasers. Oil-based colors tend to be the paint of choice with most hand colorists because they are versatile and easy to use.

To begin, take a piece of either palette paper or wax paper, and tape it to a piece of white mat board to use as a palette. Wax paper is cheaper than palette paper and is similar in texture to palette paper. If you are working on an image over several days, you can stop the paints on your palette from drying out by placing another piece of wax paper on top of them. The white board allows the true colors to show through as you mix your colors. To mix my colors, I use a skewer with no cotton on it because the cotton will soak up too much of the color.

Photo oil paints have more oil and less pigment than regular artists' oils, which is why they sometimes seem more translucent. However, artists' oils can be made to look like photo oil paints by rubbing them down. Sometimes I will apply a color, rub it in with a piece of cotton, and then reapply the same color a few more times. This allows me to see the photograph through the paint as the color gets more intense, but not more opaque.

13.21 and 13.22 © Cathy Cone. Cathy scans in found tintypes and prints them out onto uncoated printmaking papers and then paints over them with gouache. They are really wonderful to see all together.

By applying the oil paint on thickly from the start, the color will be both intense and opaque, totally covering the photographic tones underneath.

Oil bars are oil paint in the shape of a fat pencil. The bar allows you to get the look of oil paint with the ease of a pencil. If you want to get into small spaces, you can whittle the point down to a small size. Otherwise, oil bars respond just like oil paints. You can rub them in, mix them to make new colors, and take them off with Turpenoid. The bars come with a "skin" to protect the oil from drying out. You need to take a knife and peel the top layer off, otherwise the color cannot be applied and you will scratch your surface. The skin grows back every day to help preserve the paint.

Colored pencils are lead pencils, but they can be treated like oils. They can be combined with oil paints, either on top or beneath, with no ill effects. Several companies make pencils specifically to color photographs, but you can use almost any colored pencil. The most important aspect to look for is the softness of the pencil. Some brands have very hard lead that can scratch the surface of a print. Marshall's photo oil pencils, Pebeo photo pencils, and Berol Prismacolors are among my favorites. However, even these can scratch

13.23 © Beth Kokol. These mixed media pieces begin with a photo printed on printer-ready silk at the highest possible resolution and quality. Once removed from the backing paper, the silk images are then mounted on frosted Mylar using glazing medium. Beth uses glazing medium because it is thinner than gel medium and she can brush it onto the Mylar. She then paints both sides, deciding later which side she likes better. The final steps include sanding the backside of the Mylar then mounting to a solid surface such as Masonite that has been gessoed.

your print if the point is too sharp or you are too heavy handed.

Pencils are wonderful tools because, as with watercolor pencils, you can get several different effects. For example, if you simply draw onto the print, you will get a textured look. The pencil can cover an image fully or just highlight it with color. You can also take a very small amount of Turpenoid and dot it onto an area that has been toned with pencil, then take a dry cotton swab and smooth the color out. To mix colors, draw on the print with the colors you want to mix together and then take a cotton swab to combine them. For the most part you will not be able to tell which was paint and which was pencil.

If you are getting too many scratch marks on your prints, you might want to use the "extender" that comes with Marshall's paints. Extender is similar to Vaseline. It will remove the color, so only use it where you want to add color. Put a small amount in an area you want to add the pencil color to, and rub it in as best as you can. Then apply the pencil and it should go on without noticeable scratching. Turpenoid and P.M solution can be used in the same way.

Crayons are very waxy, but you can apply them or take them off in the same way as oil paints and pencils. Because it is waxy, if you rub too hard, you might find that you have taken off more color than you intended to, so work slowly. There are crayons made of soybeans that are less waxy and easier to maneuver than waxy crayons such as Crayola. Be careful about using crayons on top of oil paints, as they can lift off the oil paint. Crayons do go on top of water-colors very well.

Cray-pas are a cross between crayons and pastels. They are very cheap and are a lot of fun to use. Cray-pas respond similarly to crayons (they go on a little waxy, and can come off easily), but they have a wonderful iridescent color and can give your print a nice

13.24 and 13.25 © Brigitte Carnochan. "Pot of Raspberries." Brigitte prints on silver gelatin paper in her darkroom and then decides which ones to paint. She uses all kinds of oil paints to interpret her memory and imagination more than reality. She uses cotton swabs instead of brushes and uses an art eraser to created highlights and other effects. Though the images are editioned, each is unique.

13.26 © Antonio Martinez. Archival pigment print. This image was originally shot with 35mm b&w Tri-X film. Antonio then enlarged the b&w negative onto ortho-litho film, which resulted in a positive. This enlarged 4 × 5" ortho-litho positive was contact printed onto a modern dryplate tintype. Next, the tintype was scanned for its uniquely ephemeral aesthetic. He then returned to the original 35mm b&w negative and scanned it, so that he could composite its corresponding tintype. He then digitally painted the resulting image.

three-dimensional look. Extender also works well with Cray-pas.

Neopastels are an oil pastel. They are neither as messy nor as fragile as soft pastels, nor as waxy as Cray-pas. They can be rubbed in with your fingers or with a cotton swab.

A disadvantage of using crayons, Cray-pas, and neopastels is that they all act the same way: they may be difficult to put on smoothly and they also do not really dry. If you are over matting your print and putting it into a frame, nothing needs to be done. However, if you are going to keep it in a portfolio or send it off somewhere, for a show, to sell, etc., it is best to spray the print with fixative. (See Finishing Your Surface.)

CLEANING UP YOUR PRINT

As far as cleaning up the edges of your print is concerned, rubber cement or other resists cannot be used with oil-based media because they will take off all colors that are not in the watercolor family. If you want to keep oil-based media off an area of your print, there are other things you can do. You can use drafting tape, painters tape or Scotch Magic 811 removable tape. These tapes will not take the emulsion off your paper as they are less tacky than masking tape. If it is important for you to keep your edges clean, tape around your image before you start to paint. Turpenoid can be used sparingly to clean up. If you use

13.27 © Athur Ou. Athur uses a view camera to make multiple exposures and then makes gelatin silver prints on matte paper. The base exposure was of the rock surface, the second exposure was made in the studio of painted wires against a black background so that they can be added onto the rock background. He then hand tints them with waxed pigment to emphasize the forms within the picture.

13.29 © Barbara Ellison. This was a digital file printed on Arches hot-pressed paper and painted with Conte pastel pencils. Barbara then sprays the print with fixative.

13.28 © Jill Enfield. “Taos Adobe.” This was taken with now defunct Kodak HIE infrared 35mm film. I loved how it turned everything green shades of white instead of gray as well as giving me a lot of white area to be able to color over and have the image grain show through the paint.

it too much, it can not only take off the color, but the emulsion right along with it.

Erasers can also be used to erase unwanted color along the edges, but I don't like using them within an image. Too much use of an eraser can leave a film on your paper, much like the shininess that results from the use of too much Turpenoid.

USING OTHER MEDIUMS

Any type of medium can be put down on an image. Figuring out which ones you prefer is simply a matter of practice. Since purchasing one or two colors in each medium can be an expensive proposition, you might consider taking a workshop in order to experiment with a range of materials. Try lots of different things and then decide which materials work best for you.

Markers. Most markers are permanent, but not all, so pay attention to which ones you pick up at the art-supply store. The colors tend to be very bright and they come in a variety of point sizes, which makes them easy to draw with. Chartpak makes nonpermanent markers that can be removed with turpentine. Watercolor markers can be removed with water.

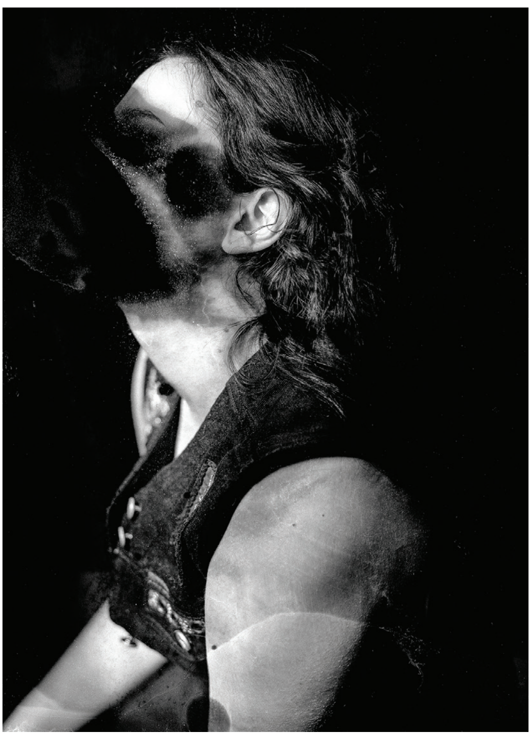
Toners. When toning silver gelatin prints, most photographers tone the entire print. Instead of toning by submerging your print in a tray, mix up the toner and use a brush or cotton swab to selectively paint the toner onto the image. Some people use this technique first and then paint on top of the toned area, while others use a variety of toners as their main medium.

Household items. Try experimenting with household items such as tea, coffee, merthiolate (used for wounds), gentian violet (used for mouth sores), and food dyes. In other words, experiment, have fun and know that you can use anything to add color to your images.

13.30 © Bridget Conn. Bridget drank from every tea bag that she uses to print her images on. Once the bags are dried and emptied, she digitally prints a portion of the image onto it. She then trims the tea bags down and collages them onto a wood panel, adhering them with matte medium. Once this is dry, she then starts painting in the highlights and shadows with Caran d'Ache watercolor crayons and then color pencils to pull out some of the details. When Bridget is finished, she seals the pieces with paraffin wax.

Mixing water and oil. Mixing water and oil effects on your paper is possible, provided you follow the right sequence. Putting oil or colored pencil down and the watercolor will give you a result similar to what you may have experienced in art class as a kid when you drew on a piece of paper with crayon and then covered your picture with black watercolor paint. The paint that went over the crayon beads up, and gives a slight polka dot effect.

If you put the watercolor down first, and let it dry, oil paint, colored pencils, chalks, or any other medium, can go right over it. The colors won't blend in the same way as they would if they were the same medium, but it may give you an effect that you will like.



13.31 and 13.32 © Bronwen Wickstrom. Bronwen paints on her negatives with a mixture of diluted bleach and full strength bleach. She then masks out some of the facial features and prints them in the darkroom.

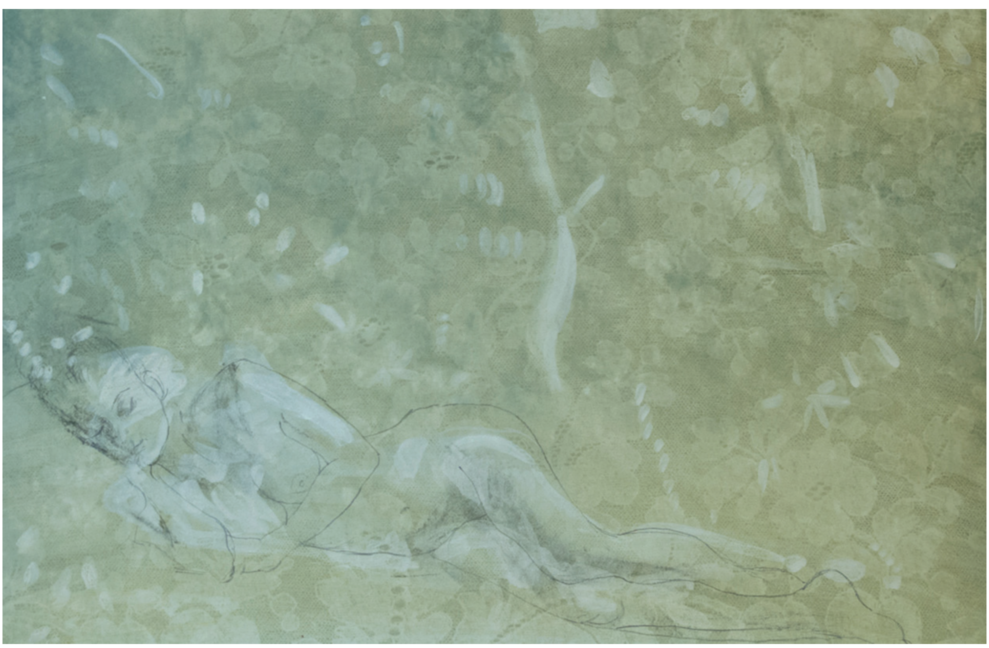
13.33 © Annemarie Borg. Annemarie coats cyanotype on Ilford photographic papers with objects placed on top while the cyanotype is still wet. She then sprays a little white vinegar and sprinkles sand on part of the surface. It is then covered loosely with cling wrap, pressed down between sheets of glass and exposed. She rinses and fixes the paper and once dried, she paints with acrylic gold tinted acrylic paint.

13.34 © Diane Farris. "Agapanthus with babies" is a hand colored silver gelatin print. Diane uses all different types of paints depending on the image.

13.35 © Lynette Zeeng. "Artichokes." This image is on an inkjet paper and painted with pastels and then sprayed with fixative for permanence.

13.36 © Amy Rockett-Todd. "For the Love of David" was created with a pinhole camera and 120 Ilford Delta 100 film, self-processed. The negatives were scanned, digitally enhanced, and digitally printed at 26 × 26" on Canson Rag Photographique fine art paper. Amy uses Rembrandt and Sennelier soft pastels, gently scraping pigment from the stick onto a mat board with an x-Acto knife, so that she can mix pigment colors and apply the pigment to the image using a natural bristled short filbert or oval wash paint brush, gently pushing the pigment into the tooth of the paper. She then uses a spray fixative on the entire print.

13.37 © S. Gayle Stevens. "Medusa." Medusa was a gorgon whose visage would turn men to stone. This version of Medusa references the lengths one will go to become "beautiful." The self-portrait with foiled snaky locks and green facial was shot hand held with a Holga – the image was scanned and a digital positive made. The digital positive was projected onto the wet plate tintype. The tintype was hand colored with 23.75K shell gold and Pan Pastels then varnished with sandarac varnish. The finished tintype is mounted in a vintage compact where you view the image in the mirror to avoid turning to stone.



13.38 and 13.39 © Sarah van Keuren. Sarah uses cyanotype as a color to paint with and exposes it to sunlight through her window. She does not measure the chemicals very carefully so that the color of the cyanotype is always different. With Figure13.39 she used a blurry low-contrast digital negative for the trees in the background and heightened the tree trunks with white watercolor pencils on the reclining model. For Figure 13.38, Sarah used cyanotype over a pencil drawing of a model. She painted on top with white watercolor and India ink.

13.40 © Jill Enfield "Taormina, Sicily." Using oil paints to put the main colors down, I then go over the print with different colored pencils to separate colors and bring out highlights. The colors are chosen not from reality, but from a memory of how it felt to be in that environment.

FINISHING YOUR SURFACE

- Spot your print after you paint it. You can use spot tone over any type of color, but it is not always easy to color over spot tone. The color layer helps to blend in the spot tone much easier.
- If you have used crayons, Cray-pas, or neopastels, you will find that your colors don't dry thoroughly. If you plan to keep the prints in a portfolio or otherwise show them in an unframed condition, you will want to spray the print with fixative, bought at art-supply stores for this kind of medium.
- Before you use the fixative, make sure any oil medium you might have used is completely dry. Otherwise the fixative will bead up. A good rule of thumb is to wait about three weeks before spraying. If you have really been heavy handed with an oil medium, wait several months to make sure all layers are totally dry.

Fourteen

MULTIPLE PRINTING AND OTHER TECHNIQUES

14.1 © Jill Enfield. "Belgium." Platinum over inkjet print. This was a digital capture and printed on Arches Platinum Rag paper with all of the black taken out and then platinum put on top, exposed and developed normally. The inkjet without the black is Figure 14.2.

INKJET WITH PROCESSES ON TOP AND ANOTHER REALLY COOL WAY TO LAYER IMAGES

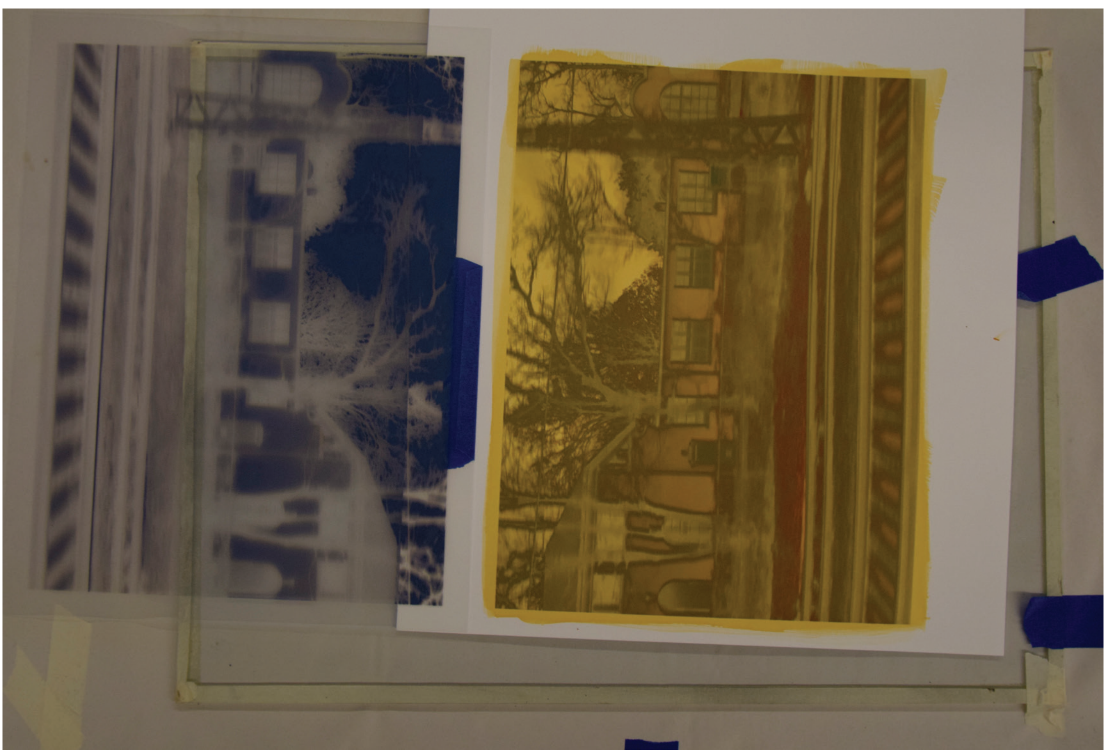
The first time I saw this was when I was at Dan Burkholder's house in the early part of this century. Thanks to Dan teaching workshops, more people are experimenting and making wonderful images this way. Dan was using platinum and palladium over inkjet prints and then when I was teaching at Penland School of Crafts in North Carolina, one of my students wanted to do it using cyanotype. It is slightly different when using a blue print instead of a brown print over inkjet, but I experimented with the Photoshop settings and came up with how to do it.

14.2 © Jill Enfield. "Belgium." This is what the image looks like before the platinum is put over it. It is an inkjet print with all of the black taken out.

INKJET PRINTS ON WATERCOLOR PAPER WITH ANY ALTERNATIVE PROCESS ON TOP

For Platinum, palladium or Van Dyke brown:

1. Pick an image with good color.
2. On the computer, make your image look great as a positive.
3. Go to Selective Color in Adjustment Layers. Select *black* as your color in the pull down menu.



14.3 © Jill Enfield. This is an inkjet with the platinum/palladium already coated on top. The negative has been registered and is ready to be placed on top for a two-minute exposure in a high output UV box made by Jon Edwards.

14.4 © Jill Enfield. Finished image of the platinum-palladium on top of an inkjet print. Printed on Hahnemühle Platinum Rag paper.

Take the black slider and pull to the left so it is –100%.

4. Go to hue/saturation and up your saturation about 45%.
5. Choose a watercolor paper (hot-press will produce a sharper result, but you can use any paper) and print using the profile for *premium matte paper.*
6. Let the print dry for about 30 minutes.
7. Now you need a negative of the same image at the same size. (Of course, you can use a different image – this is not a rule, it is up to you!)
8. You can use the same file – just turn the layers off (click on the eye icon beside each layer) and follow the directions on digital negatives in Chapter 3.
9. Put your print on top of a light box so that you can easily register your negative on top.
10. Tape your negative down on one side so that you can move it out of the way when you sensitize over the printed image.
11. Coat on the now-dry print with your (brown) sensitizer of choice.
12. When the sensitizer is dry, flip your negative back in place and expose the image in a UV box or out in the sun.
13. Follow the instructions for the sensitizer you have chosen, but expose for about 10% less time than a normal print.
14. Process as usual.
15. The color of the inkjet print will show through, unless you have overexposed your image.

For cyanotype:

Everything is the same as above except for step #3 follow these instructions instead:

14.5 © Jill Enfield. Robert Rauschenberg's studio. This image has gone back and forth between processes from every century: shot with Hipstomatic on my iPhone; made into a print on Arches Platine paper; made into a digital negative; finally an inkjet print with a palladium on top.

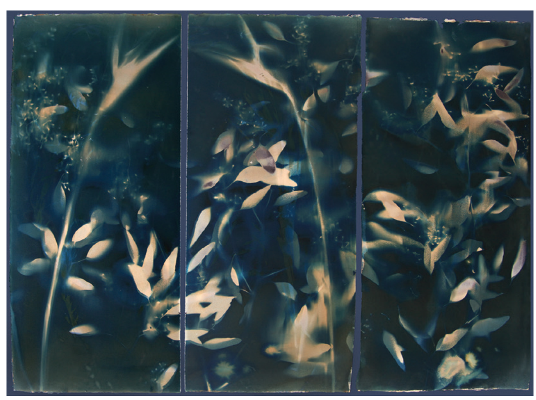
1. Go to selective color:
   (a) Choose Cyan in the color mode and take it down to –100, and the black down to –50
   (b) Then choose Blue in the color mode and take the cyan down to –100%, and the black down to –50

MULTIPLE PRINTING

I always tell my students that they should never throw anything away because there is always experimenting to be done. Though you sometimes get mixed results, it is really fun to combine processes to complete an image. Technique mixing is generally achieved by either re-registering the same negative, or using a different negative to create a second, third, or fourth exposure with a different process. However, if you are working with paper that you intended to use just one time and have now decided to use for a second process, the exact registration of the negative for the second exposure may not be possible. The paper, having been coated and run through chemicals and water, has most likely shrunk, causing the registration to be slightly off. Rather than viewing this as a hindrance, you can use this to your benefit to make interesting images.

If you know beforehand that you want to experiment with combining different processes, I recommend two things. First, size the paper before you get started. Second, keep notes as you work. I tend to start playing around in the darkroom and forget what I have done and then cannot always repeat it. Keep a pencil handy and try to get into the habit of writing down on the back of your print what you plan to do. Some people find it easier to record what they are doing and then when the prints are dry, they transcribe what they have done on the back of the prints. This way notes cannot be misplaced and you should be able to repeat a process. Or if you number your prints, you can number the notes in a notebook that you keep in your darkroom. In other words, do whatever works easier for you to be able to know what you did at the time. You may think you will remember, but even when I was much younger, that didn't happen!

Van Dyke brown and cyanotype sensitizer can be combined to create beautiful tones. You will get a different effect depending on



14.6 © Laura Blacklow. "Havana Storm." Laura made this beautiful triptych using Van Dyke brown and cyanotype on Rives BFK paper. She applied multiple layers and developments of blue and brown, using plants to contact print in the sun.

which process you use first. I found that starting with an underexposed cyanotype and then using Van Dyke brown sensitizer creates a look that is very similar to a cyanotype that has been toned with tannic acid and sodium carbonate. However, if you dilute the Van Dyke Brown solution 1:1 with distilled water, you can get some unique results.

It is also possible to start with Van Dyke brown prints and then apply cyanotype chemistry. Potassium ferricyanide in the cyanotype bleaches out the silver in the Van Dyke brown and most books do not recommend using cyanotype as the top process. However, if you use a small brush and selectively apply cyanotype sensitizer on top of an overexposed Van Dyke brown, the prints can really be beautiful. I have also applied diluted cyanotype sensitizer to a very dark Van Dyke brown print and exposed for a short period of time with some great results.

14.7 © Sam Wang, “Magnolia with J.” This platinum/cyanotype print was made by combining separate digital images on the computer. The collaged image was color separated and printed onto transparencies, which were used to print platinum and cyanotype on 100% cotton paper.

Mixing cyanotype and palladium or platinum sensitizers can also be interesting. Again, the strength of the sensitizer and the length of the exposures play important roles in the final look of the image. Putting palladium sensitizer on top of a normal cyanotype print takes most of the cyanotype off. However, putting palladium sensitizer on top of an overexposed cyanotype leaves a little bit of blue (much like the Van Dyke brown/cyanotype print) and can be very beautiful. Using diluted cyanotype sensitizer on top of a slightly dark palladium print can leave just enough blue in the shadows to be worth the experimenting time. Cyanotype is really a nice choice for adding density to weak shadows. It is a matter of experimenting with dilutions and times. I will use small pieces as test prints to try out different exposure times. I tend to stick with a dilution of 1:1, but that is certainly not your only choice.

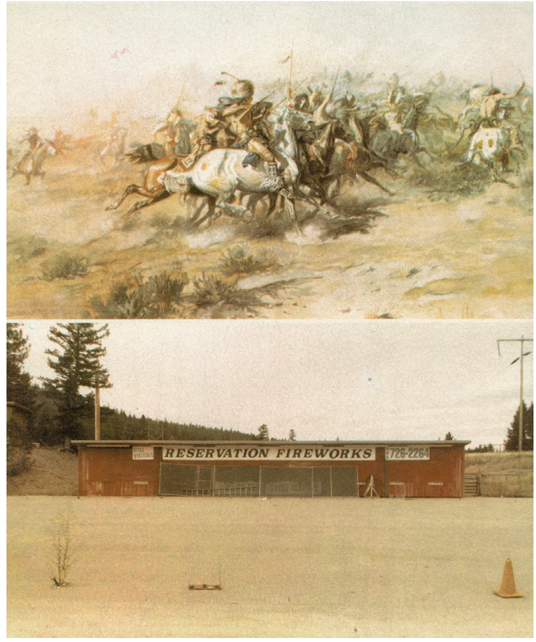
It is also possible to create layered effects with liquid emulsion prints, though getting a satisfactory result can require a lot of experimenting because the chemicals for the non-silver techniques bleach the silver in the liquid emulsion prints. This bleaching effect can be interesting if you learn to control it by coating selectively. Alternatively, you can try applying liquid emulsion on top of the non-silver processes.

You can also experiment with positives and negatives by using both pieces of film to make one image. Try using the negative first with Van Dyke brown sensitizer and then, for the second exposure, using the positive with slightly diluted cyanotype sensitizer. Then try another print using the positive first and the negative second. You can also use different negatives on top of each other or next to each other.

When you’re experimenting, don’t forget about the computer. A student of mine

14.8 © Diana Bloomfield. "Pear Tree." Gum over platinum and palladium.

14.9 Diana Bloomfield. "Budding Maple." Gum over cyanotype. Diana will choose a process to start with and then start putting layers of gum bichromate on top to maintain depth of vibrant colors. The first layer color is dictated by the image.



14.10 © Megan Crawford. "The Custer Fight." Gum bichromate over salted paper. Hahnemühle Platinum Rag paper was initially shrunk and then sized with casein, and then coated in 10% silver nitrate. Salt prints were exposed for 17 minutes, and then processed through a series of six baths (5% salt, 5% salt, water, fix, fix, water). The gum process starts with magenta (quinacridone rose) and continues with yellow (nickel azo yellow), cyan (phthalo blue), a final layer of magenta (quinacridone rose), and occasionally a final layer of cyan (phthalo blue).

showed me a beautiful book he made by painting white paint onto black paper and putting an inkjet image on top of the painted area. He then added transfers on top of that. There is no reason why you cannot do this with any of the processes discussed in this book.

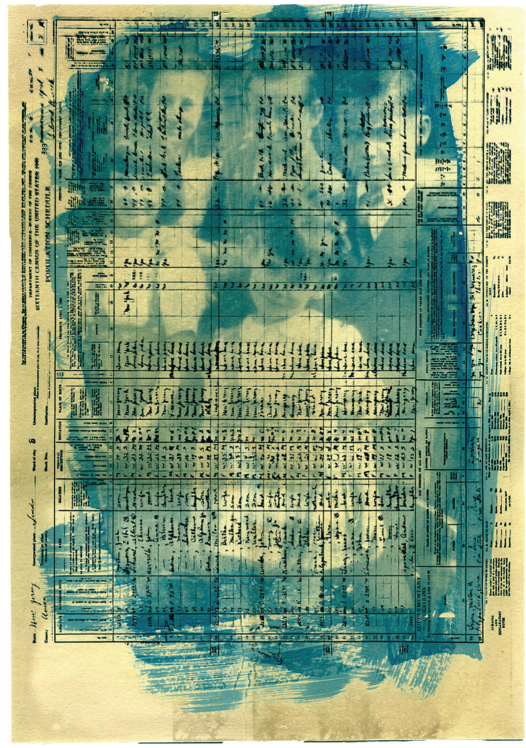
COMMON PROCESS COMBINATIONS ARE:

- Cyanotype and gum. A lot of gum printers seem to like the blue color of the cyanotype and use this instead of a blue gum layer.
- Platinum and palladium prints are beautiful on their own, but a very subtle gum layer on top can add just a hint of color and an extra dimension.

- Cyanotypes and Van Dyke browns. The blues and browns look beautiful together.
- Take a slightly underexposed platinum or palladium print and use diluted 1:1 cyanotype on top. Expose for a little less time than normal, and it will add nice shadow details.
- Overexpose a Van Dyke brown image, then put platinum or palladium on top. The combination of the browns will look multi-dimensional. If the image looks great when wet, it will dry down too flat; if it looks a little weak in the wash, it will dry down nicely.
- Cuprotype with a cyanotype on top.
- An extremely dark cyanotype can be used in combination with Dektol developer as bleach, and then treated with tannic acid and sodium carbonate (see Toning in Chapter 5). It produces great results if you then put liquid emulsion on top, then expose and develop normally. The plum color of the toned cyanotype mixed with the silver can be stunning.
- Digital printing with any of the processes on top.

In each chapter, I mention how important it is to be neat and use one brush per process and label your trays. While I was teaching a workshop, I picked up a brush I had used for cyanotype and used it for Van Dyke brown. I didn't notice anything until I developed the print and noticed blue throughout. It is my favorite multiple process print. It is 25+ years old and still looking good. I have never been able to repeat how the image looks, but that works for me.

There is no wrong way to combine processes. You might not like what the end product is every time, but start combining techniques that span two centuries of art and see what you come up with.



14.11 © Erica Thostesen. "Where She Lived." This image is from a series called "Love, Nana & Pa." This is an inkjet print with tea-toned cyanotype on rag paper. Erica's installation work, *Love, Nana & Pa*, was an outlet for her to both experience and show her fading memory of her grandparents. The combining of current and antiquated processes emphasizes her present memory with images of the past. The compositions consist of images from family archives that represent where her grandparents, lived, visited, worked, their possessions, handwriting, etc.

OTHER TECHNIQUES – BACK TO THE FUTURE

USING YOUR SMARTPHONES

As the cliché goes, the best camera you own is the one that you have with you at all times. These days, most everyone has a smartphone with them at all times. It is an amazing tool and I love using my phone. It is important to remember that while it may take images 12mb or larger, the sensors are very small, which means you will be limited in how big you can actually make those images. You will have to try it out as it depends on which

14.12 © Martha Madigan. Martha made several panels (which are each 6 feet high by 2 feet wide) by placing large plants on printing-out paper in the sun. The prints are then gold-toned, fixed and washed. Martha then makes a contact print so she has a positive image. The plants are placed on top of the panels and a digital image is made and a 3D effect is obtained. Each plant is chosen for their scale relationships and healing properties for the human condition.

phone you are using, and how you edited the image. Some photo apps on the phones actually make your images smaller, so be aware of that and check to see if the apps re-size your images in any way before using them.

If you are going to use images from your phones with an alternate process, email the images you want to use to yourself and follow the directions on making digital negatives on your computer.

Making a digital positive and then making a wet plate collodion image does show the pixels. Depending on how you are using the image, it might not matter to you. I found that when I kept the positive to no larger than a 5 × 7" ambrotypes, the result was very nice. However, when I then scanned them in to make a larger print, I was not happy with the pixilation. The pixilation was really due to the wet plate having no grain so the pixels were really noticeable once blown up.

Smartphone images can also be used in the darkroom. I have the how-to notes below, but since the software seems to change every five minutes, this is a starting point. By the time this book goes from my typing to publication we will probably have 20 upgrades that make things more confusing! Vignetting can be seen in some prints, as the smartphone screens get a little darker at the edges. It has been suggested to print at 1:1, size screen to print, or the pixels may get too large. I have found that each phone is different, so experiment to see which works best for your equipment.

PREPARE YOUR PHONE

With each upgrade, this changes slightly, but these are the steps you need to do before heading in to the darkroom:

1. Go to settings > general > accessibility
   (a) Choose > invert colors
   (b) Change to grayscale
   (c) You can also adjust contrast
   (d) You can also adjust the brightness of your screen
2. Go back to settings > general > auto-lock

Move the auto-lock to NEVER so that your phone will not turn off unless you push the button.

DARKROOM SETUP

1. The smartphone just rests ON TOP of the 4 × 5" negative carrier so that it does not fall in to the enlarger.
2. Use your lens as you normally would, but the timer will not work: your hand over the lens is the shutter speed (light control).
3. Do a test of four-second intervals so that you can figure out the exposure.
   The exposure depends on:
   - Brightness of the smartphone screen
   - F/stop of lens
   - Contact print or enlarging
   - Type of photographic paper
4. The rest is normal black-and-white darkroom printing: expose your paper and run through the developer, stop, fix, hypo clear and wash.

14.13 © Janet Fine. "Harbor." This is a combination process where Van Dyke brown was selectively coated on top of a cyanotype. Janet uses braille paper gleaned from a teacher reuse store.

For those of you who do not know how to print black-and-white silver prints, I suggest you take a class, or get a book that is solely about printing in a darkroom, as it will help you delve into how to make your prints better. It is another world in a black-and-white printing darkroom compared to historical techniques! You can get some more information if you look at Chapter 10 on Liquid Emulsion as well as Chapter 4, which is about using

14.14 © Jalo Porkkala. Kallitypes over cyanotype. The dominant color depends on the order that you print.

14.15 © Donald Anderson. Cyanotype over Van Dyke brown. Donald carefully coats his paper so the images are enhanced on the paper.

14.16 ©Frank Ebert. "Wall Art: Paris Street Child". Frank gave himself an assignment while in Paris to photograph wall art. The prints were made into four separation negatives. The first one was used to lay down a palladium print and the next were used for a three color gum on top.

14.17 "The Goatman" ©Greg Banks This image was taken with a smart phone and printed with an enlarger in the darkroom. Greg turns the brightness all the way up on the iPhone. By going to: Settings > Display and Brightness. Then he went into Settings > General > Accessibility > Accessibility Shortcut > Classic invert so there is a negative image. He places the phone in the enlarger (4x5 works better for Iphone plus) and uses the light from the phone to make a gelatin silver print. He then develops as usual.

14.18 © Dan Burkholder. Dan is wonderful at not only experimenting, but then teaching anyone who wants to learn how he made his images, how to do them. He has very funny videos on his website (see Sources for more information). This one is a platinum/palladium over inkjet. I believe he is the first one to do this.

photographic paper in experimental ways. All of the other techniques in this book are used in a "dim room" and use UV light sources.

[yellow vertical piece] *Untitled Chemical Painting [MS 80]*, 2015, unique silver gelatin photograph, 20 × 10.375". Both from the series *The Migration of Silver*

Amy did a series of lens-less, camera-less chemical paintings using traditional black-and-white darkroom chemistry and the chromoskedasic sabatier process on silver gelatin (black-and-white) paper. The chromo process is a non-historical process that alters the shape and size of the grains of silver in the paper to refract colored light instead of white light, creating the range of colors in what is normally monochromatic paper. The order

14.19 © Karen Hymer. Karen used Cot 320 paper in her inkjet printer and then put palladium on top.

14.20 © Melanie Walker. "Baggage." Melanie made this image with traditional cyanotype and after it was exposed, washed and dried, she selectively coated the print with Van Dyke brown.

14.21 © Melanie Walker. "Eclipse of the Toast." This was a Van Dyke brown with gum printing on paper and then layered with a toned cyanotype on silk sandwiched together. Melanie says she had a dream about a person with a house for a head and it made her contemplate being a woman, with no kids and being the head of the house and what that meant. The house heads have to do with common ground and a sense of longing, and a need to be connected, to be part of a family or a community and trying to convey the idea that we are all connected.

14.22 and 14.23 © Melanie Walker. Installation photos. I find Melanie's work so unique and inspirational, so I am including these two images to show how photos do not have to be two-dimensional pieces on a wall. Choosing the right installation is so important as a way to get your thoughts across to viewers.

14.24 © Rita Dibert. Collage combination of infrared film and cyanotype and a Van Dyke brown collaged along with acrylic paintings that Rita has made.

that the chemicals are applied determines the specific color as well as the tonal values. Amy primarily works with developer, the activator and the stabilizer and each image takes about 45 minutes to an hour to create, with a traditional fix and wash at the end. She has experimented with pouring, dripping, spraying, and sponging on the chemicals to create the layers and patterns. She most frequently uses foam brushes of different sizes as they hold the most chemistry but still allow for careful application. Her resists range from cooking spray to tape. Because the chromo process is activated by white light, most of her time in the darkroom is with the white lights on. For this reason, fogged or expired paper is often used as they each will create different color variations.

14.25 © Sommer Wood. Polaroid lifts with Van Dyke brown prints.

14.26 © Juliana Swatko. Cyanotype with a Van Dyke brown print on top. The two chemicals reacted with each other forming a third gold color. Juliana then hand colored the print with colored pencils.

Fifteen

CERAMICS AND PHOTOGRAPHY

15.1 © Jill Enfield. This image was originally shot with black-and-white film, printed and hand painted with oils and pencils. I scanned in the print and used Lazertran to make a decal. I then put the decal on a square tile and cooked it in my oven. I now have a permanent image, in color on tile.

I find it so interesting that photographers are using printmaking techniques, ceramic artists are using drawings and photography, and on and on. All boundaries have been broken. With a little help from people in different fields, an artist can work in whatever medium he or she feels is appropriate for each project. Throughout history artists have been relying on others to help produce work. This is nothing new. Several artists in this book make their living providing printmaking services to others. I am a firm believer that the digital age helped in reinforcing this collaborative. The access to images through digital negatives has opened up new possibilities to all artists that are very exciting.

The application of ceramic and enamel to metal began in the 1750s with the appropriation of images from copperplate engraving. Then, in 1854, Leron de Marcarson, a Frenchman, filed a patent for a process of vitrified photography onto porcelain. Around 1860–70, when gelatin was first being used in photography, photo-ceramics became popular. A layer of light sensitive gelatin emulsion containing colored enamel glaze was coated onto ceramic pieces, exposed with a negative, washed in water to develop the image, and then fired. The primary use of this process was to put images on gravestones.

So, while I am not a ceramic artist, I thought it might be a nice idea to have a section in this book that combines photography and ceramics, given that a few of these processes can be used with firing techniques. This chapter was edited by Kate Missett and read by other ceramicists for the correct instructions to get you started in the understanding of firing your pieces.

I have been working on and off with liquid emulsion on tiles for a while, and I have always wanted to make them more permanent. I have heard that some people have actually fired liquid emulsion and it has worked. I have made countless tests and the outcome is always the same – the silver burns off and I have been left with a plain tile. What a disappointment!

15.2 © Glenn Rand. Glenn is a photographer and a potter. This is a cyanotype (not fired) on one of his clay pieces that he did not fire after exposing the cyanotype.

15.3 © Glenn Rand. This piece was refired and you can see the difference in color. Glenn says sometimes he will then put another cyanotype on top so that part of the image will be blue.

According to an article on www.printandclay.net, Liquid Light does not have a sufficient metallic content to leave an image if fired. I have tried to use AG-Plus, which has more silver in it, and I have also added silver, but to no avail. Apparently, silver oxidizes during firing, which means it disappears. However, almost any other metal will work, including platinum, palladium, or gold. This may be a little expensive for the average photographer to experiment with, but it is possible.

Recently, Dr. Mike Ware mentioned that if you tone the silver with palladium, it can then be fired with good results. This is an excerpt from his paper called *Platinomicon*, page 73

> However by the 1890s, the use of palladium as a means of toning silver images was well-established in order to make photoceramic prints, which thereby gained resistance to kiln-firing under a glaze. Palladium toning of silver prints was acknowledged in several manuals of the day, and deemed to give similar results to platinum, but dismissed as impractical because palladium was much more costly than platinum at the time – 6 pence per grain or £12 per ounce, compared with ca. £2 per ounce for platinum.
>
> https://www.mikeware.co.uk/mikeware/downloads.html

When I heard there was a class at a pottery studio in Greenwich Village on photography and ceramics, I had to take it. By the way, I am terrible at hand building in clay! But I decided I was there to try things out, so I did the best I could. Luckily I had a great teacher, Kate Missett, whose work is in this book, and a lot of fun people in my class. I laughed a lot.

I suggest that if you have never done any firing before, take a class or work with a potter.

15.4 © Kit Anderson. Kit carefully applied the pigment with a small brush so the color would be just where she wanted it instead of coating the entire tile with each pigment.

Not everything photographic can be fired, but you can still use ceramic pieces to get great results. For example, instant film transfers, liquid emulsion, and Lazertran decals can be used and then protected with several coats of varnish. Tiles made this way cannot be used on a floor, but they can certainly be used for decorative purposes.

Cyanotype can be fired. Its color changes from blue to reddish-brown or yellow, but it is permanent. Gum bichromate can be fired, but instead of mixing watercolor pigments in with the gum, you use what are called mason stains. The printing is pretty much the same; you just have to learn what color the mason stains produce after they are fired. Inkjet transfers do not work, but using a laser printer with waterslide works well. Rockland has a product called Pyrofoto that I was hoping would be similar to liquid emulsion. It is a great product, but it is more for high-contrast line drawings or images, not continuous-tone images.

TERMS YOU NEED TO KNOW:

- *Cone*: A cone is a temperature measure. Potters buy them from their ceramic

15.5 © Robert Cone. Pyrofoto works great with high-contrast images or text. It is easy to use and goes on ceramic surfaces that have already been fired, which means you don't have to know what you are doing in ceramic terms to get a permanent image.

suppliers and place them in the kiln to determine the temperature. Each cone is made to melt at a specific temperature and is extremely precise – for example, 06 for earthenware, 10 for stoneware or porcelain, 018 for luster.

- *Undervitrified:* This means the clay has not been fired to the maximum melting point of the silica in the clay body, so it remains more breakable than it should be. It is the same as underfired. It is especially important to fire tiles to the correct level because they often sustain heavy use. For example, they are often cleaned with various chemicals (such as in a kitchen) that could cause later problems in the glaze, such as cracking or pitting.
- *Mason stains*: These are commercial combinations of colors (mason, standard, etc.).
- *Oxide*: These are pigments from the ground – there are only seven that are natural.
- *Slip*: This is thinned liquid clay that seals the clay surface.
- *Underglazes*: These come as slips, pencils, and pastels that you glaze over. Amaco is one company that makes underglazes that are semi-moist; they have color pan sets. Duncan is another company.
- *Ceramic stains* change color as they are fired, but underglazes are like watercolors: the colors stay as they look before and after firing. When firing photographic processes, note that silver burns out at about 500°F. For gum prints, bisque fire to Cone 2; if whites don't clear, try Cone 6. Cyanotype should be bisque fired at Cone 6.

15.6 © Jill Enfield. My first decal on an unglazed tile with lots (and lots) of air bubbles.

15.7 © Jill Enfield. My second decal with a glaze on top.

PYROFOTO

This is a product manufactured by the same people that do Tintype Parlor and Liquid Light, as well as other photographic chemicals and kits. Pyrofoto is a good option for getting high-contrast images onto bisque, or for high-fired ceramic pieces. Check out their website (listed in Sources) for interesting ideas and a list of products. Some camera stores carry their products, but if you cannot find them in your area, order them online.

Pyrofoto can be mixed with any liquid ceramic glaze and applied to a ceramic piece that has already been glaze fired. A transparency is then placed on top of it and exposed to UV light for 2–15 minutes. Using a sponge, you wipe away the unexposed areas and fire the piece again. Pretty cool!

15.8 © Elisabet Moretó. Elisabet works on bisqued clay with gum bichromate. Her negatives are from a photocopier and she exposes in the sun. Low-tech photo meets ceramics.

Materials needed

- Ceramic pieces – along with fragments for testing!
- Glazes: premixed ones work well, such as Amaco or Majolica underglaze. The word glaze implies the chemical contains silica and will form glass. Glazes are specially made chemical concoctions that sometimes include mason stains as a source of color. If you use any of these sources of color, normally you put a clear glaze over them to seal them.
- High-contrast negatives or photogram materials.
- Nitrile gloves.
- Pyrofoto (comes in a bottle).
- Sponge brushes.
- Sponges.

The steps

Working in dim room light (40-watt bulb):

1. Mix an equal amount of Pyrofoto in with the color glaze (1:1). If you are using Amaco glaze, the Pyrofoto will dilute your color a bit. If you want a darker, more saturated color, try repeating the process a couple of times, or add some mason stain to the glaze.
2. If the mixture is really thick, add a little water. Mix often.
3. Wash your ceramic piece with powdered laundry detergent or whiting and hot water. Rinse well and dry.
4. Brush a very thin coat of the mixture on your surface.
5. Dry with a cool hair dryer or fan.
6. Coat again, this time a little thicker.
7. Dry.
8. Coat again, using the same thickness as your second coat (three coats should be sufficient, but you can experiment).
9. Dry.
10. Place your negative or photogram material on the surface of the piece and either tape it down or put a piece of plate glass on top of it. You need good contact, as with other alternative processes. If your piece is not flat, make sure to tape your negative down well. The tape will not show, so use as much as you need to get a good contact.
11. Expose to sunlight, or in a UV box, for 5–15 minutes. How much depends on your negative, the color of the glaze, how many coats you've brushed on, and your light source. In other words, do a test!

12. After the exposure, put the piece in a tray of cool tap water for a few minutes to soften the emulsion.
13. Dampen a sponge in cool water and wipe away the unexposed areas. The image will slowly start to appear.
14. This can take several minutes – don't panic! Go slowly or you will damage your image.
15. Dry the piece with a cool hair dryer and repeat with other colors as wanted.
16. Fire when you are finished with the image and the glazes are completely dry.
17. Make sure you work with someone who knows how to fire. The type of glaze you used determines the firing temperature (fire to Cone 06–05).

TROUBLESHOOTING AND TIPS

- If your image does not start to show, you overexposed.
- If your image washes off, then your exposure was too short.
- If your mixture was too thin and watery, your image will be faint no matter how long the exposure was. But this might be something you want to work with, using faint images and darker ones as a shadow of one another.
- Use this product only on glazed ceramic or glass; non-glazed surfaces such as bisqueware will not develop evenly.

15.9 © Kit Anderson. Kit uses gum arabic but states that gloy gum can also be used (both on vitrified ceramics) and that egg works well on bisqued ceramics.

LASER TRANSFER DECALS

There are many companies that make these decals. You must be sure to get the proper decal for your printer, as well as making sure it is intended for ceramics and can be fired. The recommended decals at the time of this printing were from Beldecal, a company in Florida (website listed in the Sources). They work in the same way Lazertran works (see Chapter 12), but can be fired, which renders them permanent. I have also used Papilio Aqua Slide Decal paper, but I had a few issues with it. It is stiffer than the Beldecal and I kept breaking it. I put this to my advantage and started breaking it on purpose. I had issues with air bubbles with all of them – you really have to be careful and make sure they are all removed. Use a soft brush or a wet finger to work the bubbles over to the edge of the decal and out.

The Papilio PAS/Z was applied to a dish that was bought in a store and already glazed. The decals have an outdoor life of about three years unless you put urethane on them, then they may last longer.

These transfers are recommended for indoor purposes. Lazertran cannot be fired, but it can be put into the oven. Slowly bring the temperature up to 400°F.

Materials needed

- Decal paper
- Laser printer
- Positive image tray
- Glazed pieces.

15.10 © Paul Dale. Picture of Kit Anderson coating her ceramic piece.

15.11 © Paul Dale. Picture of Kit Anderson placing her negative on top of her tile before exposure.

the steps

1. Print your image onto the decal paper using a laser printer (not inkjet).
2. Always print at the highest quality level.
3. Wait at least 30 minutes to make sure the toner has dried.
4. Cut out your image the way you want it to be.
5. Place the decal face-up in a tray of water until the image starts to lift away from the backing.
6. Gently transfer the image face-up onto your ceramic surface.
7. Pat the decal flat, being careful to work out (from the center outwards) any air bubbles from underneath it.
8. You can use more than one decal before you fire.
9. Refire the piece several cones (see definitions) lower than the melting temperature of the glaze.

15.12 © Paul Dale. Picture of the finished gum on ceramic piece by Kit Anderson.

15.13 © Paul Dale. Picture of Kit Anderson's three square planters.

TROUBLESHOOTING AND TIPS

- If part of your image is out of focus, then you probably had an air bubble. If the decal does not have a good contact with the piece, the image will be out of focus.
- If you have holes in your image, then you had air bubbles between your image and the ceramic piece.The air bubbles popped while the piece was being fired in the kiln and left large holes in the image.

GUM BICHROMATE PRINTING

This is basically the same as printing gum bichromate on paper. I am using the recipe that Kate Missett gave me, but feel free to experiment with amounts, just the way you do when using the process with paper. I found using it with ceramics much more rewarding than with paper.

Materials needed

- Ceramic mixing bowls
- Ceramic surface of choice: slightly under-vitrified (porcelain works well)
- Drafting tape
- Gloves
- Negatives or photogram materials
- Pencils
- Plate glass
- Sponge brushes
- 3M #811 Magic tape
- UV box or sunlight.

Chemicals needed

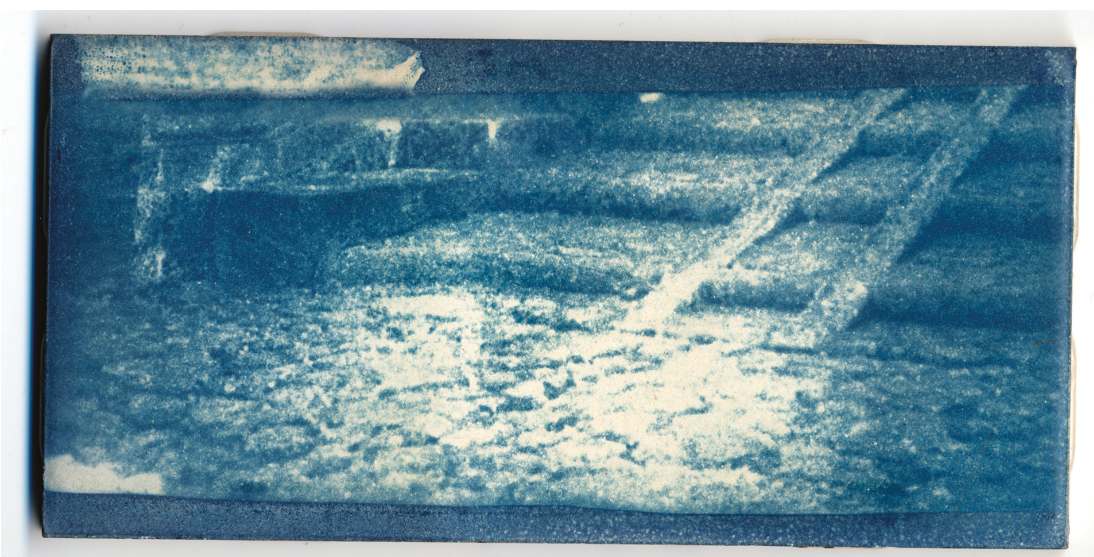
25 g ammonium or potassium dichromate
100 ml distilled water

Mix the ammonium/potassium dichromate with the distilled water and store in a brown bottle or jar. It is then ready to mix with:

gum arabic: thin to the consistency of cream with distilled water powdered oxide, mason stains, or under-glaze

Steps

1. In subdued light, mix one tablespoon of gum arabic and half a tablespoon of powdered oxide, mason stain, or underglaze.
2. Add one tablespoon of dichromate and stir well.
3. Mark with a pencil where your image will go. The marks will fire off and not be visible in the finished piece.
4. With a sponge brush, apply an even coat of emulsion to the ceramic surface. Coat first vertically, dab your brush onto newspaper to clean it off a little, then coat another layer horizontally.
5. Dry the emulsion with a cool hair dryer.
6. Tape your negative down with 3M #811 tape – it will not show!
7. Place this under a piece of plate glass, if it is flat. Otherwise, make sure you have good contact by applying lots of tape. Remember it will not show.
8. Gum is built up in layers as with paper. The first colors will be faint.
9. Expose the image for 7–15 minutes under UV light. The exposure time will be slightly shorter in bright summer sun.
10. After exposure, remove the negative and place the clay into a tray of warm water for about ten minutes to soften the emulsion.



15.14 © Jill Enfield. Unfired cyanotype on clay.

11. Start gently agitating the tray.
12. You can help this developing along just the way you do with paper. You can help it along with a brush – a fan brush works very well; or rinse the image with a sprayer.
13. Make sure the clay is totally dry before you add another layer of emulsion.
14. Repeat mixing and applying the emulsion with each color, making sure the emulsion is dry and that you maintain good contact each time.
15. When you are done with your image, make sure it is totally dry.
16. Apply a glaze and fire to the correct temperature (this depends on the glaze you are using).

15.15 © Rebecca Barfoot. I asked Rebecca to send me a piece where you used cyanotype. This is what she sent and tells me that she used "thrown and altered porcelain, multi-fired. Lithographic image transfer, underglaze, china paint, fired cyanotype emulsion, commercial decals and gold luster."

15.16 © Rebecca Barfoot. A fired cyanotype on clay.

A beautiful example was made in one of my classes with the following colors in this order:

1. Presidium yellow
2. Orange "encapsulated"
3. Saddle brown.

TROUBLESHOOTING AND TIPS

- If the emulsion feels gritty, you used too much pigment.
- If the emulsion is watery, you used too much dichromate.
- If the emulsion is too tacky, you used too much gum.
- If the emulsion is applied too thickly, the bottom won't harden and the whole thing may come off.
- If the entire emulsion comes off, try thinning the gum mixture with water.
- If the emulsion bubbles off, you underexposed.
- If the image is out of focus, you did not have good contact between your image and object.
- If your image does not clear, you overexposed.
- If you cannot see any color at all, you underexposed.
- If your emulsion has been put on very thickly, increase your exposure.

DICHROMATE EGG MIXTURE, AS PER KIT ANDERSON

Kit Anderson learned how to do this from Peter Charles Fredrick, who called it Fredrick Temperaprint. He uses eggs, either whole, just yolk, or just whites, rather than gum arabic mixed in with the potassium dichromate and pigments. Pigments should be either oxides or underglazes.

Materials needed

- 3 fresh eggs
- Ammonium or potassium dichromate
- Brown bottle to hold 100ml
- Distilled water
- Liquid measuring cup
- Pigment of your choice (either oxides or underglazes).
- Tea strainer or cheesecloth
- Two plastic teaspoons

Directions

1. Three fresh eggs are needed: Eggs from free-range chickens will produce a stronger binder because of the rich, viscous yolks.
2. Filter the eggs through a tea strainer or cheesecloth to get rid of the stringy clots from the egg, or any other bits you don't want, or else you will have white blotches in your image. Put the strained eggs aside.
3. Mix 100ml of distilled water with two teaspoons of ammonium or potassium dichromate. Store it in a brown bottle. Once this is mixed, add another teaspoon and mix well again. At the point where no more crystals will dissolve, you have a "saturated" state. No matter how much you mix, the crystals will still be at the bottom. Put the top on and rinse the bottle to keep the outside clean.
4. In another container mix 100ml of liquid filtered egg and 50ml of saturated sensitizer solution. Only mix enough for each session, because once you mix the egg in with the dichromate it will only last a few hours. Make sure to mix this very well. (Anderson mixes up a smaller amount: one egg to 25ml of saturated solution.)

If you want a strong color use 3:1 (color to liquid); for medium color use 5:1; for light color use 8:1.

Experiment with amounts and combinations, but remember that very dark colors will stop light from getting through and may prevent the mixture from becoming insoluble.

15.17 © Kate Missett. "Urban Wildlife Teapot." Kate transferred an image that she took in NYC with PhotoEZ screen.

15.18 © Kate Missett. This is a laser (Bel-Decal) transfer on a wood-fired porcelain jar.

15.19 © Kate Missett. A laser (Bel-Decal) transfer and drawing on porcelain platter.

CYANOTYPE

Any clay can be used as a cyanotype substrate, so it is only natural to combine it with firing. The only thing to keep in mind is that a lighter clay will show the image better. Other than that, follow the instructions in Chapter 5. Basically there is no difference between printing on paper or clay. No sizing is needed. You can use the same toners to change the color, or leave it blue. Some people use the 1:1 proportion typical for paper while others have used 2:1. Try both and see which works best for your images and ceramic piece.

Firing will change the color as well, and this is when it helps to work with someone who knows what they are doing with a kiln. You can fire a piece and then do another cyanotype exposure to add blue back to the image. To make multi-color images you can choose to work with only cyanotype or you can combine cyanotype and gum, just like on paper. In other words, you can use cyanotype, fire the piece, use gum colors, fire, and the blue will change. Your last step can be cyanotype that you can tone or keep blue, or you can repeat this so that one cyanotype is reddish-brown from firing, one is a plum color from toning, and the last one is blue.

Exposures are the same as on paper, anywhere from ten minutes to an hour. On clay, the image needs to be much darker. You will need to check the exposure by eye, the shadow areas (darkest areas of your image, clear on your negative) should be a silvery, very dark blue-gray color. You can do a test by making an exposure on paper and double it on clay.

Wash the clay with running water until the water runs clear. First the blue that was not exposed will wash out, then the yellow in the white areas will wash out. I have no trouble washing my pieces, but if you do, try coating them with a layer of gum before coating with cyanotype. Remember that if you put a cyanotype on your piece and do not fire it, your piece will be for decorative purposes only. You **cannot** eat on anything with unfired cyanotype!

Missett also suggested the following:

- Fire white clay a few cones under vitrification so they are still slightly porous.
- Print onto the clay with the cyanotype mixture.
- Wash under running water.
- If you are having issues with clearing, coat the bisque piece first with gum arabic mixed with water before the cyanotype, which will help to prevent absorption.
- You can also use a non-yellowing shellac or a non-firing glaze to seal them and make them more shiny when you are finished.

Glenn Rand sent me these suggestions about firing:

- Low-fire oxidation will change the iron particles to turn red or red-brown.

15.20 © Kate Missett. First the piece is hand built with slabs, bisqued to 04 then glazed with yellow glaze and refired to Cone 6 oxidation (in an electric kiln). The photographs were then printed from an HP Laserjet black-and-white laser printer onto transfer paper (available from Bel-Decal in Florida). The paper with the image now printed with iron oxide from the toner is placed into warm water until the covering sheet with the image comes loose from the paper backing and can be placed face up onto the glazed surface. Any air bubbles should be worked to the edges using a brush. The piece is then refired to Cone 04. After that firing the photos can be hand colored with china paint and luster and refired to Cone 018 in an electric kiln.

- If you fire to Cone 019, you can hand-color parts of the image with overglaze enamels.
- Oxidation firings at higher temperatures produce similar colors in the red/red-brown range, but the color will go even darker.
- Glazes over the image may cause the image to disappear. The proper cyanotype is very thin, and if the glaze absorbs iron, the image will disappear because the cyanotype is not sufficiently saturated with iron to penetrate most matte glazes.
- The color achieved through reduction firing is a deep brown. This method is recommended for porcelain or white clays only.
- Salt-glazing leaves a faint gray on a strong white background.
- Raku firing leaves a gray image if you air-dry and do not smoke the piece.
- Cyanotype does not adhere well to glazes, so do not glaze over areas to which you want to apply cyanotype.

SILKSCREEN

There are many other processes that you can apply to clay. I tried PhotoEZ, which is similar to silk screening on clay. However, I found it not particularly easy, but have included it here for people that may want to try it. This is really only appropriate for line art, not continuous tone images.

PhotoEZ is a light sensitive emulsion that is applied to a fine mesh nylon screen in order to make screen stencils. Like the other processes discussed thus far, it is sensitive to UV light and, when exposed, the emulsion changes into a tough coating. When a black-and-white, high-contrast image is exposed, the emulsion under the black areas remains water soluble and washes off, creating an open mesh for paint to pass through. If you take care of your screen, you can keep using it over and over again. Make a test image before using a larger piece!

Before it's developed, PhotoEZ is heat- and light sensitive. Unused PhotoEZ should be stored in a cool place in the black envelope it comes in. Some people store it in a refrigerator for a longer shelf life.

Materials needed

- Contact printing frame, or two pieces of glass and binder clips
- Black felt or paper
- PhotoEZ, cut to the size you want. It comes with a protective layer that needs to be separated. The green sheet is PhotoEZ. The emulsion side is the shiny side.
- Positive image or photogram materials on transparency (see Chapter 3)

15.21 © Mary Fretz. Mary was in Kate's class with me but has been working for a while on clay. These images of Manhattan are all decal transfers.

- Tap water
- Tray
- UV source

Directions

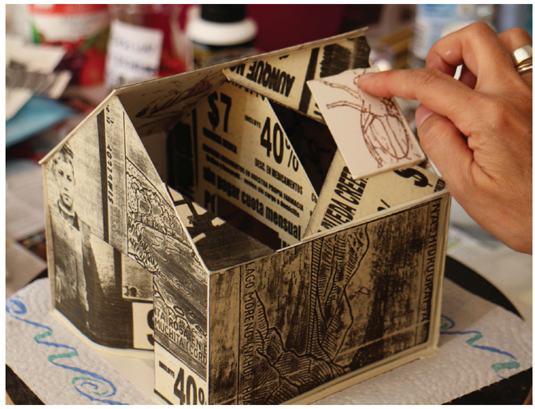
1. Working in a dimly lit room, peel off the clear covering of the PhotoEZ film.
2. Place it, shiny side up, on top of a black piece of felt or paper.
3. Place the transparency or photogram material on top of it. If you have lettering, make sure the lettering is reversed so it will end up reading correctly. (In other words, if you want the image to read correctly, you need to flip the image before printing so it looks backwards.) This way, when you place the transparency down, it will look correct.
4. Smooth the two layers together.
5. Place glass on top and clip together, or put the material inside the contact print frame.
6. Expose. If you are doing this at noon, in the sun, it should take about one to two minutes. If you are doing this with a UV box, it should take about 6–12 minutes.
7. If you are using a contact-printing frame with a hinged back, you can check your exposure as you go.
8. Once the image looks yellow-green, it is ready.
9. Place the PhotoEZ in a tray of water for about ten minutes, making sure the image is completely immersed.
10. Gently dab the emulsion side with a natural sea sponge or a soft paint brush to clear the image area.

15.22 © Erik Gronberg. Erik made this piece before the advent of digital so his process was in the darkroom as follows: “All the photo images on my ceramics are decals fired on top of the finished glaze.” Erik used kodalith film in the darkroom and then took the negatives and exposed them onto silk screen film on a silk screen frame. He printed with ink made from black enamel (or over-glaze) onto decal paper, and then cut and soaked the decals in water and transferred to the glazed ceramic before firing to about 1500°F.

11. Place your screen between soft rags and gently pat dry.
12. Re-expose the screen to a light source for a minimum of ten minutes.
13. Let it dry completely with the shiny side up. If the emulsion touches another surface when it is wet, it will stick to that surface. You can re-soak the screen until it releases from whatever it is sticking to, although it may get scratched.
14. Once it dries, it is no longer light sensitive and can be saved and used again.

TROUBLESHOOTING

- If the image on the stencil is there but not washing out enough, it is probably overexposed. Reduce your exposure time or the image may not be dense enough. Go back and tweak your positive to give it more contrast.
- If there is no image and the stencil is blue, make sure the artwork is placed between the light source and PhotoEZ; you may have left PhotoEZ out of its protective bag for too long. Be sure to work in subdued light such as a 40-watt bulb or fairy lights.
- If the stencil is washing away, the light source is not intense enough or you did not expose for long enough.
- If the image is fuzzy, you did not have good contact.
- If the film is lifting off the mesh, you’ve underexposed, leaving the film too soft.



15.23 © Graciela Olio. “Project South, Home Series.” Graciela uses Keraflex with gum bichromate. The Keraflex allows her to maneuver the clay into these delicate shapes.

15.24 © Graciela Olio. Graciela mixes glue, honey or egg with potassium dichromate and either underglazes, overglazes or oxides. The emulsion is applied to glazed pieces or Keraflex directly. If she is using a bisqued or an unfired surface, she applies 1:1 glue to water to seal the surface before putting the emulsion on. Once the emulsion is exposed and developed, she dries the piece completely and fires the initial firing to 10,200–10,400°C, which burns off the glue. The image is not completely fixed yet and now needs to be kiln-fired according to the glaze and clay that you used. Now that the work is fully vitrified, the image is permanent.

Try a longer exposure, or you've washed too vigorously, use a gentler spray.

- If the center is not washing out and edges are washing out completely, PhotoEZ is too close to the light source and is creating a hot spot in the center.
- If the paint is bleeding under the stencil, the paint is not thick enough – try using thicker paint. Or the stencil may not be making good contact or getting enough light. Try moving the light further away or use more bulbs and less time.
- If the paint is not going through, dried paint is clogging up the mesh or the paint is too thick.

PHOTO TRANSFER

You can use laser or Xerox images (but not inkjet). Smaller images are easier; notebook size will give you some issues with tearing. You can cut images smaller and then tile them together. This will print midtones, but high-contrast images work best.

Materials needed

- Brayer
- Glass covering a table.
- Gum Arabic
- Linseed oil
- Mason stains
- Plastic container with a lid
- Plastic spoons
- Soft, leather-hard, greenware clay (not fired, but somewhat dry)
- Two containers of about one quart of water, one with plain water and one with a splash of gum.

Directions

MIX THE STAINS THE NIGHT BEFORE

- Mix two parts stain to three parts oil. (If measuring with plastic teaspoons, this will make about 50 images.)

15.25, 15.26 and 15.27 © Graciela Olio. Finished pieces from her series of "Project South, Home Series."

- Mix for 15–20 minutes – it should be mixed well! Leave overnight. The consistency is similar to acrylic paint – not too watery and not too thick. The ink will dry and form a crust – you cannot add more oil to make it workable again.

WHEN READY TO WORK

1. Spread the gum on the glass.
2. Put the image in the middle of the gum, face-up.
3. Spread to coat the image with gum so that the ink will stick to the gum.
4. Wipe up the excess gum on the glass; too much gum makes a mess.
5. Stir the ink.
6. Spread the ink in a line on the glass. Use the brayer to spread the ink on the glass in one direction and then the other, so that the brayer has a lot of ink.
7. Ink the image in one direction so it does not roll up on the brayer.
8. Wash the image with water and gum by squeezing over the image with the sponge – do not brush on. Start blotting to wash the ink off the white areas.
9. Repeat inking two more times for a total of three times.

READY TO PUT ON CLAY

1. Lift the paper up by the corner.
2. You only have one shot to place this down on the clay. Once you place the image down, work from the corners out.
3. Use clear water and a clean sponge to blot.
4. Leave in place for a minute or two so that there is no transparency.
5. Burnish the image while it is moist (you can use a plastic spoon) but not soaked.
6. Use circular, light pressure and make sure you cover every detail.
7. Lift the paper from the corner; you can check it and place it back down and re-burnish if necessary.
8. You can layer with different colors; deep brown and terracotta look great!
9. Fire like earthenware, at Cone 06.

15.28 Diana Pollak who runs ArtWare for Good, (a company that works with non-profits and social good enterprises), teamed up with a high school senior, Sarah Hoffman, to design this historic living mosaic which now hangs in the hallway of the Cranford Community Center in Cranford, NJ. Digital images were made from the historical images, QR codes and words which were then heat transferred onto the tiles.

Sources: Websites, podcasts and videos

- Albumen: everything about albumen. http://albumen.conservation-us.org/id/messier2000.html
- Alfa Aesar. www.alfa.com. A chemical company that is all over the world. Check out the website and see if your country is listed.
- Alternative Photography. http://www.alternativephotography.com/ Galleries, how-to books, and more. They also have a wonderful directory of suppliers from all over the world. When I am traveling, they are my go-to site to find where I can buy what I need.
- American Science and Surplus. (888) 724-7587. www.sciplus.com/index.cfm. Anything you think you need and stuff you never knew you needed, and great prices.
- Analogue Photography Users Group. www.apug.org. Forums about traditional and historical techniques
- Anchor Optics. (856) 573-6865. http://optics.org/buyers/company/C000003298 Plans for building your own cameras and optics.
- Antec, Inc. (502) 636-5176. https://www.kyantec.com. They specialize in small quantities of more than 200 categories of chemicals and lab supplies.
- Archive on History of Photography. www.photohistorytimeline.com Privately owned – very interesting.
- Archival Supplies. www.archivalmethods.com.
- Artcraft Chemicals. (800) 682-1730. www.artcraftchemicals.com. Make kits or buy in bulk so you can mix your own chemicals. I get my chemicals from here. Fast, reliable, and great to work with.
- The Art and Creative Materials Institute, Inc at Duke University. www.acmiart.org. ACMI is an international association of about 200 art, craft, and creative material manufacturers which seeks to promote safety in art and creative products through its certification program. They have an AP Seal that appears on supplies to show that they are safe to use.
- Atlanta Light Bulbs. (888) 988-2852. www.atlantalightbulbs.com. Has good prices.
- Aztek Computer Solutions and supplies. (800) 472-7455. www.aztek.com The mylar (AZ42 Mylar) is great for using between your negative and alt. process to protect your negative against humidity and sticking to your support.
- Blue Prints on Fabrics. (800) 631-3369. www.blueprintsonfabric.com. Carries cotton and silk that is pretreated with cyanotype sensitizer. You can buy it in squares, by the yard, or as T-shirts. Fabric is ready to expose and comes with a toning kit. Also carries transparency packages with nature drawings. Great for working with children or if you don't want to bother with chemicals and sensitizing yourself.
- Bibliofind. www.bibliofind.com. A centralized location for used-book dealers, now linked with amazon.com. Type in the book you want, and it finds who has it.
- Bookfinder. www.bookfinder.com. A service for finding out-of-print books.

- Borut Peterlin. http://www.topshitphotography.com/videos/. He has really good videos on wet plate and paper negatives and other alt. processes. Fun to watch and learn.
- Bostick & Sullivan. (877) 817-4320. www.bostick-sullivan.com. Has a discussion group on its website and alternative chemicals, in bulk or kits, and other supplies you need to stock up your darkroom. They also run a symposium every year called APIS with speakers and workshops.
- BulbTronics Group. (800) 588-2852. www.bulbtronics.com. Carries UV bulbs by the case.
- Camp Tintype. www.johncoffer.com. Collodion information and workshops. The Jamboree happens every summer with wet platers coming from all over the world to exchange ideas.
- CasedImage. www.casedimage.com. Beautiful cases for ambrotypes, tintypes, and daguerreotypes by Alan Bekhuis.
- Ceramic Supply of NY & NJ. (973) 340-3005. http://shop.ceramicsupplyinc.com Can get commercial bisque tiles (not glazed for gum) or make your own.
- Cheap Joe's Art Supply. (800) 227-2788. www.cheapjoes.com.
- Chicago Albumen Works. (413) 274-6901. http://www.albumenworks.com. Founded in Chicago in 1976 and relocated to western Mass. in 1982. They do traditional printing and help museums save deteriorating images.
- Chris Patton: recipe for making your own liquid silver gelatin emulsion, also known as "Dry Plate." This is a slow emulsion; there are faster recipes available as well: https://silverghost.lightnin-bug.com/
- Collodion Manual by Scully & Osterman. www.collodion.org/pubs.html. Manuals and workshops. They teach every historical technique you can think of and ones you may never have heard of.
- Collodion Forum. http://www.collodion.com. Not always correct information, but you can ask questions and find people working in collodion. (Who is offering advice? When in doubt, look at their work).
- Conservation Resources International. (800) 634-6932. www.conservationresources.com.
- Cornell Library.http://rmc.library.cornell.edu/adw/gelatinsilver.htm Historical Photographic Processes timeline. Andrew White Architectural Photographs Collection.
- Daguerreian Society www.daguerre.org Has daguerreotype information by way of a gallery and newsletter that posts workshops and other events of interest.
- Daniel Smith. https://www.shopdanielsmith.com. Carries paints and paper.
- Darkroom Cookbook Forum. www.darkroomcookbook.com/phpbb Any information you might need to know and can ask about darkroom and chemistry.
- DF Goldsmith Chemical & Metal Corp. (847) 869-7800. http://www.dfgoldsmith.com. Laura Blacklow gets her silver from them and says they are reliable. They also have platinum and palladium. There is a $50 minimum order.
- Dick Blick Art Materials. (800) 828-4548. www.dickblick.com. Has more than 30 stores nationwide.
- Edwards Engineered Products. (512) 267-4274. www.eepjon.com. Makes exposure units, glass rods, contact print frames, ventilation systems and more. Instructions on how to build your own UV exposure unit are available on the website.
- Engravement. www.engravamet.co.uk Recommended on the wet plate website for black aluminum for tintypes.
- Environmental Protection Agency. www.epa.gov. Check on chemical disposal in your area.

- Ever Ready Blue Print Corp. (212) 228-3131. www.everreadyblueprint.com. Carries blueprints for architects. Similar kinds of places are in most major cities. You can buy the paper, expose it, bring it back, and have them develop it for you. Is it archival? No, but it is a lot of fun! You can also email files to them.
- eStreetPlastics. (972) 722-2513. Royse City, TX USA. www.estreetplastics.com. Good prices on plexi. All different shapes and colors. They drill holes, cut and polish for a charge.
- Falkiner Fine Papers Ltd. www.falkiners.com +44 (0) 20-7831-1151. Wonderful papers and bookbinding supplies (London)
- Film for Classics. www.filmforclassics.com. Carries film for old cameras and out-of-date items. Check their website, they no longer sell to individuals. They have a list of their dealers rolls@filmforclassics.com and you can email for information.
- Foma www.fomafoto.com 00-47-992-64846. Located in Norway, but produced in the Czech Republic, their liquid emulsion, papers, film, and chemicals are sold in retail stores all over the world.
- Fox Talbot Museum and Village. https://www.nationaltrust.org.uk/lacock-abbey-fox-talbot-museum-and-village. If you are in the UK, this is worth a visit. Wonderful museum and they sometimes offer workshops.
- Freestyle Photographic Supplies. (800) 292-6137. https://www.freestylephoto.biz They sell chemicals, kits and books. They have a great catalog with how-to information and how to get questions answered by their extensive board members (including me).
- Gaylord Bros. (800) 448-6160. www.gaylord.com. Archival supplies.
- George Eastman House. https://www.eastman.org Has workshops on historical techniques and a wonderful museum and source.
- Glass Cutters. Toyo glass tools are available online; most glass places or Amazon. Get the kind that has a thick hand rest and takes oil ("Toyo tap wheel; thick glass cutter").
- Hardware or home stores are also great resources. Do you have to buy expensive "photographic only" materials? How about going to the Dollar Store, or The Container Store, etc., for plastic materials, bottles or photofloods. These stores have the same kinds of materials for mixing cement and drip trays for washing machines as we use for chemical trays. It is amazing what you can find.
- Historical Photo Books. www.theoldentimes.com/historic_photography.html; also, on https://books.google.com.
- In Camera Industries. www.incameraindustries.com. Jody Ake in Portland, Oregon, is a photographer and maker of a holder made out of lightweight plastic and stainless steel. Contact information: info@incameraindustries.com.
- InkAID. http://www.inkaid1.com. (888) 424-8167. You can find their products at other retailers, but to see their full line, go to their website. They have transfer film and products for transfers as well as materials for digital printing on like no other supplier.
- Inkjet Mall– Piezograph inks and prints and chemicals. They also run workshops and print fantastic digital prints and negatives. https://shop.inkjetmall.com/
- Inkpress Papers and Transparency. www.inkpresspaper.com. It comes in sheets and rolls so you can print any size. Camera and art supply stores also carry their supplies.
- International Museum of Print and Clay. They feature artists that work with print and clay, and accept submissions from

artists and have workshops. http://www.printandclay.org/index.html

- Jerry's Artarama https://www.jerrysartarama.com/. (800) 827-8478. Great art supply store.
- Jerry's NY Central https://www.jerrysretailstores.com/new-york-ny/ (646) 846-7547. Wonderful papers. They have carried over the paper from New York Central Art Supply, which was my favorite store. They also provide demos and events at their NY City store.
- Kelley Stained Glass and Supply. www.stained-glass.com. Will bevel edges for you, glass rods, grinders, and all types of glass, any size.
- Lab supplies. www.hometrainingtools.com A good source for well-priced lab supplies, alcohol lamps, beakers, stoppers, etc.
- Lazertran. www.lazertran.com (800) 245-7547. Made in the UK but with distribution also located in the USA. Water slide decal papers for papers, cloth and other materials that can go through an inkjet or laser printer.
- Library of Congress, American Memory Photographs. www.loc.gov/index.html. Has great photos and videos on view. You can also buy copies of photographs.
- Light Farm. www.thelightfarm.com. This site is made up of a cooperative of photographers, scientists, and historians. If you want to learn everything there is about making your own silver gelatin emulsion, this is the place to go. Different recipes for different ISO settings.
- LightMeasure. http://www.lightmeasure.com. Finally! Someone has come up with an ultra-violet exposure meter! The meters are designed to enable the artist to get perfect exposures every time without the need to make test strips for every exposure, even when using light sources such as the sun where the UV levels vary.
- Luminous-Lint. www.luminous-lint.com. Great eclectic information about everything photography.
- Main Trophy (847) 439-2550. (800) 323-6054. www.maintrophysupply.com/aluminum.htm. 12 × 24" aluminum sheet (black on one side with peel-back cover) .025 thick Stock #108 – this is great for wet plate (collodion); ask for matte surface if using dry plate flat black: #308.
- Mamut Photo: Alternative Photography (+420 605-269-520) Located in the Ceska Republika. They have everything you need for alternative processes and will ship almost anywhere in Europe. https://www.mamut-photo.com/eshop/en/60-solutions
- Mark Nelson. www.precisiondigitalnegatives.com. Has a system for making digital negatives.
- Mast Bookstore. (646) 370-1114. 72 Avenue A, NYC, 10009. www.mastbooks.com. Buys and sells used books. Specializes in twentieth- and twenty-first-century art books. This is part of AbeBooks.com, but a great store to go into if you are in NYC.
- Masterpak. (800) 922-5522. www.masterpak-usa.com. Has archival materials for packing, shipping and storing prints and other types of artwork.
- Material Safety Data Sheet Information. https://www.msdsonline.com/sds-search/ Links to MSD sheets for hundreds of suppliers.
- Mike Ware's Alternative Photography. www.mikeware.co.uk. Features a number of from-scratch recipes for alternative processes, as well as historical, technical and general information.
- M&R Companies (800) 736 6431. https://www.mrprint.com Is a manufacturer of mercury-vapor UV exposure units and vacuum frames, which are also carried at some photo stores.

- Museum Services Corporation. (651) 450-8954. www.museumservicescorporation.com. Art conservation supplies and chemicals. Boards, batting paper, optically clear acetate, non-woven polyester fabric and more.
- National Gallery of Art Shops. www.shop.nga.gov. Beautiful collection of books. They also have great videos on YouTube about conservation.
- New York Public Library. https://www.nypl.org/collections/nypl-recommendations/guides/photographic-processes. Timeline to photographic history.
- Nicéphore Niepce House. www.photography-museums.com. You can visit for real or watch movies online. Either way, very cool.
- Niles Lund. www.lundphotographics.com. Makes wonderful collodion supplies and has tintype plates. Everything is sent quickly and he is always coming up with new products. If you have an idea, he can build it.
- Oriental Culture Enterprises. (212) 226-841 https://www.easternbooknyc.com. Art supplies, books and other cool stuff.
- Photo Eye Bookstore. (800) 227-6941. www.photoeye.com. Has a wonderful selection of books, as well as an online gallery.
- Photographers' Formulary. (800) 922-5255. www.photoformulary.com. A supplier of alternative chemicals, kits and bulk, and supplies; has summer workshops.
- Photographic Historical Society of New England. (781) 893-0843. www.phsne.org. Non-profit group that has yearly sales of equipment, talks, auctions, wonderful information. Photographica is a yearly show of analog equipment in the Boston area with people coming from all over the world.
- Photojojo. http://photojojo.com. how-to for fun things. Great ideas if you teach children.
- Pictorico OHP. http://diamond-jet.com/premiumohptransparencyfilm.aspx. Another favorite transparency film that can be used for digital negatives.
- Pictoriographica. www.pictoriographica.com. Jason Lane hand-makes dry plates in a box, already coated and ready to go with a shelf life of about two years. They are sold at some photo supply stores as well.
- Plastic Land. (212) 925-6376. www.plasticland.com. Carries plastic, Lucite, vinyl, etc.
- Polaroid revisited. http://the-impossible-project.com. Instant film like you remember it.
- Pradip Malde. http://pradipmalde.com/ Wonderful website with formulas and images.
- Quinn Jacobson. http://studioq.com/wet-plate-collodion. How-to videos, a blog, workshops, and books.
- Rainbow Stained Glass. (215) 785-3034. http://www.orderrag.com. (732) 681-6003 NJ. "Ruby" glass, stained glass and whiting for cleaning glass.
- RK Photo Ltd. www.thedarkroom.co.uk. They ship abroad – but not the USA due to shipping costs. They also can not ship liquids outside of England, but they do have darkroom equipment, chemicals, film and paper.
- Rockland Colloid Corp. www.rockaloid.com. Manufactures liquid emulsion, tintype kits, and all kinds of other products.
- Rose Brand East. (800) 223-1624. www.rosebrand.com Fabrics and backdrops. Rose Brand West. (800) 360-5056. Has different types of fabrics and materials, usually used for the theater, but has good prices and a good selection.
- Rubylith. www.ulano.com/knifecut/masking.htm. For negative masks or to use to cover windows.

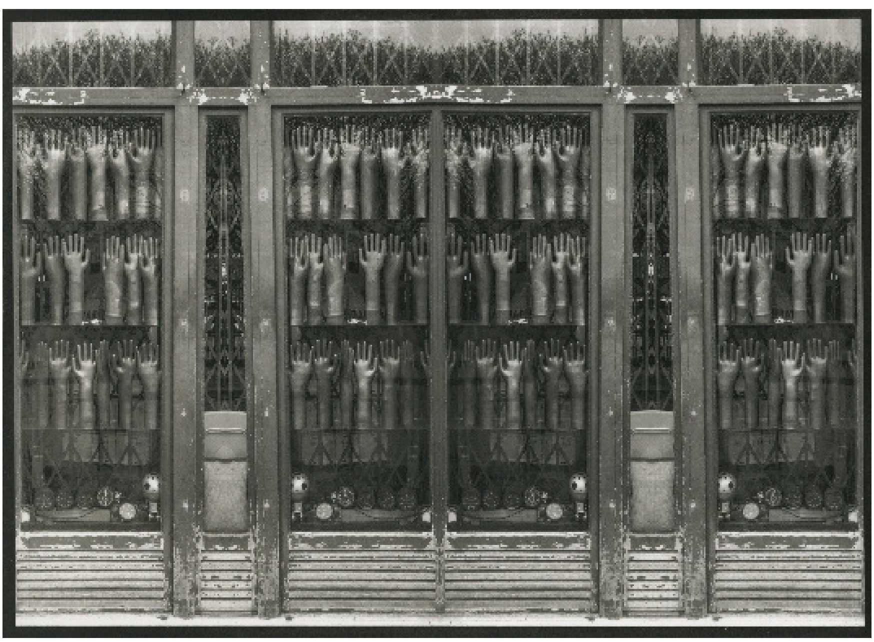
- Ruscombe Paper Mill. www.ruscombe paper.com. Located in France, they are the makers of Buxton paper, one of the favorites of many printers. They ship almost anywhere.
- Seidler Chemical Company. (973) 465-1122. www.seidlerchem.com. Carries non-silver chemicals in bulk.
- Set Shop. (800) 422-7381. www.setshop.com. Carries studio supplies, bags and books.
- Sigma-Aldich. www.sigmaaldrich.com A chemical company located all around the world. Depending on the country and the chemicals, some prices are excellent while others are expensive. Make sure you pay attention to the exact name of the chemical you are ordering.
- Silverprint Ltd. (011-44-171) 620-0844. www.silverprint.co.uk. Supplier of alternative as well as traditional camera equipment.
- S.K. Grimes. www.skgrimes.com. Makes lens mounts and boards and does repairs.
- Silk Screening Supplies. https://www.screenprinting.com. Great, cheap, aluminum UV exposure box with timer.
- Solar Fast fabric dyes. https://www.jac quardproducts.com Similar to Kwik Print that was available in the 1970s and Inko Dyes which was available until 2017.
- Strand Bookstore. (212) 473-1452. www.strandbooks.com. Known for having eight miles of books. Also has several annexes, which carry rare and signed books.
- Sunburst Bottle. (800) 363-9822. www.sunburstbottle.com. Glass and plastic bottles; no minimum order.
- Talas Bookbinding. (212) 219-0770. www.talasonline.com. Anything you need for bookbinding and really great papers for printing.
- Tim Whelen. www.mainemedia.edu/gall ery. An eclectic bookseller who is now at the Maine Media Workshop Bookstore and Gallery. He knows everything about books.
- Top bulb Gray Supply Company. (800) 867-2852.www.topbulb.com. Has hard-to-find bulbs with no minimum orders. Is sometimes cheaper than local bulb stores.
- Turner Bellows, Inc. http://www.turner bellows.com/index.html. Makes bellows for cameras.
- Unblinking Eye. www.unblinkingeye.com. Great articles and information.
- University Products. (800) 628-1912; (800) 762-1165. www.universityproducts.com. Carries archival supplies and more.
- United States Plastic Corp. (800) 537-9724. www.usplastic.com. Carries containers, plumbing, lab ware, bags, tubing, etc.
- Utrecht Art Supplies. (800) 223-9132. www.utrechtart.com. Has more than 30 stores nationwide.
- UV Light Meters. www.lightmeasure.com These meters can be used for in camera wet plate, dry plate as well as contact UV print frames or sun exposures while making prints.
- Waterslide paper. (800) 245-7547. www.lazertran.com. Has distributors in the US, UK, Canada, and Australia, and carries different types of waterslide paper.
- Water slide decal paper. www.papilio.com. Aqua Slide Transfer Paper PAS/4; water decal paper as well as ceramic and glass decal paper for screen printing.
- Wet Plate and Alternative Photography Supplies. www.wetplatesupplies.com. Located in England but can ship to the EU kits, bulk chemicals, equipment. They have several recipes to choose from and ship quickly.
- Washi Arts www.washiarts.com. Beautiful Japanese hand made papers. They ship globally.
- Whittemore – Durgin Glass. www.whitte moredurgin.com/whiting.html. Whiting for cleaning glass.

PODCASTS AND VIDEOS:

There are so many videos and podcasts and they are ever changing. Watch these, but don't forget to keep doing searches on this never ending web.

- Anna Atkins: was an English botanist and photographer. https://publicdomainreview.org/collections/cyanotypes-of-british-algae-by-anna-atkins-1843/
- Cyanotype: http://photohistory.jeffcurto.com/archives/1789 has visual http://podbay.fm/show/94009100/e/1444141855 just audio
- Christian Ernest Marclay: is a visual artist and composer. The new with cyanotype images. https://fraenkelgallery.com/exhibitions/cyanotypes
- COOPH the history of photography in five minutes. Not everything you need to know but really enjoyable to watch. www.callofphotography.com/history-of-photography/
- Dickerman Prints: A lab that has a very nice blog and a post about the history of photography at: https://www.dickermanprints.com/blog/a-brief-timeline-of-the-history-of-photography
- George Eastman House https://www.sidereel.com/tv-shows/george-eastman-house-podcasts/season-1 and https://www.youtube.com/playlist?list = PLYUGPbkoBpcWqMG-kCSGlU6qzkUECXeAX
- Gum Printing: http://www.billymabrey.com/tutorials/What-is-a-Gum-Print
- InkAID: how to videos for their products. https://www.inkaid1.com/tutorial-videos/ Also here: https://www.youtube.com/watch?v = 8nFwlu66SSE
- Joseph McAllister: cyanotypes on glass. https://www.youtube.com/watch?v = mygeYLcPuJM
- Library of Congress photograph examples, Platinum and Palladium Prints: https://www.loc.gov/rr/print/coll/589_platinum.html
- National Gallery of Art. https://www.youtube.com/watch?v = lmRRPqlSsTQ&feature = youtu.be
- Printing photos on objects: Liquid Emulsion: https://www.instructables.com/id/The-Darkroom-Liquid-Light-Emulsion/
- Sasha Krasnov Liquid Emulsion: http://skrasnov.com/blog/liquid-emulsion/printing-street-photography/
- Wet Plate Collodion: https://www.khanacademy.org/humanities/becoming-modern/early-photography/v/wet-collodion-process video
- Wet Plate Collodion & The War: https://www.thoughtco.com/wet-plate-collodion-photography-1773356
- Wet Plate Collodion, Portable Darkroom https://petapixel.com/2018/01/03/creating-wet-plate-collodion-photo-portable-darkroom/ https://www.youtube.com/watch?v = SDMjvZCRce4

© Laura Blacklow. Untitled, from “Backyard Botanicals”, cyanotype collage on Arches Platine. *Collection of the Brigham and Women’s Hospital, Boston*. (One print from an on-going series.) In conventional photography, we think of the camera as capturing time in parts of a second. However, minutes and hours might be needed for just one exposure of plants placed in contact with a hand-coated emulsion in the sun. Since Laura combines layers of cyanotype and Van Dyke brown, each print can take days to complete. The work in the Backyard Botanicals portfolio, started years ago, results in an almost spontaneous archive of years that correspond to passed/past time.



© Baba Barnett. “Hands Up” 2019. This image started as an iPhone capture, then digitally altered in Photoshop and was then made into a digital negative using QTR software. A palladium print was made on Hahnemühle Platinum Rag paper using the traditional chemicals.

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http://www.photohistorytimeline.com

http://albumen.conservation-us.org/id/messier2000.html

HEALTH AND SAFETY

http://www.infotox.com/art_materials.html InfoTox is a toxicology consulting company and has information on chemicals and how to dispose of them properly.

www.msds.com MSDS forms on line.

www.PixelatedPalette.com Articles about Health and Safety

http://www.ilfordphoto.com/healthandsafety/page.asp?n=163 Ilford Photo has a lot of good information specifically for photographic chemicals.

Conversion tables

TEMPERATURE

To convert Fahrenheit to Celsius, subtract 32 from the Fahrenheit temperature, multiply that number by 5, then divide that number by 9.

To convert Celsius to Fahrenheit, multiply the Celsius temperature by 9, divide that number by 5, then add 32 to that number.

US CUSTOMARY DRY MEASUREMENTS

1 lb = 16 oz
1 lb = 453.6 g
1 oz = 0.0625 lb
1 oz = 28.35 g

US CUSTOMARY LIQUID MEASUREMENTS

1 gallon = 128 fluid ounces
1 gallon = 4 quarts
1 quart = 32 fluid ounces
1 quart = 2 pints
1 pint = 16 fluid ounces

US CUSTOMARY LIQUID MEASUREMENTS TO METRIC

1 gallon = 3.785 liters
1 quart = 0.9463 liters
1 fluid ounce = 0.02957 liters
1 gallon = 3,785 ml
1 pint = 473.12 ml
1 fluid ounce = 29.57 ml
1 tablespoon = 15 ml
3 teaspoons (tsp) = 1 tablespoon (tbs)
1 teaspoon = 5 ml
1 ml = 1 cc

METRIC LIQUID MEASUREMENTS

1 liter = 1,000 ml
1 liter = 33.81 fluid ounces
1 liter = 1.057 quarts
1 liter = 0.2642 gallons

© Cindy Beams. “Phoebe in Lace” 2019. Cindy puts images together on the computer and then decides which process to use. Cindy did this for a series in cyanotype.

© Cindy Beams. “Listen to Freddy” 2019. Here is another example of how Cindy puts images together on the computer and then decides which process to use.

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© Martha Madigan. "Hi'aka", 2013. From the series *Human Nature*. This is a unique solar photogram on gold toned printing out paper re-photographed digitally and an edition of 10 was made on archival inkjet rag paper.

© Martha Madigan. "Graciela Growth XII", 2002–2003 from the series *Human Nature*. Giclee print from a series of 10 with 2 artist proofs.