CHAPTER 17

WET PLATE COLLODION PROCESS:
TINTYPES, AMBROTYPES, & GLASS PLATE NEGATIVES

Christopher James - Rebecca & Wisteria, Dublin, NH 2010

OVERVIEW & EXPECTATIONS

Let me begin this chapter with something to think about. Sometimes you eat the fish, and sometimes the fish eats you. If you think, for a single moment, that your talent is bigger than the wet plate collodion process, it will humble you. There is a reason that the tribe of wet collodion practitioners is a small society with a madly passionate membership. It takes time and you need to see everything that can go wrong at least a few times before you can identify the problem and the solution. It takes time to get your

techniques, and workflow, in harmony and to make the process personal and appropriate to where you are working and how the weather is influencing your results.

The process requires old and carefully tended equipment… often made by hand, or patiently restored, and given new life and purpose… as in those lovely Kodak 3A's. It requires a tenacious belief in the beautiful and the mysterious. It rewards analytical thinking, process, and patience. At the same moment, it demands a love for the accidental and unexplained, and the peace of mind to fully know that the process means more than the final product… every single time you make a plate. Wet plate, like every other alternative photographic process (and I am beginning to include film and silver gelatin printing in this genre), is not about what the equipment and the software determine but what the artist and the hand-made printmaking process can conjure up together. As T.S. Elliot wrote, "Anyone can carve a goose if the bones are missing".

This is not digital image making without penalty or sacrifice … this is photography.

I'll begin by providing a little history about the discovery of collodion and its evolution into the wet plate collodion process that revolutionized photography. The process was realized, adopted, and married to albumen, and in that partnership, ruled photography for decades, providing the opportunity for the detail prized in a daguerreotype as well as the ability to reproduce multiple prints from a single wet collodion glass plate negative.

I will describe the materials and chemistry, as well as the care and maintenance of that chemistry. I'll also provide a great many recipes for everything you'll need to know (at the moment) about collodion, iodized silver sensitizer, developers, fixer options, chemical safety, and setting up your working space. I'll then take you through a basic overview of a recommended workflow using tintypes production as the example. I'll include sections dealing with mounting, presentation and troubleshooting, including specific recommendations for hot, and arid, weather conditions and working on the road

in an ice fishing tent or the back of your car. You will then have a nice foundation to create your own workflow and personal way of doing this very provocative, seductive, and beautiful process.

***ICON – 1 here**, (A Little History)*

***Fig 17 – 2 here**, (Blind Man Holding a Cat_1850 - Daguerreotype)*

A LITTLE HISTORY

Prior to 1851, if you wanted to march in the fledgling photographic parade, the most relevant options available, provided you didn't want your images to be botanical studies rendered in blue, romantically fuzzy dichromate gum or salted paper prints, were limited to the complicated daguerreotype, Talbot's calotype, and a few odd techniques that were lightly practiced by those whose role in life was to be an interesting conversationalist at dinner parties.

The daguerreotype was known for its crystalline detail, preciousness of presentation, the time consumed for its exposures, the intricacies of the process, and the fact that it was a one-of-a-kind image. Fox Talbot's calotype was, as Michelangelo once said when describing beauty, "a purgation of superfluities".... simplicity itself. A gelatin-sized stationary, impregnated with salt, and sensitized with silver nitrate, would result in a paper negative that was suitable for making an unlimited number of salted paper prints.

Just a side note clarification: Talbot did make some developed-out positive prints from his developed-out paper negatives, and these can also be called calotypes. The calotype's resolution potential was vastly inferior when compared to daguerreotype, due to the texture of the paper substrate, and it was also much less sensitive to light, making studio portraiture very difficult. Paper negatives were occasionally waxed or oiled in order to make them translucent enough for contact print printing.

The much-sought-after solution would be a single process that could be both reproducible, like the calotype, but finely detailed, like the daguerreotype. Once the problem was solved, and the technique discovered, glass would be the obvious substrate, because it was both clear and flat. The remaining big question, however, would be how to keep the light sensitive halides on the glass throughout the entire process. A clear, and flexible, binder was needed.

***Fig 17 – 3 here**, (John Adams Whipple, Cornelius Conway Felton w/ His Hat & Coat, c. 1850 - Daguerreotype)*

Wet Plate Irony

In 1845 - 1846, Christian Frederick Schönbein (1799–1868) discovered nitrated cotton, popularly known as *guncotton*, by soaking cotton fibers in a solution of sulfuric and nitric acids. The cotton was placed in the acidic mixture for an extended period of time (I am being non-specific here for obvious reasons) and was subsequently washed well until free of the sulfuric and nitric acids. This initial process yielded a very unstable flammable material that was employed very successfully as an explosive.

Ironically, in 1847, a young medical student by the name of John Parker Maynard formulated an ingenious medical dressing that could be used to treat the wounds from Schönbein's guncotton based explosives. This medical dressing was called *collodion*, a name taken from the Greek word *kollodes* meaning, "to adhere." Maynard made his medical collodion by dissolving Schönbein's explosive nitrated cotton in a mixture of equal parts ether and alcohol.

The end result of Maynard's action was a clear and viscous fluid, similar to a diluted, warmed, honey that dried to a durable and flexible *skin*. Maynard's adaptation was used extensively by field doctors during the Crimean War (1853- 1856), in a battlefield environment and the benefits related to its use were immediate.

Collodion dried quickly, due to the evaporation of its ether and alcohol and could be applied directly upon, and around, the surface of bandages, as an adhesive skin to

keep the injury clean and dry, and as protection from infection. In some accounts it is reported that the collodion was applied directly to the wound. This collodion application technique was neither pleasant nor particularly effective.

As an aside, this emergency treatment has a reflection in contemporary battlefield first aid where super-glue (*cyanoacrylate)* can be used to close wounds quickly. Super-glue was first used in Vietnam, and is now practiced using a medical grade version of the adhesive that results in less skin damage due to the methyl alcohol in the original formula.

In January of 1850, Robert Bingham proposed the idea that Maynard's collodion solution could be applied to photographic use because it appeared to be the perfect vehicle for holding light-sensitive compounds on glass. Gustave le Gray followed soon after by publishing a theoretical formula echoing the same intentions.

***Fig 17 – 4 here**, (Frederick Scott Archer, Kennilworth Castle, 1851, Sel d'or toned Albumen from collodion negative – S&O)*

In March 1851, Frederick Scott Archer published the technique and formula for the application of iodized collodion on sheets of glass for the purpose of making glass plate negatives. Archer described a process where a light sensitive salt, potassium iodide, was combined with a solution of dilute collodion. This viscous solution was applied to a glass plate and allowed to set-up quickly via evaporation, thus preparing it for sensitizing in a bath of iodized silver nitrate.

The collodion-coated plate was then immersed in the silver nitrate for several minutes, resulting in a light-sensitive layer of silver iodide on, and in, the collodion. At this point, the plate went from having a transparent collodion coating to having a translucent and creamy appearance. You will see this same transition when you remove your plate from the silver bath. The sensitized plate was then set into a plate holder, and camera, before it dried (which would have made it less sensitive to light) and exposed and developed quickly… thus the reason for the term "wet plate."

Following the exposure, the latent image on the plate was developed, under safe conditions, in a solution of ferrous (iron) sulfate, flushed with clean water, and fixed in a mild solution of potassium cyanide or sodium thiosulfate. Intensification of the glass plate negative was common and under-exposed plates, which appeared positive against a dark background, or on dark glass, could be seen as positives and referred to as ambrotypes. The advantages were immediately evident. The process provided a detailed negative rendering on a glass substrate that was most sensitive in the wet state, permitting exposures that were dramatically faster than the calotype. Prints from wet-plate negatives were also democratically priced, being a fraction of the cost of the Daguerreotype. This democratization of the family album portrait became even more pronounced with the advent of the tintype / ferrotype process.

(**Fig 17-5,** tintype studio – 1850)

Soon after Archer published his technique, he realized that an under-exposed wet collodion negative, when laid on a dark background and viewed in reflective light, would appear as a soft tonality positive. This phenomenon was enhanced when he bleached the brown silver deposit to white with mercuric chloride. Archer called these positive collodion images *Alabastrines* playing on the white of alabaster. Eventually, image-makers adopted the now practiced use of ferrous sulfate developer and potassium cyanide fixer, a chemical combination that eliminated the need for a bleaching step. The following is a short aside dealing with the Alabastrine Positive technique from John Towler's amazing text, *The Silver Sunbeam*, from 1864.

Alabastrine Positive Process From The Silver Sunbeam (1864)

I think this is a really interesting description of Archer's Alabastrine Positive Process from John Towler's 1864 book, *The Silver Sunbeam*. In the first paragraph of the text, Towler wrote a sentence that truly gave a sense of how the public's democratic perception of photography was already beginning to take shape… "*Naturally the operation must be very simple, and but a very small quantity of color must be used, otherwise the operation will become a work of art, and none but an artist could*

perform it." This is very much in tune with the philosophical path that Steve Jobs took with Apple… make it beautifully complex on the inside but perfectly simple and intuitive on the outside.

I'm going to keep the text as written by Towler as I think the archaic tone of the writing is rather charming and will set the right note for your experimenting with the process. However, I will make a variant to the original formula so that you can more easily attempt it in your own lab.

"The coloring of collodion positives, as already remarked, may be effected on the whites of the picture, either before the varnish is flowed on, or upon the varnish itself: When well performed, it communicates life and roundness to a picture which before was flat and lifeless. The colors in use are in fine powder, and are laid on with a dry and very fine pencil of camel's, etc., hair. Naturally the operation must be very simple, and but a very small quantity of color must be used, otherwise the operation will become a work of art, and none but an artist could perform it. In all ordinary cases the color lies on the surface, and does not penetrate into the material of the film. In the Alabastrine process, however, the film is so treated as to become permeable to varnish, and thus to exhibit the color, as it were, in the collodion; besides this the whites are still retained white, notwithstanding the impregnation of the film with the penetrating varnish. Positives treated in this manner are regarded through the glass and the collodion film; the pictures, therefore, are direct, as they ought to be. The mode by which the tones are preserved soft and white, and rendered at the same time permeable, is the following"

Alabastrine Formula Solution

- 2.6 grams Sulphate of protoxide of iron (*iron(II) oxide / ferrous oxide*)
- 5.2 grams Bichloride of mercury * (*mercuric chloride*)
- 2 grams Chloride of sodium, (*kosher salt*)
- 120 ml rain or distilled water

Note: Mercuric Chloride - Mercury(II) chloride (also known as mercuric chloride) was used as a photographic intensifier to produce positive pictures in the collodion process of the 1800s. When applied to a negative, the mercury(II) chloride whitens and thickens the image, thereby increasing the opacity of the shadows and creating the illusion of a positive image (*Towler, 1864*). Mercuric chloride is toxic, white, and a soluble salt of mercury (at 6%). It has been used in disinfectant, as a fungicide, and in photographic fixers. It's also odorless, colorless, and really dangerous which is why I'm letting you know about it here. Take all safety precautions when working with this chemical.

Note: Regarding sulphate of protoxide of iron (iron(II) oxide / ferrous oxide)… this is a black powder, is very unstable, and can easily corrode into iron(III) oxide. This means that it may take a few tries before your Alabastrine process works. Ferrous oxide is often used in cosmetics and in tattoo inks.

"Select for this operation a vigorous good positive; a faint and thin film does not answer well. One that has been rather under-exposed is most suitable. Then, whilst the collodion film is still moist from fixing, pour upon it a quantity of the above solution, and keep it in motion. At first the picture assumes a dead and gray appearance; but this soon chases, and becomes continually more and more brilliant."

"It is sometimes necessary to add a little more of the fresh solution, and to retain this solution on the surface until the whites are perfectly clear. The time required for this operation varies according to the temperature and the thickness of the film. Heat promotes the effect; the plate is therefore frequently supported on the ring of a retort-stand, with the fluid on its surface, whilst a small flame is kept in motion beneath it. Unless this precaution be observed, there will be a liability to break the plate. It happens sometimes that a few minutes are sufficient; but generally more time is required. If no heat is applied, the operation may require in some cases as much as an hour. As soon as the whites have attained their utmost purity, the operation is complete. It is better to be quite certain that the whites have attained the purity required, than to shorten the time, and have the effect underdone. 'there is no danger

in giving too much time; but it is a disadvantage to remove the fluid from the plate too soon; because in drying, the whites in such a case are apt to grow darker again, and the picture assumes then the cold blue tone, which arises from treatment with corrosive sublimate alone."

"As soon as the effect has been reached, the plate is thoroughly washed in several waters, and then dried over the spirit lamp. The plate is now ready for the first coating of varnish, which communicates transparency to the shadows, without at all impairing the whites."

"The next operation is to lay on the colors carefully and artistically on those parts that require them. It is unnecessary to apply any to the Shades. Where much color is desired on a given surface, it is better to apply it by repetition, and not in one thick blotch. Colors thus tastefully laid on produce a very brilliant effect, by reason of the purity of the whites; and this effect is again increased by the softness communicated to the whole picture by the application of the penetrative varnish, which causes the color to permeate into the pores of the film, or to be seen at least in full beauty from the opposite side. This varnish is nothing more than a very pure strong-bodied protective varnish. The picture so far finished is backed up with a piece of black velvet, but never with black Japan, which would injure the film."

The positive image was then placed in a decorative case that was often the same type that housed daguerreotypes. This ornate presentation method was also occasionally applied to ferrotype / tintype metal plates. The ambrotype, due to its relatively speedy exposure and clarity, quickly displaced the daguerreotype as the vehicle used for studio portraiture. With a collodion negative you could make unlimited paper prints, particularly Carte de Visite (*card of the visit*) prints, from a single negative and these prints could be given away or put into albums. The collodion positive process had its market…but it was only from the mid-1850s to the mid-1860s and the people making them were not called photographers, but Ambrotypists. The term "photographer" referred to those who made prints from negatives.

A Little History Continued

The early positive collodion plates were occasionally referred to by the French as *daguerreotypes-on-glass* and were common throughout the 1850s and 1860s. However, most people called the plates, ambrotypes; a name introduced by Boston photographer Joseph Ambrose Cutting after Marcus A. Root suggested the name. The term ambrotype could be assumed to have been taken from Joseph Ambrose Cutting's name but in truth, it was actually derived from the Greek word *ambrotos*, meaning *immortal*... referring to Cutting's method of covering a completed image with a second sheet of glass in the fashion of preparing a slide for a microscope. Interestingly, Cutting gave himself the middle name of Ambrose to match the process.

Wet plate collodion hit its stride in the early 1850s when Blanquart-Evrard's albumen technique was used in combination with Frederick Scott Archer's wet collodion glass plate negative process. This was the first true and repeatable negative to paper imaging system capable of yielding values and details that were commercially viable and equal to the Daguerreotype image on silver-plated copper.

Today there is an ever-growing community of photographic artists using the wet collodion process as their primary means of image translation and expression. Their work is particularly meaningful because it incorporates the traditions and characteristics of the process while addressing the contextual and conceptual trends of contemporary visual expression. Several of the prominent practitioners and innovators in this select group are John Coffer, S. Gayle Stevens, Joni Sternback, France Scully Osterman, Mark Osterman, Sally Mann, Will Dunniway, Jody Ake, David Emitt Adams, and Ian Ruther.

Fig 17-6, *Sally Mann, Triptych, 2004*

As an aside, it is quite common to see ambrotypes and Daguerreotypes side-by-side and identically labeled in flea markets and antique shops. The Daguerreotype appears as a metallic mirror with a ghostly image residing in its interior. Due to its predominant reflective quality, observing the image is a bit like looking at a "*little secret*" because only one person can see it well at one time. The Ambrotype, on the other hand, is only as reflective as the glass itself and when made on clear glass it is often possible to see a slight separation between the image on the glass and the black backing behind it. This is especially evident if dark paper or fabric was used. This separation adds to a 3-D effect and is an instant clue as to the process. Beautiful variations of the ambrotype are often made using a tintype workflow on a substrate of dark glass, such as deep red, cobalt blue, green, and black.

***Fig 17 – 7 here**, Malin Sjoberg_Self Portrait_Ambrotype on ruby red glass_2009.tif*

There are many workable, published, and practiced formulas and the following recipes and technical descriptions represent a useful starting point for you to begin experimenting with wet collodion. The initial technique described herein is for the wet plate collodion ambrotype / tintype. To make a wet plate collodion *negative*, as in Archer's work, you would need to consider using a slightly different salted collodion formula (increasing the iodide to bromide proportions at a rate of up to 4:1 in the formulas to follow), longer exposures, longer development, and a weaker and more acidic ferrous sulfate, or pyro, developer. More on this later on in the chapter.

***Fig 17 – 8 here**, Christopher James, wet Plate Developer Tray, 2011.tif*

THE WET PLATE COLLODION PROCESS: MATERIALS

Although wet plate collodion work shares many of the same characteristics and sequences with traditional silver-gelatin processes, it does require more than a few equipment adaptations. For a beginner, one of the easiest wet plate camera solutions is to buy an antique Kodak 3A or 3B film camera and use pre-coated and prepared black aluminum plates, with a removable film membrane, that fit the size of the original

negative dimensions. Affordable plate cutters can be purchased from Main Trophy Co., an Illinois firm that specializes in trophy plaques. Plate stock can be ordered in bulk or cut to size by a number of businesses, such as, Main Trophy, Lund Photographics, and Bostick & Sullivan. No camera adaptation is required and the sensitized plate is held securely on the shelf that is used to support the film transport. The only pre-exposure preparation I have used is to take the sandarac varnish used to coat the finished collodion plates, or lacquer, and paint all metallic surfaces that will come in contact with the sensitized wet plate when it is placed in the camera.

If you are going to use a traditional view camera, you will need to adapt your film holders to accommodate the sensitized wet collodion plate. This is not a terribly difficult task as all you need is a conventional view camera sheet film holder so that you may modify it to accept a glass or metal plate. This process doesn't take long at all and requires only a few simple items: a power drill with a small bit, a mini hacksaw blade, silver jewelry wire, varnish, a ruler, and part of a yogurt container.

***Fig 17-9 here**, S & O film holder to plate holder conversion*

Scully & Osterman Conventional Film Holder Conversion

The easiest way to create a wet plate holder is to adapt a conventional film holder by removing the dark slides and cutting a hole in the rigid septum that separates the two sides. This opening will be slightly smaller than the size of the glass, or metal, plates that you will be using. Drill two small holes on either side of the 4 inside corners of the opening and insert a clip made from a silver wire through each set of holes to hold the plate. Bend over the protruding ends of the wire and flatten them so that the dark slide can be removed without scraping the wire. It is important that the collodion side of the glass plate is on the same plane as would be the film if it were being used for film. The sensitized plate is loaded collodion side down from behind and held in place by a "spring" made from a plastic yogurt container that is positioned between the back of the plate and the back dark slide that has been replaced. The front dark-slide is used as

usual. This is pretty easy to do and I converted my first one in about 30 minutes. If you don't feel handy, you can order them from Niles Lund, www.lundphotographics.com.

Dry Plate Holder for Wet Plate Process

Another simple method of adapting a conventional large format camera to a wet plate camera is to go antique hunting for dry plate film holders. These are often found on web sites such as eBay by looking under the headings of "vintage photographic equipment" and large format cameras and accessories. In the last year or two I've purchased six full and half-plate holders that I've been able to use in common dry plate cameras that accommodate that size holder. The only additional adaptation that I've done to make the plate holder suitable for wet plate is to varnish the inside of the plate holder in all areas where the sensitized plate will come in contact with the holder. I do this to preserve the plate holder, make clean up easier, and to prevent any metallic areas of the holder from coming in contact with the sensitized plate. A simple varnish is the gum sandarac and lavender oil one I use for varnishing the finished plate.

Antique Camera, or Holga, With No Plate Holder

Another very simple solution to the plate holder requirement is to go hunting on eBay or your local antique store / flea market for the previously mentioned Kodak 2A or 3A camera. When you look inside, you will see that there is an obvious place where the film stopped so that a frame could be exposed. Measure that area and then go and order some prepared black plates that are slightly larger than the measurement you just made. The sensitized plate will lay on top of that opening very easily and will stay in place when you close the camera up in the darkroom prior to going and making your exposure. I have also had great results with Holga plastic cameras and have only needed to build out a simple lip with gaffer's tape on one side to hold the plate steady in the camera.

***Fig 17-10 here**, Lund Acetal Resin Plate Holders*

Lund Acetal Resin Plate Holder

The ideal solution, other than having a mint condition original wet plate holder is to make a brand new one out of an opaque Lexan (a polycarbonate resin material) that will last until the end of time. A few summers ago, during a wet plate workshop, I let students use my camera and plate holders and noticed that their casual clean up after every plate was beginning to have a negative impact on the wood in both holder and camera.

Niles Lund, a wet plate practitioner and engineer who had just begun his wet plate products web site, was visiting the workshop and we started to talk about making a plate holder that could withstand any kind of chemical or physical abuse. I asked Niles to make a modern version for one of my wooden, hand-made, Japanese, full plate cameras and a few months later he had solved the problem of having the plate holder and camera disintegrate over time.

The only precautions that you need to take if you order one of these holders from Niles is to hold a paper towel under the corner of your plate holder as you go to your camera. Also be sure to wipe down the back of your freshly sensitized plate after loading it into your plate holder. The reason is that the polycarbonate resin holder doesn't absorb any of the silver excess run-off and you will likely drip on the floor, and your shoes, on your way to the camera.

***Fig 17 – 11 here**, Niles Lund, Lund Lexan Traveling Silver Tank with Dipper Top*

Plate Dipper for Sensitizing and Fixing

While both sensitizing and fixing can be done in conventional trays, it is far easier, and much safer, to use upright Lexan dip tanks for these operations. The silver nitrate tank should have an outer light-tight box, or it can be constructed using a Lexan material made of an opaque ruby red, or black, polycarbonate resin. The light safe silver tank is essential while the fixing tank should be clear so that you can see what is happening to your plate during the fixing stage. Each tank should be equipped with a

"dipper" or some mechanism for lowering and raising the plate in the solutions without touching the delicate and sensitized surface of the plate, or the chemistry.

In the 19th century these plate dippers were made from glass, rubber, ceramic or thick silver wire. One solution that works quite well is a 2" wide strip of Plexiglas® softened on one side over a stove burner and bent to have a 1/4" lip. The cheapest version is cut from a gallon milk container. The best place to get these tanks is through Niles Lund's site (www.lundphotographics.com). Niles has incorporated the dippers into his tank lids so that everything is in one comprehensive unit.

A COMPREHENSIVE WET COLLODION PACKING LIST

In other chapters I have provided dry and wet, table and sink, set-ups. Since this process is really a simultaneous combination of the two states I will give you a basic list of materials that are important to have on the road. With those materials in hand it will be quite simple to add a few additional items to your stay-at-home lab to make life easier for you.

On The Road & Lab Wet Plate Collodion Needs

- A plate camera with a relatively fast lens and a way to accommodate a wet plate. This can be a traditional view camera, an old wet or dry plate camera with companion plate holder, half or full size, a vintage Kodak camera, such as the 3A, or even something as basic as a Holga.
- A tripod or some device to hold your camera still during a lengthy exposure.
- QuickFish ice fishing tent for on the road wet plate work (www.geteskimo.com) or a clever portable wet plate set up for the trunk of your car or truck. The QuickFish tents are lightweight, easy to set up, come in various sizes and can hold tables. They can get hot in the summer but you can always cover the roof with a reflective space blanket or paint it white. These are great for multiple people in a workshop situation and you can make one of them work easily if you keep your

collodion pour, sensitized plate loading, and development in the tent and your fixing station and wash outside on a separate table.

• Portable safe light conditions. You will only need to be in safe conditions for the sensitized plate insertion into your plate holder and development. On the road, if you use an ice fishing tent, the purest solution to your lighting situation is to get a red LED caver's head band with white and red LED lights. You can adjust the angle of the light and make it fall directly on your plate for both pouring and development. A more refined solution to lighting would be to get some strong magnets to put on the outside of the tent to hold magnetic LED road alert lights on the inside of your tent. Try this site www.flarealert.com. One other solution if you have electricity nearby, festive red chili pepper lights!

• Prepared black plates, with a removable film laminate on the black side, for tintypes or… if you want to make your life complicated, asphaltum, balsam fir, and mineral spirits, to make your own blackened plates.

• Glass, and glass cutting tools, for negatives and ambrotypes. Clear glass for negatives, and black, blue and red glass for ambrotypes.

• Glass Cleaning Vise, or a non skid rubber pad, for cleaning glass with a whiting or rottenstone liquid formula.

• Funnels that are specific to the fixer, developer, and silver.

• Absorbent paper towels.

• Latex or nitrile gloves, a plastic or canvas apron, and eye safety wear.

• Enough distilled water for development and for cleaning. Usually, a day of shooting and rinsing will not require more than 5 gallons of fresh water if you are using a potassium cyanide fixer. Rubbermaid sells a fine insulated water container that is excellent. If you need it for keeping water chilled, to cool off silver tanks or developer, you might want to consider two of these… one for general use and cleaning up and the other for drinking.

• Gallon size milk containers for bringing home your used developer, developer rinse water, and post-fixing wash water.

• Collodion: chemistry to mix or prepared salted collodion. (See resources)

• A catch tray for pouring collodion on your plate and for keeping your collodion pour bottle. It is essential that you protect your plumbing in case of accidental spill. I line my catch tray with multiple layers of newspaper or paper towel. You can also sacrifice a tray for all of your collodion pouring and use it only for that purpose. **Never allow collodion to go down the drain of a sink.**

• A 7% to 9% salted silver nitrate solution for sensitizing and a tray to prevent any spill. I always keep my silver tank in a plastic catch tray.

• A liter size, silver dip tank, with a dipper / or a silver only glass tray (Pyrex)

• Ferrous sulfate developer.

• Distilled water for your developer dilutions.

• A low volume glass measure for mixing your developer.

• A catch tray for catching your developer during development.

• A fresh water tray for the critical initial rinse following development before fixing.

• Potassium cyanide (*read the fixing section thoroughly*) or sodium thiosulfate fixer.

• A one or two liter size dip tank for fixing plates. I strongly recommend a dip tank for fixer, especially if you are using potassium cyanide.

• A Tank Caddy for the silver and fixer tanks - www.lundphotographics.com.

• A tank or tray for the fixer, lined with layers of newspaper to catch any spillage.

• A tray for the final water bath following the fix.

• At least a gallon of hydrogen peroxide for neutralization of your post-fixing wash water if you are fixing with potassium cyanide. Be sure to read the section on types and methods of fixing.

• Cotton balls (for gentle plate cleaning in the washing stage).

• Coffee filters for filtering if necessary.

• Krystal Seal envelopes for transporting your plates back to the lab.

• Trash Bags for hauling away any of your trash.

Additional In the Lab Wet Plate Needs

• Glass lab wear for mixing collodion and other solutions (1000 ml to 50 ml).

• pH strips or digital pH wand and a hydrometer to test your silver bath

• A graduated cylinder for the hydrometer test

• Glass stirring rods

• Running water or water supply

• A developer helper-tray a size larger than the plate so the developer doesn't have to be poured directly on the plate in the event that you prefer that method to hand held development. www.lundphotographics.com

• A 100 ml to 200 ml shot glass for prepared developer and your developer pour

• Safe Light or a window with a foam-core over it and a cut out for a red filter

• Mina Gloss Polyurethane for non-traditional varnishing

• Sandarac varnish and spirit lamp for traditional varnishing

• Glass storage jars for collodion and varnish. Add marbles to the collodion as you use it up to keep the air space small. Keeps the collodion fluid if you aren't using it up quickly.

• Nalgene, lab quality, storage bottles for both fixer and developer. It would be a good idea to get a lab quality Nalgene bottle for your silver nitrate as well. If you can get an opaque or dark red bottle it would be ideal.

• A wet plate collodion kit with all the chemistry, spirit lamp, pre-mixed salted collodion A & B, pre-mixed developer, fixer, pre-mixed varnish, hydrometer, funnel, etc. - www.bostick-sullivan.com

***Fig 17 – 12 here**, Scott Hilton-CYCL, 2012 (wet plate neg - ink jet print)*

GLASS AND METAL PLATE PREPARATION

If you intend to make a collodion negative or an ambrotype on glass, you need to take a different approach to your plate preparation than if you are working on blackened metal. The glass plate is prepared by thoroughly cleaning a piece of clear or dark glass with a liquid slurry solution of whiting or rottenstone and grain alcohol.

Once your glass is cut to size, so that it fits into your plate holder, file the edges with a hand held sharpening stone or medium mill file to prevent any inadvertent cutting of your fingers on the sharp edges. Put on a pair of gardening gloves. To take the sharpness away, place the file at a 45˚ angle on the edge of the glass and draw the file away from you several times. Repeat this step on all 8 of the sharp edges. Then, if you have a dishwasher, wash all of the plates using Bon Ami instead of detergent. If not, wash by hand in hot soapy water and rinse in very hot water.

The glass must be totally free of any solvent, grease, and debris, or the collodion solution will not adhere to the glass effectively. A traditional glass cleaner is *rottenstone*, a fine grit-like material that can be purchased at stores, or web sites, that sell furniture-finishing supplies. It is a fine gray powder and mixing it with equal parts of powder, water and alcohol produces a good glass cleaning solution. You can also make up a bottle of calcium carbonate, or "whiting," to accomplish the same purpose. Personally, I prefer the whiting to the rottenstone. Here's the formula…

Whiting Formula for Glass Cleaning

Here's a very good calcium carbonate / whiting formula for cleaning glass. Mix it and store it in a small bottle like the culinary arts drizzle bottles that sous chefs use to make their sauces look exotic on your plate.

- 80 g of whiting
- 100 ml of water
- 20 ml of grain alcohol

Place your sheet of glass in a glass-cleaning vise (see illustration). Apply the whiting solution to the glass liberally, and with one piece of cloth, or cotton pad, vigorously cover the entire plate in a swirling motion until you hear a squeaking sound. Take a fresh piece of cloth or cotton pad and continue to buff the surface removing any and all whiting residue and lint from the glass. To verify if your plate is cleaned properly, breathe on the glass and check to see if there are streaks showing in the mist

condensation from your breath. If there are, continue cleaning. A 4 x 5 sheet shouldn't take more than a minute or two.

Super-Clean Last Step With Bon Ami

Once your glass plates have been cleaned with whiting or rottenstone, you may want to make them perfect. The best way to accomplish this is to put your cleaned plates in a dishwasher and to add some Bon Ami to the detergent holder instead of dishwasher detergent. Run a short cycle and you'll be in perfect shape to pour without problems. If, by chance, you still are having issues with your collodion adhering to the glass, read up on the albumen edge sizing that follows in this chapter.

Prepared Black Metal Sheets, Cut to Size, With a Film Laminate

If you are going to be making tintypes, by far the easiest way to begin working in wet plate collodion, then I would recommend calling up Bostick & Sullivan, Lund Photographics, or Main Trophy Supply, and telling them exactly what size plates you want and you'll get them in the mail in short order. These plates are ready to go and all you'll have to do is peel back the protective film on the blackened plate and proceed to coat with collodion. Plates come in black or chocolate brown and are in assorted thicknesses. If you opt to prepare your own metal plates with asphaltum, balsam fir, and mineral spirits, then you are a strict traditionalist and I would recommend taking a workshop with John Coffer at his Camp Tintype in Dundee, NY. Everything at John's camp is done from scratch!

If you are going to make a lot of plates, or are working with an assortment of cameras and plate sizes, you should invest in a plate cutter (about $300.) and a large box of 20" x 24" blanks. Main Trophy is the best source for the plate cutter.

*(**Fig17 –13 here**, John Coffer_ John Coffer Camera (wpc))*

WET PLATE COLLODION CHEMISTRY

COLLODION: Preparing Your Salted Collodion

You can go about salted collodion preparation by purchasing the collodion, ether, alcohol, and salts and preparing them in sequence, or by purchasing the salted collodion, parts A & B from a chemical supply like Bostick & Sullivan, and mixing them together a few hours before use, depending upon the type of collodion you make up. Making it from the separate ingredients is not complicated and if you're going to do this process seriously then you should do it from the beginning at least once.

NOTE: I strongly advise against attempting to nitrate your own guncotton in order to make your own collodion from scratch. Nitrating cotton is very dangerous and it is simply not worth the risk without the right safety equipment, facilities, or training. It is much safer to purchase prepared, "plain" and un-iodized collodion USP from a chemical supplier and salt it at home in your well-ventilated lab or outdoors. To make life easier, you can purchase the collodion in an A & B kit and simply mix the two parts together and be on your way to making plates in minutes. There is not a single good reason to make collodion on your own, as plain USP is readily available.

Safety Issue: Flammable Fumes

The fumes from the ether are very flammable and a spark could ignite and cause a problem. I'm not suggesting a Hollywood type of explosion, but it's important to err on the side of caution and handle ether, alcohol, and collodion as dangerous and flammable materials. Always mix the collodion solution in a well-ventilated lab, or outdoors, when possible and do not smoke during the process. (Insert your own non-smoking lecture here.) If you are using a lab, be sure that the ventilation is excellent and that the fan motor is flameproof, i.e. no sparks. If you use an in-line fan in your darkroom, be aware that it is likely to have an armature that generates a spark. *Do not use that type of fan during this process.*

Basic Collodion Ingredients

- Plain Collodion USP
- Ether

- 190 proof grain alcohol
- *Cadmium and / or ammonium bromide
- *Potassium iodide, cadmium iodide, or ammonium iodide

NOTE: Generally speaking, the bromides are responsible for the half tones while the iodides are responsible for the contrast and resulting densities.

Collodion Ingredients

Collodion comes in two types, "flexible" and "plain USP." Plain collodion USP is readily available from a variety of sources and gathering the other materials needed is not very complicated.

If you buy the prepared and salted collodion you will be given two separate solutions that must be put together to make an almost ready to use collodion.

- **Part A** is a mix consisting of a combination of salts such as cadmium bromide and ammonium iodide (the types of bromides and iodides change in each recipe) in a solution of 95% grain alcohol.

- **Part B** will be a mix of 60% collodion USP and 40% ether. Again, this formula will change depending upon which recipe you are using.

NOTE: Plain ether will boil at around 94˚degrees F. Keep this in mind if you are ever in the mood to warm up that particular ingredient on a cold day while the top is still on the bottle. What will happen is that pressure will build up in the stoppered bottle and you will have the potential of a pressurized reaction when the bottle is opened.

Different formulas will have different proportions and combinations of ingredients and are often referred to as being a "double-salt" or "triple-salt" collodion depending upon how many salts are used in the formula, e.g., "Ol' Workhorse" that you will see shortly in this chapter is a triple-salt formula.

To make a working solution you will need to combine the A & B solutions in an glass bottle and allow it to "age" for a short time. Salted collodion solutions using ammonium iodide are usually ready to use within 24 hours. Solutions with potassium iodide generally take longer to age. *

***ALWAYS USE GLASS TO MIX AND STORE YOUR COLLODION** - *never use plastic when mixing or storing ether and collodion as the ether will destroy the plastic.*

Collodion will begin its useful life with a pleasant amber color and will progressively become darker and redder in tonality as it ages. This color change is the result of free iodine that is gradually released into the solution. As a general rule, a freshly mixed salted collodion working solution will have a shelf life of six months but different formulas will have different life spans. To increase the life of your collodion, it isn't a bad idea to replace the empty space in your storage bottle with glass marbles.

Using Aged Collodion

As it ages, collodion begins to break down and has less resilience and tenacity in adhesion to the glass and aluminum plates. It will also become less effective. This diminished effectiveness does not mean that you should throw out the old collodion. Instead, mix up a fresh solution of salted collodion and combine it with the older collodion, up to 50% - 50%, to give you a very workable hybrid collodion that is perfect in dealing with both mid-tones (the older formula) and highlights and contrast (the newer mix). Better still, the collodion is already salted and ready to go as soon as you mix it up and let it settle.

Older collodion tends to yield a wonderful range of tonalities and subtle highlights but there is a point of diminishing returns when the age of the collodion will begin to give you an assortment of problems. These would include poor adhesion to the plate and less resiliency in the collodion. This is an issue if you use a cotton ball to clean the edges of your plates in the final wash. Another related issue that may rise up and

make you a little upset is seeing your image dissolve before your eyes when you varnish your finished plate using the traditional sandarac varnish.

NOTE: Before we get to the recipes, some important things to remember. **NEVER, EVER, POUR COLLODION DOWN A DRAIN** or you will experience a plumbing disaster of unrivaled proportions. The scope of the problem will be so vast that you won't even be able to tell a good story about how bad it was. When I pour plates in my lab sink, I always do so over a large tray lined with several layers of paper towels or newspaper so that if I get clumsy I'll only spill into the tray and not down the drain. This 30" x 40" tray is also where I put my silver and fixing tanks. If there is ever a spill, everything will stay in the tray and out of the drain and septic system.

***Fig 17 –14 here**, Christopher James, Nelske Elzer, Maine 2010*

Disposing of Old or Contaminated Collodion

Another thing to remember is that if it is truly time to get rid of old, or contaminated, collodion, set out a cookie sheet, or large tray, outside (away from children and pets) and line it with newspaper. Pour your old collodion onto the newspaper and let it evaporate into a skin-like yellow film. This collodion film is very flammable so don't be casual with it around open flame. It might be exciting to set a match to old dried collodion on newspaper as a way of disposing it and it is an exciting way to "take out the trash." However, burning old salted collodion is not really a great idea. Not because of tiny explosions and flames but because the collodion contains heavy metals in the form of cadmium which become airborne when set afire and these fumes can be harmful to your health. The safest method of disposing is to take the newspaper and paper towels to your local recycling center for disposal.

COLLODION RECIPES

There are literally dozens of working collodion recipes and I'll give you a few of them to get you started. The ingredients are pretty consistent and change proportions depending upon how the collodion will be used, time of year, type of contrast required,

metal or glass plates, and a few other personal and professional considerations that are relevant to the artist using the formulas. The basic ingredients are prepared Plain Collodion USP, ether, 190 proof grain alcohol or denatured alcohol, and bromide and / or iodide salts. The iodides are responsible for the contrast and image density. The bromides are necessary for sensitivity to light and for the mid-tones on the plate.

Bostick & Sullivan Prepared Salted Collodion

This recipe is a simple, effective, and fast-clearing formula to use and perfect for a workshop or class environment where you are likely to go through a lot of collodion in a short time and need a simple way to salt your collodion and replenish your stock easily. The collodion comes in two containers. Part A consists of the cadmium bromide and ammonium iodide salts in a solution of alcohol. Part A is approximately 42% of your solution. Part B consists of 60% collodion and 40% ether. Part B equals 58% of your total volume. Part A & B are combined to create a working salted collodion that is clear and ready to use in a few hours.

Combine salted collodion A & B into a single solution in the following manner. Make sure you have adequate ventilation and are wearing a pair of latex or nitrile gloves, eye protection, apron, and a dual respirator if you are overly sensitive to harsh fumes. **Always mix your solutions in glass.** Take a clean glass beaker and have some isopropyl alcohol, or grain alcohol, on hand for clean up. Be sure that your mixing beaker and collodion storage bottle are the appropriate volume for the amount of collodion you are making up.

Bostick & Sullivan Working Mixed Collodion Ratios:

- 15 ml Part A to 35 ml Part B ... or
- 60 ml Part A to 140 ml Part B ... or
- 150 ml Part A to 350 ml Part B

Step #1: Over a large tray lined with newspaper or paper towels, pour Salted Collodion Solution Part-A (cadmium bromide and ammonium iodide salts and

alcohol mix) into a clean, glass, graduated beaker. Then slowly pour it into the clean amber glass bottle that will become your pouring and storage bottle.

Step #2: Take your Salted Collodion Part-B (the collodion and ether mix) and slowly pour it into a glass-graduated beaker that is in measured proportion to the Part-A that you selected.

Step #3: Slowly pour Part-B into the storage bottle containing Part-A until it stops flowing. You will see stringy white ligand-like pieces in the solution and this is totally normal. Cap the bottle and shake vigorously for 10 seconds. Wait until the solution clears, in minutes to hours, and you're ready to coat a plate and sacrifice it to the silver nitrate solution in order to introduce salt to the silver sensitizing bath… stay tuned… that part is coming. If your silver has already been iodized, you are good to go and can begin coating as soon as the new collodion becomes clear and cloudless.

I've been using this formula in workshops for a few years and it is quick, predictable, has a good shelf life of 6 – 7 months. It also has decent mid-range values and contrast, and is user friendly. It is not a collodion with attitude and for the beginning wet plate artist, a good way to fall in love with the process.

*(**Fig 17 –15 here,** S. Gayle Stevens & Judy Sherrod_nocturnes_3 2012 (20x20-wpc)*

Old Reliable Collodion

This is a historical salted collodion that has been around for a long time. As its name implies, it is reliable, has a long shelf life of up to a year, has great adhesion and sensitivity, is easy on newcomers to the process, and is ideally suited to positive images (ferrotypes and ambrotypes). It is also quite suitable for making glass plate contact negatives. However, be warned, without significant plate intensification it is considered a bit too weak for contact printing in UV light with processes such as albumen and

salted paper. Like the Bostick & Sullivan salted collodion it is made in two parts. Here are the ingredients.

Part A:

- 3 g cadmium bromide
- 6 ml distilled water
- 4 g potassium iodide
- 200 ml grain alcohol

Part B:

- 240 ml Plain Collodion USP
- 100 ml ether

Part A: Old Reliable Bromo-Iodized Solution

Step #1: In a small glass measuring beaker, dissolve 3 grams of cadmium bromide in 6 ml of distilled water. Use a glass rod to break it up if possible.

Step #2: Dissolve 4 grams of potassium iodide into the cadmium bromide solution.

Step#3: Add 200 ml of 190 proof grain alcohol

Part B: Old Reliable Collodion Ether solution

Step #1: In a glass beaker, dilute 240 ml of Plain Collodion USP with 100 ml of ether.

NOTE: always add ether to collodion and not the other way around

Step #2: Gently add, and stir, the Part A bromo-iodozed solution into Part B.

Speeding Up the Ripening Stage of Old Reliable

You have a choice here. Because you used potassium iodine in Part A, the "ripening" time for the Old Reliable is generally a few days to a week. However, you can greatly speed the ripening up by adding 2-3 of drops of tincture of iodide. You can also add some of your old Old Reliable to your fresh Old Reliable and cut your ripening time down to a day or so. Notice that there is a significant difference in the ripening time

between the Bostick & Sullivan formula, using ammonium iodide and Old Reliable's potassium iodide.

Pour your 540 ml of prepared salted collodion solution into a suitable glass bottle and let it sit undisturbed for a day or two. Do not treat it roughly or shake it up. If you do, you may end up with bubbles and sediment on your plate after pouring. Also, make a practice to routinely clean off the lip and seal area of your pouring bottle to avoid the collodion chunks that inevitably fall onto your freshly coated plate if you ignore this advice. You'll notice the problem because it usually looks like a large pimple surrounded by a halo of dark.

Fig 17 – 16 here, Alison & Ruby Rose - New Mexico, 7-13-2012 (wet plate collodion)

Ol' Workhorse Collodion Formula

This is my favorite collodion recipe. Ol' Workhorse is a triple-salt, instant-clear, collodion formula that has been around for a while and was given to me by John Coffer who got it from Bob Szabo. The formula is a close cousin to Old Reliable and differs with the addition of a second bromide salt. This is a great field collodion and has a nice sensitivity to salted collodion's available spectrum (a great proportion of which is, by the way, in the UV end of the scale).

Ol' Workhorse has a shelf life of about six to eight months but, like other mixes, the out of date collodion can be utilized to iodize fresh collodion by mixing them together at no more than 50% -50%. Ol' Workhorse is similar to Old Reliable in that it produces fine soft negatives that are often too soft, without intensification, for decent contact printing in UV. This is especially true when you are producing negatives for albumen or salted paper. It does, however, excel with positives on glass and metal. This is a truly great collodion for tintypes and produces a creamy coloration with deep blacks and beautiful mid-tones, especially with potassium cyanide as a fixer. I really appreciate how great this formula is for beginning students in challenging working conditions and on the road. It is a forgiving collodion, ready to use almost as soon as it is mixed (it

clears quickly), and has an extended shelf life. It can be combined with fresh collodion easily when it gets too old to use and gives you the added benefit of nice mid-tones with the contrast from the fresh collodion added to your out-of-date mix.

It is also quite flexible if you need to change it due to the weather, e.g. you can add extra alcohol to the formula in hot weather that will help reduce the possibility of collodion peeling from your glass or metal substrate that is sometimes caused by the collodion drying too quickly. If you add ether, it tends to toughen the film, causing the collodion to shrink and contract when drying, which results in an increase in the possibility of the collodion peeling from the glass or metal substrate. This formula will also work well for collodion negatives on glass when coupled with the negative intensification instructions in this chapter. One last thing… If you do a bit of research on this formula you will find several different recipes all claiming to be Ol' Workhorse. Every practitioner has their personal additions and alterations and if you make wet plates long enough, you will make changes as well. This is the core triple-salt Ol' Workhorse formula and it is a winner.

(***Fig 17 – 17 here***, David Puntel, Mathilda, Berlin, 2011 (ambrotype)

Ol' Workhorse Ingredients: A & B

Part A: Collodion

- 240 ml plain collodion USP (cellulose nitrate in ether-methanol solution)
- 100 ml ethyl ether

Part B: Bromo - Iodizer

- 1.6 g cadmium bromide
- 1.4 g ammonium bromide
- 6 ml distilled water
- 5 g potassium iodide
- 200 ml 190 proof grain alcohol (Everclear)

Part A: Mixing Ol' Workhorse Collodion Ether solution

Step #1: In a glass beaker, dilute 240 ml of Plain Collodion USP with 100 ml of ether. *NOTE: always add ether to collodion and not the other way around*

Step #2: Gently add, and stir, the Part A bromo-iodozed solution into Part B.

Part B: Mixing Ol' Workhorse Bromo - Iodized Solution

Step #1: Dissolve 1.6 grams of cadmium bromide and 1.4 grams of ammonium bromide into 6 ml of distilled water.

Step #2: To this mixture, add 5 grams of potassium iodide.

Step #3: Add 200 ml of 190 proof grain alcohol

All of the seasoning and storing information from Old Reliable is identical to Ol' Workhorse so just refer to the information above. For your information, as of this writing, Bostick & Sullivan are producing a Part A & B Ol' Workhorse for commercial sale and it works very well. Here's the working solution for A & B and the order of mixing.

Ol' Workhorse Working Solution: Parts A & B

Collodion: Part A	Bromo Iodizer: Part B
25 ml	40 ml
50 ml	80 ml
125 ml	200 ml
250 ml	400 ml

If you are intending to produce ambrotypes or glass plate negatives you can increase the adhesion qualities of the salted collodion by adding 3 ml to 5 ml of amino silane to each 100 ml of collodion.

To increase moderate contrast in your salted collodion, add 4 drops of 1% tincture of iodine to each 100 ml of salted collodion. Speed is not greatly affected.

To Mix: Measure the desired amount of Part A collodion USP into a graduated glass beaker or cylinder. Do not use plastic! Pour this measured amount into a clean and

dry pouring bottle. I like to use the 250 ml or 500 ml Kimax blue top wide mouth bottles. Mark the bottle with the date of mixing. Then, using the same graduate or beaker, measure out the corresponding amount of Part B Bromo Iodizer. Next, pour the Part B into the dated pouring bottle holding the Part A collodion. Cap the bottle and shake vigorously. Let the solution relax and it will be ready to use almost immediately.

Clean up the graduated cylinder with very hot water that will loosen the milky skin of the collodion from the glass and flush and wipe with paper towels. Do not pour your rinse water or collodion skin down the drain. Collect it with a paper towel and bag it with a plastic freezer bag and put it in the regular trash. I like to finish off the clean up with Everclear alcohol.

Freshly mixed collodion will change color and speed as it ages. It will start off as a straw color and as it ages, the contrast will increase and the color will change to a burgundy red.

Quinn Jacobson's Quick-Clear Collodion Formula

This is a formula that is a modification of one published in an 1856 book, by M.H. Ellis, entitled, "The Ambrotype and Photographic Instructor." The formula provided here makes a bit more than half a liter and because of its ability to clear quickly, is almost ready to use as soon as it is made.

Part A: Collodion & Ether

- 240 ml of Plain Collodion USP
- 160 ml Ether

Part B: Cadmium Bromide

- 3 g cadmium bromide
- 5 ml warm distilled water

Part C: Mix Part B into Part A

Part D: Iodide, Alcohol, and Water

- 4 g Ammonium Iodide
- 5 ml Distilled Water
- 160 ml Grain Alcohol

To Mix: Slowly add Part D into Part C and shake the solutions together during the mixing sequence.

(**Fig 17-18,** Quinn Jacobson_Tim_MadisonAve_2004)

Scully & Osterman Collodion for Positives:

This formula, from France Scully Osterman and Mark Osterman, is very close to Old Reliable except that it has a little less alcohol in the bromo-iodide and more ether in the collodion-ether mix. Which leads to this revelation of the effects of solvents in collodion.

Scully and Osterman use an ether-rich collodion formula for making ambrotypes where density is not only unimportant but detrimental. This helps establish a more delicate range of tones. A higher ratio of alcohol, though never more than 50% - 50%, provides stronger deposits of silver when making negatives where density is desirable. Be warned however that alcohol also introduces water into the collodion, a primary cause of ripple-like "crepe" lines.

Part A:

- 236 ml plain collodion USP
- 155 ml ether
- 3 g cadmium bromide
- 4 ml warm distilled water

Part B:

- 155 ml of 190 proof alcohol
- 4 g ammonium iodide

Step #1 - Add 236 ml plain collodion USP to a 550 ml amber glass bottle and then slowly add the 155 ml of ether. Cap the bottle, shake the solution, and place the bottle aside for a short time.

Step #2 - Take a small glass beaker and pour 4 ml of warm distilled water into it. Then add 3 g of cadmium bromide to the beaker and proceed to break it down by crushing it with a glass rod. If you have trouble getting the bromide to dissolve, hold the beaker over a flame and move it around until the cadmium bromide dissolves completely. Once it is dissolved, slowly add it to the bottle containing the collodion and ether mix and shake the bottle. Call this bottle **Part A**.

Step #3 - Place the ammonium iodide in a glass beaker containing 155 ml of 190-proof alcohol and stir this with a glass rod until it dissolves. Call this **Part B**.

Step #4 - To make the working solution, slowly combine Part B to Part A, shake the solution to mix it up. *Note: This will be the last time you will shake the bottle.*

Step #5 - This formula has a relatively short shelf life of several weeks though it will keep longer if refrigerated. If you wish to make a collodion that does last longer, substitute the potassium iodide for the ammonium iodide. This solution might be cloudy at first but it will clear given enough time.

Note: *Some water is beneficial in collodion, however too much promotes the formation of crepe lines (like the parallel lines one sees on the beach after the tide goes out) in the surface of the plate. If lines are a problem, the ammonium iodide and cadmium bromide may be dissolved in alcohol instead of water but do not use an alcohol lamp when mixing.*

Ether-Less Collodion: Substituting Grain Alcohol for Ether

Every so often, due to storage, safety, or availability concerns, it may be prudent to substitute grain or denatured alcohol for the ether in your collodion formula. This is increasingly true if you are traveling to a country with sensitive political concerns where bringing ether, grain alcohol, and collodion into that country may cause some difficulties for you in customs. The issue at hand is the increase in water content in the collodion formula due to the presence of 5% water in the grain alcohol.

In some cases, you may find yourself in a position of simply having to substitute grain alcohol for ether, a situation that my friend and former student, Travis Hocutt, encountered when teaching wet plate collodion in Argentina, where ether was simply unavailable to him. If you are in this quandary, you will find that the alcohol and collodion mix will flow normally at first, but will take on a thicker, honey-like, consistency as the solution is used up. For this reason, Travis increased his proportion of alcohol to keep the solution fluid and useable.

The act of evaporation (which ether is very good at instigating) becomes especially important following the collodion pour, and the set up of the collodion, preceding immersion into the silver-sensitizing bath. The extra water in the collodion may result in a reduction of the adhesion quality of the collodion to the plate and the need to extend the wait time between the pour of collodion and the immersion into the silver-sensitizing bath. Though it's always prudent to ensure that the collodion is properly "set" before immersing it in the silver bath to avoid the film from lifting from the glass, generally, formulas strong in alcohol adhere better to glass than those strong in ether. This is due to the amount of shrinkage the film experiences when high percentages of ether are used. Here is an "ether-less" collodion formula which is an alcohol bromo-iodizing collodion called Lea's Landscape #7 Alternate Formula. It features two bromide salts and two iodide salts in an ether-less, alcohol, and collodion solution.

Lea's Landscape #7 – Non-Ether Collodion Formula

In a 125 ml glass bottle or larger beaker, combine the following ingredients:

- 100 ml Everclear grain alcohol

- 1.5 g cadmium bromide
- 1.3 g ammonium bromide
- 3.4 g cadmium iodide
- 2.6 g ammonium iodide

Dissolve the cadmium bromide in the alcohol (this will take a little while as the cadmium bromide doesn't dissolve easily in alcohol). Then, dissolve the ammonium bromide into that solution followed by the two-iodide salts in the recipe.

To Make a Working Strength Solution:

In a clean, glass, liter sized, bottle add:

- 100 ml of the 4-salt formula above
- 200 ml of grain alcohol
- 300 ml of plain collodion USP.

Let it sit and ripen for 2-3 days. When it is clear and straw colored it is ready.

Timmermans Ether-less Collodion

My friend, Alex Timmermans, became allergic to ether and constructed a collodion formula that keeps him healthy and produces successful plates. It is a double salt formula, effective for a few months before turning a deep red, and it yields plates with a nice long tonal range.

To construct the formula, make up the bromo-iodizer by dissolving 2 grams of cadmium bromide and 3.5 grams of ammonium iodide in 4 ml distilled water. Keep the water content to 4 ml and warm it if necessary to dissolve the salts. Add this to 200 ml of grain alcohol. In Alex's working formula, combine 4 parts of the bromo-iodizer to 3 parts collodion USP.

This very simple formula clears quickly and can be used right away. To keep it useable longer, store it in a cold location and add a few drops of acetone.

Cleaning Plates with Old Timmermans Collodion

When it loses its effectiveness, Alex suggests that it can be used to clean your glass plates. He pours the old collodion on the plate, lets it dry, and then immerses the plate in hot water. The collodion comes off the glass easily and leaves you with a very clean plate that can be used again.

***(Fig 17-19,** John Coffer – Haystack_Scan10138-wpc)*

Coffer's Poe Boy Collodion – No Ether - No Grain Alcohol Formula

This is a formula from John Coffer and one that you can use when you do not have 190 proof grain alcohol or ether available to you.

Part A:

• 240 ml Plain Collodion USP

• 300 ml denatured alcohol (*hardware store type*)

Part B:

• 6 ml warm distilled water

• 3 g potassium bromide

• 5 g potassium iodide

Part C:

• Tincture of iodine (*a few drops*)

Add 300 ml of denatured alcohol to the 240 ml of Plain USP Collodion and stir it until it is clear. Mix up the 5 g of potassium iodide in the 6 ml of warm distilled water in a glass beaker and stir with a glass rod. Next, in the same glass beaker, add the 3 grams of potassium bromide and stir into solution. If it doesn't go into solution easily, try warming the mix over a very low heat, stirring as you go. Try this before adding more distilled water as you want to keep the water content to a minimum since you aren't

getting the benefits of the rapid evaporation caused by the ether in a traditional formula. Also, denatured alcohol has water in it and too much water in a collodion formula causes what I refer to as "crinkles" in the collodion. In my experience, and observation, a little water is necessary because the collodion needs water to allow the silver and iodine to mate.

Add Part B to the collodion and denatured alcohol solution and stir until it is uniform. Now, add 2-3 drops of tincture of iodine to help speed up the ripening process. Then let it ripen for a few days before using it. The shelf life is about six months.

*(**Fig 17-20,** Aspen Hochhalter_Untitled#24_2011 – wpc)*

THE SILVER NITRATE SENSITIZING BATH

The Silver Nitrate Bath

A silver nitrate sensitizing bath, following the collodion pour on your glass or metal plate, is necessary in order to sensitize the collodion… so that it will record reflected light in the camera, resulting in a latent image ready for development. I know this seems entirely obvious to most of you, but for those completely trained in the mushy democracy of digital photography, it's important to know how film worked. You are essentially making film except your substrate is a rigid glass or metal plate coated with collodion rather than a substrate of flexible plastic film. Here's how you prepare your silver nitrate sensitizing bath.

NOTE: Remember, silver will stain and discolor your skin very easily, due to the silver nitrate reacting to the proteins in your skin. Always wear nitrile or latex gloves to protect your hands, an apron to protect your clothes, and eyewear to protect your eyes in case you splash or inadvertently touch your face or eyes while working. It's difficult not to get a stain on yourself, somewhere, if you are working with silver nitrate so please rest assured that you will survive the henna-like stain and that it will go away on its own

after a few days. While you have it, think of it as evidence that you are very cool for making hand-made photographs.

The recommended working strength of a silver-sensitizing bath is between 7% and 10% depending upon whom you're speaking with. I personally prefer a 7% solution and will give you the instructions for that dilution. Most of my wet plate friends prefer the more traditional 9%. As you can see below, however, changing the concentration of the solution is really easy to do. If you want a softer silver bath, say a 7%, just mix 70 grams of silver nitrate with 1000 ml of distilled water. If you want a 9% strength, mix 90 grams of silver nitrate with 1000 ml of distilled water.

A Standard 7% Solution

- 70 grams of silver nitrate
- 1000 ml distilled water

To make this 7% silver solution, thoroughly dissolve 70 g of silver nitrate crystal into 1000 ml of distilled water. Pour this solution into your vertical silver nitrate tank. Again, I strongly recommend that you sensitize your collodion-coated plates in a tank, rather than a tray, as it is safer, cleaner, and more process-efficient. This silver-sensitizing tank is lightproof and made of polycarbonate resin. It, and the clear window-fixing tank, are sturdy, made for travel and come with secure clasps and a moisture proof O-ring foam seal. If you work on the road, you can get the tank caddy as well that will hold both the silver and the fixer securely.

Iodizing the Silver Nitrate Bath

Once you have your silver nitrate sensitizing bath ready to go, you still need to iodize it before immersing your first collodion plate for in-camera exposure. This is necessary because newly formed iodides are soluble in concentrated silver nitrate. If the silver bath is not saturated with iodides first, the first plate or two will have a grainy appearance due to the excess silver nitrate on the plate, effectively cannibalizing the iodides (that are responsible for image formation) as the plate begins to dry while in the

camera. Iodizing the silver is really a simple task. Simply coat a plate with your prepared salted collodion and put it in the silver tank for a few hours. That's all.

If you're in a really big hurry, you can squeeze a few drops of tincture of iodine into the silver and that will do pretty much the same thing… iodize the silver nitrate. One final technique for quickly iodizing your silver is to add 15 drops of your prepared salted collodion to the silver bath. A yellow precipitate will form but will disappear as you work the solution. Personally, I like the romance of leaving a collodion plate in overnight but this does the job very nicely. One quick reminder, if you use a plastic pipette to put your collodion drops in the silver, that pipette is pretty much toasted. If you plan to make this a regular thing, I would invest in a glass pipette for this sole purpose.

Fig 17-21 here, Sally Mann_FACE_GRID1_2012 – (wpc)

CARE & MAINTENANCE OF A SILVER SENSITIZING BATH

Testing the Silver Sensitizing Bath for pH

Taking care of your silver bath is a sound idea because it will last a very long time with the right amount of attention. A fresh silver nitrate bath will have a pH in the ideal range of pH4 – pH5. The pH scale measures how acidic or basic a substance is. The pH scale ranges from 0 to 14. A pH of 7 is neutral. A pH less than 7 is acidic. A pH greater than 7 is basic, or alkaline. Battery acid is pH 1, vinegar has a pH of around 3, acid rain has a pH of 4 to 5, your pee, saliva, and blood is in the 6 to 7 range if you're healthy, hard water from the tap is around 8, baking soda has a pH of 9, ammonia is around 11, and Clorox bleach is pH around 11.5.

Like everything else, your silver sensitizing solution has a pH as well and when it's in the slightly acidic pH 4.5 range, many of the problems encountered chemically in wet plate collodion are eliminated. Over time, the silver bath may begin to lose some of its necessary acidity and this will be evident to you because your images will show

evidence of “fog” or “veiling” after you’ve corrected everything else that you can think of, e.g. correct exposure, development time, development technique, safelight environment, etc.

At this point, test the pH of your silver nitrate bath and if it needs acidifying, because the pH has risen above your ideal pH range of 4 to 5, then add a drop of glacial acetic acid for each 250 ml of silver solution. You can also use nitric acid. With either acid, you should be back within the normal pH range of 4-5. Be aware that your film speed will slow down as the solution becomes more acidic. Another quick bit of information: If you’re making glass plate collodion negatives, it is better to have a slightly higher pH than when making a wet collodion positive.

To test the pH level of acidity, you may use a piece of litmus paper, or a digital pH tester wand. If you are testing your pH with a state of the art digital pH-testing device (I use a Jenco Model 619), you will need to calibrate it with a buffer solution. Call up a chemist for assistance and go to a chemical supply, like Fischer Scientific, to get a pre-made buffer as pure buffers are too fussy to make at home. Once you have your buffer, everything else is quite simple, just follow the directions that come with the pH tester.

The Red Cabbage pH Tester Solution

This is a very cool Red Cabbage pH Indicator test for those wishing to go low-tech. It was created by Anne Marie Helmenstine, Ph.D. (I had an urge to type pH.D. here). These are the basics of it.

Red cabbage juice has a natural pH indicator in its juice that will change color based on the pH of the solution tested with it. The juice contains a water-soluble pigment molecule called “flavin” (an anthocyanin) which is found in an assortment of fruits and vegetables. Acid solutions will turn anthocyanins red. Neutral pH solutions will turn purple and base / alkaline solutions will turn green and yellow. This makes it possible to determine the approximate pH of any solution based on its color from the red cabbage juice test strips. How does this work you may ask… simple according to Dr.

Helmenstine. “The color of the juice changes in response to changes in its hydrogen ion concentration. pH is the -log[H+]. Acids will donate hydrogen ions in an aqueous solution and have a low pH (pH < 7). Bases accept hydrogen ions and have a high pH (pH > 7).” Is that clear?

To make the pH test solution, chop up 2 cups of red cabbage into small pieces and put them in a glass container. Boil up some distilled water and then cover the cabbage with it and let it steep for about 10-15 minutes. Filter out the veggie bits and keep the liquid. This will have a red to purple cast to it and will be about pH 7, or neutral pH. To test a liquid, pour about 100 ml of the red cabbage juice into a glass beaker and then add the liquid you are testing until it changes color… if it is an acid or a base.

You can also make red cabbage pH test strips. Take filter paper (or coffee filter) and soak it in a **concentrated** red cabbage juice solution. After a few hours in the concentrated juice, remove the paper strips and allow them to dry by hanging them on a line. Cut the filter into strips and use them to test the pH of various solutions like your silver nitrate bath that should have a purple cast with a slight lean to violet.

Red Cabbage pH Indicator Colors:

- Red = pH of 2
- Purple = pH of 4
- Violet = pH of 6
- Blue = pH of 8
- Blue-Green = pH of 10
- Greenish–Yellow = pH of 12

Testing the Silver Sensitizing Bath for Specific Gravity

Another indicator of your silver bath’s general health is to periodically test its specific gravity using a hydrometer… the same piece of kitchen equipment that you use when making home brewed beer. Simply put, get a hydrometer and a graduated cylinder. It’s important not to get a hydrometer that is too large for the graduated cylinder because it has to be able to float for you to get a reading. If you buy a starter wet

collodion kit, such as the one that Bostick & Sullivan sells, it will come with a hydrometer and graduated cylinder.

To test the specific gravity (essentially meaning the amount of healthy silver in your solution) pour 50 ml of your fresh and unused iodized silver solution into a graduated cylinder and then slowly lower the hydrometer into the solution. Read the scale on the side of the hydrometer and record the number. That is your bath's unused specific gravity. I put this number on my tank and silver storage bottle, along with the pH, and date it. A fresh silver bath of 7% - 8% will have a specific gravity of 1.08 and can produce fine results even at 1.04.

After I've worked the silver for a while, and find that it is giving me contrasty images and taking longer than normal to expose, I will filter the silver solution and once again test the specific gravity. If the number has dropped below 1.04 then I will add silver to the solution. There are a few ways to do this. One is to have a back up silver nitrate solution in the 30% dilution range and add a little of that to the used silver until the specific gravity is back to looking good again. Another technique, one that John Coffer uses, is to have a solution of 12% silver nitrate (120 grams of silver to a liter of distilled water) on hand and to pour off half of the old silver solution and replace it with the fresh 12%. That usually takes care of the problem.

Filter Your Silver Nitrate Sensitizer Solution Often

Not much to add to that headline. Over time, your silver solution will get crapped up with little dry collodion bits from all of the plates you've been running through it, dust, debris, and general dirt around the lab or in the field.

Put on a pair of latex gloves and an apron. Take a coffee filter, fold it in half, fold it in half again, take one edge and pull it into a cone shape and put it in a plastic or glass funnel used for nothing else but filtering your silver. I like to take a cotton ball and place it in the bottom of the cone and then gently pour my silver through it into a clean "silver-only" glass container. You'll be surprised how much crap is in the solution. Then, pour it back into your rinsed out tank and let it sit in the tank for a few hours so that any

little silver bits can settle. If you don't, you may get little white things on your plates that we call "comets." You'll see why if you get some as they look like small shooting stars and comets off in deep space.

Sunning Your Silver Nitrate Sensitizing Solution

This is a very easy task to perform when your silver nitrate bath is getting tired, but necessary to the overall health of your silver bath. Sunning your silver solution is a way to give it a good visual inspection and cleaning.

1. First, get a large glass jar, or easily handled glass container, with a total volume that will allow you to pour all of your silver solution into it. Go outside (yes, the sun is OK for the silver sunning treatment) and pour the silver solution into the glass dish, or glass jar, in direct sunlight. You can get a nice 2-gallon glass jar, used for putting up homegrown sauces and vegetables, at your local farm supply.

2. Put a plastic screen over the dish, or jar, to prevent pets, and living things, from checking it out, and make sure that there are **no children anywhere** around… or that none will be as long as the silver is out in the sun. The silver solution will begin to turn a muddy grey… don't worry about it.

3. Wait a few hours and notice that the contaminants have settled on the bottom of your container. Take a tray, cover the bottom with newspapers in case you spill anything and then filter the sunned solution, through a filter and cotton ball funnel set up, into your washed out silver bath container.

4. Get out your hydrometer and graduated cylinder and check your specific gravity. Compare it to the original specific gravity reading you made with the fresh silver solution and add new silver as needed. If you're feeling really compulsive, you can check the pH level as well and add acid as needed… chances are, after fixing the specific gravity, you'll be good to go.

5. One quick hint for those of you who live and work where winter means blizzards and freezing temperatures. Sunning your silver with a simple drugstore grade tanning light works well and you can stay indoors.

You are almost ready to silver sensitize your collodion plates and make images. But before you do this, you need to make your developer, a simple fixing solution, and set up your working space. Before that step… here's a bit more information about the silver for those of you who work in the hot and arid sections of the world.

***(Fig 17-22**, Christopher James, Amanda King, New Mexico, 2011)*

HOT & DRY WEATHER CONSIDERATIONS FOR SILVER

Recently, while teaching a wet plate collodion road show workshop at The Santa Fe Photographic Workshops, my class and I experienced a morning of frustration. If you are working in hot weather, I have found that a 7% solution works a lot better than a traditional 9%. Working out of an ice fishing tent set-up in New Mexico, where the temperature was in the upper 90s outside and about 130° F in the tent, and very, very dry, the higher concentration of silver had a tendency to create a fogged impression similar to a plate that has been slightly, but fatally, over-developed.

Part of the problem had to do with the temperature of the silver bath that had risen considerably in the ice-fishing tent we were using for sensitizing and development. After reducing the silver bath concentration from 9% to 7%, we placed the sensitizing tanks in an ice chest of cold water. Be sure not to put too much water in the ice-chest as it would make the silver tank buoyant and cause it to tip over.

After cooling off the 7% solution, the fogging effect completely disappeared and all subsequent plates, for the rest of the day, and subsequent days, were perfect with no veiling or fogging present. Be aware, however, that too cool a silver solution also has its issues. Simply put, find a nice ambient balance between hot and cold and keep it there.

One other way to deal with this problem is to bring along a thermos of cold distilled water. Before development, mix your developer 1:1, or 1:3 if it's developing too quickly, with cold water from the thermos. Or, make your dilution at home and put it in a cooler, surrounded by ice, and simply pour a shot glass of the cold developer and process.

The 1:3 developer option, kept in labeled plastic water bottles, on ice, will extend your developing times up to 90 seconds. This will give you more time to evaluate the details in the bright areas of your plate that will become your detailed shadows after development. Consider adding a few drops of your silver nitrate to the shot of developer for a little highlight boost.

Double Silver Bath For Long Exposures in Hot and Dry Weather

Another thing we learned on the same very hot day… recently, at The Santa Fe Photographic Workshops, one of the Wet Plate Collodion Workshop participants was experimenting with pinhole and zone plate wet collodion exposures. Some of her exposure times were over 5 minutes long and there was a distinct possibility that her collodion was going to dry out too much during the exposure, thus reducing the chances of a successful plate.

Following her long exposure, in near zero humidity and very hot air, she returned to the safety tent and noticed that half of her plate had dried out. The solution to the problem was to re-immerse the exposed plate into the silver bath for 20-30 seconds, letting the solution re-wet the collodion. Doing this, allowed for a much smoother development as it created a situation where the developer could easily flow onto the wet plate ensuring a smooth and even development pour.

Wet Paper Towel in the Bellows Trick For Dry Conditions

Another way to deal with arid and hot conditions and long exposures is to utilize the wet paper towel trick. This was suggested by Niles Lund who was visiting the

workshops during this particularly brutal heat wave. He suggested placing a damp paper towel, on a sheet of plastic, inside of the bellows. In the hot weather, the bellows heated up, creating a humid environment due to the wet towel, providing some additional moisture to the sensitized plate in camera. It actually worked really well and could be used in the winter months when humidity is low.

(**Fig 17-23,** David Emitt Adams_Chikara_2011 – wpc)

FERROUS SULFATE DEVELOPER FORMULAS

A Simple Ferrous (Iron) Sulfate Developer: For Positives and Negatives

There are essentially two traditional directions to go chemically with your developer; the iron sulphate direction that almost all modern wet plate collodion artists use, or the pyrogallic acid developer which is, to me, less pleasant, not as adaptable to your positive and negative needs, and requiring of longer exposure times. I'm going to go with the simple ferrous sulfate formula and then give you a few optional ferrous sulfate developers that are popular with a number of my wet collodion friends.

- Ferrous Sulfate Developer for Positives
- Ferrous Sulfate Developer for Negatives
- Weather Sensitive Ferrous Sulfate & Sugar Developer
- SOS Iron Negative Developer
- Bostick & Sullivan Ferrous Sulfate Developer for Positives and Negatives
- Vinegar – Sugar Developer

Ferrous Sulfate Developer for Positives on Metal (Tintypes) and Glass (ambrotypes)

This standard ferrous sulfate developer is proportionately similar to the Bostick & Sullivan developer on the following page that requires dilutions. There is little that is complicated about it and there is a lot of room for being flexible with the proportions and fine-tuning a working formula of your own.

In this first recipe, you will be able to make the developer in two different ways… #1 - with more ferrous sulfate and less acid for positives (tintypes and ambrotypes) and in #2 - with less ferrous sulfate and more acid for negatives.

- 16 grams of ferrous sulfate
- 400 ml distilled water
- 24 ml glacial acetic acid
- 24 ml 190 proof grain alcohol

In a clean, 500 ml glass beaker or measuring cup, mix the ingredients in order… ferrous sulfate into the distilled water and then add the acetic acid and the grain alcohol.

Increasing Image Brightness on the Plate By Adding Potassium Nitrate or Silver Nitrate to the Developer

If you find that your highlights are a little flat and need some brightening, and you are not using potassium cyanide as your fixer, which would brighten them considerably, you may goose your developer a bit by adding small amounts of either potassium nitrate (saltpeter) or silver nitrate (from the iodized sensitizing bath) to the working developer. Using a pipette, add a few drops and notice the difference.

Ferrous Sulfate Developer for Negatives on Glass

- 12 grams of ferrous sulfate
- 400 ml of distilled water
- 32 ml glacial acetic acid
- 32 ml 190 proof grain alcohol *

In a clean, 500 ml glass beaker or measuring cup, mix the ingredients in order… ferrous sulfate into the distilled water and then add acetic acid and the grain alcohol.

**Note: The reason for the increase in the amount of grain alcohol in the formula for negatives is to help the solution flow more easily. You may wish to avoid the possibility of dissolving the collodion by staying with the 24 ml in the positive formula recipe. If you have trouble with a smooth pour, add a little more alcohol to the more acidic negative-on-glass recipe.*

Fig 17-24, Joni Sternbach_11.08.05 #3 Ahearn Twins

Hot and Cold Weather Ferrous Sulfate Developer: Sugar Recipe

Here's another ferrous sulfate developer from Will Dunniway. It's one that is referred to as a sugar developer and is unique in that grain alcohol is not needed when the silver bath is new. It can also be modified depending upon the temperature of the environment you are working in. Sugar is added to this formula, as an organic restrainer, in situations where hot weather conditions may be the cause of ineffective development or chemical fogging. Other actions that may help, given the same problems, include diluting the stock developer with a bit more water, reducing the amount of ferrous sulfate in the formula, or slightly increasing the amount of acetic acid.

- 16 grams of ferrous sulfate
- 18 ml of glacial acetic acid
- 15 – 20 grams of sugar in warm weather / 5 grams in cold weather
- 20 ml grain alcohol (not necessary if the silver bath is new)
- 1000 ml distilled water (There is a similar formula that calls for 1/3 the amount of distilled water in this formula indicating this is a flexible number depending upon the weather and behavior of the developer)

To mix, dissolve the ferrous sulfate in the distilled water and then add the remaining ingredients. Filter the solution through coffee filters (Chemex brand is best according to Will). Shelf life of this developer is quite short, about 4 months, and you'll know when it's aging because the color will become deep red amber… like a hearty ale. Be sure to label this well so no one makes a mistake and takes a sip.

Bostick & Sullivan Stock Developer for Positives and Negatives

Here's a nice, and very reliable, ferrous sulfate developer that I've used for several years now and it's a very comfortable recipe for those new to the process. Here's the easy to use developer from a stock solution for both positives (tintypes) and glass plate negatives. This developer is dilution specific. If you don't wish to make your own developer, you can buy it pre-made as a stock solution, and ready to use, from Bostick & Sullivan.

- 64 g ferrous sulfate
- 8 g potassium nitrate
- 100 ml glacial acetic acid
- 100 ml Everclear grain alcohol

To Use:

- **For Positives**: dilute 1:1 (1 part stock formula to 1 part distilled water)
- **For Negatives**: dilute 1:3 (1 part stock to 3 parts distilled water)

The fresh developer works perfectly well as soon as it is mixed in a proper dilution for your positive or negative collodion development. I recommend 40 to 60 ml for development of a hand-held full plate. In hot conditions it is a good idea to slow down the speed of development and if you dilute your stock 1:2 or 1:3 instead of 1:1 it will help you get a more even and resolved image on the plate while extending your development time. If you chill your developer to 45° F, you can extend development to 60 to 90 seconds… a more relaxing way to process your plate.

(**Fig 17 - 25**, Kristin Hatgi & Mark Sink_Shelby #234)

Hot Weather Developer: Sugar-Free Recipe

Here's another very effective hot weather developer, formulated by Dana Sullivan

and one of my MFA grad students, Dave Hyams, that I used in the epic heat wave of 2012. This is especially effective when working on the road in ice fishing tents or dark-boxes and it appears to solve the hot weather problem of fog. It is a sugar free recipe that relies upon the addition of potassium nitrate and an increase of the acetic acid concentration from 2.5% to 5%. Vinegar is a 5% acetic acid. This is a working solution that you can dilute to 1:3 and process at a temperature of 40° F to 45° F for 90 seconds.

- Add 50 ml of acetic acid to 900 ml of distilled water

(*always add acid to water*).

Then dissolve:

- 16 g Ferrous Sulfate
- 2 g Potassium Nitrate
- 50 ml Alcohol

Hot Weather Developer: Using Bostick & Sullivan Stock Developer

If you are working with a stock Bostick & Sullivan ferrous sulfate developer, and want to adapt it to a hot weather formula, try this recipe to make a standard working solution:

- 250 ml B&S Stock Developer
- 375 ml Vinegar
- 375 ml Distilled Water

SOS Iron Negative Developer in Hot Weather

This formula is particularly useful for use in hot weather when fogging can be a problem. I've found that it's a tricky developer to get right and I would first recommend cooling off your regular developer before embarking on the long learning curve with this one.

- 355 ml of distilled water
- 9 g ferrous sulfate
- 18 g of white sugar

• 10 ml of acetic acid

A properly exposed ambrotype will become visible within 5 seconds. You will see the exposed areas turn darker as they are reduced to metallic silver. Continue for 10 additional seconds. If the entire image is formed before 15 seconds, the plate was over-exposed. If you push the development longer than 20 seconds the exposure was probably too short. *Development must be stopped before the details in the shadows are evident or the image will be fogged.* Extended development will result in grey images.

*(**Fig 17 - 26,** Robert Szabo, Tattoo - wpc)*

Sweet & Sour Developer (Vinegar – Sugar Developer)

Here's another version of a developer that can be customized for hot weather working conditions. It is unique in that it substitutes vinegar for acetic acid. Jody Ake worked out this developer formula when he couldn't come to a reasonable solution for safely shipping glacial acetic acid. Instead, he substituted supermarket grade vinegar and sugar. When combined with ferrous sulfate and Everclear grain alcohol he ended up with a flexible formula that he could travel with. This developer yields a warmish – neutral image tonality. The formula is altered depending upon the shooting situation. If the ambient temperature is hot, add a bit more sugar to the formula. If additional contrast is needed, reduce the amount of sugar in the formula.

• 2 TBS ferrous sulfate
• 2 TBS sugar
• 2 capfuls of Everclear 190 proof grain alcohol
• 1 liter of white vinegar

***(Fig 17 - 27,** Michael Mazzeo _9_Andre- (ambrotype)*

GLASS PLATE NEGATIVES AND INTENSIFICATION

While a sizeable portion of this dialogue is dedicated to making wet collodion tintypes and ambrotypes, there will be times when you will want to produce a wet plate collodion negative in-camera that is suitable for contact printing with UV sensitive processes such as albumen and salted paper. This means that you will need to shoot the negative on glass and then intensify it to a degree where the densities are sufficient to stand up to a contact printing procedure in the sun or UV exposure unit.

Subbing Your Glass Plate

The first step you will need to attend to is to cut and clean a sheet of glass that will fit perfectly into your plate holder or modified camera. Please refer to the glass cleaning instructions in this chapter. Once the glass is squeaky clean it is time to move to the albumen subbing stage of the process.

In order to create a nice adhesive-like environment for your collodion, you will want to coat your entire glass plate with an albumen subbing. Unlike an ambrotype subbing, where you may only be subbing the very edges and sides of your glass plate, the glass plate negative works best with a full albumen sub-coating. Make up a subbing solution with the formula below and then flow your plate in exactly the same manner that you do when pouring collodion. Allow the subbing to dry thoroughly and then proceed to pour your collodion onto the surface of the dried albumen subbing and subsequent sensitization in the silver nitrate.

- White of a single large egg
- 2 drops of ammonia (not totally necessary)
- 100 ml of distilled water

Iodizing the Plate for a Contact Negative

Coat your subbed albumen plate with your prepared collodion and sensitize it in your silver nitrate bath… but for 3 to 5 minutes instead of the 3 minutes that is normally recommend for tintypes and ambrotypes.

Triple Your Exposure

In order to ensure that you are giving yourself the best chance of an adequately dense glass plate negative you will want to give your image about three times the exposure that you would for an ambrotype or tintype. Following exposure, you can use the same developer that you have been using for tintypes and ambrotypes with a similar dilution. In some cases, as with the Bostick & Sullivan prepared ferrous sulfate developer, your dilution will change from 1:1 to 1:3. Then… it's time to intensify the negative.

A Simple Intensification With the Sun

A very simple intensification, that involves very little effort on your part, is to develop the plate following exposure, rinse it properly until the rinse water flows in a sheet off of the plate (same as in the first wash with tintypes and ambrotypes), and re-expose the plate to the sun.

This action causes the silver in the highlight areas of the plate to exhibit a slight increase in density. Mind you, this is only a very modest intensification and it better to graduate from this simple solution for a thin negative to a chemically enhanced intensification of that negative.

A Chemical Intensification When the Plate is Wet

The most straightforward method of negative intensification, and one that is practiced widely because of its chemical simplicity, is a two stage bleaching and enhancement process that *takes place* ***while the plate is still wet*** but fixed and adequately washed. Remember, washing times will change quite a lot between fixing with sodium thiosulfate or potassium cyanide. Be sure to read the information to follow.

Step #1: Bleaching Stage

Stock Solution A: (to make 100 ml of 18% copper sulfate solution)

- Mix 18 grams of copper sulfate with 100 ml of distilled water.

Stock Solution B: (to make 100 ml of 9% potassium bromide solution)

- Mix 9 grams of potassium bromide with 100 ml of distilled water

Fig 17 – 28 here, *France Scully Osterman, Embrace, Collodion Negative*

Intensification and Workflow:

To make a working solution of bleach, take 7 ml of Stock Solution A and add it to 7 ml of Stock Solution B. Add your 14 ml of A & B to 300 ml of distilled water. Put this solution in a tray and immerse your fixed and washed plate in it for 20 seconds. If you choose, you can forget the tray and simply pour and flow the solution on the plate as you would a developer. Watch the bleaching action and determine if pulling the plate from the bleach earlier than 20 seconds is warranted. Colder chemistry, or a wish for greater intensification, may require a longer bleaching time.

After bleaching, rinse the plate for a minute or two in softly flowing water. Then rinse with distilled water and smoothly immerse the plate in the silver intensification bath that is made in the following manner. Again, you may elect to flow the solution instead of using a tray.

Step #2: Silver Intensification Stage

- Mix together 12 grams of silver nitrate, 200 ml of distilled water, and 6 drops of nitric acid.

Pour your silver solution into a Pyrex glass dish or plastic tray. Slowly and gently, wearing gloves, immerse your plate in the intensification solution. The intensification will take place almost instantly. Then, remove the plate and wash it thoroughly before setting it aside to dry.

IODINE / PYRO REDEVELOPMENT FOR GLASS PLATE NEGATVES

If you wish to increase the negative density on your plate in stages, providing you with a bit more control, you may decide to try a redevelopment technique that incorporates tincture of iodine and pyrogallic acid (a favorite of the "pyro-maniacs" who live and die for the perfect tonal scale and negative).

This is a 2-stage process that requires a reduction of the visible image with the iodine and then a re-intensification with pyrogallic acid and silver nitrate. The process takes place in ambient light.

Part A - Tincture of Iodine Solution

- 400 ml of tap water
- A few drops of tincture of iodine

Take 400 ml, more or less, water from the tap and add a few drops of tincture of iodine (the type used on cuts and available from a pharmacy) to the water until it takes on the color of a nice anejo tequila, or freshly made collodion. You can use it immediately or store it for use later on.

Part B - Pyro Redeveloper With Silver Nitrate

Mix together:

- 355 ml of tap water
- 6 g of citric acid
- 1 g pyrogallic acid

Store this solution in a 500 ml bottle.

Part C – Silver Nitrate

- Iodized silver nitrate from your silver bath to be used in droplet amounts stored in its own bottle or taken directly from the silver bath with a pipette / eye dropper.

Step #1 – Reduction

You can perform the next steps in normal ambient room light. After the plate has been processed completely, and you have put on a pair of nitrile or latex gloves, hold

your exposed and processed glass plate in your hand as if you were going to develop the plate, e.g., flat and face up like a tray. Gently pour the tincture of iodine solution over the plate and agitate until the image turns pale.

Wash the plate in tap water until the water tension stops beading. This is the same smoothness that you look for when rinsing your plate following ferrous sulfate development.

Step #2 – Re-exposure to UV light for several seconds

If you are performing this task in the daytime, simply continue the procedure with the ambient room light providing the re-exposure needed. At night, you can give the plate a brief experience with a UV exposure unit.

Step #3 - Re-Development Using Pyro and Silver Nitrate

After re-exposure, put a modest amount of your prepared pyrogallic developer in a shot glass to which you have added several drops of iodized silver nitrate from your silver-sensitizing bath. Repeatedly pour the solution on the plate, agitate, and pour it off … back into the shot glass. Repeat this sequence for several minutes until you attain the desired density. You will notice that the glass negative's densities will get progressively darker with each flow of the developer. This will be followed by a good washing sequence involving several changes of fresh water.

Step #4 – Drying the Plate

Dry the plate in a drying rack and once it is ready you can use it as a contact negative with any process you desire.

***Fig 17 – 29 here**, Christopher James, Joe Swayze, July -2010 Maine.tif*

WET PLATE COLLODION FIXERS

Sodium Thiosulfate Fixer

This is the simple fixer and one that is very familiar to all who work in alternative processes. After the wet plate is coated, sensitized with the silver, exposed in the camera,

developed in a ferrous sulfate developer, and rinsed thoroughly, it needs fixing to remove the unexposed silver and bring out the beauty in the plate. This is the stage in the process where you get to open your present.

There are two ways to go about this task. The first is to make up a safe, and familiar, sodium thiosulfate fixer, the same one you have probably been using in most of your alternative process techniques, in a dilution between 15% to 20%.

To make a 15% solution, mix 150 grams of sodium thiosulfate into 1000 ml of distilled water. To make a 20% solution, mix 200 grams of sodium thiosulfate into 1000 ml of distilled water. Personally, when I use sodium thiosulfate to clear tintypes in a workshop situation with new students, I use a 20% dilution as in the recipe below.

Sodium Thiosulfate Fixer for Positives: 20% Solution

- 200 g sodium thiosulfate
- 1000 ml distilled water

The sodium thiosulfate fixer should be mixed fresh for each session and will require a 5-minute fixing time and a solid 20-30 minute wash following the fix. The shelf life is pretty decent but the 20% dilution will necessitate making up fresh fixer at least a few times during a multi-hour working session. You'll know when you need fresh fix because the plate will not clear as quickly.

You can use a commercially manufactured Rapid Fixer, such as Ilford's, in place of sodium thiosulfate and a typical dilution will be a 20% concentration of the film recommendation for Rapid Fixer. Personally, there is so little difference between the Rapid Fix and sodium thiosulfate that I would just stick with the sodium thiosulfate and save your money.

Sodium Thiosulfate Fixer for Negatives: 15% solution

- 150 g sodium thiosulfate
- 1000 ml distilled water

When making a collodion glass plate negative, sodium thiosulfate is sometimes the preferred fixer because it leaves the collodion slightly darker when seen by reflected light. It also eliminates the chance that the shadows will be dissolved in the fixing stage which may happen with a more aggressive fixer such as potassium cyanide.

When using sodium thiosulfate, fix the plate until it shows clearing and then extend the time by at least twice that time… usually about 5-6 minutes. Following the fixing bath, gently wash the plate in clean water for 20 – 30 minutes being very careful not to disturb the fragile collodion surface.

*(**Fig 17-30**, Jody Ake_self portrait_ 2007 - ambrotype)*

POTASSIUM CYANIDE FIXER

This is the simplest explanation of how the word cyanide came into being. The iron-containing dye, Prussian blue, had been first accidentally made, around 1706, from substances containing iron and carbon and nitrogen. Unknown at the time, cyanide, was formed during the manufacture of this dye.

Prussian blue, as colored pigment paint, was first used by the artist, Pieter van der Werff, in his painting *The Entombment of Christ*, in 1709. It was one of the first synthetic, chemically-made, pigments and cherished for its lightfast qualities and deep blue coloration. The pigment derived its name from the use of prussic acid and ferrocyanide. The name "ferrocyanide", means "blue substance with iron", from Latin ferrum / "iron" and Greek kyanos / "(dark) blue". When ferrocyanide was analyzed, removing the iron from the compound, and from its name, left "cyanide".

*(**Fig 17- 31**, Pieter van der Werff, Entombment of Christ, 1709, Picture Gallery, Sanssouci, Berlin)*

Potassium cyanide (KCN) is the not-so-simple fixer. If you are always careful with all phases of your chemistry, pay attention to lab details, and don't object to a little risk,

then you can make up a batch of 1.2% potassium cyanide fixer. Personally speaking, potassium cyanide is my choice of fixer and is far superior, in many ways, to sodium thiosulfate for wet plate collodion positives (tintypes and ambrotypes) and negatives for the following reasons.

The Good Things About Potassium Cyanide

• It produces a brighter and more detailed image. If I make an identical exposure with two separate plates, and fix one plate with potassium cyanide, and the other with sodium thiosulfate, the potassium cyanide fix shows a distinctly more luminous and more resolved interpretation of all available values. Recent comparative tests, on clear glass, resulted in a cooler black with the potassium cyanide which was a bit different than the "coffee & cream" appearance seen on blackened metal plates. Visually, to me, there is no contest. However, I have friends who have shown me plates where the difference between fixers appears to be marginal so if you prefer to use a less aggressive fixer than potassium cyanide, and it eases your mind, your plates will not suffer by comparison.

• Using fresh potassium cyanide, the plate fixes and clears in 30 to 40 seconds. Sodium thiosulfate, or Rapid Fix, takes 5 to 6 minutes.

• The final wash time with KCN is 5 minutes. Sodium thiosulfate is 20-30 minutes and if you are on location, this is a very big difference. Water weighs 8 pounds a gallon and this means that in the field you will need to bring it in and bring it back out.

• Unlike sodium thiosulfate, an extended fixing time in potassium cyanide can be used to reduce density. For this reason, it is a better idea to use sodium thiosulfate for glass negatives, as you will need all of the density you can get on the glass plate.

• It lasts a lot longer than sodium thiosulfate but will slow down and show signs of yellowing in the plate image when it begins to lose strength due to the volume

of plates being fixed. This yellow-toned contamination indicates the formation of silver cyanide. At this point it will be necessary to make up a new batch of fixer and dispose of the old. Please see my instructions below for neutralizing this dangerous potassium cyanide chemical with a simple drugstore grade 3% hydrogen peroxide.

A Few Not So Good Things About Potassium Cyanide

• Potassium cyanide (KCN) is a deadly poison. **Never, ever, handle this chemical with bare hands and be sure that your nitrile gloves have no tears or holes in them.** Check before you touch anything related to the KCN.

• Always wear an apron and work in a well-ventilated space, with a fan, hood, or outdoors.

• Always wear eye protection and a respirator when working with dry potassium cyanide.

• Never leave it open where children or pets can have access to it.

• Never inhale dust from this chemical. Wear a respirator when mixing.

• Always store it in plastic rather than glass, before or after mixing, so that the container won't break if dropped or bumped.

• **Keep potassium cyanide far away from all acids at all times.** The developer has acetic acid in the formula. This means that you must be very sure that your first rinse, following development, is done in fresh water and is totally complete before going to the fix. You will know when it is ok to go to the fixer because your post development rinse water will flow off of the plate in a smooth sheet of moisture. Potassium cyanide is a deadly poison… period. Respect it and you won't have any trouble. I recommend softly rinsing the plate with a slow flow from the tap just prior to immersion in the fixer. This precaution will help you

avoid an irregular Prussian blue cast on the plate when the washing time is inadequate.

• Be prepared to neutralize the used potassium cyanide with 3% hydrogen peroxide before you dispose of it anywhere. Also be prepared for any splash or spill. Always have several liters of hydrogen peroxide on hand next to the KCN tank in case there is any question of splash or spill.

• Be VERY careful with the potassium cyanide… Again, before you immerse the plate in the fixer, following the developer, and subsequent wash, make sure that the water is flowing off the plate in a flat sheet and not exhibiting the "oily-like" resist surface texture it had when you first put it into the wash. I will repeat… **There is acetic acid in the ferrous sulfate developer and it must be removed in that first wash. The water must run off the plate in a smooth and continuous sheet and not be textured or oily looking in any way. If acid comes into contact with the potassium cyanide it may release hydrogen cyanide gas, which has a greater toxicity than the potassium cyanide.**

• There is a rumor that ordering this chemical as an individual buyer, versus ordering it through an institution, will put you on the Homeland Security Watch List. To me, the results are worth getting a few questions and a friendly pat down at the airport.

• If you are anxious about using this chemical for fixing… don't use it. There are perfectly fine alternatives. Potassium Cyanide is best for working in the field due to its speed and the fact that it doesn't require nearly as much water as an alternative fixer.

Recipe for a 1.2% Potassium Cyanide Fixer

Be sure to label your plastic container with the large words:

POTASSIUM CYANIDE: POISONOUS.

- 12 g potassium cyanide

• 1000 ml distilled water

DANGER: WEAR NITRILE GLOVES, AN APRON, EYE PROTECTION AND RESPIRATOR MASK WHEN MIXING. KEEP THIS CHEMICAL AWAY FROM ANY ACID. FOR NEUTRALIZATION AND DISPOSAL INSTRUCTIONS SEE BELOW.

Using Potassium Cyanide Fixer

It is important to remember that in traditional black and white silver gelatin printing the black parts of the image represent the developed silver. In the ambrotype and tintype process it is the light colored areas that are the developed silver. The blackness of the plate provides the shadows, which are not reflecting light.

The purpose of these fixing baths is to remove the unexposed silver halides. The potassium cyanide version of the fixer is the preferred solution for collodion positives because it works quickly, producing a lighter and more reflective silver particle and leaving perfectly clean shadows in the final image. When using potassium cyanide, fix the plate until the unexposed silver halides are completely removed. This is usually accomplished in less than a minute, usually in 40 seconds. It is essential that the plate be removed from the potassium cyanide fixer before the chemistry removes too much of the image silver. If you have fogged the shadows of your image it is possible to clear these areas by extending the fixing time but you run the risk of image degradation. Wash the plate for at least a minute in clean water, though extended washing doesn't hurt the image.

Fig 17-32 here, *Christopher James, Angelina Kidd, New Mexico, July 2011*

SAFE DISPOSAL OF POTASSIUM CYANIDE

Neutralizing Potassium Cyanide to a Non-Hazardous Potassium Cyanate

READ THIS FIRST: Never execute the neutralization of potassium cyanide without adequate safety protection. This means: Wear industrial grade

nitrile gloves vs. medical grade, as they are thicker. Potassium cyanide is readily absorbed through breaks in the skin in the form of cuts and scratches. After use, rinse the gloves with hydrogen peroxide and discard. Always work in well-ventilated spaces. Wear an apron, dual respirators, and eyewear.

Before you begin, read these directions twice. Have a back-up person present in the event something goes wrong. I know this sounds scary but if you pay attention to detail, and exercise proper safety techniques, this is an uncomplicated process.

• Potassium Cyanide (KCN) has an MSDS Health Level Hazard of 3, and a dangerously high pH of 11, depending upon concentration. It is a heavily regulated chemical. It can be detoxified most efficiently with hydrogen peroxide and will be converted to potassium cyanate (KOCN), with an MSDS Health Level Hazard of 1, and a water-like pH of 8 that is unregulated and safe.

$KCN + H_2O_2 \rightarrow KOCN + H_2O$

• You need a 3% hydrogen peroxide (H2O2) (the type found in the drugstore and supermarket) and the same strength used for cuts and minor wounds.

• 50 ml of 3% hydrogen peroxide will neutralize 1 gram of dry potassium cyanide

• **To Neutralize Dry Potassium Cyanide**: Put on eye protection, a respirator, and industrial nitrile gloves. Know exactly how many grams of dry potassium cyanide you are going to neutralize. Place the dry potassium cyanide in a non-breakable beaker. Dissolve the potassium cyanide in cool water first in a proportion of 1g to 100 ml water. After it is dissolved in the water, oxidize with 3% hydrogen peroxide (drugstore grade is 3%) using at least 50 ml of hydrogen peroxide to every gram of potassium cyanide that you dissolved.

Place the open beaker in a well ventilated and VERY SAFE place and let it stand overnight. **DO NOT** cap the container as the peroxide may create a gas and that will result in pressure within the closed container. The following morning, dilute this now safe potassium cyanate solution with water at a proportion of 3-4 times the liquid volume you are neutralizing. Rinse everything with hydrogen peroxide. An interesting side note… when you neutralize the potassium cyanide, it will turn a milky white. If you leave the neutralized KCN outside in the light, it will turn chocolate brown because of the silver in the fixer.

• **To Neutralize a Liter of 1.2% Potassium Cyanide Fixer**: To neutralize a 1.2% potassium cyanide fixer solution (a standard dilution for wet plate collodion): Put on eye protection, a respirator, and industrial nitrile gloves and place the old potassium cyanide fixer in an indestructible plastic bucket, i.e., a drywall compound bucket will work well. Be sure the total volume of the bucket will accommodate twice the volume of the fixer you are neutralizing. If you have an industrial chemical hood you are in luck… use it. If not, I recommend going outside for this next step.

Slowly add 600 ml of 3% hydrogen peroxide to each liter (1000 ml) of used 1.2% potassium cyanide fixer. You have now converted a heavily regulated chemical to a non-hazardous, un-regulated, potassium cyanate. You will notice that there is a visible reaction between the potassium cyanide and the hydrogen peroxide. This will subside in a relatively short time. Allow the solution to stand overnight in a very safe place out of reach of anyone who may be curious about it. Do **NOT** cap the container as the peroxide may create a gas and that will result in pressure within a closed container. The next morning, saturate this now safe potassium cyanate solution with water at a rate of 3-4 times the liquid volume you are neutralizing.

Once again: For every 100 ml of 1.2% potassium cyanide (12 grams to a liter of distilled water (1000 ml) is the standard wet plate fixer concentration) you would use 60 ml of 3% hydrogen peroxide. This would be the minimum dilution but it is acceptable to use more hydrogen peroxide if you wish. It is always better to err on the side of excess

hydrogen peroxide when performing this task.

Note: Even though the cyanide has been oxidized to potassium cyanate, the wet plate fixer still contains silver that may require special disposal depending on state and local regulations. It would have to be treated the same as spent sodium thiosulfate fixer.

• **Potassium Cyanide & Sodium Thiosulfate Fixer Warning:** There is a published formula that mixes sodium thiosulfate with a small amount of potassium cyanide. This fixer works well but cannot be neutralized in the same manner as described in this section. A mixed thiosulfate / potassium cyanide fixer is a different bag of worms when it comes to disposal! Hydrogen peroxide will not only oxidize the potassium cyanide, but it also reacts with the thiosulfate, to oxidize it to sulfate. Therefore, the 600 ml of 3% hydrogen peroxide per liter of fixer does not apply and ceases to be a simple disposal problem. Instead it becomes a complex analytical problem of: a) How much cyanide is present; b) How much thiosulfate is present; c) How do I detect the end point of the oxidation reaction so the cyanide and thiosulfate are consumed? Bottom line… don't be complacent about using these instructions for neutralizing a hybrid fixer

Neutralizing Waste Water After Using Potassium Cyanide Fixer

• You will have wash water from fixed plates (the first two rinses), whether you are working on the road or in the lab. The potassium cyanide concentration will be very low in these rinse baths. Collect your wastewater and then add about 300 - 400 ml of 3% hydrogen peroxide per liter of water and let stand overnight before discarding. After the first 2 or 3 rinses, the cyanide concentration should be so low that further treatment is not needed. Make sure you clean everything that is touched by the potassium cyanide with hydrogen peroxide.

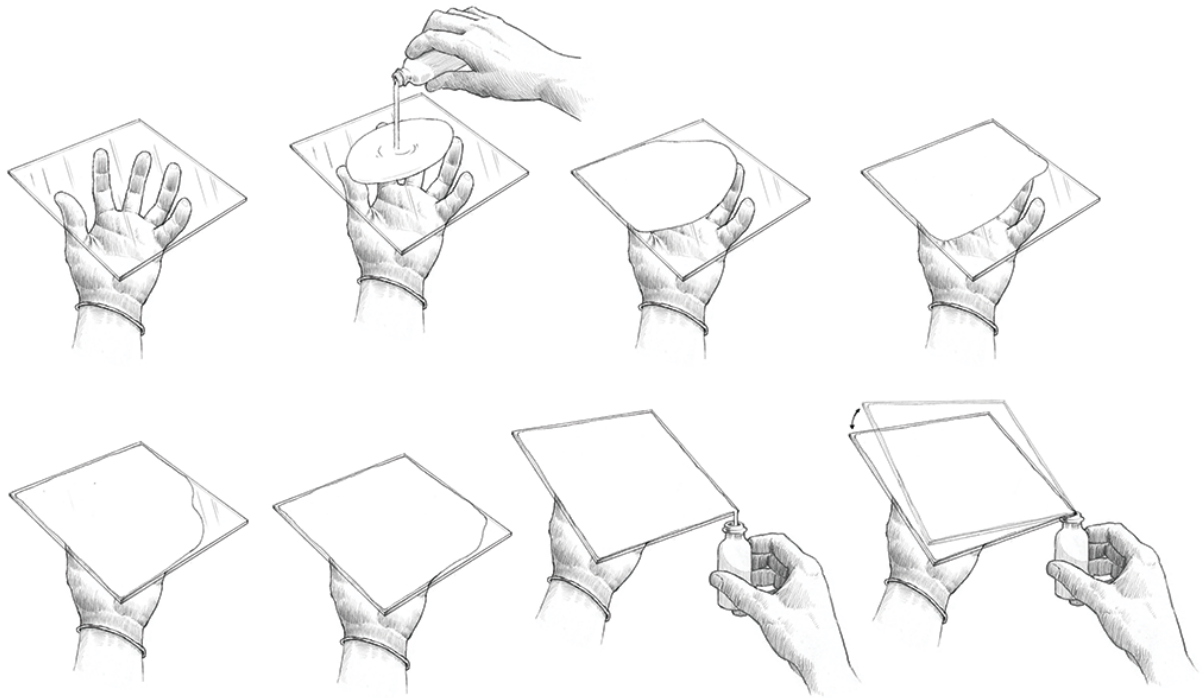
Silver Recovery From Neutralized Potassium Cyanide

• Once you have successfully neutralized the potassium cyanide by converting it into an un-regulated potassium cyanate, it is a simple matter to run it through a silver recovery system as you would any other fixer used in photography. Please adhere to any, and all, federal and state regulations regarding silver removal.

***(Fig 17-33,** K. K. DePaul_Three_2010 (wpc).tif)*

WET PLATE COLLODION WORKFLOW:

Note: The following workflow will be specific to the tintype because that is the most forgiving of the options in wet plate and the best way to learn the process. The same sequence, and working process, will be totally compatible between tintypes, ambrotypes on glass, and glass plate negatives. Although the chemistry, and list of tasks and options, will change when making wet collodion negatives on glass, the workflow will be compatible. These additional parts of the workflow are detailed in other sections of this chapter.



(**Fig 17-34**, Pouring Wet Collodion (Joe Boyle Illustration)

Coating the Plate with Salted Collodion

If you're a scuba diver you no doubt remember the first time you went into the ocean for your Open Water certification dives. Once you relaxed, you may recall looking over at your Divemaster and marveling at how totally at peace she looked in her neutral buoyancy… seemingly able to move in the water without ever moving her body… simply breathing. When you saw that ease, it was then that you knew just how good you needed to be. Watching someone who knows how to pour a beautiful collodion plate is just like that feeling… it's really the art of the process.

But, in the interest of covering the wet plate aesthetic spectrum, I will add that there is an entirely different school of thought about pouring one's plates and it is the organic opposite of the perfectly poured one. Examples of this type of pour abound, especially among brand new wet collodion folks, and can be illustrated by the plates of, say, S. Gayle Stevens or Sally Mann, who utilize the ebb and graphic flow of the collodion as an intended aesthetic. Personally, I love this effect and equate the freedom in it with that of a child's drawing… something every well-trained artist would like to get back to.

*(**Fig 17-35**, S. Gayle Stevens_through_my_looking_glass_2011 – wpc)*

In order to be a great wet collodion artist, you'll need to practice. I would recommend getting a few metal or glass plates and practicing with lightweight vegetable oil or thinned syrup. The point of this practice is to judge the amount of liquid it will take to cover the plate easily; not so much as to have a heavy build up or so little as to prevent full plate coverage. It won't take you long to figure it out and since you can pour and put your plate in the silver tank in ambient light conditions, you will find the learning curve to be fast and gratifying.

Put on your apron, nitrile or latex gloves, and eyewear. In daylight, or ambient room light, decide how you're going to hold your plate. Some like the "claw" method where you grasp the lower left plate corner between thumb and forefinger. This will

generally leave a very small un-coated spot in the corner of the plate. Others prefer the "waiter" method where you hold the plate like a waiter holding a tray of plates. This requires a bit more skill and the first time I used the technique I poured collodion into the cuff of my latex glove. If you do this to yourself, you will understand why it was such an effective battlefield bandage. Some 190 proof grain alcohol, or denatured alcohol, will clean your skin pretty well.

Make a plate holding decision and then take your salted collodion and begin slowly pouring into the center of your plate. I personally look for the collodion to form an ellipse in the center of the plate, reaching edge to edge in one direction, and stop pouring just as the collodion reaches the shortest width dimension of the plate. Hold onto the collodion bottle because you're going to use it again in a few seconds.

Gracefully, tilt the plate towards the lower left corner (where you may be holding the plate if you are doing the "claw" holding technique) letting the collodion flow up to your fingers in the corner, but not so much of a tilt as to let the collodion flow off of the plate and into the cuff of your latex glove. Then, with gentle haste, tilt the plate so that the collodion runs to the upper left corner but stop before it runs off of the edge. Now, change the plate's tilt so the collodion freely flows to the upper right corner. Finally, tilt the angle of the plate a bit to allow the collodion to fill in the lower right corner.

Now, tilt the entire plate at a slight angle (collodion side up of course) making the lower right the lowest corner of the angle. Put that corner of the plate tip into the collodion bottle so that the excess collodion flows back into the bottle and gently rock the plate, using the corner tip in the bottle as a fulcrum, back and forth at a slow and moderate speed and angle… like the ticking of an antique clock. This smoothes out any uneven densities that may be setting up on the plate. Keep in mind that you are working with speed and efficiency now because your collodion is beginning to evaporate and it will begin to set pretty quickly, signaling that it's time to immerse it into the silver-sensitizing tank.

Bring the plate back to level when the collodion stops dripping into the bottle… this usually takes about 10 seconds after you start rocking the plate after the pour. Bringing it to level will help prevent collodion flow lines on the plate. I generally keep the plate moving at this point. Depending upon where you are making the plate will determine what you do next.

If you are in a very arid and low humidity environment you will not be waiting very long before putting your coated plate into the silver nitrate sensitizing bath. Usually as soon as you complete the pour-off into the collodion bottle you can immerse the plate in the silver nitrate. The reason for this is that the ether in the collodion is drying very rapidly and you will end up with a host of little problems on the final plate if you linger too long after the pour. If you are in a humid environment, you need to wait a bit longer, usually 30-45 seconds (although I seldom wait more than 30) so that the ether has a chance to evaporate a bit before I immerse the plate in the silver bath.

I recommend a small squeeze test on the corner of the plate to determine when it's time to go into the silver. Once I think that the sheen of the collodion has turned from liquid to satin, I will do a tiny squeeze test to a corner of the plate. When I release the squeeze, I should see a small patch that looks like the texture of my fingerprint or latex glove. At that point, I am sure that it's ready for the silver.

One more thing about rocking the plate…. If you rock too quickly, or at too great an incline, in low humidity conditions, you will often end up with "crepe" lines that look like sand on the beach after the tide has gone out. This is because the collodion is drying rapidly and you are creating a lot of centrifugal and kinetic force with your rocking motion.

Sensitizing the Coated Plate in the Salted Silver Bath

Turn off the room lights (safelight is fine) and immerse your collodion coated plate into the silver nitrate sensitizing tank, or tray … you now require safelight conditions until you get through the development stage and into the first rinse tray.

Some people prefer to do their collodion under safelight conditions and simply go through the entire process in that red light. If that makes you comfortable, feel free, but it really isn't critical to pour your plate under safelight. However, when it is time to immerse the plate into the silver bath, it is a good idea to be in those total safelight conditions. If you are using a tray for your silver sensitizing (not recommended) that is another story.

After the plate is immersed in a solution of silver nitrate for 3 to 4 minutes (this is the time for tintypes and ambrotypes… glass plate negatives require a longer sensitizing time) it is time to remove it from the bath and load up your plate holder. Again, the environment for this stage is a darkroom with a red filtered safelight, a room with deep red Plexiglas on the windows, or my preference, a caver's LED headlamp with a red filter. If you are working on the road, the red LED caver's headlamp is perfect but can be replaced with several red LED, non-blinking, emergency road flare lights or a string of red chili pepper lights. Both of the LED solutions and chili lights work great in the ice-fishing tent.

(**Fig 17-36**, Amanda King_Maggie_2012 - wpc)

What Is Happening in the Silver Tank

During the 3 to 4 minute immersion period, the silver nitrate bonds with the iodides and bromides in the salted collodion and creates a light-sensitive, silver halide deposit on, and just under, the surface of the collodion.

After the immersion time, the plate is sensitized. As you remove it from the tank you will see that it is milky white. Sometimes, depending on the skill of your pour, you may notice swirls or changes in the overall milky coloration of the sensitized collodion on the plates. Don't worry about this yet. Just keep going, as most of the flaws will often disappear during the process… or be replaced with other ones.

Watch Out For Legs

One thing I would recommend looking for as you remove the plate from the silver bath are what I refer to as "legs." These have the same description, look, and meaning as the legs on the inside of a glass of deep red wine after you take a sip and put the glass down. If you see the legs when removing the plate from the silver bath, gently lower the it back into the silver for another 20 seconds or so and the legs will usually go away, leaving you with a perfectly smooth and sensitized plate surface.

Loading the Plate Holder or Camera

While still wet, gently blot the edges of the plate on a paper towel and be sure not to rub or touch the sensitized collodion itself. Insert the plate into your plate holder. I know this seems too obvious, but be sure the sensitized side of the plate is facing the direction of the lens and subject. It is a good idea to mark the plate holder with a piece of tape so you don't forget which side is front facing in the excitement.

The sensitized plate is then placed directly into the camera for the exposure. Be very careful during this stage, because the plate holder may still be dripping silver nitrate. A technique that helps make less of a mess is to drain the silver nitrate sensitized plate over the immersion tank, or a blotter, and to wipe off the rear of the plate once you have placed it in the plate holder. This technique prevents any excess silver nitrate from migrating to the front of the plate, a problem that often results in streaks called "oyster stains."

Again, take all necessary safety precautions and under no circumstances touch anywhere near your eyes during the process because silver nitrate contact causes serious eye damage. Almost everyone who works in wet plate, no matter how careful they are, occasionally gets silver nitrate on their skin. Nine times out of ten it is on their fingers and generally because they have removed their safety gloves and are wiping down their plate holder for the next plate. Don't be alarmed by the stains. The silver reacts with the proteins in the first epidermal layer of your skin and turns it a nice henna color for a few days. Don't worry about it… BUT… don't be casual either. And never touch your face when you are working with silver nitrate.

If you are using an antique camera, a pinhole or zone plate lensless camera, or a Holga, the procedure is the same except that instead of loading a plate holder to put into your camera, you are loading the camera itself. Essentially, in this case, your plate holder and camera are the same thing.

***(Fig 17 – 37 here**, Keith Carter - Galina's Gift - 2012 - ambrotype)*

EXPOSURE

Presumably you have set up your shot before coating your plate. Remember, you don't have a lot of time and that is why it is called wet plate. Once the plate holder is in the camera, remove the dark slide to expose the plate. When this step has been done you may then remove the lens cap from the lens and expose the plate. You are the shutter and counting off seconds using the words, "one ansel-adams… two ansel-adams… etc" usually results in an accurate time. Average exposure times can be as brief as a second or two when working outdoors, in open light, and using period portrait type lenses. I recommend shooting primarily in open shade as that light will yield the best values with this process. Your personal working style will have to be worked out over time and will depend on a multitude of factors in chemistry, gear, subject matter, and where you work. I will tell you that I've rarely had a good exposure using bright sun and prefer open shade in almost all circumstances.

iPhone App Exposure Meter: Pocket Light Meter

This could be fun. There is a free iPhone app that is pretty efficient as a light meter for wet plate exposure. It's called, appropriately, Pocket Light Meter. It's pretty cool, very easy to use, and surprisingly accurate. Download the app and open it up. First, set the ISO to 1, the app's lowest setting. Next, click the "gear icon" and click on Exposure Settings. Last, set the "Exposure Correction" for minus -2 2/3 EV. Everything else is pretty normal. Pick a spot in the shot to meter, tap the screen to set the area you are calculating, set the aperture, and it will give you the required time of exposure for

wet plate tintype or ambrotype. I was impressed that it was so accurate, even with direct sunlight or indoors.

If you don't have an iPhone… my personal technique, using my Hermagis portrait lens, is to expose the plate for the equivalent number of seconds equal to the aperture I am using. I realize this isn't science but it is simple and it works for me almost all of the time.

In-Camera Exposure Test Strip

My friend, Niles Lund, showed this simple technique to me. Just like exposing a test strip in the darkroom (for all of you old school folks who still practice the wet craft under romantic safelight) it is a simple matter to make an in-camera test-strip to determine the perfect amount of time to give to a given subject. Begin by exposing the entire plate for a period of time that is your best, experienced, guess. We'll call this the "base" exposure. After the base exposure, close the dark slide 1/4 of the way and expose again for one base exposure. Push the dark slide in ½ of the way closed and expose again for two base exposures. Finally slide the dark slide in 3/4 of the way and expose again for four base exposures. This will give you total exposures on the collodion of 1x, 2x, 4x, and 8x the base exposure. In other words, four exposures separated by one-stop intervals.

Develop and fix the plate as you would normally and inspect the image for the appropriate exposure range. This is a great technique if you're just starting out, using a camera you're unfamiliar with, trying out a new lens, or working in unfamiliar lighting conditions.

Another very simple variation of this exposure test is to pull the dark slide, make a single base exposure, and then close the slide in equal intervals adding a specific and equal amount of time to each band. After developing the plate you will see a series of bands at a single aperture, with a range of exposures built on a base of the initial exposure plus equal increases in exposure. This is especially valuable as a working tool if

you are heart-set on a particular depth of field or are limited by the amount of time you can expose.

This process is most sensitive to blue, violet, and UV light but less so to shades of red, brown, amber, green, and yellow light. Remember, the success of an ambrotype, or a tintype, is often dependent upon keeping the deepest shadows from being exposed.

To make a negative, on the other hand, you would give the same scene twice the exposure and develop much longer with a weaker and more acidic developer to build up density. Refer to the formulas for negatives.

Note: A proper ambrotype (or tintype) needs the correct amount of exposure, as does a negative. It's just that a positive doesn't require as much exposure as a negative because you will be using a stronger developer and a shorter developer time. If you underexpose an ambrotype and push the development, you get an ambrotype with high contrast and no shadow detail.

Once the exposure has been made, replace the lens cap on the camera and then return the dark slide to the plate holder. Immediately return to the darkroom, or your antique, wet collodion darkroom wagon, or red ice fishing tent, and proceed with development. Development must be done before the collodion dries.

***(Fig 17-38**, Michele Pritzl-Rogers_2012_wpc)*

When Exposure is Delayed, or Long, in Camera in Hot Weather

Occasionally, while working in hot and arid conditions, your exposure, following sensitization of the plate, can be delayed. This may happen due to a need to re-focus, a change in weather conditions, or having to go a distance between your sensitizing area and your camera. In situations like this, you will want to keep the sensitized collodion from drying out on your plate.

A good solution to this dilemma is to take a piece of plastic, like one side of a zip-lock bag, and lay it on the lower bellows in your camera. Then double or triple, fold a

section of paper towel and dampen it so that it is wet but not dripping with moisture. Lay it on the plastic inside your camera and take care to keep the height of the plastic and paper towel to a minimum. When you close the back of the camera, the interior will become humid due to the heat on the outside of the camera. When you place your plate holder, and sensitized plate, in the humid environment of the camera it will buy you some additional time and help prevent the sensitized collodion on your plate from drying out.

(**Fig 17-39** Sally Mann - Omphalos Grid-3_2012)

PLATE DEVELOPMENT

Flooding the Plate with Ferrous Sulfate Developer

In a darkroom, or red LED lit environment, (lit by your caver's light headband, chili pepper lights, or road flare red LED lights), it is time to process your freshly exposed plate. Begin by removing it from the plate holder, being very careful not to scratch or touch the delicate collodion. Place the exposed plate in a "helper tray" or in your hand, like a waiter holding a tray, over a catch tray. Then, very gently flood the developer across the surface of the collodion commencing from the edge of the plate. Do not pour the developer directly onto the plate, as this will wash away some of the silver on the surface that is needed for full development.

My preference is hand development. I begin by holding the plate in my hand using the "waiter" grip. Then I gently flood the plate with the developer being careful to walk that fine line between almost touching the plate's surface while pouring on the developer and trying to balance all of the liquid on the surface of the plate. Immediately, look for the developer on the surface of your plate and be sure that the developer has covered the entire surface. Then begin to move the plate rapidly, keeping it flat, and focus on the image that will begin to come up.

Hand holding the plate for development is often the best technique to use when you need to stop development in a split second. Using a helper tray often causes a delay in flushing the plate with water to end the development as it takes a bit of skill to get the plate out of the helper tray. Helper trays are best for beginning students of the art as it is easier to flow the developer across the plate with a small mini-wave making development more uniform. For the more experienced wet collodion artist, hand development is more efficient and controllable.

***(Fig 17-40**, Tom DeLooza - Icarus 2012 - 60" x 24" - wpc)*

When to Stop: Re-thinking Development Time

A properly exposed Ambrotype, or tintype, will become visible within under 10 seconds. As you flood the exposed plate with your developer, you will see the exposed bright areas emerge on the plate as they are reduced to metallic silver. You are not looking for the quality of the finished image as that will come later in the fixer. For now, you are seeking detail and it is essential to flush your plate with fresh water almost immediately after seeing your image emerge.

If the entire image is formed before 10-12 seconds, the plate was over-exposed. If you push the development longer than 20 seconds the exposure was probably too short. ***Development must be stopped before the details in the shadows are evident or the image will be fogged.*** Extended development will result in flat, grey, images and is usually the most common fault of new wet plate artists. To give you a little more control during development, dilute your developer to extend the time of development.

Cold Developer Option at 1:3

However… for a more relaxed development experience, keep you developer in a 1:3 dilution and pack it in ice. Take a shot glass and fill it with the cold developer and flood your plate. Now, instead of looking for a finished development in 10 to 15 seconds, your development time will be extended up to 60 seconds. Keep the developer rapidly

moving on the plate until you see the details in the brightest areas of your plate and then flush the plate with fresh water.

First Wash: Stopping Development

Just as you see the highlights with density begin to appear, immediately flood the plate with fresh water over a catch tray. Repeat this flooding with fresh water two more times and then immerse your plate in a tray of clear water. This stops the development and it is now OK to turn on the lights, or open the tent flap. The plate is then washed with fresh water until the oily look, where developer and water make a texture, is totally gone and the rinse water flows freely off the plate.

Wash until the water ceases to bead up on the collodion surface and be positive that it flows off in a continuous smooth sheet. It is critically important to wash the plate well before proceeding to the fixing stage that can also continue to be done in daylight. You will know that you have done this part incorrectly if you have Prussian blue stains on your plate. If you are making a portrait you may see your subject look like an extra from the movie Avatar. Again, continue washing until the water no longer beads on the surface of the plate.

One more bit of advice… change your rinse water often and make sure that your very last final rinse is in clean water that is void of developer residue. This is a perfect way to avoid the blue staining of an image that sometimes occurs in potassium cyanide fixer when you neglect to keep this final wash, before fixing, clean.

Fig 17-41 here, *Alex Timmermans, Mario, 2011 (black glass ambrotype)*

Fixing the Plate

There are several fixing options so please go back to the fixer section of this chapter and review thoroughly. Fixing the plate is where you get to open the "present" but it is serious business and you want to be sure that you know what you're doing before starting.

It is important to remember that in traditional black and white silver printing the black parts of the image represent the developed silver. In the ambrotype and tintype process it is the light colored area that is the developed silver.

The purpose of the fixing bath is to remove the unexposed silver halides. The potassium cyanide version of the fixer is the preferred solution for collodion positives because it works quickly, producing a lighter and more reflective silver particle and leaving perfectly clean shadows in the final image.

When using potassium cyanide, fix the plate until the unexposed (light colored) silver halides are completely removed. Let the fixer continue its action for about 40 seconds, before moving the plate to a water wash bath. *It is essential that the plate be removed from the potassium cyanide fixer before the chemistry removes too much of the image silver*. On the other hand, if you have fogged the shadows of your image it is possible to clear these areas a little by extending the fixing stage.

NOTE: It is important to remind you that the wash water for the plates coming out of the potassium cyanide fixer will need to be neutralized before it is disposed of. Please refer to the safety and disposal instructions for potassium cyanide in this chapter.

Washing the Plate

When using potassium cyanide, your fixing should be pretty much complete in 40-60 seconds although you may want to stay a bit longer if you want to open up the highlights a little or dissolve a thick collodion line on the edge of the plate. Once you transfer to the final wash, it will be important to wash your completed plate for at least 2-3 minutes in clean water, though extended washing doesn't hurt the image or the plate.

When using sodium thiosulfate, fix the plate until it shows clearing and then extend the time by at least twice that time… usually around 5 minutes. Following the

fixing bath, gently wash the plate in clean water for 10 – 20 minutes being very careful not to disturb the fragile collodion surface.

You can see from this comparison the significant differences between the length of fixing time and the subsequent length of time needed to complete the wash cycle. In the field, this difference in water usage is significant. Whatever water you bring in, if not neutralized in the field, you must bring out.

***Fig 17-42**, Sarah Nesbit, Working Harder to Reclaim That Context_2011-(wpc)*

Drying the Plate

As soon as your plate begins to dry, you will notice that it becomes brighter and greatly improved. Drying is a pretty simple matter of leaning the plate against the wall and letting it dry. You can also use a plate drying rack, a dish drainer rack for plates, or the low heat from a burner on the stove (at a distance please) or spirit lamp. Don't use a hairdryer… dust is not your friend. In the summer, all you have to do is take your plate outdoors in the sun, turn around a few times, sing the first verse of Home on the Range, and your plate will be dry. If you wait overnight, you can gently buff the surface with a cotton ball and the highlights (exposed silver) will begin to shine like a mirror. Watch out, if you're overly enthusiastic you will scratch the delicate surface.

If you elect to use an open flame for drying, it is imperative that you move the plate continuously to ensure even drying and to prevent cracking the plate. This is especially important when dealing with glass. Be aware that the water dries first and then the collodion. During this stage, the image is extremely fragile and all precautions must be taken to avoid harming the collodion surface. If you did not clean your plate well the collodion may begin to peel at this stage. Pyro-developed images are also prone to peeling if the glass plate's edges are not previously subbed with albumen.

Because the image on your plate is made of silver, it will behave like silver and begin to tarnish if you don't tend to it properly with a delicate coating of sandarac varnish, organic wax, or a high quality gloss polyurethane.

***Fig: 17 – 43 here**, Keliy Anderson-Staley_beekeeper_2010 (wpc neg on sg-2010)*

VARNISHING / WAXING THE PLATE

Once the ambrotype, or tintype, has completed its process, it is essentially a silver image on glass or black lacquered plate. This silver, when exposed to air and the environmental tribulations of air, heat, humidity, abrasion and adoring touching, will begin to show signs of being unhappy. The air especially, will cause the silver to tarnish and turn grey. Since these are your highlights, it is generally an unwelcomed color shift. One simple way to prevent this problem is to seal the image behind a layer of varnish. I'll discuss the traditional method first and then give you two more contemporary options that are gaining a lot of favor among wet collodion artists.

When varnishing is employed, a protective coating of gum sandarac, alcohol, and oil of lavender is flowed over the plate in an identical manner to the way you flow on collodion at the beginning of the process. This varnishing step is, for many artists, quite complicated due to the difficulty of pouring a perfectly smooth coating. Personally, I am always a little anxious during the varnishing stage and especially when working with a plate I am happy with. I like the lovely oil of lavender smell in the lab… an improvement over the ether and alcohol odor of the collodion… however, a lot can go wrong at this point after a lot has gone right. Unvarnished collodion plates are prone to abrasions, peeling, and severe tarnishing over time. The varnishing step will impart a warmer tone to the image and slightly darken it. A note: because the plates tarnish, it is possible to take a cotton ball and gently buff areas of the plate to "polish" the highlights. Here is the traditional varnish formula and application.

Ambrotype and Tintype Varnishing Formula and Technique

- 414 ml of 190-proof grain alcohol
- 57 g gum sandarac

• 44 ml of oil of lavender

Mix the ingredients together until the gum sandarac has completely dissolved. Then, strain and filter the mix until you have a perfectly clear yellow varnish. You may have to filter the varnish several times before it is perfect. Before the varnish is poured on the dry plate it is necessary to warm the plate. This is neatly done with a small spirit lamp, that burns alcohol with a controllable flame, and these can be easily found on the Internet. You can also use a small Coleman Catalytic Propane heater that is usually used for camping and keeping the interior of tents warm. This is a non-flame heat source. One other source of heating the plate, both for drying and prior to varnishing, is a single burner hot plate set on its lowest heat setting. On a hot summer day, you can also use the sun to heat your plate but if it's too hot, the varnish will turn an opaque white when it comes into contact with the plate.

To begin, pour a small amount of your varnish into a varnish-pouring bottle. Heat the bottle up with a water bath or a catalytic heater. Then, warm the plate over the spirit lamp, hotplate, or catalytic heater, by holding it over the heat source while smoothly moving it around. When the plate is just warm enough to the touch, pour a small amount of the warmed varnish in the center of the plate and move the plate around quickly until you have a complete and smooth coating. The warmed varnish will be like water. Hold the plate to a vertical position and pour off the excess back into the varnish storage bottle. This should feel very similar to your technique when pouring collodion, but faster.

When the varnish appears to have set, hold the plate in a flat horizontal position over your heat source, moving it continuously, until the varnish is completely dry. Be careful not to proceed to this step until the alcohol from the varnish has evaporated or else the varnish may catch on fire and you'll drop your glass plate. This step is not difficult, so please don't be too worried. You may, if the weather is nice, the wind isn't blowing, and the pollen is low, take your plate outside in the sun where it will dry quite quickly. Place the plates in a drying plate rack for a day so that they dry completely in a

quiet environment. One more thing, if the collodion that you were using was too old, the alcohol solvent in the varnish may destroy the image instantly.

You can order the varnish pre-mixed and ready to use from Bostick & Sullivan if you are looking to save time and trouble.

Renaissance Wax Option

An option for protecting the surface of tintypes is an excellent product called Renaissance Wax, a microcrystalline wax polish that is used extensively in antique restoration and as a protective sealant by museum curators. Used primarily for furniture restoration, it also has wide acceptance for use on metals and any protection for important objects that are subject to the alkaline oils in human fingertips. It creates a barrier against moisture and contaminants in the air.

To use it on a plate: Heat the underside of the plate with a hair-dryer. Apply a very thin coating of the wax to the entire plate, in a swirling motion, with your fingertip. Re-heat the plate and then begin to gently buff the surface of the plate with a soft micro-fiber cloth or cotton ball. I like using eyeglass cleaning micro-cloth squares for final polishing but the cotton balls for everything up to that point. You'll see the wax begin to smooth out and as you buff, the surface will begin to shine and take on a brilliant sheen. Re-heat the underside of the plate as needed and continue buffing gently until the entire surface is perfect. Unlike Sandarac varnish, the plate is instantly ready for travel.

Gloss Polyurethane Option

Recently, when working with a lot of students in a workshop, it became clear that their work was getting better as the week went on. On the face of it, this is really positive but there is one problem that had to be addressed… how to get the last plates home safely when there wasn't enough time to varnish them. At that point I opted for a simple solution and showed them how to avoid the heartbreak of a bad varnish experience on a favorite plate. This involves protecting the plate in a similar manner to the traditional

Sandarac, with a varnishing stage that looks nearly identical to sandarac, and prepares the plate for travel in an hour or two.

I have taken to recommending spraying several very thin layers of high quality, gloss, polyurethane. My preference is Minwax Gloss Polyurethane. It looks like the traditional varnish when dry, protects the plate for travel (best for students) and is a simple process guaranteeing that the plate they like will last and not be messed up with a less than perfect varnishing technique.

The technique is simple. Go outside on a non-windy day and place the plate on a clean and dry surface, like butcher's paper or the wall of a cardboard box. Spray very light coats, from one side to the other, bottom to top. Then, move the plate 90 degrees clockwise and spray it again. Move another 90 degrees and spray again and finish the cycle off by one more turn and spray. If you look across the surface of the plate it will have a very low orange peel like texture at this point. If it's summer, hold the plate in the sun for a few minutes and the texture will flatten out and the surface will dry like a varnished mirror. Or, use a heat source on the bottom of the plate to warm the polyurethane and allow it to flatten out. In an hour or two it should be perfect and ready for bagging.

NOTE: This solution to protecting your plate is down the list of my first options but in a pinch, when you need to travel, it works pretty well. Be careful of letting the plate get too hot and don't use the technique if there is any wind that will blow dust on your freshly coated polyurethane. If quick mobility with a new plate is called for then I would opt for the Renaissance Wax.

***(Fig: 17 – 44 here** Travis Hocutt_16 Suns_2011 – wpc)*

WET COLLODION PROJECTION WITH AN ENLARGER

If you are ever in the mood to make a wet plate collodion tintype, ambrotype, or glass plate negative, it is a relatively simple matter to use your enlarger to project to your silver sensitized wet plate. Almost everything that you do outside, you will do in the darkroom except that rather than using a camera to capture a subject on your sensitized plate, you will project your existing subject, in the form of a film positive, to the plate. It is still a positive-to-positive - negative-to-negative event. Best yet, you can get into the wet plate collodion process without the need of a wet plate camera or very pricey Petzval lens. All you need is the darkroom and everything else. I'll detail this technique using the creation of an ambrotype as the example.

The first step for an enlarger projection is to create a nice film positive to be used for projection in the enlarger. This can be in the form of a colored transparency but be aware of wet collodion's sensitivity, or lack thereof, to some of the colors within the visible spectrum. You may also make a very serviceable film positive from any digital source using Pictorico Ultra Premium OHP inkjet film. Simply make the most perfect positive image on your monitor, size it to your negative carrier (a glass carrier will be best), and print out several variations of density to discover what works best for you and your individual chemistry and process.

Then, take the film positive into the darkroom, load up the negative carrier and project your positive to a flat surface, with a white piece of paper so you can focus properly, that is absolutely identical to the height of your sensitized plate that will be projected upon. Mark the area that the plate will sit during the exposure with pieces of masking tape in the corners. Place the tape so that each corner is clearly marked with an L shape and compound the tape in height so that you can simply drop the plate into the location and have it rest solidly up against the corners of the tape. This will prevent movement by accident. Also, place a thin black piece of paper down on the enlarger deck surface to prevent a bounce reflection from the deck to and through the sensitized glass of the ambrotype in waiting. Set up your timer for the exposure and go on to the next step that is the preparation of your glass plate.

This information is a short duplication of plate preparation found in this chapter. The first step is to thoroughly clean your glass with a solution of whiting (calcium carbonate) or rottenstone. Then, when you are positive that the glass is perfect, clean it some more with cotton balls soaked with Everclear grain alcohol.

Next, prepare an albumen subbing solution (see the recipe in the chapter) and with a Q-Tip, paint the edges of the glass plate, all 8 of them plus about 1/8 to 1/4 inch on the surface of the glass. You can also dunk the plate edge into a very shallow tray of albumen, one edge at a time. Or, you can coat the entire plate by pouring on a layer of albumen and coating your plate with it as you do when coating with wet collodion. All three of these techniques, on the cleaned glass, work exceedingly well.

The rest of your experience is just like traditional darkroom except that you are going to pour a plate with your salted collodion and move directly to the enlarger. A decent place to begin exposures, with an average value laden positive, is F.8 for 20-22 seconds. Make a test strip but do not abuse the wet collodion on the plate as you perform the strip test. At the end of the exposure, go through the development, fixing, and washing stages for wet collodion and after the plate has dried (where it brightens considerably) determine your optimum exposure.

CONTACT POSITIVE FILM PRINTING ON SILVER SENSITIZED COLLODION

Believe it or not, you can make contact print exposures on a freshly prepared collodion plate. I know it sounds impossible, and that your negative will surely stick to the collodion, but it works and the detail is excellent.

I've never had the courage to use a one of a kind film negative, say from the now departed Polaroid Type 55, but have no qualms at all about scanning that film and making excellent duplicate positives (which are required) on Pictorico Ultra Premium OHP Inkjet Film. It is a very simple matter to scan and invert your best negative to a positive and reproducing it on OHP using a glossy or Photo Rag printing profile. When

producing your film positive for this technique, remember that high contrast positives do not work very well unless that is the effect you are seeking. Better to go for a neutral tonality and non-theatrical positive. This is the same mind-set you use when shooting outdoors with a camera; open shade and dappled light is almost always more successful than direct sunlight and high chiaroscuro.

You may expose your plate with a traditional enlarger or simply get a 15-watt bulb in a shop light fixture and position it 24" from the plate. Do a test strip and you will be in business in no time. This is a nice way to incorporate the ease of Pictorico Ultra Premium OHP negatives with almost anything you can think of scanning.

With a single 35-watt CFL florescent bulb (I use a CFL bulb, Calumet Quattro, set up with a single bulb) place the film positive, plastic side on top of, and in direct contact with, the silver sensitized collodion plate. Raise the light 5 to 6 feet over the plate and film and expose the plate with a simple flip of the on-off switch on the Quattro control pad. A nice film positive should expose well in 2-4 seconds.

To increase the detail and brightness of the resulting plate, as contact positive plates are often a little flat (like the difference between video and film), add 6-8 drops of silver to your ferrous sulfate developer before processing the plate.

***(Fig: 17 – 45 here**, Todd Vinson _1_Tree Against Storm, 2008 - wpc neg)*

TROUBLESHOOTING WET PLATE COLLODION

Here is a partial and interesting list of some of the things that can go astray when making wet collodion imagery. A few things on this list come from the Household Cyclopedia (1881), but most of it comes from making mistakes and watching my students make them… and then playing around until the answer comes. Ask any bear in the woods, playing is the best way to learn anything.

Please keep in mind that I am not referring to the following as imperfections and failures. To me they are "issues" that you may be having with the process. And, I keep telling myself; there is always the possibility that a flaw now will become a signature technique later on if you can repeat it.

Veiling

Veiling is a malady that presents itself to you primarily in hot weather and it has the look of sediment lying upon the surface of the plate. This is different than the look of an under-exposed plate that is weak and pasty, an over-developed one that is flat and lacking contrast, or a fogged plate that looks like it has a dull layer of fog over it. Usually it is caused by hot weather and it's easy to fix.

Simply take a cotton ball and while the plate is in the rinse tray, immerse the cotton ball and ever so gently clean the plate, being careful not to scratch the delicate collodion surface on the plate. That should take care of the veiling. The cotton ball is also a way to get rid of collodion bits and pieces that are sitting on the plate's surface. It will not, however, be able to free small bits and pieces from underneath the collodion skin that became part of your plate during the initial pour. Be delicate.

A veiling look can also be present if the silver bath is too depleted of actual silver. *See the Maintenance of the silver bath in this chapter.*

Hot Weather Fogging

When the cotton ball is ineffective in dealing with the veiling effect, and the weather is hot, the silver bath will occasionally be responsible for giving you a fogged plate that is similar in appearance to an over-developed tintype or ambrotype. One of the solutions to this problem, for me, is to reduce the 9% silver nitrate concentration to a 7% sensitizing bath.

The other thing I do is to cool off the silver bath, especially if you are working outside and the bath's temperature gets too hot. My method for cooling off the silver is to put water and ice in a picnic cooler, just enough to cool the inside of the cooler with

the lid closed but not enough to cause the silver tank to become buoyant… this is very important. The other solution is to mix your developer per plate using cold water with the overly warm developer.

One additional solution to overly warm developer is to dedicate your developer to a non-metallic thermos and to keep it in the refrigerator the night before using it. This will guarantee that your developer will be in the 40° F range prior to diluting it with distilled water for your plate development.

(Fig 17-46, Craig Barber_Jared's Sugarbush_2009 and on - wpc)

Hot Weather Development Technique

If you are used to processing your plates with a helper tray, you may find it more efficient to employ a hand-held plate development technique where you hold the plate and flood it with a coolish developer until you see the first hints of detail in the highlights. This seems to be effective in hot weather because of the increased speed in plate development.

In hot weather, the length of time taken moving the plate from the helper tray to the water bath is often too long and the plate suffers from over-development and a generally flat and uninspiring appearance. Holding the plate by hand allows you to immediately flood the plate with fresh water precisely at the perfect moment of development… once, twice, and three times in rapid succession. Then drop the plate into a clean water bath until the water flows off in a perfectly even sheet of water. Then move to a second clean water bath prior to fixing.

The temperature of your developer is quite important when the weather is steamy and hot. I have tried keeping the developer cool when using a tent for processing outside in hot weather and there is no decent way to accomplish this other than to use a cooler. It is important that the developer is neither too cool before processing, nor too warm. It is a “mama bear” middle temperature that is best.

The least problematic way to handle this is to keep your distilled water in a thermos, and when you dilute your overly warm developer stock with it, 1:1, the temperature will settle in at a nice 70˚ to 75˚ degrees. If you don't have to endure the heat, simply mix your developer to working strength at the beginning of the work session and don't worry about temperature.

For a Slower Development, Make It Colder

If you want a more leisurely development time, dilute your developer 1:3 and keep it in a cooler so the working temperature is somewhere in the vicinity of 30 to 60 seconds.

Adding a Few Drops of Silver Nitrate For Contrast Boost

When using a cold ferrous sulfate developer, especially a sugar developer, you can add 3 or 4 drops of your silver nitrate sensitizer to approximately a shot glass of ferrous sulfate developer. I find the development time is accelerated, that the highlights pop and appear to result in more silver on the plate, but that the shadow areas are not appreciably affected.

Double Silver Bath For Delayed Development

In hot and arid conditions you may find that your plate dries too quickly. This could be a situation that occurs due to any factor that delays your workflow. When you return to your work-space, you may see that the plate has begun to dry unevenly, which may have an effect upon the smoothness of your development pour. Visually, this is made evident by a collection of softly detailed drip-like lines that remain following the fixer. This appears to be the result of the plate drying out unevenly prior to development where the developer naturally gravitates more quickly to the moist parts of the exposed plate. The fact that you must stop your development so quickly is the cause of the unevenness. The solution to this problem is to re-immerse your plate in the silver bath for 20 seconds, or so, in order to re-saturate the plate's surface. This technique will allow you to have a smoother flow of the developer across the entire wet surface of your exposed plate.

Clouding

Full plate clouding comes from over-exposure, or diffused light leakage prior to development of the plate, or alkalinity of the silver bath, or too much, or too little, acid in the bath (nitric or acetic… more often than not it is too little), or organic matter in the bath, or the use of colorless collodion indicating something is way off.

Other things that it could be… vapors of ammonia or sulphuretted hydrogen (a poisonous and noxious gas with a smell of rotten eggs made by the action of acids on sulfides). Start by changing one thing at a time. The clouding may sometimes be eliminated by the application of a weak solution of tincture of iodine, followed by immersion into a solution of sodium thiosulfate fixer.

Random Spots Upon the Plate

Every so often, you will see random spots from excess of potassium bromide in the collodion, a contaminated silver nitrate sensitizing bath, a super-saturation of the bath with iodide of silver, dust upon the glass or coating (silver nitrate and organic matter are incompatible), or a situation where there is a concentration of silver nitrate drying before exposure. Again, begin trying to remedy one thing at a time until you figure it out.

Curtain-like Marks on the Plate Edge

This visual malady comes from the plate being too dry (you may have rocked too long) before dipping into the silver bath in low humidity situations, or not long enough in the first water bath to remove the greasy appearance prior to fixing. Be really careful of this last point if you are using potassium cyanide for a fixer. Acid in the developer that is left on the plate could be really dangerous to you when it goes into the fixer. A gas may result from contact between the developer and the acetic acid in the developer. Be sure that you rinse the developed plate until the water flows off the plate in a single, non-textured, perfectly smooth sheet of water. Visualize this and take your time.

Oily Lines – See above… from the removal from the first water bath too soon.

(Fig 17-47, Edie Fogel, Journey, 2012)

Silver Comets

Comets, or tiny star-like images in the universe of your plate, are the result of random bits of debris within or upon the collodion skin. There is often a perception that comets originate in the silver. My sense of the situation is that they begin in the collodion stage and become obvious following the silver sensitizing and subsequent processing of the plate.

As an example, as you unscrew the top of your collodion pour bottle, one that you have been using for a while, small little bits of collodion that have dried on the lip of the bottle, have a habit of falling onto the perfect surface of collodion that you have just poured. It sets rather quickly and on occasion it will set up with that little bit of dried collodion embedded in the recently poured surface. When you immerse the plate into the silver bath, the point of contamination becomes like a rock in a stream, causing the silver to flow quickly past the point of origin and forming a shape much like a comet. Unless the bit of dust or collodion is large, you generally don't see it until it's too late. If you do see it, it's too late anyway. The issue is physical and chemical.

Comets can also be created after the plate is removed from the silver-sensitizing bath, after removing your sensitized plate from the silver and loading it into the film holder. If you handle the loaded holder roughly you are likely to scatter a little dust debris on your collodion, resulting in comets.

Try your best to keep your silver bath, and collodion, really clean. Filter the silver bath often and if you have recently moved it, give it a chance to settle before immersing a plate. Handle your collodion gently. Always immerse, and remove, the plate slowly

into, and from, the silver bath. Try not to check on your plate while it's in the silver bath. Once you are in the silver bath, be patient and don't move the plate until the time is up.

Wavy Lines

These result from a host of reasons including the use of a glutinous, thick collodion from want of rocking when pouring off the collodion, or not getting the plate into the silver bath fast enough in very low humidity environment.

Curved Lines and Odd Abstract Shapes

Sometimes, the odd shapes of images are simply the result of pouring your collodion in a free will manner. If you like the look, feel free to pour creatively whenever you wish. Other types of odd shapes and marks occur because of uneven development. You can tell the difference because the odd shape collodion pours still have a nice image quality about them. Badly flowed developer has a more liquid appearance and the values in the image are uneven and partially realized and partially not.

Often, this comes from the developer not covering the whole plate immediately or thoroughly. A solution would be to change your developing style. If you have been using a helper tray, try hand-holding the plate and gently sweeping the developer over the surface and flushing the plate with clean water at the first sign of highlight detail. This will generally clear up the problem because holding the plate by hand, and balancing a flood of developer on the surface for that brief time, takes more focus and concentration… which generally leads to better development.

Yellow patches

This is often the result of imperfect removal of the silver iodide in the fixing bath and a good indication that your fix is getting really tired. You are going to want to filter it and repair it with fresh fixer.

Gray and Flat Image Character

This is most often the result of over-development. I usually begin to seriously consider ending the development when I see highlight details arrive in the shadows. A

good rule to follow when doing ambrotypes and tintypes is to over-expose in the camera and under-develop on the plate. When developing a negative, the development time is not as critical and you can survive an over-development easily.

***Fig 17-48 here**, Niles Lund, Collodion Spectrum*

Black and White

This can be explained by the spectral sensitivity of the silver iodized collodion that extends beyond the visible blue and into the ultra-violet region of the spectrum. The sensitivity of collodion begins to fall off around the middle of the spectrum, in the green region and that means that the colors below it, such as yellow, orange and red, will not contribute to a photochemical (actinic) response, meaning those colors will be recorded as black. The colors above the green, into the blues, violets and beyond, will be rendered as white. A sky with clouds is very difficult to capture as the spectrum of the white clouds has about as much blue as the sky itself. Lemons and tomatoes appear a shiny black, almost like tinfoil sometimes, and a blue and white checked tablecloth may be realized as a plain white fabric.

Collodion Curls & Albumen Subbing

This is a problem with ambrotypes and glass negatives. When using glass, the collodion sometimes lifts away from substrate. This is generally the fault of not cleaning the glass well enough, insufficient alcohol in the collodion or want of roughness of the edges of the glass. Try putting an albumen subbing solution on the edges of the glass plate with a Q-Tip. You might also try a product called amino silane which is used to create a micro-porous surface on different substrates when carbon printing.

One technique to help with holding the fragile collodion on the glass plate is to whip up some albumen (egg whites) subbing, and with a Q-tip, apply a thin coating around the front lip edge of your glass plate. You can also make up a batch of albumen subbing and apply it to a perfectly cleaned plate in much the same manner, as you would pour fresh collodion.

Albumen Subbing Formula To Prevent Collodion From Lifting Off Glass

- White of a single large egg
- 2 drops of ammonia (not totally necessary)
- 100 ml of distilled water

Whip the ingredients together in much the same way you do when making albumenized paper. Using a hand held blender, whip the albumen until there are no stringy "ligands" in the egg whites. If you don't have a hand blender, just put the ingredients in a small container and shake briskly. To use, simply paint a thin line 1/8" to ¼" wide line of albumen on the top and around the edge of the glass plate with a Q-tip.

Collodion Curl and Separation Due to Ether and Alcohol Problems

I'm going to quote my friend, Niles Lund, on the issue of collodion lifting off the glass plate due to the proportions of alcohol and ether in the collodion. This is, of course, a different issue than the usual problem of peeling collodion due to inadequate cleaning of the glass plate. Niles wrote, "Generally, collodion (5% USP, as obtained commercially) is thinned for use in photography with equal parts of ether and alcohol. If the relative amounts of each solvent (ether and alcohol) are varied along a continuum from primarily ether (and very little alcohol) to primarily alcohol (and very little ether), one will find the collodion film to vary in physical character from tough and leathery to spongy and fragile". Niles also wrote, "…these problems are intertwined as are so many in collodion work. Improper cleaning of the glass doesn't allow the collodion to stick as well, which allows the collodion shrinkage to exacerbate the problem by causing the film to peel up around the edges."

If too much ether is used, not only will the film be tough, but it will also be prone to shrinking on the order of 2.5% when it dries. This may not sound like much, but on a 10-inch plate, this is equivalent to 1/4 inch. It's this combination of shrinkage and the leathery nature of the film that's responsible for the film peeling and sliding off the

plate. To prevent this, it is necessary to increase the percentage of alcohol in the mixture. Begin by adding a volume of alcohol equivalent to 5% of the total collodion volume being used. Swirl the alcohol into the collodion mixture then pour and process a new plate. If peeling still occurs, add an additional 5% alcohol to the collodion and repeat.

Blue Tint in Parts of the Tintype

Recently in a workshop in my studio, after two straight days of beautiful coffee & cream highlights, and richly detailed mid-tones, we started to get a consistent blue tint on every plate. We made up fresh rapid fixer, tried double washing with distilled water, made fresh developer at 1:3 and still the blues persisted. Then we decided to extend the wait time from collodion pour to silver sensitizing from our usual 30 seconds to a minute. That helped a bit. When we combined that step with developing the plate 20 to 25 seconds past our normal stop and rinse point, the problem disappeared.

The blue malady is often attributed to a weakness of the bromo-iodizer in the collodion. I have an alternative theory. After three or four fresh water flushes to stop development, I usually put the plate in a tray of fresh water, and holding both edges, move it out of, and back into, the water much like the action of a plunger going through the water. This causes the physical flow of the water to be faster on the edges of the plate than in the center. If the rinse cycle is too short, when you can still see an oily resistance to water on the plate or when your last wash rinse is contaminated by too many washes without being changed, that would leave a bit of ferrous sulfate developer on the center of the plate. When that residual iron developer meets the fixer, it turns a random portion of the plate's surface area Prussian blue… or blue substance from iron.

Another solution to the blue tint is to extend plate development by diluting the developer with distilled water or in hot weather, adding a little additional acetic acid to the stock developer.

Crystals on the Plate

After the plate dries, following the fixer and wash cycle, you will notice a curtain of cool looking crystals covering the plate. This is usually crystallized fixer (sodium thiosulfate more than potassium cyanide) that has not been thoroughly removed from

the plate through washing. I have seen this with sodium thiosulfate when working in the field and when the final wash has not sufficiently removed the residual fixer.

Developer Flows Greasily

This happens because there is insufficient alcohol in the developer. Imagine pouring water on a baking sheet with vegetable oil on it… that's greasily.

A Mottled and Irregular Collection of Spots and Patches

This malady is often the result of developer that is too cold or too hot, that you stopped your development too quickly, or that your technique was less than stellar.

Islands and Lines on the Developed Plate

One very good explanation is an uneven pouring of developer on the exposed plate. As with pouring developer on a freshly exposed platinum / palladium print, any hesitation in the flow of the solution will be illustrated forever by these flaws.

Circular Pale Spots

A circular, and pale, area on one section of the plate is generally caused by pouring the developer on the plate with too much speed and from too great a height. These transparent / translucent areas cannot be fixed after the fact and are usually seen in one spot… where the developer first hits the plate. This also shows up as a lack of density in an area of a negative or over-brightness in a positive. One solution to the problem is to use a helper tray that is too large for the plate, pour the developer to the side of the plate in the helper tray, and in one motion, sweep a wave of the developer over the plate.

Crepe Lines / Curtain Lines

Crepe, or curtain, lines (sometimes referred to as "crinkles") look like the rippled beach sand in a tide line after the tide has gone out. In my experience, this seems to be a bigger problem for wet plate artists working in a hot and arid environment than in one where there is more humidity. Crepe lines can be the result of several factors. There may

be an excess of water in your collodion formula and a solution to this is to add a little more ether to your collodion mix.

Crepe lines can also become evident when there is too steep an angle on the hand held-plate after full collodion coverage in a dry environment. The solution to this is to add an excess of collodion to the initial pour on the plate. This excess breaks the surface tension and allows the collodion to not set up as quickly, causing the crepe lines to form while pouring back into the holding bottle. This situation occurs when people pour too little collodion on the plate in an effort to be thrifty with their collodion stock.

One more solution, that works especially well for me, is to rock the plate more slowly than is the normal practice, while simultaneously reducing the angle of the plate as you pour off excess into the holding bottle. Rocking the plate too rapidly after the collodion pour, combined with the steep angle as you drain the excess collodion back to the collodion storage bottle, is a simple problem to fix. Flatten the angle of the plate to a slight tilt to the pour off corner and rock very slowly, side to side without changing the angle. Again, this seems to be a problem associated with dry and arid air more than cool and humid air and when the collodion sets up more quickly than you might have expected it to.

(**Fig 17-49,** Bev Conway, Ambrotype of Sarazah, 2005)

Giving New Life to Old Red Collodion With Acetone

Acetone, $(CH_3)_2CO$, is a clear, flammable, liquid that is used primarily as a solvent, i.e. the key ingredient in nail polish remover and paint thinner. It can be added to an out-of-date not very light sensitive red collodion to bring that collodion back to life for another opportunity to make you happy. Simply add 2 ml of acetone (hardware store variety will probably be fine) to each 100 ml of old, red collodion. Within a few days, the red color will change to a pale yellow and will be useful again.

This information comes from a variety of sources and seems to have originated with a fellow named Alexander Murray in the early 1930s. Alex Timmermans ran a test in 2011 and got great results. However, he also discovered that using a sandarac varnish on the plate with the re-stored collodion was not very successful, probably due to the acetone itself. You might want to try Renaissance Wax if you are using the collodion with acetone formula.

An Overwhelming Darkness

The two most likely explanations of a wet plate without any highlight detail, or image presence, are the result of insufficient exposure or collodion that has seen better days. Try the exposure test first (*see the section in the workflow part of this chapter*) as that is the easiest solution to the problem. If increasing the exposure fails to fix the problem, take a look at your collodion and see if it appears dark red like an aged sherry. Check the date it was made. Is it over 6 months old? If so, try making up, or ordering, a new batch of collodion.

As mentioned in the collodion description in this chapter, collodion breaks down after a while and loses its effectiveness. Don't throw your old, red, collodion away. You can mix it 50% to 50% with your fresh salted collodion and reap the benefits of nice mid-tones with the old and punchy highlights with the new. You can fool around with this proportion in many ways but try to allow the newer collodion to dominate the refreshed mix.

An Overwhelming Brightness

If your tintype / ambrotype plate is very bright, almost like a mirror with a ghost image, you have exposed far too much silver and have negated the lovely optical effect of the under-exposed image upon a dark background. The simple solution is to re-work your exposure calculations.

Sometimes It's just Fog

Of course, sometimes the brightness is simply a case of fogging. The light that causes this effect can come from anywhere and is somewhat common to those explorers

who work out of the backs of their cars and trucks, and in ice-fishing tents. More often than not, it is caused by a light flare, or leak, somewhere along the workflow following the silver sensitizing. The most common places to look for the problem in order of possibility (in my experience) are problems with the plate holder, the bellows of your camera, and believing that red cellophane is a perfect safelight.

There are many logical tests for determining where the light leak is coming from and the most obvious one is to test a sensitized plate without actually trying to expose it. For instance, loading your plate holder with a sensitized plate and walking outside into the sun with it and then returning to the safe space and developing it. If you see any lightness after development, then your holder is the problem and requires attention.

A bellows test is pretty simple as well. Load the plate holder with a sensitized plate, once you have determined that it is not the cause of the problem, and put it in your camera. Leave the lens cap on the lens. Pull the dark slide up a quarter of the way for 15 seconds. Then repeat this step three more times. Return the dark slide to the plate holder and go and process the plate. If you see any brightness, then the bellows, or some other critical part of the camera near by, is letting in light. The reason for the strip testing is to see how bad the leak is and what you can get away with before having to go to the expense of replacing your bellows.

Remedy For a Foggy Silver Bath

This is an entry from Thomas Warwick in *Photographic News for Amateurs*, August 1859, dealing with silver bath problems he was having at the time.

Sir, - I constantly see in the "News," and other journals of the kind, inquiries how to recover a silver bath that has acquired fogging properties. I have just recovered a bath from the worst state I have ever seen one in, to give one of the brightest positive pictures that has ever come under my notice. I had been trying experiments, and had used it for gelatine, honey, gum, raspberry syrup, paper, and I hardly know what did not go into it. When I had done, I thought, well, now I will try a collodion plate in it; the result was as might be expected. Scarcely, (after a prolonged

exposure), after being held up to the light after developing, was any picture visible, and to look upon it's surface it looked like a piece of whity-brown paper laid on the glass rather than collodion; now was the time to try the effect of "sunning." I put it out in full sunlight for an hour, carried it back to my dark room till the morrow, when I tried it again, and I got a plate not a whit improved; on filtering, I found a large quantity of black precipitate on the paper; I had about 3 pints of (silver) bath and of course did not want to lose it.

I then put into it about a small teaspoonful of carbonate of soda, let it stand till the next day, when I filtered it, and added acetic acid for a positive bath, and the result is, as I have before stated, the cleanest and brightest blacks in the shadows I have ever seen.

Increasing Image Brightness Nitrates

If you find that your highlights are a little flat and need some brightening, and you are not using potassium cyanide as your fixer, which would brighten them considerably, you may "goose" your developer a bit by adding small amounts of either potassium nitrate (saltpeter) or silver nitrate (from the iodized sensitizing bath) to your working developer concentration. Using a pipette, add a few drops and see if you notice a difference.

(**Fig 17-50**, Christopher James - Brannen Vick, Santa Fe, 2010)

Wet Plate Karma

I will repeat from the intro… Sometimes you eat and sometimes you are eaten. Learn to love your accidents and be patient. There are days when even the most meticulous wet plate artists can't get out of the "weeds". When this happens, don't get angry or frustrated. Stay positive; only make one correction at a time. Keep good notes, and the problems will work out.

PRESENTATION OF COLLODION POSITIVES

Museum Mount Tintype Presentation

Tintypes are elegantly simple to present. Go to the hardware store and get a tube of GE Clear Silicone II. Cut a museum mount style window mat (hinged double board mat with the front mat cut to create a window) with the window opening slightly larger than the plate dimensions. Make a hinge with linen bookbinding tape between the two parts of the mat. Position the tintype so that it sits perfectly in the window opening and make small pencil marks to show you where your plate will be positioned. Take the plate and apply a drop (about the size of a dime) of Silicone II to each corner of the plate and one drop to the center. Carefully position the plate, according to your light pencil markings, on the back base board and let it sit flat for a few hours while the Silicone sets up. That's all there is to it.

Single Glass Mount

The collodion image was made on a single glass plate and placed in a case with the collodion side down to prevent abrasion of the image. The back of the plate was blackened to allow the shadows (the more transparent areas of the exposure) to appear black, with a black asphalt varnish, dark fabric, paper, or japanned ferrotype plate. This allowed the viewer to see the image in a "right-reading" positive form.

Note: Applying black paint, black varnish or asphaltum directly onto the collodion surface is not recommended. Historic examples are often found in very poor condition.

Double Glass Mount

This double glass method was more expensive and used when a collodion plate could not be turned over as in the case of ferrotypes, ruby glass ambrotypes, or on clear glass ambrotypes with delicate tinting on the collodion surface. Images were presented collodion side up and because of this they were laterally reversed. This allowed the subject to view their image as they saw themselves in the mirror… a very natural way of seeing ones portrait.

The Cutting Patent Method

A variant of the positive collodion on glass was invented by James Ambrose Cutting of Boston in 1854. A positive image on clear glass was sealed with a separate piece of glass applied to the collodion side of the plate. The cover glass was permanently cemented in place with small amounts of Canadian balsam in the fashion of microscope slide preparation. Cutting used the term Ambrotype in his English patent and although it refers specifically to collodion positives mounted in this fashion, all positive, in-camera, collodion images on glass were eventually called ambrotypes and the term became generic.

Fig 17 - 51 here, *(France Scully Osterman, The Assumption 1999 – Relievo Variant triptych, three tinted double-plate relievo ambrotypes, tinted with gold leaf, 16" x 20" total, Private Collection)*

Relievo Variant

Another presentation method provided the viewer with a 3-D effect. The positive collodion image of a subject seated in front of a dark-colored background was made on clear glass. When the plate was processed, a black varnish was painted on the reverse of the plate but only in those areas where the subject of the image appeared on the plate. An optional method of the Relievo Variant is to expose a fully exposed and processed second plate and then lay the two plates of glass together, providing the impression that the subject was in relief against a light background. The most amazing 19th century relievos feature a complete second collodion image under the first with a scenic background (either real or painted) behind the subject.

Recycled Cases on eBay

One of the easiest solutions for tintype or ambrotype presentation is to go to eBay, or a similar auction site, and go hunting for old Daguerreotype and ambrotype ornate cases. Simply bid and win and when you get the case, clean up the wood, cushion, and bright-work, cut your plate to size, and install. Simple as can be.

SETTING UP YOUR WORKING SPACE

For those of you who are considering going out into the field and romantically making wet plates out of the back of a horse drawn darkroom on wheels, have fun. If you want to hit the road with your wet plate process there are a number of nice resources for you:

• Make your working space as bright as possible. You can illuminate with red safelights and decorative string lights and since you only have to really keep it UV free for the plate holding and development moments, you should do what you can to make sure that you have plenty of light for every other stage in the process.

• John Coffer's, *Wet-Plate Collodion Photography in the Field Workshop Manual or The Doer's Guide to Wet-Plate Photography*. You can find models of his traveling darkroom and perhaps be inspired to attend his Camp Tintype in Dundee, New York and use it in the field.

• Will Dunniway also has a nice layout for a traveling wet plate lab in his manual, The Wet Collodion Plate.

• My former student Lisa Elmaleh makes her plates in the Everglades out of a lab in the trunk of her car and I have other students who prefer used Toyota trucks with caps on them for their wet plate lab.

Fig 17-52 Lisa Elmaleh, Lisa's Everglades Car Trunk Darkbox, 2010

Fig 17-53, Lisa Elmelah, Mangroves, 2010

• Workshop situations would require a larger lab and for this you could rent a truck and outfit it with blackout curtains and an exhaust fan. However, there is a very nice solution for being on the road and that is a red ice fishing tent. Eskimo QuickFish 3

is the name of the product and it will fill all of your outdoor lab needs for only $179.00. You will have to purchase a plastic, or canvas, tarp for the floor to keep out dust.

• Black Art Woodcraft (www.blackartwoodcraft.com) makes a very nice traveling dark box that can be easily adapted to the road. It's expensive but wonderful and you only live once.

(**Fig 17 –54,** Black Art Woodcraft Traveling Dark Box at a Will Dunniway Yosemite Workshop (Bob Szabo)

The less adventurous can make a space at home that isn't too complicated and one that doesn't involve a lot of waste. If you have an unused home darkroom, and still have an exhaust fan and a safelight, you are good to go. In fact, I installed a window in my lab after the enlarger left and blocked the light with a removable piece of thick foam-core. I'll let you figure out your own set up but here are the basic lab needs. Go to www.lundphotographics.com for developer helper trays, dip tanks, and dipper paddles.

HOMEMADE CFL LIGHTING SET-UP

My friend, and former student in an assortment of alt process workshops, Michelle Cole, was generous enough to send along her solution to creating a consistent wet plate CFL (compact florescent light) lighting set up for a reasonable investment. Her idea is an excellent one for those of us in parts of the world where winter happens or for those who want to work on their plates at night at home. In a proverbial nutshell, here is her set-up.

(Fig 17 –55, here, *(Michelle Cole CFL set-Up)*

What you are seeing in the illustration are two homemade soft-boxes constructed with wire hangers, aluminum foil, and vellum. The CFL's are inside of course.

Michelle writes, “My "strip" lights consist of a 10-outlet power strip bungeed to a light stand. I then used socket-to-outlet converters to attach single to double bulb sockets. The nice thing about the power strip is that I can position the lights anywhere I want on it - high or low.” She added that she has an idea of improving on the soft-boxes by constructing them out of foam-core and lining the inside with foil.

Since collodion is most sensitive to blue light, Michelle opted to use the highest temperature CFL's she could find.

- All bulbs were purchased from:
  www.1000bulbs.com.
- The 16 smaller bulbs are: 30watt (120watt equivalent) and 6400K
  https://www.1000bulbs.com/product/1598/FC30-FEIIS30W65.html.
- The 4 larger bulbs are 65watt (300watt equivalent) and 6500K
  www.1000bulbs.com/product/6052/FC65-S65.html.

With a fresh batch of collodion, her exposures are between 20-30 seconds with these lights configured as pictured.

*(**Fig 17-56**, Michele Cole_Sticks_(tintype)*

STUDIO LIGHTING OPTIONS FOR WET COLLODION

Falcon Eyes Daylight Kit For Wet Collodion Exposure

My Friend, Alex Timmermans, in the Netherlands, uses a Falcon Eyes Daylight Kit LHD-B928FS for his wet collodion studio exposures. This very powerful daylight kit features two lamps with nine 28-Watt daylight bulbs each. The light output of a 28-Watt Spiral lamp is comparable to 140-Watts normal light. An added benefit is that you can switch the lamps on and off in pairs of two to adjust the right amount of light. Included in the kit: 2 x Lampholder LHD-B928FS, 2 x Light Stand W805, 2 x Octabox 80 cm, 18 x 28W Spiral Lamp. This is an excellent system for studio wet plate but it is difficult to find the units in the US. The Westcott Spiderlite is a good alternative... few heads but a similar output.

Westcott Spiderlite TD6

B & H sells the Westcott 1200W Spiderlite TD6 7' Parabolic Umbrella Kit and this is what they say about it. “This is a powerful daylight source with added punch thanks to its silver interior. Imagine welding several beauty dishes together, then add the wrap-around light quality of a really large light source and you have the Parabolic Umbrella. It features a solid metal shaft that tapers to 7 mm to fit European type heads like Elinchrom, as well as standard 8 mm models. The included bonus front diffuser offers even softer results.”

The Spiderlite TD6 kit includes the TD6 lamp head and 6 digital-friendly, daylight-balanced, 50W full spectrum fluorescent lamps with a CRI of 90+. Three switches on the light head allow you to use 2, 4 or 6 lamps to control power output. It features all-metal construction, 180-degree rotation and a built in adapter ring. Retail in 2013 was around $500.

CLOSING THOUGHTS

The wet collodion negative was used as the primary camera image for all of the major printing processes of the 19th century including; salted paper, cyanotype, albumen, carbon, Woodburytype, lantern slides, Orotones, milk glass positives, Ivorytypes, ceramic photographs, gum, platinum, gelatin and collodion printing-out papers. Dye-sensitized collodion negatives were used for the first color processes. The wet-plate collodion process was also used for in-camera positive images such as ambrotypes and tintypes. Collodion emulsions were also used for dry plate negatives, lanternslides and collodio-chloride POP printing-out papers.

Learning the basics of wet collodion is generally more difficult than other historic alternative printing processes simply because so many different things can go haywire so quickly. Today, a graduate student of mine called to ask why her perfectly good silver nitrate bath had turned nasty on her and become coffee and cream brown between one plate and the next. In this case, we simply began with checking the pH of the silver and going from there. Make no mistake about this, mastering a collodion variant requires a serious commitment in both equipment and time. While you can teach yourself from

reading this chapter, or other historic literature, the best way to shorten the learning curve is to attend a collodion specific workshop or arrange for a private tutorial.

Fig: 17 – 57, here, *(Christopher James, Portrait of Nelske, 2010)*

Shameless Plug

There are now many competent collodion specialists teaching the basics of the collodion process, and if you have the opportunity, seek them out and spend a week learning the process at a sane pace. I personally teach several workshops each year at The Santa Fe Photographic Workshops, in Santa Fe, NM and have an outstanding group of assistants who make the experience a perfect one. I also teach one to three person workshops in my studio in New Hampshire. The process is a featured technique, as a thesis direction, in my MFA program at The Art Institute of Boston at Lesley University, where the spirit of the program is centered on alternative processes, artist books, and all of the ways that photography is integrated into all mediums.

Mark Osterman and France Scully Osterman have long been champions of the process and conduct private tutorials in their studio in Rochester, NY. Mark teaches the technical evolution of photography, from the earliest Niépce processes to making gelatin emulsions at the George Eastman House / International Museum of Photography. His wife France is equally skilled as a practitioner and artist. The Ostermans were among the first to pursue serious research on the modern collodion process and continue to be an influence on the photographic fine art community.

Another workshop experience that would be outstanding for those really dedicated to "old-school" experiences is John Coffer's Dundee, NY wet plate collodion camp. At John's Camp Tintype, everything is made from scratch and the atmosphere can only be described as "authentic." If you are on the west coast, Will Dunniway, in Carona, CA., offers workshops on a regular basis and is a master technician.

Fig: 17 - 58 here, *Will Dunniway, Floyd Oydegaard, Bear Coat*

A FEW RESOURCES

Bostick & Sullivan – www.bostick-sullivan.com
Dick Sullivan, Dana Sullivan, and Melody Bostick have been my friends and suppliers of chemistry for decades. A great and trusted business for all your alt pro needs. They also sell prepared wet collodion kits and prepared, cut to order, black plates.

Niles Lund – www.lundphotographics.com
Niles is an engineer and avid wet plate photographer. He has a full range of uniquely designed wet plate products and adaptations such as dip tanks for silver and fix. He also does custom lens boards and plate holders out of a black lexan polycarbonate resin that doesn't break down or absorb silver or collodion. Beginning in 2012, Niles will begin selling a heavy gauge tintype stock that is white enameled on one side and gloss black, with protective film, on the other.

Artcraft Chemicals – www.artcraftchemicals.com
Mike Jacobson is a very knowledgeable chemist and businessman and can answer most every chemical question as well as supply anything you need for wet plate chemistry.

Alpine Stained Glass – www.alpineglass.com
They sell a full selection of glass and cutting material and tools. Look for deep purple, black, ruby, and deep blue glass for ambrotypes.

Main Trophy Supply – www.maintrophysupply.com
Supplier of prepared, cut to order, black plates with a protective film. They also sell plate cutters that are relatively inexpensive and cost efficient if you are cutting a lot of plates for multiple size plate holders.

Black Art Wood Craft – www.blackartwoodcraft.com
They make all sorts of wet plate objects such as cameras, tanks, plate holders, etc.

Western Bellows – email: westernbellows@aol.com
Jim Ormand makes replacement and new bellows for your camera.

Clarkson Laboratory & Supply Inc. – www.clarksonlab.com
Wet Plate chemistry including the hard to order potassium cyanide.

***Fig 17 – 59 here**, Christopher James, Keith Carter w/Eskimo Ice Fishing Tent_Santa Fe Workshops, 2012)*

Eskimo Ice Fishing Tent - www.geteskimo.com - They make a nice selection of outdoor environments in the form of ice fishing tents, notably the QuickFish 3, that accommodate 2 and 4 people, tables, and chemistry. You may need to paint the outside roof area white to keep the temperature cool in the summer and / or reinforce the seams with a liquid black electrical tape solution. These tents are lightweight and inexpensive and great for workshops and travel.

In Camera Industries – is a customized plate holder manufacturing enterprise run by noted wet plate collodion artist, Jody Ake. Jody is making 4x5 and 8x10 holders presently but will have 5x7 and 11x14 holders by the time you read this sentence. There is more info at http://incameraindustries.com/

Unlike standard wood plate holders, each plate holder design is more precise, lighter weight, and far less vulnerable to staining and decomposition. These holders can be used for wet collodion (ambrotype/tintypes), paper negatives, dry plate, daguerreotypes, and any in-camera process. In addition, the holders are crafted to fit all standard cameras, barring the need to retrofit, trim or alter the camera, plate or holder.

WET PLATE COLLODION SIZE DESIGNATIONS:

Traditional Whole Plate:	6 3/4 ” x 8 ½ ”
Japanese Whole Plate:	6 7/16” x 8 7/16”
American Half Plate:	4 ¼” x 5 ½”

European Half Plate:	4 3/4” x 6 ½”
Japanese Half Plate:	4 5/8” x 6 7/16”
American Quarter Plate:	3 ¼” x 4 ¼” and 3 ½” x 4 1/8”
Kodak Brownie 3A with bellows:	4 1/16” x 4 ¾”
Kodak Brownie 2C box / no bellows:	3 3/16” x 5 11/16”
Holga with gaffer’s tape shelf lip:	2 7/16” x 2 11/16”
Eighth Plate:	2 1/8” x 3 ¼”
Ninth Plate:	2” x 2 ½

Fig: 17 - 60 here, *Michael Kolster, ribbon – (ambrotype)*