

THE BOOK OF ALTERNATIVE PHOTOGRAPHIC PROCESSES: 2nd Edition
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SAMPLE - CHAPTER 21
THE ALBUMEN PROCESS

[Fig 21-1 here](#), (France Scully Osterman, Embrace, 2002 – gold toned albumen / H. Greenberg Gallery)

OVERVIEW & EXPECTATIONS

This chapter is pretty direct in its intentions... to guide you into making albumen prints with as few problems as possible. I'll begin, as I do in every chapter, with "a little history" about the brief and luminous life of the albumen process... a beautiful and labor-intensive technique involving egg whites, salt, acetic acid, silver nitrate, and occasionally, gold chloride. You will learn how the process works and how to prepare the chemistry with both the traditional, and contemporary, raw egg white albumen. I'll also be offering you Zoe Zimmerman's unique matte albumen method. This technique will be in print for the first time and is the one I use exclusively to introduce students to the process. It is also my favorite way to make an albumen print. I'll also describe the "instant gratification" and powdered albumen versions of the technique and will do my best to simplify the coating, printing, processing, toning, and fixing stages. I'll go over some trouble-shooting issues and discuss the importance of not taking too many short cuts. This technique is truly beautiful, and one of my personal favorites.

[Fig: 21 – 2 here](#) (Nadar, Self Portrait Carte d' Visite in hot air balloon - 1863 - albumen)

[ICON – 1 here](#) (A Little History)

A LITTLE HISTORY

The earliest photographic prints on paper were created using sodium chloride salted papers that had been sensitized in a bath of silver nitrate to create UV sensitive silver chloride. The principle fault of the salted silver based processes of this particular technique was that the salted paper print was most often dull and lifeless due to a dilute 1:1 albumen and water surface coating, and to the absorption of the sensitizer by the paper's fibers.

You will recall -- from the 1860 exchange of letters between Henry James and William Henry Fox Talbot (Chapter 17, Dichromate Options) that Fox Talbot had been thinking about gelatin and gum binders for silver nitrate since 1840 when he performed some experiments involving albumen on glass that he fumed with iodine and then sensitized with silver nitrate... creating a light sensitive silver iodide coating. In conjunction with that work, Talbot also conducted several experiments that included combining albumen with potassium iodide. According to his notebooks, none of these albumen binder processes met his expectations or were successful.

In 1844, in Boston (*home of the Red Sox*), John Adams Whipple (*See Fig 1-6, his Daguerreotype of the Moon from 1852*) and his friend, William Jones, conducted a series of investigations using Fox Talbot's calotype chemistry on glass plates coated with milk. This proved to be less than successful so they switched to albumen as a binder and for the next several years worked on perfecting their new technique. Their work, like Talbot's early albumen experiments, was never officially recognized, nor formally presented or published.

In 1847, Claude Felix Abel Niépce de St. Victor (1805-1870), a career cavalry officer, and cousin of Nicéphore Niépce, published a detailed description, in the *Compte rendus des Séances de l'Académie des Sciences* (a prestigious French scientific journal that has been in existence since 1835), of his experiments incorporating starch, as a photographic binder, on glass. In his account, he described how a glass plate was coated with potassium iodide mixed in a starch binder solution of albumen. Once the solution had dried on the glass plate's surface it was sensitized with a solution of aceto nitrate of silver (*silver nitrate with added acetic acid*) and exposed to sunlight in contact with a

negative of some type. Following a rather fast exposure of approximately 20 - 25 seconds, the sensitized glass plate was developed with a solution of gallic acid (notice the direct relationship to Fox Talbot's initial calotype development technique), resulting in a finely detailed plate.

At the conclusion of his article, Niépce de St. Victor recommended replacing the starch with the superior albumen binder and briefly documented the preparation of the albumen and its use. Unfortunately, the process was unacceptable for portraits because an average exposure with his new technique took 15 to 20 minutes. Not only that, the development of the plate with hot gallic acid required hours of intensive labor and the rapid oxidizing nature of this acid, I will speculate, likely resulted in far more failures than successes. Even more unfortunately, Niépce de St. Victor's plates, notes, and journals were destroyed during the 1848 public riots of the second French Revolution,

[Fig: 21 – 3 here](#) (Louis Ducos Du Huron, Self Portrait Made With Distorting Camera, 1888 - albumen)

In 1849, Louis-Désirée Blanquart-Evrard (1802-1872) devised an albumen paper process (a silver chloride sensitizer with an albumen binder) that was remarkably similar to Niépce de St. Victor's, and that featured the option of being exposed in either a wet or dry state. Coincidentally, Blanquart-Evrard's inspiration occurred at the same time when many photographers were adopting the practice of shooting very large glass plate negatives. This demanded a different and more explicit translation of detail than salted paper could ever provide.

Within a year of his discovery the entrepreneurial Blanquart-Evrard plunged into a very successful business of mass-producing albumen images utilizing his recently announced technique. In his establishment, Blanquart-Evrard worked with the top photographic artists of the day, i.e., Le Secq and Du Camp, and published the esteemed *Photographic Notes* with his partner, Thomas Sutton. Their enterprise, founded in Lille, France (1851), was the first commercial photographic printing and publishing firm in history.

[Fig: 21 – 4 here](#) (Robert Howlett, Isambard Kingdom Brunel, 1857 - albumen)

At this point, the albumen concept was getting a lot of attention. Fox Talbot, as was his habit, quickly placed a patent on the concept of the iodide fuming sensitization of albumen. Niépce de St. Victor recovered from the riots and published a declarative manuscript on an improved albumen process (*including the addition of honey into the albumen binder to counteract the problem of cracking*), and John Whipple finally got around to publishing the work he did with Jones and placed a patent on his version of the albumen process... which also incorporated honey and bromide salts. In fact, it was Whipple who first incorporated honey into the albumen.

Blanquart-Evrard's albumen technique, when used in combination with Frederick Scott Archer's wet collodion glass plate negative process (1851), was considered the first true and repeatable paper-based imaging system capable of yielding values and details that were commercially viable and commensurate with the Daguerreotype image on silver-plated copper. In its formative stages the results of the process were often flat and uninspiring. This problem was rectified by the adoption of a gold chloride toning process, which resulted in an intensification of print "color" and a variety of tonalities ranging from aubergine, purple, red, and brown to black. Aubergine was the color the early practitioners were aiming for and the intensification was needed due to the 1:1 albumen dilution.

[Fig: 21 – 5 here](#) (Lewis Carroll, (Charles Dodgson), Irene McDonald, 1863 - albumen)

For over 30 years, the albumen process was *The Process* in photography and its consistency - relative to other image making systems that were known at the time - rivaled silver gelatin papers in the modern day. Prepared albumen paper, *without the silver sensitizer*, was commercially produced for an exploding photographic marketplace and the insatiable demand for the paper, by both professional and amateur photographers, was unprecedented. One of the most common, and oft repeated, anecdotes from that era is that the Dresden Albumizing Company, in Germany, used

more than 70,000 egg whites per day to meet the albumen paper demands of the public. It is interesting to note that only women were hired to prepare the albumen paper because it was believed that their hands and touch were softer than a man's.

In the last few years there has been a resurrection of the albumen process by contemporary artists whose work equals, and in some cases greatly exceeds, the qualities of the original albumen techniques. With the advantages of contemporary image making systems and concepts, photographic artists are once again being charmed by the absolute beauty of the process. Among the best are Zoe Zimmerman and France Scully Osterman.

Fig: 21 – 6 here (Zoe Zimmerman, *Under Your Hat*, 2006, - gold toned matte albumen)

HOW THE TRADITIONAL ALBUMEN PROCESS WORKS

First, I am going to make a distinction between what I call the traditional albumen method and others... such as Zimmerman's matte albumen technique. In the traditional method, the preparation time is lengthy and quite fussy. In a more contemporary way, such as the matte albumen, the process is quite fast and less complicated.

A piece of fine-quality, lightweight drawing paper, stationery, vellum, or glass, is initially coated with a thin layer of albumen in a solution of either ammonium chloride or sodium chloride (*kosher salt*), in combination with acetic acid and distilled water. Don't simply go to the market and buy some table salt. If you are going to go the sodium chloride route, use kosher salt, rather than a conventional table salt, as it is pure sodium chloride and is not cluttered with additives.

Several days later, the prepared albumen paper is sensitized by floating it in a distilled water and silver nitrate solution in a tray for 3 minutes, or by brush coating. As soon as the paper is dry it may be used. You will load your newly sensitized albumen paper into a contact printing frame with your negative (*negative density range is a high*

2.0 to 2.2 with this process) and exposed to UV light until the image prints-out and begins to show signs of dark metallic “bronzing” in the darkest shadows.

The exposed albumen paper is given an initial rinse in either tap water containing chlorine or distilled water with a pinch of sodium chloride (kosher salt) to remove a good portion of the excess silver nitrate by precipitation. It is vital to remove all of the excess silver before toning. At this point, think about either toning for color and permanence, or about going directly to a double-tray set up of 15% sodium thiosulfate (plus 2 g sodium carbonate to make the solution neutral). The prints will be immersed in the separate fixing baths for 2.5 minutes in each tray, washed for 20 to 30 minutes, and hung to dry.

The resulting print is quite often the perfect technique, even for the most discerning alt pro artist, due to its clarity, resolution, and surface elegance. The principal reason for this clarity is the albumen base support, which has an important function: it fills the pores in the paper, like a gelatin glyoxal sizing stage in gum bichromate, preventing the sensitizing solution from being swallowed up by the paper.

Another reason for the increased clarity is that albumen is an organic sensitizer that results in greater printing speed and contrast than can be obtained with plain salted paper. This results in the paper having a thin, and thoroughly saturated, sensitized “skin.” It is this albumen skin, working as a colloidal binder, that holds the light-sensitive silver salt in suspension above the paper’s surface, providing a finely detailed image that is essentially unaffected by the substrate’s texture. Albumen is a beautiful thing.

Fig: 21 – 7 here (Mike Robinson, Flatiron Building, NYC, 1996 - albumen)

ICON – 2 here, (Table Set Up)

TABLE SET UP FOR TRADITIONAL ALBUMEN PAPER PREPARATION

- Pencil
- Electric hand blender wand (very inexpensive on eBay)
- Refrigerator (not required for the Zimmerman Matte Method)
- Cheesecloth or fine strainer
- A large funnel
- 2.5 dozen large eggs
- 28 % acetic acid
- Distilled water
- Ammonium chloride
- Mixing bowl
- A new dark glass bottle for storing the albumen
- A marker and tape for your label
- Clothesline and clothespins

THE ALBUMEN

If you are into “process,” you will have a lot of fun making the albumen solution from raw eggs... and you will end up with more yolks than you can safely consume. In the past I recommended considering the use of prepared powdered albumen... or developing serious cholesterol based passion for the leftover yolks, which can be used in making crème brûlée... see the great recipe below!

METHOD #1: TRADITIONAL RAW EGG ALBUMEN

Traditional Method

- 16 Jumbo Size Eggs
- Good hands or a yolk separator
- 2 ml 28% acetic acid
- 15 ml distilled water
- 15 g ammonium chloride

If you double coat, you will need: (*See below*)

- 500 ml of 70% isopropyl alcohol
- 15 g ammonium chloride

Separate the Yolks from the Albumen

To make 500 ml of albumen (*enough to double coat about 75 8"x 10" pieces of paper*) you will need about 16 large size eggs. (I recommended 2.5 dozen in case you decide to make the Zimmerman matte method or you get yolk in your whites and must begin separating again.) Carefully separate the whites from the yolks with a yolk separator, or with the shell halves like a professional chef, and add them into a non-metallic mixing bowl until you have 500 ml of egg whites (*albumen*). Avoid any shell bits, yolk parts, blood, or odd stringy stuff in the whites.

Note: If you make any mistakes at all, like a little bit of yolk in the albumen, start over. Some albumen printers separate their egg whites in small batches to avoid yolk contamination. When the albumen looks perfect, add it to the larger collection of egg whites. You should now have 500 ml of pure albumen in a non-metallic container.

Adding the Chemicals

To your 500 ml of albumen, add:

- 2 ml of 28% acetic acid
- 15 ml of distilled water
- 15 g of ammonium chloride.

Whip It Good

Whip the egg whites into stiff peaks (*like the top of a Starbucks latte*). If you are being true to this idea of tradition, you will be using a bundle of quills to whip the albumen. If you don't have time to pluck a goose, use an electric blender wand. Let the solution sit overnight, uncovered and un-refrigerated, just as they did in the 19th century. The foam will settle revealing to a clear yellow liquid with a thin crust of white dried albumen by the next morning. When you wake up, while the coffee is brewing,

simply poke a hole in the crust and carefully pour out the clear albumen into a pristine and clean glass container. If you're careful, you won't even need a filter. Allow the solution to age another 24 hours at room temperature. Warmth breaks down the proteins but if you can't take the aroma, cover the container and put it in the refrigerator.

[Fig: 21 – 8 here](#) (Dan Estabrook, Interior, Floating Cloth, 1996 - albumen)

Strain and Refrigerate for a Week

On day # 2, remove the now-liquid egg whites from the refrigerator and let them warm to room temperature. Remove the froth that has settled on top of the albumen mixture and strain the solution through cheesecloth. Return the solution to the refrigerator where it will do absolutely nothing for the next week.

Once your albumen has been removed from the refrigerator simply keep it at an ambient temperature out of direct sun. I store mine in a cardboard box with bubble wrap around the glass bottle. Your new albumen solution should be kept in a well-labeled container. If it gets too cold you will get dull images. If it gets too hot you will get a toxic omelet... trust me... this is not a pleasant situation. Clearly you can see that this process takes some adjusting to. It is slow and methodical and totally antithetical to a 21st century instant gratification mentality. This is exactly why the people who make albumen images love the process.

[Fig: 21 - 9 here](#) (Zimmerman, Renaissance – matte albumen)

METHOD #2: ZIMMERMAN'S MATTE ALBUMEN PROCESS

Method #2: Single Session Raw Egg Albumen Process

This is my favorite albumen method and one that I use in a class or workshop teaching situation for a single session demonstration. I really appreciate the simplicity of the technique and love the color and quality of the matte image on a perfect paper substrate. This albumen recipe was given to me by Zoe Zimmerman who is, in my

humble opinion, one of the very best albumen printers working today. Zoe's signature matte albumen printing method varies from the traditional technique, both technically and visually, in several ways. You can print within an hour or two of your albumen preparation. It opens up the option of making prints on a greater variety of papers, including thick printmaking papers, as no floating is required or necessary. As well, the highlights tend to be whiter than those in the traditional albumen print (*likely due to the citric acid in the formula*) and when toned with a thiocyanate toner, the prints mimic the tonality, surface and color (depending on time and mix) of a Pt / Pd print. Here's her process.

[ICON – 2 here, \(Table Set Up\)](#)

TABLE SET UP FOR ZIMMERMAN'S ALBUMEN PAPER PREPARATION

- A large 2-liter plastic beaker or mixing bowl
- Pencil
- Paper towels
- An electric plastic kettle – dedicated to heating salts and citric acid
- A large beaker of wash water (albumen gets sticky)
- Electric hand blender wand (very inexpensive on eBay)
- Cheesecloth or muslin for straining albumen foam
- A large funnel
- Distilled water
- 2.5 dozen large eggs
- Citric acid
- Sodium chloride
- Tapioca starch
- A new dark glass bottle for storing the albumen
- A marker and tape for your label
- A selection of fine paper for albumen coating (see below)
- A thick piece of Lucite or glass

- A good squeegee
- Clothesline and clothespins

ZZ Albumen Starch Solution

40g Sodium Chloride

3g Citric Acid

40g Tapioca starch

1 liter distilled water

2 1/2 dozen eggs

Step #1 - Mix the sodium chloride and citric acid into 950 ml of distilled water in a non-corrosive pot. Stir until the chemistry is dissolved and then bring it to a gentle boil. I like using an electric kettle with a hidden heating element. Look at Chef's Choice models.

Step #2 – Meanwhile, mix the tapioca starch with the remaining water until it looks like paste and there are no lumps in it. Add this *roux* mixture to the boiling citric acid and sodium chloride salt solution from Step #1 while stirring constantly. Stir until the mixture appears translucent as opposed to white & starchy. This will take about 3-minutes.

Remove the mixture from the heat and allow it to cool to about 110° F. When the solution is sufficiently cool remove the foam - skin from the liquid surface and strain the remaining solution through cheesecloth-lined strainer. You may have to do this a few times but don't get compulsive about it.

Step #3 - Next, separate the egg white from the yolks. Can you do this like a professional chef? - Crack the egg cleanly and then shift the egg contents back and forth between eggshell halves as the white albumen slurps (I can't think of a better way to describe what the albumen is doing) into the holding container and the yolk stays in the shell. If not, use an egg separator.

Whip the egg whites in batches of 500 ml, with a hand-held blender wand, for one or two minutes. Allow the froth to settle, and strain the solution through a funnel lined with dampened muslin or cheese-cloth. This solution is mixed with an equal portion (500 ml) of the tapioca starch, sodium chloride and citric acid solution (1:1) and used as soon as it is ready.

You will notice that Zoe's method doesn't require a refrigerator period and this is bound to raise a few questions in the alt pro hen house but I will ask all who doubt to remain calm and look at the quality of the prints for affirmation that the method works very well.

A Very Quick Word Regarding Paper

Hot press, and smooth paper works well for this process. Somerset Satin, or Arches 88 printmaking papers work flawlessly with the Zimmerman matte albumen method. Cot 320, Weston Parchment, and Buxton, are also recommended but Arches Platine has a tendency to yellow quite badly during the dry down. The albumen - starch solution can be applied to the paper with a hake brush, but a two to five minute immersion method works best. Weston tends to yield a more reddish color without toning while Cot 320 provides the richest shadows. Be very careful handling the albumenized Weston... it's quite fragile.

Step #4 - The freshly mixed 1:1 albumen solution is now gently poured it into a very clean tray. Submerge sheets of paper completely in the solution, doing your best to be sure there are no air bubbles trapped on the paper's underside. Soak the paper for two to five minutes and then run it along the tray edge when removing it from the tray.

Step# 5 - Place the paper on a flat, smooth surface, i.e., glass, Lucite, or Plexiglas and with a single gentle but firm stroke, squeegee off the excess albumen solution from the paper on one side. A soft and flexible squeegee is necessary; Zoe uses a windshield wiper blade as they meet the requirements, are inexpensive, and come in a variety of sizes. Hang the paper on a line with clothespins to dry. After a minute, flip the paper 180 degrees... this will help prevent one side of the paper being more thick with albumen

than another. Try to be sure that there is no excess albumen dripping down the paper's surface. This mistake will frustrate you if you overlook it. When the paper is bone dry, it is ready to be sensitized. It can also be stored indefinitely for later use. Be sure to mark your paper as "albumen" on the side that has been squeegeed. It is actually a good idea to mark your paper with paper type and process before you begin to do all of these steps.

ZZ Sensitizing Solution for Matte Albumen

60 g silver nitrate

7.5 g citric acid

500 ml distilled water

Step #6 – In low ambient light - mix the silver nitrate and citric acid in the distilled water until fully dissolved. Pin the paper to a smooth, very clean surface, and using a hake brush, apply the sensitizer in smooth even strokes in one direction. Quickly dry with a blow drier until the paper is no longer glistening wet and then apply the silver nitrate in the other direction. Blow dry again until the paper is bone dry. You are now ready to expose your print. You can coat for a third time but this may be overkill depending on the paper you are using. A thicker paper looks beautiful with a third coating.

You might also consider doing drop count formulas in a shot glass, per print, rather than risking contamination by re-dipping your brush in silver nitrate.

Step #7 - Exposing, washing, toning, fixing, etc. can be done according to the instructions for traditional albumen printing in this chapter. I've found that a full range negative requires a 2-minute exposure in the low humidity environments of Santa Fe and Aspen. You can control contrast with sun and shade combination exposures using the shade exposure to determine the contrast and the sun to determine shadow densities.

WHAT TO DO WITH THE EGG YOLKS

A Great Recipe for Crème Brûlée

- 2000 ml heavy cream
- 20 large egg yolks
- 30 ml vanilla extract (*Xanath (Mexican) is best*)
- 400 g granulated sugar
- Serves a large class of 16 -20

Step #1 - Vigorously beat the egg yolks and granulated sugar in a large bowl, until the mixture becomes light in color and the sugar has dissolved.

Step #2 - In a large saucepan, combine the heavy cream with the vanilla extract and bring the mixture to a simmer; when small bubbles have formed around the edges of the cream turn off the heat.

Step #3 - Slowly pour the cream mixture into the egg and sugar mix, and with a wire whisk blend the two together gently. Then, strain the combined mix through a fine mesh strainer and cover the mixture with a sheet of plastic wrap, pierced several times to release any steam. Place the mix in the refrigerator overnight.

Step #4 - Preheat oven to 350°F (180°C). Place 16 to 20 six-ounce ramekins (individual soufflé dishes) in a large baking pan that is deep enough that water can reach at least halfway up the sides of the dishes so that it can work as a double boiler (*bain-marie*).

Step #5 - Fill ramekins 3/4 full. Place the pan in preheated oven and pour hot water into baking pan so water level reaches halfway up the sides of the ramekins. Cover pan with a sheet of heavy-duty aluminum foil, sealing edges to retain steam. Cook 40 to 50 minutes or until the custard sets.

Note: To test for doneness, gently shake the individual ramekins; if the custard is a little wobbly return it to the oven and check again in 5 minutes. Look for a circular

shape, about an inch wide, in the center of the custard that remains loose while the outside edges are firm.

Step #6 - Remove ramekins from baking pan and chill custard in refrigerator several hours.

Step #7 - To serve put a thin layer of granulated sugar atop each custard; then , using a hand-held propane blowtorch, char the tops of the custards until the sugar caramelizes.

METHOD #3: POWDERED ALBUMEN

A few years ago, I became less enamored with the traditionally prepared albumen because of its “dead mouse” odorous rating factor. I tried the powdered albumen method for a while before switching to Zoe Zimmerman’s matte albumen method and saw no distinctive difference between the real egg and powdered egg. The “dead Mouse” factor was actually a bit worse with the powdered version but it could have simply been the brand that I was using. In case you don’t like Crème Brûlée here’s the formula for the powdered albumen.

- 72 g powdered albumen
- 475 ml distilled water
- 2 ml 28% acetic acid
- 15 g ammonium chloride

Dissolve 72 g of the powdered albumen in 473 ml of distilled water. Add the 2 ml of glacial acetic acid and 15 g of ammonium chloride to the powdered albumen and distilled water solution and whip it into froth. Label the container really well and refrigerate the solution for 24 hours.

On day # 2, remove the now-liquid egg whites from the refrigerator and let them warm to room temperature. Remove the froth that has settled on top of the albumen mixture and strain the solution through cheesecloth. Return this solution to the

refrigerator for the next week. If this still takes too long for you, there is a modified instant gratification (*sort of*) version and that would be Method #4.

METHOD #4: INSTANT GRATIFICATION METHOD

- 72 g powdered albumen
- 10 g kosher salt (sodium chloride)
- 475 ml distilled water

I don't know if I should even tell you about this one. Sure, it's technically an albumen technique but it's a long way from the pristine beauty of really well done traditional albumen. However, always thinking about the positive application, I'll imagine that your particular image-making tastes may run to the more organic and free and this process may just be right for what you need to express.

First, dissolve 72 g of the powdered albumen in 475 ml of distilled water, and when it's in solution add 10 g of kosher salt (sodium chloride) and whip it into a nice froth. You will quickly notice that we're not adding any acetic acid and that we're using kosher salt in place of ammonium chloride.

Let it sit for a little bit and then skim off the frothy foam. Notice how we're eliminating the 24 hours in the refrigerator and the filtration step?

Now, take a hake brush and coat your paper with a smooth and even solution of the albumen. Notice that we've completely abandoned the concept of aging our albumen? Mark the front, or back, of the paper with a notation indicating which side has been coated and hang the paper up to dry for a day or two in a low light environment. This drying period will help harden the albumen so that it will accept the silver nitrate sensitizer.

After the two days, coat the paper with a 15% solution of silver nitrate sensitizer and get on with making your prints.

OLD ALBUMEN IS GOOD ALBUMEN

It should be noted at this point that old albumen is good albumen. Mike Robinson typically uses albumen that is over a year old because as it ages, the proteins break down, and this results in a drop in the pH level to around 6. This means that there will be less yellowing of the highlights in the final print. I have been using a bottle of albumen that is now 5 years old and really rather offensive... but it works beautifully. The problem is that it stinks so bad that I can only demo it outdoors in the summer and I notice, with each passing year, that my students stand further and further away from me while I'm showing them how to prepare the paper. This summer I threw it out and just used the Zimmerman albumen because it was ready in an hour and used up before it began to ripen.

THE CHLORIDE & NEGATIVE RELATIONSHIP

In the first stage of albumen coating, the amount of the ammonium, or sodium, chloride in the solution can be used to counterbalance the density of your working negative. Here's how...

Any normal density negative is considered "thin" for an albumen print. However, if that is the type of negative that you have to work with, you can still make a pretty decent print by cutting the amount of sodium, or ammonium, chloride in half and using a more diluted (*less than 15%*) silver nitrate sensitizing solution.

Fox Talbot figured out that there must be an excess of silver to salt to make this work. Typically, a 4 or 5 to 1 ratio is used with long scale negatives with a density range of 2.0 to 2.25. If you increase this ratio you will be able to print *flatter* negatives, but too much of an excess of silver to salt will cause problems such as bronzing and highlight yellowing.

AMMONIA FUMING FOR CONTRAST

If the silver-to-salt ratio is reduced, you run the risk of uneven or under-sensitizing and you'll see a malady referred to as "measles" (*the word says it all*) as well

as flat and weak prints. One more thing to think about is that fuming the sensitized paper with ammonia will give you a significant increase in tonality and contrast when using flatter negatives. It also gives the silver halide a higher pH, which makes it more sensitive. The ammonia fuming technique is far easier than trying to fine-tune the silver to salt balance. Fuming is essentially subjecting the paper, or plate, to the fumes of a particular chemical in an enclosed environment. If you intend to try this method with any chemical that is particularly aggressive, like ammonia, please consider doing so in a space with decent ventilation. When France Scully Osterman and Mark Osterman fume (that's not the same as having a marital spat) they use a large plastic storage box for the task. The bottom of the box is covered with an even layer of wadded cotton and ammonia is drizzled evenly over this. The paper is taped, albumen side down, to the inside of the box lid and placed on the box. Usually about 4 minutes is enough. Be sure to let the paper out-gas for a few minutes before placing it in the printing frame.

[ICON – 2 here, \(Table Set Up\)](#)

TABLE SET UP FOR COATING TRADITIONAL ALBUMEN

- A thin, high quality, writing or drawing paper (Somerset Satin & Arches 88 are very good for this process.)
- A Pyrex lasagna size glass dish or tray
- A pencil and notepaper
- Matt knife
- Clothesline and clothespins

Coating the Paper with Albumen

First, get a nice thin paper to work with. I recommend a 100 % rag paper, such as Somerset Satin, Arches 88, Buxton, a high quality stationary, vellum, or drawing paper. If you live in France, look for Mark and France Scully Osterman's favorite albumen paper, Canson Crobb 'Art. This is the only paper available that has the same weight and feel of the 19th century papers. I would also recommend, trying Weston Diploma

Parchment, a paper produced by the Byron Weston Paper Co. (a division of Crane Paper) in Boylston, MA.

Next fill a lasagna size, Pyrex glass, baking dish, or a brand-new plastic tray (*that will always be for albumen coating*), with your prepared albumen solution. Take a piece of your paper and mark it with a pencil to indicate the side that is to be coated with the albumen.

Next, you need to float the paper on the surface of the albumen in the tray. A very good floating technique is to make a pseudo-origami "*serving tray*" out of your paper by folding up the 4 sides of the paper a quarter inch so that it looks like a tray. This fold can be trimmed off at a later time and it gives you something to hold on to during the floating steps while simultaneously preventing the solution from getting onto the backside of the paper, which will result in uneven densities in the finished print. When your tray is formed, set it carefully on the albumen, like putting a toy boat in a bathtub, and move it around a bit without making bubbles.

Float your serving-tray formed paper in the albumen solution for 3 minutes and then remove it by dragging it slowly and smoothly over the side of your tray. If your albumen solution has too many air bubbles in it then you might want to try slowly filtering it into another tray.

Check the paper again for any air bubbles. If you find some, pop them with a pin or toothpick. If it looks hopeless, and the albumen is still fluid on the paper, re-float the paper for an additional minute and then try removing it again, gracefully, by pulling it over the edge of the tray. Hang it on a line to dry and don't fuss with the paper by trying to keep the albumen from collecting at the bottom of the recently hung paper. Just trim that edge off later along with the folded edges of the serving tray.

Glossy or Matte Surface

A dry albumen coated paper will have a nice semi gloss reflection. However, if you double coat, or steam the paper, it will become glossy. To make a true matte surface

albumen coating all that you have to do is make an arrowroot starch solution and mix it into your prepared albumen before coating. Of course you could also simply use the Zimmerman matte albumen method and save yourself a lot of trouble.

Arrowroot Starch For Matte Surface Albumen

- 12 g Arrowroot Starch
- 12 g kosher salt (*sodium chloride*)
- 300 ml distilled water

To prepare a matte surface albumen coating; take 12 g of arrowroot starch and mix it into a paste with a little of your distilled water. Add 12 grams of sodium chloride and the rest of the distilled water to the arrowroot paste and, in a clean pot, boil it for 1 minute. Once the solution has cooled off, remove the skim from the surface and mix the solution 1:1 with your prepared albumen coating solution.

Fig: 21 - 10 here ([Jesseca Ferguson, 2 birds / negative island, 1999 - pinhole albumen](#))

TRADITIONAL ALBUMEN HARDENING OPTIONS: DOUBLE COATING

Single coating albumen generally *will not* require a hardening step. However, if you double coat, there are a few albumen hardening methods available to you before you sensitize the paper for printing. These methods will result in a glossier albumen print.

Method #1: The Hay Loft

According to James Reilly, 19th century albumenists simply stored their freshly albumenized paper in a warm loft for half a year. This was the amount of time it took to slow cure and harden the albumen.

Method #2: Steam

In the 19th century, it was thought that steam would be an adequate vehicle for hardening albumen. The problem is that the level of steam it's possible to generate at

home isn't strong enough to do this task nearly as well as letting the albumen age in the hayloft for half a year. However, if you don't have a hayloft and wish to try the steam method, feel free. The worst it will do is remove the albumen. Steam was used however to make the paper more pliable prior to floating on the silver solution. To do so, steam the original albumen coated surface for one minute before the second albumen coating; obviously, this is like cooking an egg. A handheld clothes steamer or a piece of heavy-duty window screen, laid over a soup pot of boiling water will work as well. Another option is to use a steam iron and iron the albumen coated paper through a clean piece of thin paper; set the clothes iron on a silk setting. After steaming, hang the paper up to dry.

Method #3: Isopropyl Alcohol & Ammonium Chloride

Still another method, and really the most practical of the three, is to harden the first coating of albumen with a 500 ml bath of 70% isopropyl (rubbing) alcohol combined with whatever amount of ammonium chloride you used in the original coating, i.e., 15 g in our original formula, and immerse for 15 – 20 seconds. Be careful that you don't treat the paper in too strong an alcohol concentration, as it will dissolve the albumen, or for too long, as it may lead to cracking in the albumen surface.

Why are you doing the ammonium chloride again? Because it is possible that the isopropyl alcohol will cause the original ammonium chloride in the formula to leach out and abandon the albumen coating. Replacing this ammonium chloride with what you've included in your alcohol solution, makes up for the loss.

These techniques will prevent the first albumen coat from breaking down during the application of the second coating. Be careful of *blistering*, which is not an uncommon second coat experience. After hardening the coating, hang the paper using film clips on the top and bottom of the paper on a line in a dust-free place.

Silver Nitrate as a Hardening Agent

Just a quick bit of information that you are already accommodating in this process. A strong solution of silver nitrate will harden albumen whereas a less strong

concentration will dissolve it. I am recommending a 15% silver nitrate concentration in this chapter but you can easily, and effectively, increase that percentage up to 20% without a problem.

Flattening Albumen Paper

You will find that double-coated albumen paper is very difficult to keep flat. I like to use my old dry mount press (it's still good for something) for this purpose. When the albumen paper is dry, heat your press and when it gets to about 200° F, turn it off and put your stack of coated paper in the press. Let the press cool and in a few hours you'll have a stack of flat albumen sheets. Be careful not to burn the albumen.

[ICON – 3 here, \(Measuring Chemistry\)](#)

[ICON – 2 here, \(Table Set Up\)](#)

TABLE SET UP FOR SENSITIZING TRADITIONAL ALBUMEN

- Flattened and sensitized albumen paper
- Pencil and paper for taking notes
- Scissors or matt knife for trimming paper
- Maybe a pair of white cotton gloves if you're nervous
- Clean paper for the table surface coating area
- Contact printing frame
- Negative or photogram materials for contact printing
- 15% silver nitrate sensitizer (30 g of silver nitrate & 200 ml distilled water)

15% SILVER NITRATE SENSITIZER

Sensitizing the Paper: 15% Silver Nitrate

- 30 g of silver nitrate
- 200 ml of distilled water

Under low tungsten, or ambient, room light, mix a 15% solution of silver nitrate being extremely careful not to get it on your skin or in your eyes. Silver nitrate is not light sensitive until it is combined, or comes into contact, with an organic material such as albumen, gelatin, or dust, or humans. Be cautious; avoid getting it on your skin, keep your hands away from your eyes, and be wary of fluorescent light as it emits low levels of UV light and may fog your paper.

Your albumen-coated paper can be sensitized by using either the “serving-tray” floating technique, rod - Puddle Pusher, or hake - foam brush application methods. Brush coating is less expensive but not as effective in my experience. Your newly sensitized paper will generally be acceptable for printing for up to a day after this step... but that is pushing it unless you make a formula with a preservative in it... see below.

The density of your print can be controlled, to a point, in this stage by adding or reducing the amount of distilled water used in making the silver nitrate solution. I have used 20% concentrations successfully. A more dilute solution, say 10%, results in a softer image and is generally less than satisfying. Whatever concentration you make, be sure to stir well, and when the silver nitrate is totally dissolved, pour it into a dark glass bottle and label it well. The solution is clear and can be mistaken for water so please don't be casual with it or with how you store it. Do not store it in the refrigerator where it can be opened by mistake.

15% Silver Nitrate Sensitizer with Citric Acid

There is a semi-popular theory that the addition of citric acid to the silver nitrate sensitizer will lengthen the time the silver nitrate solution will be suitable for coating. I believe this works as advertised. In other words, the citric acid works as a restrainer. This is the same formula that I use for salted paper. Add 5 g of citric acid to every 100 ml of sensitizer.

Acid Restrainers in the Silver Sensitizer in Humid Conditions

In exceptionally warm and humid conditions it is a good idea, some say imperative, to add a little citric or acetic acid to the silver nitrate sensitizer. This slows

down the exposure time as the acidity acts as a restrainer, slowing down the interface between the silver and the halide salt. It will cause the print to become more red in color. This is a good formula and I advise using it for anyone printing in the summer at sea level or in relative humidity that is uncomfortable.

- 30 g of silver nitrate
- 200 ml of distilled water
- 4 g of citric acid (*will result in light-sensitive silver citrate*)

Silver Nitrate Replenishment During Sensitizing

If you are sensitizing your albumenized paper by floating it in the 15% silver nitrate solution it will be necessary to replenish the silver nitrate as you progress. Make up a 25% solution of silver nitrate by mixing 25 g of silver nitrate with 100 ml of distilled water. After every 8 x 10 sheet of paper, add 15 drops of your 25% silver nitrate.

Precipitating Contaminates from a Discolored Silver Nitrate Solution with Kaolin

You can maintain a silver nitrate solution for years if you add 15 g of kaolin to every 1000 ml of your silver nitrate solution. Kaolin (*china clay*) is a clay mineral more correctly known as kaolinite. It is a mineral, soft, white in color, used as one of the primary ingredients in porcelain, and made up of individual crystals in its pure form. Kaolin's whiteness, opaqueness, large internal surface area, and non-abrasive quality make it an ideal filler material for chemical and paper production. Kaolin precipitates the organic matter that has combined with the silver nitrate and allows it to fall to the bottom of the container.

Be sure, when pouring the silver nitrate into a tray or beaker for coating that you don't disturb the kaolin. The best technique is to use a small siphon to move the solution from the bottle to another location. (*An inexpensive siphon can generally be found at*

an auto supply store.) After using the silver solution you must replenish it with your 25% silver replenisher or you'll soon have a weak solution that will give your prints the dreaded "measles."

The other 19th century method is to "sun the bath" by placing the silver solution in a large clear glass cookie jar. Stir in enough sodium bicarbonate to get the solution to reach neutral pH and set the jar on a sunny windowsill. The sunlight will cause the dark organic contaminants to precipitate and fall to the bottom of the jar. This technique was also used in the wet-plate process.

ICON – 4 here, (Coating Icon)

COATING SILVER NITRATE SENSITIZER

Set yourself up in a room with very low light. Put on a pair of fresh Nitrile gloves and remind yourself to be careful not to touch your face or eyes while you are doing this part of the process. You have coating options... float coating, rod coating, or brush coating.

Using the same technique that you employed in the albumen float coating, make your origami "serving tray" out of a sheet of albumenized paper, pour into a Pyrex casserole dish, or super clean tray, your silver nitrate solution and float the paper on the silver nitrate surface for 3 minutes. Gracefully peel the paper from the silver nitrate solution and be careful not to get any silver nitrate on the back of the paper. Hang it up to dry in a dust-free and dark environment and be sure to lay down a lot of newsprint underneath the drying line to catch the dripping silver nitrate.

If you elect to brush coat, you will be able to work more quickly and you'll have those romantic brush coating marks on the outside of your image area that show nothing existed on that paper until you put it there. The first thing to do is mark out where the coating will take place with 4 faint pencil "L" marks. I will recommend, as I do for salted paper coating, that you use a brand new foam brush for every paper you coat. These are very inexpensive brushes and by using a new one you avoid the problem of

transferring organic (*albumen*) contamination from a previous coating to your silver nitrate. I will also use a hake brush for this coating stage but will thoroughly clean the brush in distilled water, and dry it, before going to the next piece of paper.

Tack down your paper on a very clean flat surface. Next, measure out your silver nitrate solution into a shot glass with an eyedropper. A 4 x 5 negative area can easily be covered with 25 – 30 drops of solution. When you're ready, pour the contents of the shot glass into the center of your coating area and brush the silver nitrate quickly, lightly, and evenly over the marked out dimensions of your coating area.

You can also pour a small amount of the silver nitrate into a plastic or glass beaker, or hot-liquid paper cup, and dip your brush into the solution. Brush-coat it in the same manner you have been using throughout - light, even strokes covering the full image area vertically and then horizontally. After the coating, allow the paper to air dry in the dark until it is "bone" dry. In environments where high altitude and lack of humidity are normal, you will find that the paper will dry very quickly... a very nice situation when working in albumen.

[ICON - 5 here \(Contact printing Frame\)](#)

EXPOSING ALBUMEN

Exposure Control

Although you have about 24 hours to use the sensitized paper it is a good idea to expose the print as soon as the paper is bone dry. If you wait too long before exposing the paper, the contrast in the final image will decrease and you'll eventually get yellowing highlights due to *silver albumenate*, which begins to be created quite rapidly. (More on this in a few paragraphs) If you know that you will not be printing the sensitized paper right away consider using the silver nitrate with preservative citric acid formula. You can also use drops of acetic acid. With pH strips, monitor the bath as you gradually bring the pH down to about 3.

Place the paper and your negative into a hinged back contact printing frame, “right reading” positioning, and go sit in the sun or shade with it. If you don’t have sunlight, use a mechanical UV printing unit. As with POP and salted paper techniques, exposing in direct or indirect sunlight is a personal choice. Personally, I prefer to begin my albumen exposure in open shade and will take it practically to the end of the exposure in that light environment. At the end of the exposure sequence I will give the exposure a 1 to 2 minute shot of direct sun to intensify the shadows. In the summer, an average negative will require 4-6 minutes in the shade and 1-2 minutes in the sunlight. Negatives with a lot of density will require longer exposure times while thinner negatives may demand that almost all of your printing is done in shade.

Albumen is a POP printing-out process and so you will be periodically examining your print during the exposure in order to determine when it is perfect. Exposure time is dependent upon the density of your negative, time of day, heat and humidity, etc., so it is important to write all of this information down when you’re printing.

Note: If the negative is an unvarnished gelatin emulsion film or plate, you should place a sheet of clear Mylar, or a Krystal Seal envelope between the negative and the albumen paper to prevent the excess silver from migrating to the film emulsion causing future damage.

What to Look For

When you think it’s time to check on the exposure, go into low light, release one side of your contact printer and check the image. Look for a purplish colored print with “bronzed” to solarized tonalities in the deepest shadows. Bronzing is a term used to describe having a metallic look to the darkest values. This will be the visual sign that tells you when the print is exposed well. Over-expose about 1 to 1.5 stops darker than you would like the finished print to be because it will lose a little density during the upcoming stages. This is similar to the recommendations I gave you for a salted paper print even though it requires less over-exposure than does salt.

[ICON - 6 here, \(Checking Exposure\)](#)

Exposure & Silver Albumenate / Highlight Yellowing

You may recall that in the salt process I recommended facing the contact frame away from the sun and printing in open shade to achieve a modest contrast gain and a bit more control of your exposure. The albumen process, like all silver chloride printing out processes react in the same way. You may also place a sheet or two of tissue paper over the printing frame and print in direct sunlight to increase contrast. The best strategy with albumen paper is to process the print immediately. This action will reduce the amount of *silver albumenate* that is being formed during the albumen's extended contact with the excess silver nitrate in your sensitizer formula. The longer the silver nitrate excess in the sensitizer solution remains in contact with the albumen, the more likely it is that the highlights in that print will turn yellow over time. Silver albumenate does not "*fix-out*." This results in white highlights turning yellow as in many historical albumen prints.

Yellowing of a finished albumen print is often the result of the wrong paper for the process. You may need to test papers to find out what works well for you but I would recommend beginning with Somerset Satin, Arches 88, or Cot 320 as they are all proven papers.

Color & Exposure: Using the Right Negative

From a purely classical perspective, it is pointless to work with a thin negative - because it will be near impossible to get that lovely aubergine coloration in an albumen print if your negative can't hold up to sufficient exposure. The tone of the albumen print is dictated by how deeply you can print. If you stop exposing too soon, you'll never get the d-max strong enough to get rich tones.

[ICON - 7 here, \(Sink Set Up\)](#)

SINK SET UP FOR ALBUMEN

Tray #1 – Salted tap water with citric acid

Tray #2 – Fresh running water

Tray #3 – Toner Trays

Tray #4 – Rinse Tray

Tray #5 A – 15% Sodium Thiosulfate Fixing Bath

Tray #5 B - Optional: Sel d'or Toner / Fixer Monobath

Tray #6 – 1% sodium sulfite hypo clearing bath

Tray #7 – Final Wash in clear running water

[Fig 21-11, \(Christopher James, Mary's Chair, Santa Fe, 2007 - albumen\)](#)

PROCESSING ALBUMEN

Salt / Citric Wash First Bath

This first bath tray consists of a slightly acidic salt bath whose purpose is to precipitate the free (or excess) silver by producing silver chloride. You will often see a milky residue coming from the print's surface, as the excess silver nitrate starts bonding with the chloride. If you have no salt in this bath, you will not be removing the free silver and this will create problems with your toning, as the gold will not adhere to the silver unless the free silver is eliminated. Here's your first bath mix:

- 10 g citric acid
- 30 g kosher salt
- 1000 ml distilled water

Following your exposure, immerse your print in this bath of salted water that has been made slightly acidic with the addition of citric acid, lowering its pH. Under low to moderate light, agitate the print slowly for about 5 minutes or until no more milky precipitate is visible.

Following this step, move your print to a tray filled with fresh water and gently agitate. Repeat the fresh water exchange for 5 to 10 minutes. If you have a black plastic tray this will help you to see when the water is completely clear.

ALBUMEN TONING

Optional Toning Prior to Fixing

Un-toned, an albumen print will be reddish-plum to warm brown in color. Toning the print, *prior to the fixing stage*, will provide you with options for the color of your finished work. It will also greatly assist in making the print archival and less susceptible to fading and yellowing as time goes on. Gold-toned prints will render a variety of colors depending on the length of the immersion, i.e., purple-brown, aubergine, slate gray, and blue-gray. The slate blue and grey tones are considered the least archival.

Albumen Gold Toner

- 2 liters warm distilled water
- 1 g gold chloride
- 8 g sodium borate

In a clean non-metallic beaker, carefully add 1 g of gold chloride to the distilled water and stir it into solution with a glass or plastic rod. Next, add the 8 g of sodium borate and stir until it is completely in solution. Filter the sediment that did not go into solution through a fine stocking or piece of cheesecloth and store it in a dark glass bottle. To tone the print, simply immerse the print in the toning solution and remove it when you are happy with the color. The print is then fixed and washed.

Salted Paper Toners for Albumen

Seeing as there are so many other similarities between the albumen and the salted paper processes, an option you might wish to consider is using salted paper toning formulas with your albumen. Please refer to the Salted Paper chapter toning section for recipes and instructions for the following toners.

- Gold / Borax toner (*warm / reddish color*)
- POP Gold - Ammonium Thiocyanate Toner (cooler whites and darks)

- Gold - Sodium Acetate Toner
- Palladium Toner
- POP Platinum Toners

[Fig 21 – 12 here](#), (Dan Estabrook Rose, 1995 - albumen w-gold borax)

FIXING THE ALBUMEN PRINT

15% Standard Sodium Thiosulfate Fixing Bath: 2-Tray Set Up

- 150 g sodium thiosulfate
- 2 g sodium carbonate (*to make the fix slightly alkaline*)
- 1000 ml distilled water

Your fixing bath will be a familiar one. Dissolve 150 g of sodium thiosulfate (*anhydrous / dry*), and 2 g of sodium carbonate, into 1 liter (1000 ml) of distilled water to make a 15% fix solution.

Make up 2 trays of this fixer. Immerse the print in the first fixing tray of this fixing bath for 2 minutes. Remove the print and immerse it in the second fixing tray for an additional 2 minutes.

On average, using a double tray fixing set up, you should be able to adequately fix up to 2-dozen prints before having to re-mix.

SEL d'OR TONER / FIXER MONOBATH FOR ALBUMEN

Sel d'or Toner / Fixer Monobath

Several years after the Daguerreotype process was announced a French physicist, by the name of Hippolyte Fizeau, introduced an important process addition, called sel d'or (salt of gold), that gave Daguerreotypists a way to intensify and tone their work. Sometime between 1847 and 1855 the process was supposedly incorporated into the calotype, salted paper, and albumen processes.

For many years, in the mid-19th century, sel d'or gold toning was commonly incorporated into the albumen and salted paper processes although it was quite difficult to predict whether the technique would improve, or fade, the print. When an albumen or salted paper print was immersed in the sel d'or toner / fixer monobath the image color would lighten (orange-brown) and then reconstitute itself to either a cool sienna, purple, or blue-black. The final image color is based upon the depth of the printing, the toning formula, and the length of time the print is in the toning solution. . Print deeply if you intend to use this technique.

The sel d'or toner is actually a toning-fixing monobath and is constituted by mixing a solution of gold chloride into a solution of sodium thiosulfate and a little bicarbonate of soda, to make the solution lean a bit to alkaline. Using it allows the photographer to both tone and fix their print in a single action. Again, it is unpredictable and the following formula is more "kitchen-sink" than lab. Toning / fixing time is approximately 4 minutes following the wash stage.

Sel d'or Toner / Fixer Formula

500 ml water

75 g sodium thiosulfate

1-teaspoon bicarbonate of soda

3 grains of gold chloride (Use a 30 ml Stock Solution)*

Stock Gold Solution for Sel d'or toner / fixer

154 ml distilled water

1 g gold chloride in a glass ampule (1 gram = 15.43 grains)

Take your 1-gram ampule (*a sealed glass or plastic capsule*) of gold chloride and drop it into a bottle containing 154 ml distilled water. (Break the ampule and leave it there.) Because 1 gram equals 15.4 grains, and you mixed this amount with 154 ml distilled water, every time you need 1 grain of gold for a formula all you need do is add 10 ml of the gold stock solution.

1 % SODIUM SULFITE HYPO CLEARING BATH

If you want to be absolutely sure that all of the residual fixer is gone from your print you may mix up a solution of 1% sodium sulfite hypo clearing agent. Simply dissolve 10 g of sodium sulfite into 1000 ml of water and agitate your print for several minutes before going to the final wash.

FINAL WASH

Wash the toned and fixed image for 30 minutes and hang to dry.