

Cyanotype Detailed Instructions

Cyanotype Formula, Mixing and Exposing Instructions

START HERE
if you have
Open Stock
Chemistry

1. Dissolve 40 g (approximately 2 tablespoons) Potassium Ferricyanide in 400 ml (1.7 cups) water to create STOCK SOLUTION A. Allow 24 hours for the powder to fully dissolve.
2. Dissolve 100 g (approximately .5 cup) Ferric Ammonium Citrate in 400 ml (1.7 cups) water to create STOCK SOLUTION B. Allow 24 hours for the powder to fully dissolve.

START HERE
if you have the
Sensitizer Set

If using the Cyanotype Sensitizer Set, simply fill each bottle with water, shake and allow 24 hours for the powders to dissolve.

3. In subdued lighting, mix equal parts SOLUTION A and SOLUTION B to create the cyanotype sensitizer. Mix only the amount you immediately need, as the sensitizer is stable just 2-4 hours.
4. Coat paper or fabric with the sensitizer and allow to air dry in the dark. Paper may be double-coated for denser prints. Fabric may be coated or dipped in the sensitizer.

START HERE
if you have
Pretreated Fabrics

Jacquard's Cyanotype Fabric Sheets and Mural Fabrics are pre-treated with the sensitizer (as above) and come ready to expose.

5. Make exposures in sunlight (1-30 minutes, depending on conditions) or under a UV light source, placing objects or a film negative on the coated surface to create an image. (*Note: Over-exposure is almost always preferred to under-exposure.*) The fabric will look bronze in color once fully exposed.
6. Process prints in a tray or bucket of cool water. Wash for at least 5 minutes, changing the water periodically, until the water runs clear. Do not use soap. With wetting, the print will change from a bronze to blue color. To instantly process prints to the final deep blue color, submerge washed prints in a dilute solution of hydrogen peroxide, then rinse.
7. Air-dry the prints on a clean clothesline or on newsprint or blotting paper. If peroxide was not used in step 6, prints will slowly oxidize to their final, deep blue color over the course of about 24 hours.

NOTES:

- Use distilled water if your tap water is hard.
- The stock solutions are stable long term and can be used to create the cyanotype sensitizer whenever you are ready to coat a substrate.
- Mold growth may occur in the Ferric Ammonium Citrate solution (STOCK SOLUTION B) over time. This will not affect the performance of the chemistry. Skim off any mold or decant the solution through a coffee filter before use.
- Sensitized paper or fabric may be stockpiled and stored. Use within 6 months for best results. Store in a cool, dry environment, preferably in a sealed bag to avoid oxidation.
- Coated paper and fabric may darken over time. If it appears dark, it is not necessarily expired; test it—it may just require a longer rinse in hotter water.
- Cyanotype prints are archival. However, yellowing may occur if prints are exposed to phosphates or high pH solutions. Cyanotype printed fabrics should always be laundered in cold water using non-phosphate detergents. Use care while handling cyanotype prints, as sweat and hand oils may also cause discoloration.
- Do not wet fabric or paper before or during exposure. Make sure your hands are dry when handling the sensitized fabric or paper. Make sure the printing surface and objects used are dry.
- Cyanotype fabric can be ironed before exposure—just make sure to use a dry iron that does not spit or leak water. Iron the backside (not the print side) and use care while handling.

continued...

Creating Images

A **photogram** is a print made by placing objects on the sensitized surface. Photograms can be made from any object that casts a shadow or blocks the light—plants, leaves, toys, tools, stencils, stones, sand, cutouts, string, lace, doilies, etc. You can even place your hand on the print surface for the duration of the exposure to make prints of your hands. With the mural fabric, you can lay on the fabric during exposure to make full-body prints.

Make **photographic prints** by first creating a film negative. To easily transform any image into a film negative to create photographic cyanotype prints, visit Jacquard's online Negative Generator at www.JacquardCyanotype.com. Negatives may be printed through any inkjet or laser printer onto transparent film or acetate media such as Jacquard's SolarFast Film.

You can also make prints from line **drawings** by drawing directly on the film using Jacquard's Film Marker.

Place a piece of glass or acrylic on top of the print to keep objects or negatives flush and keep them from moving during exposure. You may also use pins, magnets, tape, a printing frame, etc. to secure the film during exposure.

Trouble Shooting

Blurry or out of focus photographic prints:

Using a film negative to make cyanotype prints is a contact printing process. The film must be flush on the print surface for optimal resolution and detail. Otherwise, the print may appear out of focus or blurry. The easiest way to ensure good contact is to print on a flat surface and place a heavy piece of glass on top. Prints should also be facing the light source perpendicularly during exposure—if the sun is not directly overhead, this may make it necessary to use binder clips to hold the substrate, film and glass together.

Dark blue or blown out prints:

The dark areas of the film may not be dense and opaque enough to block the light adequately. To achieve good contrast on the print, the negative must be dense enough that it completely blocks the light in its darkest areas. Stacking two negatives may be the best solution—this will double the opacity and contrast. The print may also be over-exposed. Try reducing the exposure time.

Pale or low-contrast prints:

The print was probably not exposed long enough. The light source may not be intense enough. Or the negative may be too dark. Over-washing can also result in pale prints.

Water spots:

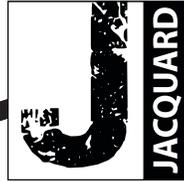
The print may become splotchy if you touch it with damp hands. Sometime leaves or design elements can produce moisture during exposure. You may also have splashed or dripped on the print prior to washing. Make sure when you submerge the print in water, you do so swiftly and without splashing.

Discoloration to brown or yellow:

Discoloration may occur if the print is exposed to phosphates, soap or dirty objects. Make sure the drying line/surface and clothespins are clean. Make sure the washing tub or tray is clean and free of soap. Only handle prints with clean hands.

Prints darken during drying:

The print was probably not thoroughly washed. Make sure the water runs clear before hanging to dry. Do not dry in direct sunlight.



FAQs

What is cyanotype?

Cyanotype is an antique photographic printing process distinctive for producing Prussian blue monochromatic prints. Developed in the mid-19th century, cyanotype was quickly embraced as an inexpensive method for reproducing photographs, documents, maps and plans (hence the enduring architectural term “blueprint”). Famously, it was also used by Anna Atkins and other field biologists for indexing plant specimens—the first photograms ever made! Cyanotype is an extremely forgiving photographic process, easy to do, safe and inexpensive. As one of the earliest photographic processes ever developed, it is still favored among alternative process enthusiasts and is often the first chemistry explored in alternative photo classes.

Is it permanent?

Yes, cyanotype prints are archival. However, yellowing may occur if prints are exposed to phosphates or alkaline environments so, cyanotype fabrics must be laundered in cold water using non-phosphate detergents. Over-washing may also cause the print to fade. Use care while handling cyanotype prints, as sweat and hand oils may also cause discoloration. If fading occurs over time, washing the print in a dilute bath of hydrogen peroxide can usually restore it to its original intensity.

Is Jacquard’s Pretreated Cyanotype Fabric sided?

Prints can be made on either side of Jacquard’s Pretreated Cyanotype Fabrics. However, being a cotton sateen, the sides are different. One side of the fabric is slightly reflective and shiny. This is the print side. Look closely at the fabric to determine which side is the print side.

Can I make cyanotype prints on paper and fabric? How about wood?

Yes, any natural surface can be treated with the cyanotype sensitizer, including silk, cotton, wool, hemp, linen, canvas, paper, leather and wood.

Can I make cyanotype prints on polyester?

As polyester is not a natural fiber, it generally cannot be used for cyanotype.

How should I wash my cyanotype fabric prints?

Keep washing to a minimum if possible. We recommend hand-washing in cold water using a non-phosphate detergent. Do not use Synthrapol or SolarFast Wash.

Does cyanotype only produce blue prints? What about other colors?

An unadulterated cyanotype will always be blue. However, there are many methods for toning finished cyanotype prints to other colors using household materials like tea, coffee and soap. Cyanotypes can be toned to a variety of browns, blacks, yellows and more. See our “Toning Cyanotype Prints” document for more information. For sun printing with a full range of colors, use SolarFast.

What is the difference between cyanotype and SolarFast?

SolarFast is a true dye, so the two are very different. See our document “Cyanotype vs. SolarFast” for detailed information about these differences. The main differences are:

1. Cyanotype is used dry, so treated substrates can be stockpiled and packaged, whereas SolarFast must be used while damp, directly after coating.
2. Cyanotype has a greater range of tones than SolarFast, though the color range is significantly more limited (cyanotype is always blue whereas SolarFast is available in 14 colors).

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FAQs

3. Cyanotype is not as washable and permanent as SolarFast is on fabric.
4. Cyanotype is inexpensive and goes further than SolarFast.
5. In many ways, cyanotype is more forgiving and easier to use than SolarFast.

Is it dangerous?

Cyanotype is non-toxic and does not present any significant health risk or danger. That said, care should always be taken to avoid ingestion, inhalation and contact with skin when handling the cyanotype chemicals and fabrics.

Is it safe for children?

Yes, cyanotype is safe for children and makes a great classroom activity! That said, care should always be taken to avoid ingestion, inhalation and contact with skin when handling the cyanotype chemicals and fabrics. Adult supervision is highly recommended.

How does it work?

This may be more of a technical answer than you are looking for, but this is how the cyanotype reaction works on a molecular level:

All ferric (iron III) salts become sensitive to light when combined with organic substances. Ferric ammonium citrate, which has the chemical formula $C_6H_8FeNO_7$, is one such substance. This light-sensitive compound is mixed with potassium ferricyanide and water to create the cyanotype sensitizer, and this mixture is used to coat a surface such as fabric or paper. Exposure to ultraviolet light breaks down the iron compound by oxidation, thereby releasing carbon in the form of carbonic acid and creating a new iron compound. The exposed print is then immersed in water, causing a reaction between the new iron compound (peroxide iron salt) and the potassium ferricyanide. A deep-blue compound, ferric ferrocyanide or iron (III) hexacyanoferrate (II), is formed within the substrate fiber. The more light the sensitized substrate is exposed to, the more of this blue is produced.

What is the cyanotype formula?

- Solution A: 20% ferric ammonium citrate in water
 - Solution B: 9% potassium ferricyanide in water
- A : B = 1:1 = final solution, also known as the cyanotype sensitizer.

Can you screen print with cyanotype?

Yes, the cyanotype sensitizer can be thickened for screen printing using the SolarFast Thickener. Screen prints may then be exposed to light, with or without film or objects on top, and processed in water as normal.

Can I paint or print on top of a cyanotype print?

Yes, embellishing prints with dyes, paints or markers is a great way to add color to a cyanotype. However, if the paint or dye has a high pH, the blue color of the cyanotype beneath may fade or disappear completely. Experiment to see what the different effects of over-coloring are.

Can I make cyanotype prints on patterned fabric or found paper?

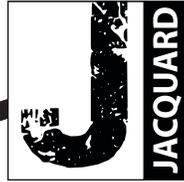
Yes, like a dye, cyanotype is transparent, so anything beneath the blue of the print will show through. Printing on top of patterns, pages of books, newspaper, etc. is a great way to create a layered image.

Can cyanotype prints be made on colored fabric or paper? How about black substrates?

Like a dye, cyanotype is transparent, so printing on colored substrates will have an additive effect. Printing on a yellow fabric will produce a green on yellow print, for instance, instead of blue on white. Printing on red will produce a purple on red print, etc. Prints made on black substrates will not show up.

Have other questions? Contact Jacquard at service@jacquardproducts.com or 800.442.0455

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Cyanotype Tips and Troubleshooting

Tips

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- Cyanotype prints are archival. However, yellowing may occur if prints are exposed to phosphates or high pH solutions. Cyanotype printed fabrics should always be laundered in cold water using non-phosphate detergents. Use care while handling cyanotype prints, as sweat and hand oils may also cause discoloration.
- Do not wet fabric or paper before or during exposure. Make sure your hands are dry when handling the sensitized fabric or paper. Make sure the printing surface and objects used are dry.
- Cyanotype fabric can be ironed before exposure—just make sure to use a dry iron that does not spit or leak water. Iron the backside (not the print side) and use care while handling.

Troubleshooting

Blurry or out of focus photographic prints:

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Pale or low-contrast prints:

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Water spots:

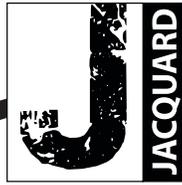
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Discoloration to brown or yellow:

Discoloration may occur if the print is exposed to phosphates, soap or dirty objects. Make sure the drying line/surface and clothespins are clean. Make sure the washing tub or tray is clean and free of soap. Only handle prints with clean hands.

Prints darken during drying:

The print was probably not thoroughly washed. Make sure the water runs clear before hanging to dry. Do not dry in direct sunlight.



Cyanotype vs. SolarFast Fact Sheet

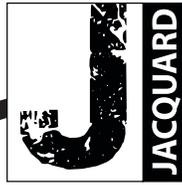
What is the difference between Cyanotype and SolarFast?

This is one of the most common questions we are asked. Both are photographic sun-printing processes, but they are markedly different. *This document explains the differences:*

Cyanotype	SolarFast
Cyanotype prints are always blue. Prints can be toned to other colors such as brown, yellow and black using post treatments (see our "Toning Cyanotype Prints" document), but the initial print is always blue.	SolarFast is available in 14 mixable colors, allowing for photographic prints in virtually any color desired. Finished prints cannot be toned to other colors.
Cyanotype can be done on fabric and paper, but printed fabric must be laundered carefully. Only non-phosphate detergents can be used, and the print is prone to fading and discoloration with washing.	SolarFast is permanent on paper and fabric and can be laundered like any commercially dyed fabric. It is exceptionally washfast.
Cyanotype prints are made once the sensitizer has dried. This means coated paper and fabric can be stockpiled and used at a later date. Also, there is also no risk of staining the negative.	SolarFast prints are made while the dye is still damp. This means prints must be made immediately after the paper or fabric is coated. Stockpiling coated paper or fabric is not an option. Also, because the dye is damp when used, the film negative may get stained during photographic contact-printing (fortunately, SolarFast Film can be wiped clean!).
Cyanotype produces a broader range of tones and detail than many of the SolarFast colors.	Some of the SolarFast colors produce a narrower range of tones compared to Cyanotype.
Cyanotype is very economical. The chemistry can be purchased as powders and used to sensitize large pieces inexpensively.	SolarFast is only available as a liquid and may not go as far as the Cyanotype chemistry.
Jacquard offers pretreated Cyanotype fabrics that are ready to use.	Because SolarFast must be exposed while damp, pretreated fabrics are not available.
Cyanotype is prone to discoloration, making mixed media, over-dyeing, etc. somewhat risky or problematic.	SolarFast is great for mixed-media. SolarFast prints can be embellished, over-dyed, etc. without risk.
Cyanotype prints are processed in cold water. Hydrogen peroxide, which is optional, readily available and inexpensive, is the only auxiliary chemical used.	SolarFast prints must be washed in hot water after exposure. SolarFast Wash is highly recommended for initial wash.
The Cyanotype process has been around for more than 150 years, so there is plenty of literature and information available.	SolarFast was invented by Jacquard Products in 2013.
Exposure times for Cyanotype are short (3-15 minutes, depending on conditions).	Exposure times for SolarFast are generally longer than they are for Cyanotype (10-25 minutes, depending on conditions).
The Cyanotype sensitizer is generally a liquid with the consistency of water. It can be thickened with the SolarFast Thickener.	SolarFast comes thickened so that it will not bleed or spread on fabric. It can be thinned with water or thickened further with the SolarFast Thickener.
The blue color of Cyanotype is caused by the precipitation of a pigment within a fiber.	SolarFast is a true dye that develops color with exposure to UV light and chemically bonds to the fiber.
Cyanotype is generally considered a forgiving and easy to do process.	SolarFast tends to have more of a learning curve, but it is also easy to do.
Because Cyanotype prints are made on dry media, full-body mural prints or handprints are easily done.	Because SolarFast prints are made while the dye is damp, making full body mural prints with SolarFast could be a messy affair.
The Cyanotype sensitizer is made from two stock solution that, once mixed, have a very short shelf life.	SolarFast is a one part system with a virtually limitless shelf life.

6.29.15

Cyanotype vs SolarFast Fact Sheet



Toning Cyanotype Prints

Peter Henry Emerson, an early proponent of photography as art form, once wrote that “no one but a vandal would print a landscape in red, or in cyanotype.” In Emerson’s time (Circa 1890), the Prussian blue hue of cyanotype just wasn’t considered very tasteful. Thus there developed a culture of altering (or “toning”) blue cyanotype prints to more subdued and “acceptable” hues.

There are a number of methods and agents used to tone cyanotype prints. Here we offer the simplest (and least toxic) methods for toning cyanotype prints on paper or fabric to a variety of browns, blacks, purples and yellows.

THE BASICS:

Toning a cyanotype print generally involves two basic steps: a bleach step, and a toning step.

1. The bleach step requires a chemical with a high pH and involves “reducing” the blue iron color, generally to a golden yellow.
2. The toning step requires the presence of tannins, which chemically bond to the reduced iron and change the color of the print.

All the toning methods below are variations on these two steps.

EXPERIMENT!

There is no “right” way to tone a print. Have fun with it! Toning is not an exact science, and results can be unpredictable. Experiment with mixing and matching toners, skipping or changing the order of the steps given below, etc. Often, for instance, you can achieve three distinct results by either skipping the bleach step, bleaching after toning, or repeating the sequences given. You may also get different results by allowing different amounts of drying and/or washing times between steps.

KEEP IN MIND:

It is generally a good idea to start with an overexposed print if you plan to reduce/bleach. Underexposed prints can often be toned nicely by skipping the bleach step altogether. Allow the print to dry at least 24 hours before toning. Otherwise, you may experience erratic results. Pre-wet the dried prints just prior to toning to allow for even penetration of the reducer and toner. Plan on leaving the print face down in the toner for long periods of time, or plan on agitating the print as it tones. Avoid air bubbles, as they will result in untoned blue spots.

NON-TONING POST-TREATMENTS:

There are several methods for altering a cyanotype that do not involve toning. For instance:

- **Hydrogen Peroxide:** Submerging your washed print in a dilute bath of hydrogen peroxide after the initial wash will cause the blue to instantly reach its maximum intensity. In theory, the print would reach this intensity over about 24 hours as it dries and oxidizes, but using peroxide instantly oxidizes the print to its final color. Great for instant gratification!
- **Vinegar Wash:** Using white wine vinegar in the initial wash can increase the tonal range and decrease the overall contrast of a print. In other words, the highlights will become bluer and you will see more subtlety in the midtones. Variations in concentration of the vinegar bath will affect contrast to varying degrees.

- **Post-development Vinegar Bath:** Using a vinegar bath after washing in water can have a different effect: generally you will see an increase in contrast, with the deep tones becoming deeper and the highlights becoming whiter (see example 1.2).

TONING:

I. THE BLEACH STEP:

- The most common bleaching solution is made from soda ash (sodium carbonate). Generally, 1-2 teaspoons are used in about 1 liter of water. Make sure the soda ash is fully dissolved before submerging the print (otherwise you may see speckles, like in example 5.1).
- Other bleaching solutions can be made using soap, detergent, ammonia or chlorine bleach. Ammonia tends to produce a browner image. Chlorinated bleach will damage fibers and is not recommended.
- The purpose of bleaching is to break down (or “reduce”) the iron so that the tannins in the toner can bond more easily. The bleach step is generally quite short (under 5 minutes). The time needed will depend on the density of the print, the concentration of the bleach bath and the toner you intend to use. (If your water is heavily chlorinated, you may not even need to bleach your prints. Also as stated above, sometimes the bleach step may not be desirable.)
- If you bleach too far, you may lose overall density in the print—the shadows may become pale and the mid-tones may vanish completely. If you bleach too little, your shadows will remain blue while your midtones cooperate. (This “split-tone” effect can actually be pretty interesting! In example 3.4, for example, notice the difference between steps 5 and 6.)
- Leave the print in the bleaching solution until it reaches a uniform, golden yellow color and then quickly submerge it in water to stop the bleaching action. With experience, you’ll learn that it is usually a good idea to pull the print out of the bleaching solution a few seconds before you think it’s ready, as the print will continue to bleach for a bit, even once it is placed in the wash bath. If you’re trying to make a golden yellow and white print, then you’re done! (See example 2.1). If the print turns a bright purple as soon as you place it in the solution, the bleaching solution is too strong. Play with the solution until you’re comfortable with the rate of bleaching.

2. THE TONING STEP

The range of colors you can achieve by toning is relatively limited (brown, black, purple, yellow, navy), but within these parameters, you can achieve a diverse range of qualities and effects. (For printing in virtually any color you like, use SolarFast.) Certain toners are more efficient and stain less, while other toners produce a wider range of possibilities. Keep in mind that, in all likelihood, the base color of the paper/fabric will become stained, at least a little bit. The degree of this base staining can be minimized by using more dilute solutions of toner, but this will generally require longer soaking time.

Tea Toner: Every type / brand of tea will produce a different color. Tea toners work well with minimal bleaching, but require long times in the toner—generally 2 or more hours (up to 24). Use fresh brewed, hot tea to keep the time down, but keep in mind that hotter solutions will stain more. Make sure to use teas with tannins in them, like black tea or green tea. White tea, red tea and most herbal teas don’t contain enough tannins to effectively tone a print. To reduce staining, soak toned prints in clean water for at least 10 minutes after toning.

- Green tea tends to produce a warm, eggplant black, and it is mild enough that it doesn’t stain the paper base too badly. If you skip the bleaching, you can also achieve a greenish black (see example 3.2). Sometimes green tea toners will leave a pinkish highlight which can be an interesting split-tone effect (see example 3.1).
- Black tea stains the most, but it produces a unique rich warm black/brown shade. Used after extensive bleaching, it will produce a beautifully neutral brown (see example 3.3). With minimal bleaching, you may see a split-tone, with warm highlights and cool shadows (see example 3.4).

Coffee Toner: For the truest black, coffee toners are generally the best. Coffee toners produce a cool black (in contrast to the warm black of tea toners) and they stain less (see example 4.1). Coffee toners tend to require less

time than tea toners, and work remarkably well without bleaching. Instant coffee seems to work just as well as brewed coffee.

Tannic Acid: The original cyanotype toner, tannic acid tends to produce an even brown print with a lot of staining.

Wine Tannin: Used in microbrewing and vinology, wine tannin is a lot like tannic acid, but it dissolves more easily in water and is more readily available. Wine tannin produces a beautifully even warm black (split-tones are rare) and keeps staining to a minimum.

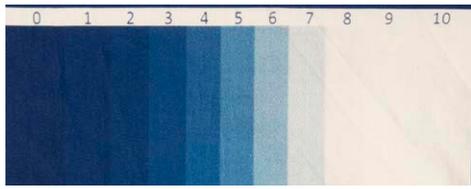
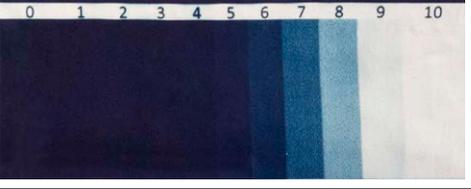
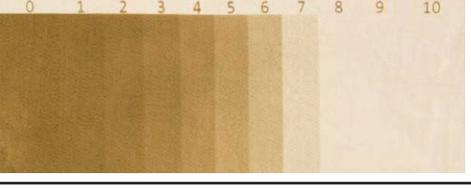
Wine Toner: Red wine in particular is known to contain tannins and can be used to tone cyanotype prints to a purplish black. Because of its red color, staining is almost unavoidable, but again, it can be an interesting effect.

Borax Toner: Probably the most unpredictable toner, borax can be used to achieve a violet print. Bleaching is generally not necessary, but results may vary.

Soda Ash Toner: As stated in the bleaching step section, soda ash may be used to achieve a yellow tone. An extremely dilute bath may also produce a blue/yellow split-tone (see example 5.1) or, even more diluted, a navy print. This toner is extremely sensitive and requires practice.

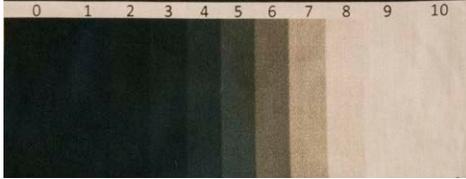
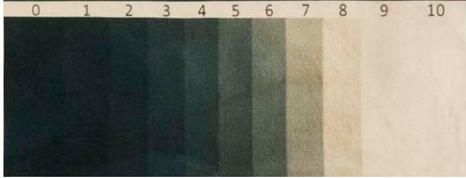
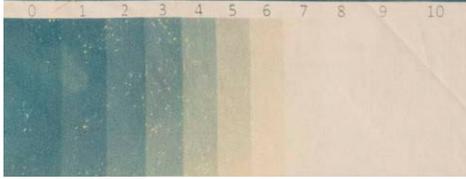
Combination Toners:

Again, combining toners, playing with the order of operations and repeating steps can produce a wide variety of results. Experiment and you will make your own discoveries!

Examples of toned prints	
	1.1 Untoned cyanotype print
	1.2 Print washed in 10% vinegar solution. Notice the increased tonal range and decrease in overall contrast.
	2.1 Soda ash bleach only
	3.1 Soda ash bleach then green tea toner
	3.2 Green tea toner, no bleaching

7.13.15

Toning Cyanotype Prints

	<p>3.3 Black tea toned after bleaching</p>
	<p>3.4 Black tea, no bleaching. Notice the split-tone, evident in steps 5, 6 and 7.</p>
	<p>4.1 Instant coffee, no bleaching</p>
	<p>5.1 Yellow/blue split-tone from minimal bleaching. Speckled from undissolved soda ash.</p>