

SAMPLE - CHAPTER 16 THE GUM BICHROMATE PROCESS

[Fig 16 – 1, here](#), (Christopher James, John Q. w/ His own Negative, 2005, cyanotype & gum)

OVERVIEW & EXPECTATIONS

Here's the truth... In gum bichromate printing there are very few *absolutely correct* ways to do anything. Here's another bit of reality... In my experience, gum bichromate printers are the most passionate, and hard-headed, of all alternative process artists when it comes to their particular way of doing the process. I can just imagine many of my friends reading that last sentence and saying, "he's talking about me!"

When the gum bichromate process is broken down into its three components, and explained in the simplest of ways, it appears to be amazingly uncomplicated. However, to nearly every one of my students who has been seduced by the process, and for those artists who are dedicated to it, gum bichromate reveals itself to be one of the most complex in the alternative process genre.

Gum printing is ridiculously seductive, due to its limited chemistry, simple water development, unlimited color potential with watercolors of the artist's choice, and its flexible ability to be coupled with a wide range of other alternative and graphic arts techniques. I think of gum as the photographic ambassador to the graphic and fine arts. Because of its pigment and substrate options and brush application, gum bichromate printing is one of the few photographic processes capable of achieving that wonderful element of *gesture* - gesture being the evidence of painterly expression, of the *artist's*

hand, in the creation of a mark. Sadly, in conventional photography, the element of gesture is rare (and often mistaken for camera movement).

In this chapter I will, as always, offer you “a little history” and describe how the process works. I will then discuss the negative, how to generate a set of CMYK negative separations with ink-jet printer output, and relaxed registration techniques... this will allow you to place multiple applications of color on the same piece of paper without losing the original details of the image. You will also learn how to make a gum print from a single contact negative.

You'll learn about mixing the chemistry for the sensitizer and the relationship among the three primary ingredients in the technique: gum Arabic, a dichromate (potassium or ammonium) sensitizer, and pigment... generally watercolor. This will be coupled with instructions for applying the sensitized emulsion, processing the print, and re-applying sensitized coatings for subsequent layers and depth. I'll discuss development-clearing gum prints, and conclude the chapter with a comprehensive trouble-shooting section.

Considering the basic simplicity of the process you'll notice that there seems to be an unexpected abundance of information. Part of the reason is that I want you to see the infinite menu of variables within gum printing. If you investigate the process beyond this book, you will find published evidence that will occasionally seem contrary to some of the information in this chapter. You need to be aware that gum bichromate printing suffers from the same problem as do many other alternative processes... untested and erroneous instructions that are endlessly repeated as gospel.

You'll find that you will not have trouble making good gum bichromate prints if you follow the instructions in this chapter, and the Paper chapter, (dealing with paper preparation) that precedes it. Of course you're going to have issues to deal with, everyone does with gum, but the path I'm laying out for you is a well tested one and you'll be fine. Just relax, take your time, keep notes of what you are doing, and realize that the gum bichromate process will reward you individually as you modify the myriad

elements of the process to suit your own personal working style, imagery, and intentions.

[Fig: 16 – 2 here](#), (Christina Z Anderson, Crack a Girls Ribs, 2005 - gum)

[ICON – 1 here](#), (A Little History)

A LITTLE HISTORY

An interesting hypothesis from a book by Picknett & Prince entitled, *Turin Shroud – In Whose Image? The Truth Behind the Centuries-Long Conspiracy of Silence* (Acacia Press, 1994) suggests that Leonardo da Vinci (1452-1519) may have been the creator of the Shroud of Turin by using a mixture of dichromated egg with human or animal urine. Guess whose image is on the Turin shroud? ... None other than Leonardo da Vinci's of course. The book's authors, if correct, would give Leonardo da Vinci credit for the first photographic image, several hundred years before the medium's "official" beginning. To put this curious factoid in context, the publisher's catalogue is rife with books dealing with conspiracy theories dating back to the fourteenth century. Who knows? Considering everything else da Vinci has accomplished, it might very well be true.

The earliest attributable considerations regarding the effect of light on bichromates seems to be the intellectual property of the French chemist, Louis-Nicolas Vauquelin (1763-1829), at the tail end of the 1700s. Although Vauquelin published over 378 separate papers on chemistry, the bulk of his writing did little more than provide analytical observations and data. Interestingly, he was one of the first academics to consider instructing his students by means of actual, hands-on practice in the laboratory and for that he gets a big round of applause.

Mungo Ponton (1801-1880), the Scottish inventor (*with the all-time best name in the history of photography*), expanded on Vauquelin's analytical wisdom in 1839 when he discovered that paper impregnated with potassium bichromate (*bichromate and*

dichromate are the same thing, by the way) was sensitive to light. In Ponton's process, paper was coated with a potassium dichromate solution and exposed to sunlight using objects to create a photogram negative image. The exposed print was then washed, to remove any unexposed dichromate, and dried; leaving a light buff colored sepia print that consisted of chromium dioxide. The print was rather handsome at first, but tended to fade to a delicate gossamer-like green after several months. Ponton's single solution Pontotype is directly related to the idea behind Poitevin's Dusting-On process (1858) and a sizing technique for liquid emulsions on paper... both of which are covered later in this text.

A year later, in 1840, Edmund Becquerel (1820-1891) added to the rapidly expanding base of photographic knowledge by producing images using iodine in combination with starch. Specifically, he showed that he could produce electric currents by exposing certain liquids and metals to UV light and had invented a machine called an *Actinometer* that could calibrate and measure the response of those materials to light. This discovery eventually led to the development of the photoelectric cell. It was Becquerel, by the way, who first figured out that continuing the Daguerreotype's exposure through a red glass filter could intensify the final plate.

In 1854, William Henry Fox Talbot began working on the concept by observing the ability of potassium dichromate to have a hardening effect upon a colloidal gelatin directly proportional to the degree of UV light that the gelatin received. Fox Talbot's modest success in this area was followed by the work of Alphonse Louis Poitevin (1819-1882), who continued the investigation of how bichromates were able to render gelatin insoluble upon exposure to light. In 1856, Honoré d'Albert Duc de Luynes, an exceedingly wealthy arts patron, put up a prize of 10,000 francs to anyone who could describe a photographic printing process that was permanent. Poitevin won the prize for two processes: the Carbon Print and the Collotype. Additional history will be forthcoming in the following Dichromate Options chapter but in the meantime, here are a few other related techniques to consider.

Fig: 16 – 3 here (Felix Nadar, George Sand, Woodburytype – 1877)

Woodburytype

Walter Bentley Woodbury (1834 -1885) is credited with the creation of the Woodburytype (a.k.a. *Photoglyptie* – *Stannotype* – *Photomezzotint*) in 1864 -1866 - a process that was widely practiced for nearly 25 years and known for its amazing tonal range and ability to render values without any grain whatsoever. In fact, as is true of most people who invent new processes, the genius of Walter Bentley Woodbury was assisted by several decades of experimentation by a host of other artist / scientists / entrepreneurs such as Mongo Ponton, Becquerel, Fox Talbot, Poitevin, Beuregard, Paul Pretsch, and John Pouncy.

To produce a Woodburytype, the artist would make a thick gelatin relief on a piece of carbon paper by exposing it to a continuous-tone negative. The relief image was dried and then compressed into a lead intaglio plate under enormous pressure from a hydraulic press. The lead, having taken the detail of the hardened gelatin impression, would now become the printing plate for the next step. The lead intaglio plate was encased in a mold and pressed against a fine-quality paper. Pigmented gelatin ink was then poured into the mold, where it deposited the gelatinized ink in proportion to the depth of the plate. Interestingly, the Woodburytype is generally a dark reddish brown and seldom printed in black, even though any color could have been used.

Corot's Cliché Verre Etchings on Glass

A fascinating bit from the same time period... the French painter, Jean-Baptiste-Camille Corot (1796-1875), tried his hand at processes utilizing bichromates and colloids and made cliché-verre prints on glass using pure albumen as his sizing agent. He also made colloidal etchings by coating glass plates with wet sensitized collodion emulsion. The plate was then exposed to light, which darkened it entirely. Corot then etched into the darkened emulsion, and when finished, contact printed the plate to a piece of sensitized paper for a paper print. Corot and others also utilized a technique in which they would burn a tallow candle close to a glass plate, leaving a soot-blackened sheet of glass. The soot was then drawn into with a variety of mark-making tools to create a

negative plate of lines and textures. The etched soot on the glass was then used as a contact negative in conjunction with a sensitized sheet of paper.

The Fish-Glue Process

As an aside, there is another really interesting technique known as The Fish Glue Process that applies these same principles, but does so for use on a metal plate substrate. Alphonse Louis Poitevin is credited with the invention of this process. In the Fish Glue Process, ammonium dichromate and water-soluble fish glue were mixed and coated on a metal plate. Following exposure, the un-exposed and un-hardened glue (*acting like gum Arabic does in a traditional gum process*) washed off the plate, which was then dried, and heat hardened. The heat hardening produced an enamel-like surface that was subsequently acid etched (*likely with dilute nitric acid or a Dutch Mordant*) and used in an intaglio press, un-inked, to make a bas-relief image. Fish glue is still being manufactured and can be purchased, should you get an urge to try this seldom-used technique. You might also want to test it with household white glue. (*See the Resource section in the Appendix of this book for a supplier of fish glue.*)

Fig: 16 – 4 here, (Robert Demachy, Cigarette Girl, 1902 - gum)

Gum and Pictorialism

In the late nineteenth, and early twentieth, centuries, photographic image makers viewed themselves as dedicated artists rather than as the gentleman scientists, as had photographers of a half-century earlier. Some even began referring to themselves as *Pictorialists*. They worked extensively with the gum process, due to its ability to mimic the painterly image and to express the artist's intentions and feelings. For critics of the movement, this categorized the imagery as warm, romantic, and fuzzy.

Indeed, gum bichromate was championed in America by the *Photo-Secessionists*, (*first cousins of the UK's The Brotherhood of the Linked Ring*) a coalition of photographers such as Edward Steichen, Gertrude Käsebier, and Clarence White, and in due time, Alfred Stieglitz, who were dedicated to Pictorialist expression in the medium. Their inspiration came from the aesthetic integrity of multiple European organizations,

such as the Wiener Kamera Club in Berlin, who struggled to have their photographic art appreciated within its own unique context rather than as an imitative reflection of “reality.” This is, of course, the principle argument born of the aesthetic ruckus started by Peter Henry Emerson in 1889.

HOW GUM BICHROMATE WORKS

John Pouncy had come to a conclusion, the underlying principle being: a mixture of a potassium, or ammonium, bichromate salt (*dichromate and bichromate describe the same thing*) in a saturated solution is mixed with a colloid, such as gum arabic, gelatin, glue or starch. This UV light-sensitive liquid mixture is then applied to a substrate, such as paper, and dried. A contact negative, the same size as the finished print, is placed in direct contact with the dried sensitized coating in a contact-printing frame and exposed to sunlight. The portions of the sensitized paper affected by UV light through the negative will then become insoluble in direct proportion to the amount of light received.

By itself, the dichromated salt and the gum Arabic (*sap from an Acacia tree*) will produce a buff or tan-colored image. This particular sensitizer is often employed as a preliminary sizing layer for hand-applied liquid emulsions and unique substrates. If a coloring agent, most often watercolor pigment, but occasionally a gauche or a metallic powder, is added to the dichromate and gum Arabic sensitized mixture, the color of that pigment will remain in the UV light-hardened emulsion.

Again, because the dichromate / pigment / gum arabic mixture will harden in direct proportion to the degree of UV exposure received. In a first exposure, the thinnest parts of the negative (*the shadows*) will allow the most exposure, and will cause the image upon the coated paper to become the most insoluble and hardened in those areas. The densest parts of the negative (*the highlights*), will require more exposure and will as a result, harden less during the same exposure time. This means that during the wash-development stage the un-hardened pigment simply falls away from the paper leaving the highlights color-free. This is exactly why sizing is so important. It is also why, if you didn't yet read the previous chapter on paper preparation, you probably don't

understand what you just read. The other factors that will influence the outcome of your gum print are many, but the most relevant include the dichromate sensitizer-to-pigment ratio, and the amount of pigment in the sensitizer mix, the paper you choose, water type and temperature, paint type and color, and how all of these work with the chemistry and your individual technique.

[Fig: 16 – 5 here](#), (Stephen Livick, Kali Mural #528, 1991 - gum)

A FEW WORDS BEFORE WE BEGIN

Any change in the principal components of the gum process (gum type, sensitizer type and strength, ratios of one to the other, water type, temperature, paper, time of year, etc.), on any given day, may change the final results in a gum print. This is exactly what makes the process so interesting and so much fun to do. As long as you avoid investing your self-worth and abilities as an artist, in the success of every print, you will be fine. Be patient and don't try to become the "best" at this process. My friend, Judy Seigel, has probably spent more time and energy exploring the variables of this gum process than anyone I know and she is still coming face-to-face with the unexpected tricks or treats of the process. It would be a "fool's errand" to try to conquer gum bichromate printing in a short time. Judy offers decent advice when she suggests that one can come to a working truce with gum simply by paying attention. The gum bichromate process is amazingly fluid and flexible and should be approached with a spirit of play, adventure, and discovery.

[Fig: 16 – 6 here](#), (Judy Seigel, Two Men & Tree, 1983 - 2000 - gum)

THE GUM BICHROMATE NEGATIVE

Because gum bichromate, like other alternative processes, is a contact printing process it is necessary to work with negatives that are the same size as your final printed image. The vast majority of gum printing experiences require more than a single exposure and multiple "passes" (*applications of sensitizer and subsequent exposure*) of sensitized color are the norm. For this reason, it is common to have a set of *registered* negatives, fine registration, with which to successfully print a selection of highlights,

mid-tones and shadow details on the same paper. Of course if you wish to be more free form than that, and not have anything match up, that's perfectly fine as well. Registration is important if you really want to control how the print will evolve.

If your intention is to have a single color gum, with many applications of the same color, one negative may be all that you will require. If your intention is to deepen the shadows of a previously made print, such as a cyanotype or platinum / palladium, then a single negative may be adequate. With a single negative, it's only necessary to adjust the concentration of pigment, exposure, and / or amount of sensitizer in order to make a resolved image.

It is advisable to have negatives that would be appropriate for a normal grade of silver gelatin paper. This means that the negative will have an average negative density of 1.0 to 1.8. This is a general suggestion, unless you intend to make gums with interdisciplinary intentions, where the tonal values are secondary to the concept. If you are looking for a full tonal range, and gum is more than capable of giving this, it is best to avoid negatives that are too high in contrast... unless, of course, that is what you're looking for.

There are a host of film varieties and developers available for nearly any type of negative interpretation you could wish for. For the last few years I have been separating transparencies into separate CMYK (*C= cyan, M= magenta, Y= yellow, K= black*) files in Photoshop and printing them out digitally on Pictorico OHP inkjet films. I have also been taking original color or black & white images and converting them to CMY and CMYK negative sets for gum printing. One of the workflows that you can read about in this, and the Digital Options, chapters is how to apply custom curves to your digital files that are designed for the process. You can make your own or you can go to the Internet and find many free versions to test out. **Note:** *Please refer to Digital Options, Chapter 5, for a complete workflow regarding making a color layers on a digital negatives.*

Fig 16 – 7 here, (Applied Gum Bichromate Curve and Comparative Step Wedges)

In almost every situation, digital negatives are perfectly satisfactory for gum bichromate printing and they provide a flexibility and speed in negative reproduction that only Polaroid matches. You may also wish to consider using negatives made from laser copy machines or making your own with a cliché verre technique. Refer to Chapter 2, The Negative, and Chapter 3, The Digital Options, for more information. In the meantime, I am going to reproduce the instructions for CMYK and Color Layers here that are in the Digital chapter just in case you haven't read that information yet.

MAKING DIGITAL SEPARATIONS FOR GUM PRINTING

Simple Workflow In Photoshop

Note: I am including the following information in both this Gum Bichromate chapter and the Digital Options chapter. There is relevant information here that can be applied to many processes and it especially important to see this B&W to CMYK workflow in context with the process and related illustrations.

Gum bichromate artists have always had to accomplish a few tedious tasks before getting to the fun parts of the process with all the colors and splashing around in the sink. Along with paper sizing, making CMYK (Cyan, Magenta, Yellow, & Black) negative separations was one of my least favorite things to do for a day in the studio. In the beginning you could shoot the separations in camera or move to the darkroom with an existing negative, and do your separations there with various film types, filters, and projection. Then along came digital imaging, Adobe Photoshop and Pictorico OHP.

In the first edition of this book I was all impressed with Photoshop v.5 and by the fact that I could make CMYK (*cyan-magenta-yellow-black*) separations from a black and white source with only 26 easy steps... I called it the "speedy, non-fussy version." Now I'm using Photoshop CS2. Next month I'll probably be using Photoshop CS3. No matter, the fact is that with CS 2 or 3 I can now tell you how to go from a black and white (Grayscale) source to CMYK, or from a RGB (*red-green-blue*) source to CMY (*cyan-magenta-yellow*) or Grayscale in a flash. Best of all, it really is speedy and simple... even for the technical neophyte.

These sequences are a good start. They are not the last word in making digital separations on Pictorico OHP film, going from Grayscale to CMYK, or RGB to CMY, nor is it inflexible. For instance... if you flip and exchange Step E with Step C, your separation negatives will look different.

These particular workflows are ones that I worked out via email exchanges with several friends - David Stinchcomb, in Oklahoma, Tony Gonzalez in NY, and xtime Burrough in CA. Their brains don't melt when they think about things digital and they have been a great help in getting this information into a simple and easy to follow workflow. Tony's 3-color CMY workflow will come later in this chapter.

As with any alternative syntax in any medium, individuals will adjust the steps in any process to suit their individual needs. Again, these are only workflow recommendations but they work and will certainly get you started.

One other thing to consider, the separations I am offering here are simple workflows designed for those who just want to have an easy and more than adequate way to generate their digital negatives quickly. If you are really serious about perfection and knowing everything there is to know about this subject, then you will want to consider graduating to advanced level considerations such as those developed by Dan Burkholder or Mark Nelson. Dan's web site (www.danburkholder.com) and book are amazingly complete and he has custom profiles and instructions for just about everything you will need. You can find Mark Nelson's advice in Dick Arentz's *Platinum and Palladium Printing: 2nd Edition*.

C-M-Y-K GUM SEPARATION NEGATIVES

On Pictorico OHP in Photoshop

Note: In this example you are starting with an RGB color file and your intention is to convert it into a set of B & W, C-M-Y-K negatives that you can use in gum bichromate

printing. This information is duplicated in both the gum bichromate chapter and the Digital Options chapter.

[Fig 16 – 8 here](#), (John Quackenbos, 35mm Transparency, 1999)

[Fig 16 – 9 here](#), (C-M-Y-K Gum Separation Grayscale Sequence)

[Fig 16 – 10 here](#), (John Quackenbos, Cyan Mural, MPW-4 color gum, 1999)

R-G-B TO GRAYSCALE C-M-Y-K SEPARATIONS

On Pictorico OHP In Photoshop

Step #1 - Open up your image file and work on it in Photoshop until it meets your expectations and intentions. Save it with a label that will indicate that it is specifically for the particular set of CMYK negatives you are making.

Step #2 - Go to > Menu Bar, then to > Image, then to > Mode, then click > CMYK

Step #3 - Go to > Image, then to > Adjustments, to > Curves and click >Load

Step #4 - Find your > Gum Curve (the. sacv file) and > click Load. *

Step #5 - Go to > Image, then to > Adjustments, and click > Invert

Note - You have an option at this point in the process. Some gum printers want a set of negatives that are really “punchy” and have a good deal of contrast. If you are one of these gummists then this is where you will go to > Image, then to > adjustment and click > Auto Levels. If you are seeking a more true to life CMYK interpretation of an actual color set, then you might want to skip this step. Try it both ways and see what you like. At some point in the process you will be adjusting levels, and by doing so, the contrast levels of your negatives. Depending

on the type of negative separation set you want, contrasty, or sort of true to life, you can adjust now or after you make your separation set.

Step #6 - Next, go to the palette that is probably on your screen, indicating Layers, Channels, and Paths. Click > Channels and, using the tiny arrow on the top right corner of the palette, click > Split Channels. Presto! ... Photoshop will automatically create 4 separate, and distinct, B & W negatives for you. These are your CMYK separations.

Step #7 - For each of these negatives... Go to > File and to > Save As. Title your negative to as whatever you need to name the file in order to remember it. I name my sets by the title of the image and what color negative I will be applying when gum printing. i.e., Cyan, Magenta, Yellow or Black.

Step #8 - Go to > Image, then to > Adjustments, and > click Levels and adjust them manually... bringing the left and right adjustment markers to the extreme ends of the Levels histogram. Do this step for each of your separations. Keep in mind that you are making a unique set of negatives here and that you can adjust the contrast of these negatives using Levels or Curves to suit your needs or the type of color you are using. This will make sense once you begin doing the actual gum printing.

Step #9 - Go to > Image, to > Canvas Size, and give yourself a little white, black, or gray border to use for registration marks, pin holes, or other miscellaneous marks that will be your guide for gum registration. You can apply registration marks automatically with your printer in > Print With Preview... See Below. **

Step #10 - Print out the CMYK negative separations using Pictorico OHP ink jet film.

*** Free Curve Profiles**

The most immediate, and simple, solution for getting a free Curve Profile for gum bichromate printing is to go to Malin Fabbri's excellent alternative process web site. www.alternativephotography.com In their negatives and curves section you will

find a number of free profiles that you can download and use to make negatives. I personally like David Hatton's Gum Curve but you can easily begin with that and adjust it to fit your intentions. Then simply save it as a curve to use another day.

**** Adding Registration Marks**

If you want to add registration marks to your film make sure that you have enough room outside of the image to do so. I will add here that this is how my Epson printer software allows me to create registration marks. Most printer software packages come with a method of adding registration marks to the printed works, but you may have to dig around in your own print dialog box to find something like "output", "crop marks", "printer marks", or "registration"...isn't that annoying?

Anyway, after you check to see if you have enough room on the outside of your image... Go to File > to Print With Preview. There is a blue box under the Preview image and if you click on it you will get a choice of Color Management or Output. Choose Output and you will get a rather large menu of things you can set up before printing... one of these items is registrations marks. Check that box and if you have enough white space around your negative the marks will appear. If they don't appear, check the box that says scale to fit media and they will pop up because the program automatically resizes the image to include everything necessary.

Fig 16 – 11 here, (Gonzalez CMY Gum Curve Profile)

Fig: 16 – 12 here, (Tony Gonzalez, Jaclyn, CMY Separation Set)

R-G-B to C-M-Y / GRAYSCALE GUM SEPARATION NEGATIVE

Note: In this example you are starting with a color file, perhaps R-G-B, and your intention is to convert it into a set of C-M-Y grayscale negatives that you can use in your gum bichromate printing.

Step #1 - Open up your image file and work on it in Photoshop until it meets your expectations and intentions. Save it with a label that will indicate that it is specifically for the particular set of C-M-Y negatives that you are making.

Step #2 - Go to > Image on the Menu Bar, then to > Mode ... then click > Multichannel

Step #3 - Next, go to the palette, that is likely on your screen, indicating, "Layers," "Channels," and "Paths." Click >Channels and using the tiny arrow on the top right corner of the palette, in this box, click > Split Channels. You will automatically create 3 separate, and distinct, B & W positives for your C-M-Y separations. Execute the following steps for each of the C-M-Y files.

Step #4 - Go to > Image, to > Adjustments, and click > Auto Levels. Or click > Levels instead and adjust your negative manually to your own taste. At some point in the process you will be adjusting levels, and by doing so, the contrast levels of your negatives. Depending on the type of negative separation set you want, contrasty, or sort of true to life, you can adjust now... or after you make your separation set.

Step #5 - Go to > Image, to > Adjustments, and click > Invert

Step #6 - Go to > Image, to > Adjustments, to Curves, and click > Load

Step #7 - Find your Gum Curve and click > Load. *

Step #8 - Go to > Image, to > Canvas Size, and give yourself a white, or black, border to use for registration marks, pinholes, or other miscellaneous notes. **

Step #9 - Go to > File and to > Save As and title your negative to whatever you need to name the file in order to remember it. I label mine by the title of the image and what color negative I will be applying when gum printing.

Step #10 - Check your levels one last time and continue to print out the negative separations using Pictorico OHP ink jet film.

[Fig: 16 – 13 here](#), (Tony Gonzalez, Jaclyn Curtain, 2005 - CMY gum)

REGISTRATION

Registration is done after sizing / hardening. If you intend to make multiple passes, or if you are working on a more complex gum, such as trying to duplicate a color transparency from 4 CMYK separations (*See the workflow above*), it will be necessary to register your negatives. If you don't register them, you will often get curious and unexpected results where none of the C-M-Y-K separations line up. This accident may well be a *good* technique if you use it intentionally.

There are many ways to register negatives and paper. Some of the methods include Photoshop registration marks (*see above*), paper punches, pushpin holes, stick-on transparent registration targets applied during negative production, or an old dye transfer punch-board that can easily be found on eBay. You can also register simply by laying your coated paper on a light table and quickly registering your negatives to the sensitized paper and locking it in with pieces of transparent tape. This is harder to do with darker color layers of course. Don't stress about the light from the light table. Even though your dried emulsion is sensitive to light, you still have plenty of forgiveness in the emulsion speed and will have time to secure the registration without fogging the image... as long as you're really quick about it. The point of registration is to give yourself a repeatable and mechanical way of accurately aligning your negative, or a different one, on the same piece of paper. This is especially true when a different color is assigned to each negative and where it is difficult to see the base image after recoating.

A Simple Registration Technique

On a light table, register all of the negatives to be used in your print. With a mat knife or sliding blade paper cutter, trim the margins at different lengths of all but one negative so that when they are in registration each piece of film will have a different

height but will still be in registration with the others. Run a strip of tape across the packet of trimmed edges so they can be picked up as a set.

When this is done, place the packet of taped negatives on the area of your *sized* paper that you will be printing on. Move the sized paper and the taped negative pack to a clean and porous surface (such as Foam Core) that will accept a pushpin and poke a pinhole through at least three margins of the negative set and paper. These holes will serve as your registration reference guides later on. Of course, if you wish to have a lot more control, then your registration techniques will have to be a lot more sophisticated than what I've described. If you have a strong urge to make this process more complicated, please feel free to do so.

Fig: 16 – 14 here, (Sarah Van Keuren, Geometric Seascape 2001 digital gum)

THE GUM BICHROMATE RECIPE

The sensitizer emulsion for gum bichromate printing is prepared in simple and separate steps. You begin by mixing your dichromate solution. Most gummists use either potassium or ammonium dichromate but it is also acceptable to use sodium dichromate... although I don't know anyone who does. Potassium dichromate is a bit softer than ammonium dichromate but clears out in the highlights better than does ammonium dichromate. Potassium dichromate yields a bit more contrast, takes a little bit longer to make a complete exposure, which is good, and usually avoids yellow dichromate staining. Most serious gummists that I know use potassium dichromate. Just for the record, the difference in saturation between ammonium dichromate (25%) and potassium dichromate (13%) may be the reason for the way they behave differently. If you were to add water to the ammonium dichromate, taking it to a 13% solution like the potassium, it is probable that you will avoid some of the less aggressive traits of ammonium dichromate, i. e., less concentration softer print.

Whichever dichromate you elect to use for your sensitizer is added to a mixture of gum arabic and watercolor paint to make the complete sensitizer solution for coating. Additional water can also be added and will help make your emulsion smoother. The

proportions of gum arabic to sensitizer can be adapted to suit your contrast and exposure time requirements as well. Some gum practitioners also substitute a liquid rabbit skin glue or albumen for the gum arabic. Immediately you can begin to see that the process is not one where hard and fast rules apply.

Potassium & Ammonium Dichromate

Potassium, or ammonium, dichromate is your UV sensitive component and is added to your mix of liquid gum Arabic and watercolor pigment to create the sensitizer emulsion that will be coated upon your paper. It is a typical alternative emulsion, suitable only for contact printing under UV light. You don't have to worry very much about working with it under normal low light conditions because your sensitizer isn't that sensitive until it is dry. I once gave a gum printing demonstration in a motel lobby where the motel's yellow sheets were hung over sun filled windows. I performed another gum demonstration in the back of a van in a parking lot on a rainy day - and had no problems with fogging there either. Avoid long periods of time under excessive fluorescent light as you would with other alternative processes.

An Interesting Fact Regarding Dichromates:

The speed of the emulsion will be slower in proportion to the pH of the water used in creating the coating solution. The more alkaline the water is, the higher its pH (*above 7*) and the less the dichromate's sensitivity to UV light. Conversely, the more acidic the water, the lower the pH (*less than 7*) and the greater the dichromate's sensitivity to UV light.

Making a Stock Saturated Dichromate Solution

Dichromates are used in gum sensitizers in a saturated solution. A saturated solution is defined as one in which no more of the dry chemical can be dissolved in water without creating insoluble sediment.

As mentioned earlier, ammonium dichromate is *saturated* at around 25% to 30% while potassium dichromate is saturated at 10% to 13%. Ammonium dichromate is more sensitive than potassium dichromate (*due to more dichromate ions in the solution*) but

the only differences that you might notice will be shorter exposure times and a slight increase in contrast. Potassium dichromate is a little softer and you will experience an easier time clearing the print with potassium in your sensitizer. Again, one factor will impact another, such as the pH of the water you saturate with, and you'll need to work out your own system to accurately predict outcome.

Let's say that you are going to use potassium dichromate in your sensitizer and you need to make a saturated solution. Knowing that potassium dichromate become saturated between 10% and 13%. Take digital gram scale and weigh out 10 g of potassium dichromate and stir it into solution in 100 ml of water. This makes a 10% working dichromate solution... simple, huh?

There is a range here and if you opted to make a saturated solution of 13% then you would be using 13 g to the 100 ml of water and this would be making a slightly faster sensitizer. In truth, you don't need a scale at all. Just keep adding the dichromate to the water until the dry chemical ceases to dissolve any more.

You can experiment and decide what strength is best for your own work. In any case, this saturated dichromate solution, whether it is potassium or ammonium, will last for a very long time when stored in a dark airtight bottle. Be sure to label the bottle with information regarding its contents, its percentage, and the date it was mixed. Be sure that the bottle has a plastic cap... no metal ever! Lastly, be sure to store it in a safe place where children cannot reach it; when mixed, dichromate solutions look a lot like a sugared drink!

NOTE: Be cautious in how you handle ammonium or potassium dichromate: It is dangerous and poisonous and highly allergenic. Never put bare skin in contact with any dichromate solution. This chemical can cause lesions on your tender flesh through contact and can damage your lungs by breathing it in its dry state. Be very careful with storage and never leave the chemistry unlabeled or where children can get their hands on it. Please reference the chemical section in the Appendix before using dichromates.

[Fig 16 – 15 here](#), (Christopher James, *Grace in Gum*, 1989 - gum)

WATERCOLOR PIGMENTS

The watercolors you use must always be “professional” artist quality, *not* student or “*academy*” grade paint. Inferior paint often does not clear well in the highlights, or the shadows, and can be one of the reasons, besides poor paper preparation, bad gum Arabic, and too much sensitizer in the formula, for paper staining. There are almost no exceptions to this warning about academy grade paint. The best paints that I’ve used are made by Schmincke Horadam Aquarell, Winsor & Newton (professional grade only), Linel (Lefrance & Bourgeois) and Sennelier. Stephen Livick recommends adding twice the amount of pigment to gum ratio if using Sennelier (*12 g pigment for every 12 ml of potassium dichromate*). Each of these manufacturers has types of paint that are better than others and you will spend a little money testing them.

Watercolor paint is composed of finely-ground pigments mixed with gum Arabic for body and glycerin or honey for viscosity and to assist in bonding the color to the substrate. The only other ingredient you’re likely to encounter will be clove oil, which is added to prevent mold growth.

It would be a simple task to begin writing about watercolor paint but a much larger one to finish telling you everything there is to know about it. I’m going to explain a few basics and then leave the rest up to you. I would like to recommend that you try to locate a book called *The Wilcox Guide to the Finest Watercolour Paints*, by Michael Wilcox. You may also try to access the related web site which is mind-boggling ... just Google it. This site should satisfy even the most demanding scholar, which is lucky for you because copies of the book are quite rare. Just to give you an idea how precious the book is... as I write this, there were two used copies on Amazon and they are over \$165.00 each.

For beginning work it is a good idea to have “primary colors” from a single maker on hand. Schmincke or Winsor & Newton are good choices. The primary colors include

red (*alizarin crimson, Permanent Carmine*), blue (*Phthalo or cobalt*), and yellow (*Lemon Yellow, New Gamboge or Cadmium Yellow Medium*). Winsor and Newton's Naples yellow is also a really nice color and is creamier than the other yellows, as is Transparent Yellow. You may also wish to have a black (*Lamp Black*) and a gray such as Davy's Gray, which is a very pale creamy greenish slate color. If you need a stronger green I would recommend Oxide of Chromium over a straight green, as it will clear better. You can also mix your own green from the blue and yellow you have in your primary set. Of course, you may use any color you wish from the manufacturer's stock as long as the quality is good. Be aware that some colors are suspect in regard to permanence and ability to clear in the wash development stage. Those of you who are color blind, or color-impaired, might be considered creative, so don't avoid the gum bichromate process for those reasons.

It would be numbing to provide a complete list of recommended paints because there are so many different brands of watercolor and gouache (*watercolor with white pigment added*), and a color from one manufacturer will behave quite differently than the identically "named" color from another. You will have to discover those that are best for you within the parameters you work in. Keep careful notes and you'll work it all out eventually. I would recommend going to the firestorm that is the alt process newsgroup and checking out their archives that discuss gum bichromate color. Note: Daniel Smith, one of the best art supplies to be found anywhere, gives information re: such things as "light-fastness" in their catalog. Daniel Smith also makes and sells their signature line of high quality watercolors and these can be found on their site... www.danielsmith.com.

Testing Pigments For Gum Printing

One of the best methods of testing a particular pigment for gum bichromate printing is to mix together a gum formula consisting of 12 ml gum Arabic, 12 ml saturated potassium dichromate, and 1 g of the pigment being tested. Coat and dry your sized and hardened gum paper, place an opaque object, like a coin, in the sensitized area, expose it to UV light for 15-20 minutes, and then process it normally in a soaking wash-development bath for 30 minutes. The paper under the opaque object should clear

completely in the wash development bath. If it does not, the paint is not a suitable one for gum bichromate printing. Or, you need to work on your sizing technique

The Most Often Recommended Paints / Pigments Based on Gum Performance

OK, OK... I know that I said I wasn't going to list all of the paints but this short list will be enough to get you started on your experimentation with color and paint.

Lefrance & Bourgeois / Linel: (Founded in 1720) - Natural Earth (Lightfast Raw Umber) Helios Yellow, Ruby Red, Hortensia Blue, Ivory Black, Peach Black, Cobalt Blue, Warm Green, Warm Sepia, Bayeux Violet, Naples Yellow, Viridian, Venetian Red

Winsor & Newton: Cobalt Blue, Permanent Rose, Terre Verte, Oxide of Chromium, Naples Yellow, Rose Madder, Alizarin Crimson (hue), Lamp Black, Permanent Magenta

Sennelier: Cobalt Blue, Phthalo Blue, Lamp Black, Phthalo Green Deep, Sennelier Red, Veridian, Warm Sepia, Permanent Magenta, Cerulean Blue (*very heavy paint!*), Yellow Ochre

Schmincke Horadam Permanent Carmine (magenta), Cadmium Yellow Middle (yellow), Phthalo Blue (cyan)

PAPER FOR GUM BICHROMATE

It is important to use a paper that is well made and able to stand up to all sorts of abuse and have superior wet strength. No wimpy papers are suitable for gum bichromate printing. They must be able to withstand repeated washing times of extended duration as the process requires a complete wash after every pass and there is no limit to the number of passes you might perform in a single print. For minimal passes, a paper with a weight of 140 lb might be adequate.

For gum projects with several applications, exposures, and development experiences, a 300 lb. paper will work well. I have used 1160 lb. Arches when I have intended to make gums where I could use power tools and sanders as part of the working process. In all cases, even with high quality watercolor papers, you must gelatin size and harden the sizing if more than a single pass is planned for. Please refer to the previous chapter for specific information and recommendations for paper.

My personal paper favorites are 300 lb Lana Aquarelle, well-sized 300 lb Fabriano Artistico (a luxury experience), and 300 lb Arches Aquarelle.

GUM ARABIC

Gum Arabic, or gum acacia, can be traced back in time to 2650 BC where it was harvested from the sap of various species of Acacia trees in Nigeria, Cameroon, Chad, Mali, and the Sudan. The Acacia trees grow primarily in the sub-Saharan (Sahel) areas of Africa and the Sudanese variety is considered the premium grade. In gum printing, the dichromate is added to the gum to create the liquid foundation of the gum sensitizer.

Grades of Gum Arabic

Gum Arabic can come in a variety of purities. Superior Selected Sudanese / Nigerian gum Arabic is considered the premium grade and has a very pale color and clarity. This gum Arabic is hand selected, cleaned, and sifted free of any impurities and alien organic matter. This is the grade of gum Arabic that you would want to use with delicate colors such as yellow. It's also very expensive. Winsor – Newton sells this expensive Sudanese grade.

Kordofan No. 1, is a good grade of gum Arabic and quite excellent for gum printing. This grade has a slight haze and is pale to dark yellow. I believe that Bostick & Sullivan sells the slightly hazy, pale yellow, Kordofan#1. This brand is good for just about everything. After #1 comes the "Siftings" grade which can be recognized by a cloudy and yellow amber color. This is pretty common and a step up from the lowest grade, "Dust #3," which is opaque and dark amber-brown. You'll find this grade in

printmaking studios in art departments with small budgets. To be considered saleable, the gum Arabic must have minimum moisture content of 12% - 14%.

New Vs. Old Gum Arabic

One thing that seems to make a difference is the age of the gum Arabic. I've heard from more than one gum bichromate worker that the way ammonium dichromate mixes with pigment, and the way it hardens during UV exposure, is better when the gum has aged a bit rather than when the gum is fresh and new. Older gum Arabic tends to adhere to the paper more effectively and is somewhat responsible for more predictable and cleaner looking prints. Tony Gonzalez told me that he has four gallons of the stuff aging in his darkroom.

A few gum bichromate artists claim that different types of gum arabic have different printing speeds. They are probably correct, but I'm not sure you should lose sleep over this possibility. Gum arabic is also handy for masking.

Essentially, you are buying the sap from an acacia tree and the color of it does not always determine the quality. Most art supply outlets sell it by the quart or gallon to meet the requirements of printmakers and lithographers.

Preparing Gum Arabic Solution From Dry Gum

Mixing gum Arabic from a dry state is relatively simple... it just takes a little longer to get to the stage where you can use the gum. The mix is essentially a 1:6, i.e., 30 g of photo quality gum Arabic to 180 ml distilled water. Put the two ingredients together in a glass or plastic beaker and let them stand for several days until the gum dissolves. Any residue can be filtered or strained off leaving you with a clear gum Arabic to work with. Some of my friends add 0.50 g of mercuric chloride to the solution as a way of preventing bacterial and fungal growth in the solution. I'm not an advocate of this practice if you are not extremely familiar with chemistry and related safety precautions ... this amount of mercuric chloride is lethal.

Using Glue as a Substitute for Gum Arabic

There is a nice idea for using liquid glue as a substitute for gum arabic. This formula is from the Randall Webb and Martin Reed book, *Spirits of Salts*. First, make up a 5% potassium dichromate sensitizer (5 g to 100 ml of distilled water). Next, place a small amount of watercolor pigment, about the size of a #2 pencil eraser, in a ceramic cup. Then add 5 ml liquid glue to the cup and stir it into the paint. The Webb-Reed book indicates that you shouldn't be concerned if the mixture is a "rubbery mess" but that could be their sense of humor. Add 5 ml of the 5% potassium dichromate mix to the "rubbery mess," mix the ingredients together, quickly coat your paper with a thin coating of the solution, dry it thoroughly, put the coated paper and negative in a printing frame, and expose in UV light. Presto!

[ICON – 2 here, \(Table Set-Up\)](#)

TABLE SET UP FOR GUM BICHROMATE PROCESS:

Glyoxal – Gelatin - sized paper

A small measuring beaker able to measure in single ml increments

Clean paper for the table surface

A selection of hake or foam brushes for coating paper

Clean water in a beaker for brush washing

Pencil for marking paper with procedure notes

Contact printing frame

A selection of professional quality watercolor paints in tubes.

(Basic colors will include red, yellow, blue, and black. If separating CMYK, cyan, magenta, yellow, and black.)

Gum Arabic

A saturated solution of potassium or ammonium dichromate

Negative / CMYK negatives for contact printing

Paper towels

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

GUM BICHROMATE SENSITIZER EMULSION

The Best Gum Sensitizing Emulsion

I imagine that that headline got your attention. The truth of the matter is that nearly everyone I know who is good at this process has their unique way of performing it and this includes their recipe for the sensitizer emulsion. There are also so many variables to take into consideration that it is a small wonder that anyone agrees on anything connected to the process.

The general consensus among contemporary gum bichromate printers is to use a sensitizer that will expose easily and clear quickly. The gum to sensitizer ratios run from 3:1 to 1:1 with variations in the proportions depending upon when the “pass” occurs in the printing sequence. We’ll get to this later but essentially what this means is that if you are making a yellow pass, your first sensitizer might be a gum to dichromate sensitizer ratio of 1:2. A second pass might then change to a gum to dichromate ratio of 1:1 and by doing this you will experience an increase in printing speed, and a reduction in contrast.

If you take all of the variables out of the equation; the paper is fine, the sizing is perfect, the paint and gum is of excellent quality, and the dichromate is mixed to a perfect saturated state, then the ideal base sensitizer emulsion would be... 1 part gum to 1 part dichromate sensitizer and some paint... usually ½” to 1” out of the tube.

A 1:1 Sensitizer Using Potassium Dichromate

All variables in place and in good order, this formula is generally very successful and the proportions of potassium dichromate to gum are similar to the mix used by many of the most technically successful gum artists. Use the following ingredients and mix them according to the directions for ammonium dichromate. Pigments have different densities and different manufacturers make similar colors in different concentrations. Therefore, the amounts used in an 8” x 10” formula such as this one will fluctuate, depending upon the color and make of the paint. Figure a half-gram weight to be in the ballpark.

- 6 ml of gum Arabic
- 1/2" to 1" watercolor pigment
- 6 ml of saturated potassium dichromate solution

Begin by taking a clean paper cup and adding 6 ml of gum Arabic to it. Then add your watercolor paint and stir it into the gum. You can add a little water if you want a less dense solution. Now it's time to sensitize it. Add 6 ml of your saturated potassium dichromate and stir it into solution. Your sensitizer is ready to go.

[Fig 16 - 16 here](#), (Carmen Lizardo, American flag blue house, 2006 – gum)

Gum bichromate artist, Carmen Lizardo, uses a thinner sensitizer and mixes her formula using simple "kitchen" measures: 1 Tsp gum, 1 Tsp ammonium dichromate, 1 Tsp, pigment, and 1 Tsp distilled water. There isn't much chance of this formula being misunderstood. Carmen says that she does alter the pigment to gum – sensitizer ratio depending on the intensity of the pigment, i.e., cadmium red vs. a Davy's Gray.

Stephen Livick, who is one of the very best gum printers around, has a very basic initial sensitizing emulsion formula that is similar to many other great gum printers. The sensitizer is based on a 1:1 ratio of gum to potassium dichromate sensitizer with varying degree of paint depending upon color. He mixes: 12 ml of gum and 12 ml saturated potassium dichromate. To this he adds:

- First Coat: 2.5 grams Linel's Helios Yellow
- Second Coat: 2.5 grams Linel's Ruby Red
- Third Coat: 4 grams Linel's Hortensia Blue

Notice that Stephen doesn't have a black (K) pass as he feels the 3-color sequence makes quite enough black for his imagery. Tony Gonzalez is another gum printer who also foregoes the black pass in favor of a cyan.

3 - COLOR C-M-Y GUM BICHROMATE

It isn't always critical to have a set of CMYK separations to make a beautiful gum bichromate exposure. Tony Gonzalez, who teaches at Queens College in New York, has a terrific workflow that utilizes cyan, magenta, and yellow negatives that are made on Pictorico OHP ink jet film and an Epson 1280 printer. (See Fig 16 – 19)

In detailing the way he works with making his CMY negatives Tony explained that he did extensive testing using his Epson 1280, Pictorico OHP film, and Media Street inks. After about a year, he determined the percentage of black ink that would be equivalent to the density of silver in the Stouffer 21 Step Tablet. Knowing that a 65% black density is equivalent to step #2, 70% black is equivalent to step #3 and so forth. Tony then based his curve profile on an 8 step (*including Dmin and Dmax*) tonal scale that is more or less the tonal range he concluded that he could achieve in his gum prints.

As you can see in the following description of an 11-layer set of exposures, Tony is printing two very short black passes but is using his Cyan negative for the exposure. (If you forgot how to make a cyan negative, you can refer back in this chapter for instructions or go to the Digital Options chapter). In the following gum workflow set, Tony uses the following Schmincke Horadam watercolor pigments. These are not the most expensive watercolor paints but they work extraordinarily well for him and for the way he has worked out his system.

Gonzalez C-M-Y-K Gum Color Equivalents

- Magenta: Schmincke Horadam Permanent Carmine,
- Yellow: Schmincke Horadam Cadmium Yellow Middle
- Cyan: Schmincke Horadam Phthalo Blue
- Black: (*using the Cyan negative*) Winsor Newton Lamp Black

[Fig: 16 – 17 here](#), (Tony Gonzalez, Rachel, Nail Polish, 2004 – CMY gum)

Tony's Gum Recipe

For the sensitizer, the gum to dichromate ratio is 1:1. For his negatives, Tony uses 12 full eyedroppers of gum and 12 full eyedroppers of ammonium dichromate. He uses a ¼ inch worm squeeze of pigment for Cyan, Magenta, & Yellow paints. For the black equivalent, use a 1" worm squeeze of W & N black paint but use the cyan negative for the 2 exposures.

Gonzalez Exposure Unit

Note: Exposures are made using an exposure unit with an outside dimension of 18" x 32". Inside the unit are three 24" double fluorescent fixtures with 6 Phillips, F20T12/BL, 20-watt fluorescent UV Black Lite bulbs, with approximately 1" between each bulb. There is 4" between the bulbs and the negatives. All bulbs are controlled by an on/off toggle switch. You can purchase these bulbs inexpensively. See the Resources section in the Appendices.

Gonzalez's Gum Bichromate Workflow:

- **Layer #1** – Magenta Negative– at 1:2 gum to sensitizer ratio
Exposed for approximately 4 minutes and develop for 1 hour.
- **Layer#2** – Yellow Negative - at 1:2 gum to sensitizer ratio
Exposed for approximately 4 minutes and developed for 1 hour.
- **Layer#3** – Cyan Negative - at 1:2 gum to sensitizer ratio
Exposed for approximately 4 minutes and developed for 1 hour.
- **Layer #4** - Magenta Negative – at 1:1 gum to sensitizer ratio
Exposed for approximately 4 minutes 45 seconds and developed for 1 hour.
- **Layer #5** Yellow Negative - at 1:1 gum to sensitizer ratio
Exposed for approximately 4 minutes 45 seconds and developed for 1 hour.
- **Layer #6** Cyan Negative - at 1:1 gum to sensitizer ratio
Exposed for approximately 4 minutes 45 seconds and developed for 1 hour.
- **Layer #7** - Magenta Negative – M at 2:1 gum to sensitizer ratio
Exposed for approximately 2 minutes 30 seconds and developed for 1 hour.
- **Layer #8** Yellow Negative - at 2:1 gum to sensitizer ratio
Exposed for approximately 2 minutes 30 seconds and developed for 1 hour.

- **Layer #9** Cyan Negative - at 2:1 gum to sensitizer ratio
Exposed for approximately 2 minutes 30 seconds and developed for 1 hour.
- **Layer #10** Cyan Negative - at 2:1 gum to sensitizer ratio
Exposed for approximately 2 minutes and developed for 1 hour.
- **Layer #11** Cyan Negative - at 2:1 gum to sensitizer ratio
Exposed for approximately 2 minutes and developed for 1 hour.

A TRADITIONAL GUM SENSITIZER EMULSION FORMULA

- 9 ml of gum Arabic
- 1/2" to 1" of artist's grade watercolor pigment
- 3 ml of saturated ammonium or potassium dichromate

This is a time honored formula that you'll find in a lot of literature and one that tends to clear very well due to the abundance of gum in the sensitizer. It does, however, provide a rather soft impression in each pass. Begin by adding the 9 ml of gum Arabic to a small plastic, paper, or glass container. Next add the watercolor paint and stir the paint into the gum until it's smooth. To sensitize this paste, add 3 ml of a saturated ammonium, or potassium, dichromate solution and stir it into solution. Please be aware that this formula is one of those old "horses" that has made its way from one source to another since the beginning of time (*more or less*). It works perfectly well but it isn't, by any means, the last word in gum formulas. I like it for workshops because not many things go wrong with it. Each individual will adopt his or her own personal working styles, techniques and mixes to suit their intentions and their imagery. In addition, each person's coating technique, washing style, or purist to non-purist approach, will be different according to who they are and what it is they need from the ratios and combinations of gum, paint, and dichromate. As they say in the gum labs, "It's not how impeccable your formula is, it's how you use it."

An Alternative Sensitizing Formula: "The 5-10-10"

Here's another formula that I like for large pieces because the sensitizer doesn't dry as quickly and the details are pretty nice after each pass. This sensitizer formula

makes a coating that is texturally smooth and a bit pale. As I said, it's a good choice for print details that are delicate and built up patiently over subsequent exposures. This is also great formula for darker colors used to increase shadow depth in gum and combination processes such as gum and cyanotype.

- 10 ml of gum arabic
- 10 ml of warm distilled water
- 1" or more of quality watercolor paint
- 5 ml of ammonium or potassium dichromate

[Fig: 16 – 18 here](#) (Ernestine Ruben, Big Bird, China, 2007 – gum)

Cyanotype or Sensitizer Without Pigment First Pass

When your paper has been correctly sized and hardened, and you have registered your negatives with the paper so that multiple applications of exposure are possible, it is time to coat the paper. If this is your first experience with gum, or if you have not had any success with the process before, choose one of the dichromate formulas above and prepare for success.

Select the color(s) you wish to mix for the first coating. Generally, a lighter value is used first so that you can get a sense of where you will be going with the print. This lighter color is often used to print for the highlights in your negative. Measure a small amount of watercolor pigment into the gum and stir it well until it is thoroughly in solution. Now add the dichromate sensitizer under low light and stir slowly until all of the ingredients are melded together as one.

It is not uncommon to make a first exposure using only the gum arabic and the sensitizer. This exposure, providing it is not too long, will give you a light tan-colored image of your negative. You may also elect to begin your first gum exposure on top of another non-silver process such as cyanotype. In this case, your initial base color will be blue and will take the place of the Cyan in your C-M-Y-K sequence.

It is quite permissible to work under normal room light conditions, but I generally prefer to *mix* my colors under a brighter light so I can better evaluate them. It is also a good idea to paint a piece of the scrap paper with your intended emulsion and blow-dry it to quickly see what the color will look like when it's not wet. Keep in mind that when you add the dichromate to the watercolor / gum arabic solution the color will change due to the orange color of the dichromate sensitizer. Don't worry about this change, because the orange color will wash out during processing.

[ICON – 4 here \(Brush Coating\)](#)

COATING

Coating a gum bichromate emulsion on paper is not difficult but requires practice. There are several ways to coat well. The standard technique is to work on dry, gelatin-sized and hardened, watercolor paper using a hake or foam brush. Mark the printing area with light pencil registration marks, and quickly brush-coat in even vertical, and then horizontal, strokes. Work fast, lightly, and smoothly until the emulsion just begins to become tacky. Select the width of your hake brush by the size of the area that you are coating. Obviously, a 1" brush is a more difficult tool to work with if your coating area is large. It is much less expensive to use a hardware store type of foam brush and this type of brush comes in wide assortment of sizes. I personally prefer working with the hake brush. This is because the hake brush absorbs less of the sensitizer emulsion and can be easily washed for additional use. Judy Siegel makes a case for using a foam brush saying that all you need to do is gently moisten the brush with a dropper of distilled water and gently blot it with a paper towel. She's probably correct, but I'll stick with the hake because it simply feels better in my hand. Again, be careful to paint lightly, to cover the entire area that will be printed, and to be graceful with the coating.

When the emulsion begins to "set up" (*looks and feels more gummy than liquid*), take a clean, and dry, 4" hake brush and very gently whisk it back and forth until all of your application streaks have blended into a smooth coating. Barely touch the paper

when doing this and you will appreciate the results. Of course, if your intention is to have a coating that is not smooth but more "*painterly*," just go with your instincts and coat gesturally to your heart's content. When you are satisfied with the look of the coated surface, allow the sensitized paper to dry in a low light level environment; don't force-dry it with a hairdryer unless you have it set on a cool. Write down all of the technical information, such as the coating formula, paint amounts, and type, date, time of exposure, and stage of the print. Write this information also on the back of the paper for reference. Gum printing is about strategy and acquired knowledge more than intuition and impulse.

Fig: 16 – 19 here (Melissa Good, *Occupancy / Vacancy* – 1998 - gum)

An Alternative Wet Coating Technique

An alternative method of coating is to initially soak the prepared paper in room temperature water. After removing your paper from the water bath, gently blot it until it is slightly damp with no visible water reflection on the surface. Be careful not to abuse the paper's fibers when blotting. Coat the paper in exactly same manner as you would with dry paper. You should notice a smoother coating, and will probably find it unnecessary to use the 4" hake brush for evening the emulsion coating. Dry the coated paper in a low-light environment, or force-dry the print with a hairdryer set on a cool setting. It is a good idea to contact print immediately after the paper's fresh emulsion has dried. The wet coating method will give you a somewhat lighter image, which is perfectly fine because you will be building your image over time with multiple applications.

An Alternative Spray Coating Method

For really large gum bichromate pieces, you might want to investigate the possibility of spray coating your sensitizer. The proportions are identical to the smaller print sensitizer formulas... you just use a lot more of the stuff and it gets increasingly expensive. Don't even think about this unless you are willing to build a ventilation spray booth with great ventilation, are willing to wear a full haz-mat body suit with goggles

and dual-respirator, and are all alone. I wouldn't dream of spray coating in a group experience due to the danger of dichromate contamination.

[ICON – 5 here](#), (Contact Printing Frame Icon)

EXPOSING THE NEGATIVES

It is pointless to attempt, or recommend, a uniform gum "*standard*" for exposure, as the variables are too numerous to define such a paradigm. These variables include density, quality, and type of pigment, humidity, time of day, negative density, strength of sensitizer, type of gum arabic, type of paper, and / or anything else that is a part of the process. There is no such thing as a "*correct*" exposure. As with most elements of this process, each part of the process is a variable that will change when another variable enters the equation. To compound the problem, you need to know what the exposure time will be as checking on the print during the exposure will tell you next to nothing about how things are going.

The exposure must be made, as in every alternative processes, with a UV light source such as the sun, a 1000 watt quart lamp, or a hellaciously expensive graphic arts, vacuum frame, exposure unit with a 3000 watt ultra violet light source. I really like these units but they are really only practical for an institution or the idle rich.

The advantage of a mechanical UV printing unit is that it is consistent year round, 24 hours a day. Gum artists working with a UV exposure unit are able to calibrate their work with less guesswork and they can better evaluate exposure times in a deductive manner. Other gum artists like the more organic and casual ritual of printing in the light of the sun. In my experience, sunlight appears to provide a "*crispier*" image and a faster exposure time. As with all of the alternative processes, you will need a hinged-back contact-printing frame for printing. You can also use 2 sheets of plate glass... especially for larger works where a contact sheet is impractical.

It might be a good idea when beginning a new print to make a test strip of exposures using a Stouffers 21-step-wedge. If you don't have one of these, lay opaque

strips over the contact frame holding the negative and sensitized paper. Remove a strip every 20 to 40 seconds during the exposure. When using dark colors it is not a bad idea to increase the number of test strips. Don't forget to keep notes of what you are doing, including formula, time of day, and test strip times. After making the test exposures, develop the test print and you will have a pretty good idea what exposure times you should use that day. Remember that the gum process is an evolving one and is more like printmaking than like traditional silver gelatin printing. Make a plan for your printing strategies and be patient. Here are a some basic starting exposure times to work with... mind you, I have no idea what your variables will be so don't be upset if my suggestion isn't dead-on for you.

- Sun – In the middle of the day, in the summer, with a light color and a perfect coating, on a beautifully sized and hardened paper, that is perfect for gum printing, with a negative that is not too dark, and not too light, in a geographical location that is temperate and bright, with a 1:1 gum to sensitizer ratio... I have no idea. You're going to have to test.

- 1000-watt quartz lamp – Figure about 15 to 20 minutes

- Tony Gonzalez's exposure unit – If you're using his unit figure 2 – 5 minutes of exposure.

- 3000 watt Graphic Arts Exposure Unit – Figure 4 to 8 minutes - I've made Naples yellow exposures with this unit in a minute and a half so it is always best to run a few tests before you get too involved in thinking you have the exposures wired in. Don't forget, every single variable is going to change things.

Fig 16 – 20 here, (Cheryl Harmeling, Brynmore, 1998, single coat gum)

Printing a Single Color Gum with a Single Negative

Quite often, especially in a workshop environment that compresses many alternative processes into a very short time, it is common to demonstrate the techniques of gum with a single negative. This is a cost-effective, and time-efficient, method of illustrating how the gum bichromate process works without taking the time to produce multiple densities with a complete set of C-M-Y-K negative separations.

By this point you should be getting a good idea of how to think about gum printing so I'll not take a great amount of time discussing single coat strategies. Essentially, you're going to be using a single negative throughout the process. To get any kind of exposure diversity you'll have to switch up the following variables; gum to sensitizer ratio, choice of colors going from lightest to darkest, length of exposure times, and amount of water in the sensitizer.

In order to penetrate the highlight densities of your negative, make your first exposure a fairly lengthy one so that the highlight details will show. You may also refer to an earlier mention of printing with only a 1:1 ratio of gum Arabic and dichromate (no pigment) in order to lay down a tan-colored base to show highlight detail.

In a single negative / single color gum it is advisable to make the coatings thinner and less sensitive rather than use a normal sensitizer mix, playing with the ratio theories mentioned above. On subsequent exposures you can increase the ratio of gum to dichromate, back to the standard, adjusting your elements as you see the need. One thing to keep in mind when making a gum print from a single negative is that you do not want to print for the finished image on a single pass. The reason for this is that your shadows will block up. It's better to parcel out exposure time over several exposures, each taking a percentage of the total time necessary to complete the finished density. Again, keep notes on everything you do.

A Simple Single Negative Strategy

This is really basic but it does the job of letting you teach yourself the process. I'm going to keep this vague purposely because I want you to delve into the chapter and look for the answers. If you are brand new to this technique and have one contact negative to

play with, here is a possible strategy for you. First make sure that you have performed the gelatin sizing and hardening process perfectly. Now, try printing a single negative with a longish exposure and a small amount of paint. Then, for a second pass, after washing and drying the first pass, use a lot of pigment and a short exposure. For a third color pass, try using the right amount of paint, with the right amount of exposure. You should end up with your first good-looking gum print.

A Dichromate First-Step Strategy From the Past

A caveat: Although I haven't done this gum variation it sounds like it might be fun and a good solution for going on a gum printing vacation in the wilderness with pre-dichromated sensitized paper, a bottle of gum Arabic and a few tubes of paint... and making gum prints.

A while ago I heard about a technique that Robert Demachy and some old time Gummists used to do. It's a different approach to gum bichromate printing and it works in an odd kind of way. Begin by gelatin sizing and hardening your paper as you would normally. Then make up a saturated solution of potassium dichromate (10% - 13%) and coat it directly on your dry paper. The light level should be pretty low but the paper, once dry, will keep for a long time.

When you are ready to print, make up your gum and pigment formula and, if you think the solution is too thick, add distilled water in place of the dichromate... since it is already on the paper. Then all you do is expose and wash-develop in the normal manner.

[ICON – 7 here, \(Sink Set Up\)](#)

SINK SET UP FOR GUM BICHROMATE

Tray #1: A very clean tray filled with clean water

A soft hake brush for gently feathering the print during washing

Tray #2: A 1 % solution of potassium metabisulfite for clearing highlights and intensifying color values if needed.

Tray #2: If you use potassium metabisulfite you will need to have a Tray #3 for a 30-minute final wash in cool running water. If you opt to spray the potassium metabisulfite on the freshly washed print, you will need the tray #3 as well.

[Fig 16 - 21 here](#), (Lisa Elmaleh, *The Long Goodbye*, 2006 – gum)

WASHING & CLEARING

Development of the exposed gum print is very simple. You only need fresh water to complete the process... however, there are a few things you need to pay attention to.

Following exposure, immerse your paper in a tray, of ambient temperature water, that is larger than your paper. If the water is too hot you will unwittingly erase subtle details. If the water is too cold, the clearing will take forever. Gently agitate the paper, face down, for about 30 seconds and then very carefully change your water... holding on to the edge of your paper so that it stays still during the change. Place the print face down in the new fresh water bath and *leave it alone*.

The unexposed areas of the image will soften and drop gently to the bottom of the tray. If you agitate aggressively or run water on the surface of the emulsion you will wreak havoc on wet and fragile details in the image. Look across the paper's surface after your highlights have cleared and you will see a distinct bas-relief of the image. This relief exists because the exposed (*hardened*) areas of the image are still on the paper and swollen with water. The unexposed portions of the image will be lying peacefully on the bottom of your wash tray... providing your exposure was correct. If you exposed for too short a time, everything will fall off the paper. If you exposed for too long a time, nothing will.

In my experience, light colors will yield a perfectly developed print within 10 to 15 minutes. Black pigment prints will take much longer to clear than will prints with lighter

colors. Single exposures with very thin colors such as Naples Yellow or Davy's Gray may take only minutes to clear. *Clear* means that the highlights are paper-base clean and the well-exposed shadow values have tonal delineation and detail.

Often you will initially see nice separation within your shadow details only to have them float away or drip off your print's surface. This indicates that you are close to having a correct exposure time but those particular areas simply haven't had enough exposure yet. Don't throw away the print. Wash it well, dry it and recoat with the same or a different color, and expose the negative again for a slightly longer time.

Prints that have been overexposed will show less contrast, flat highlights, or blocking in the shadows. Making a bath of 15 ml of ammonia, or household bleach, to a liter of water, can often repair these flaws. Be careful because this bath is very efficient at removing a lot of detail in a hurry, especially if the solution is hot. This particular remedy often becomes a technique, like spraying your cyanotypes with a mist of Tilex® toilet bowl cleaner for an unusual reticulated effect. If you are not into really aggressive gum printing (*and some people live for that effect*), I would simply re-do the print.

Another method for clearing heavily stained or overexposed prints is simply to let them soak overnight. Again, if you underexpose the print you only have to dry it, recoat it, register, and reprint the same color and negative. Your exposure on your second "pass" will likely require less time to achieve the effect you were going for in the original exposure because you will be building upon a layer of detail that already exists. Personally, I prefer a series of small exposures to one big exposure, but this is just a matter of personal taste and workflow.

Stopping Development and Re-Exposing

There will be times when you may not want to develop the print to completion or, conversely, when you wish to produce an image that is significantly different from one where you left the print to gently soak for a total clearing of the highlights. Incomplete development, where you leave a good deal of original color behind (*especially in the highlights*), can be achieved by stopping the development about halfway through and

laying the paper flat, face up, on a blotting surface. If you hang it to dry, the colors will run. If you decide to abruptly stop development in progress, because you like the way it looks, you can harden the image by re-exposing the paper to UV light after it has dried.

Forced Wash-Development

On the other hand, forced development of the print, where you wish to eliminate or transform detail, can be achieved by running water directly on specific areas of the print. You may also change the way a print will look by using a brush, gloved finger or etching tool to mark in the soft and swollen pigment. Remember, in the wet state the emulsion is very sensitive to abrasion and abrasion is not always something to avoid. I have used a commercial handheld garden sprayer, the type that allows you to adjust water stream pressure and flow size, to “draw” into the soft emulsion. Use your imagination and have a good time with the options. If the end result is a mess, then chalk it up to experience and see if you can use the knowledge in a positive way. The fundamental wisdom of this is that the relationship of exposure and development depends upon a good marriage between the gum and the dichromate. The paint is the “unrequited suitor” and only stays in the relationship if the gum hardens and refuses to wash away.

A FEW WORDS: CONVENTIONAL WISDOM & STAINING

One of the “*old rules*” stipulates that a greater concentration of paint than “normal” (*whatever that means*) will result in the staining in your print’s highlights. I have generally found that a greater concentration of paint in the emulsion will actually have the opposite effect and will result in *less* staining. Judy Seigel confirms this point in Issue #2 of her excellent, but sadly no longer published, *Post-Factory Photography Journal*. Judy is still doing reprints however and if you want to have a complete set they are available.

For many years, I have been laying multiple gum arabic washes, with batik resists, on watercolor papers prior to making my watercolor paintings. By doing this I was able to paint and then return to specific sections with a wet brush to pull away painted pigment and expose highlights. This was possible because the paint was sitting

on the gum Arabic rather than in paper's fibers. It made sense, the extra paint would not be a significant factor in staining when sitting in a gum arabic solution. In fact, I have always considered extra pigment (more than an 1", but not so much that flaking occurs) as a quasi filter, resulting in cleaner values and less stain potential. Be aware that a greater concentration of paint may also result in a shorter tonal scale, higher print contrast, and possible flaking.

Fig: 13 - 22 here (Christopher James, Sisters, Takaragawa Baths, Japan – 1986-
watercolor and gum Arabic)

The Relationship of Sizing - Color - Staining

There is a relationship between the sizing formula you select and the final colors and highlight tonalities in the print. A hardened gelatin sizing, which allows for the successful clearing of highlights, will occasionally hold fast to the potassium, or ammonium, dichromate and stain your image. This result, in some cases, is a yellow tinting of lighter values within the print. These yellowish flaws can generally be cleared with a potassium or sodium metabisulfite bath following the wash-development... but there is a better solution to this problem; a fresh water rinse directly after the 5 minute Glyoxal hardening of your gelatin sizing. (*See the Paper chapter*)

Rinsing After Glyoxal Hardening To Prevent Staining

After the (5 minute) Glyoxal (*Stage #2 in the Sizing and Hardening paper preparation for gum bichromate*) is allowed to permeate the gelatin sized paper completely, it should be rinsed for 5 minutes in a fresh, cool, water bath before it is hung to dry on a line. This removes excess Glyoxal from the surface of the paper. If you avoid doing this step, the paper may turn a little yellow-beige in the highlights down the road ... sometimes even before you use the paper for an exposure.

Clearing Stains with 1% Potassium Metabisulfite

In the event that you have dichromate stains in your highlights or borders (*the tan color*) you may clear them out with a simple 1% solution of potassium metabisulfite. Simply mix together 10 grams of potassium metabisulfite into 1000 ml of distilled

water. Prints can be immersed or you may elect to spray the solution on the surface of a damp print. You might even consider selectively painting the potassium metabisulfite on problem areas. You can try sodium metabisulfite if you are low on potassium metabisulfite. You can also try potassium alum but this chemical may not help the archival intentions you have for your image. In any event, this clearing step, and subsequent wash, will be your final ones after all of your color impressions have been made.

Clear the print in the potassium metabisulfite bath until the stain goes away and then wash it for 30 minutes in clean running water. Be cautious of the percentage concentrations of the metabisulfite because they it may be more aggressive than you had anticipated. Also, don't use a sodium *bisulfite* bath as it softens the gum too much. Be sure to do a test piece before committing your print to a clearing bath and adjust the percentage strength as necessary. I suspect the 1% will work fine as long as your stains are not caused by over-exposure... in which case you are out of luck.

You may also spot-clear with this solution using a small brush. If you notice that your emulsion has become fragile in the potassium metabisulfite clearing bath, you may want to consider drying the print and going to the final wash later on. If all attempts to clear your gum print have failed you can try a few things in the next printing session to avoid the same problem.

Fig: 16 – 23 here (Stefanie London, Tulips, 1989 – gum and mixed media)

TRIOUBLE SHOOTING GUM BICHROMATE:

Note: Any of these suggestions may be disregarded if they don't fit your working style.

First Rule of Fixing Gum Bichromate Problems

Many of the solutions for gum problems are mentioned in the earlier sections of this chapter. There are a lot of things to consider when tracking down gum vexations and this next section will deal with a lot of them. However, there is a rule... When hunting for remedies to problems... **ONLY FIX ONE THING AT A TIME.**

Sizing

If you are experiencing staining, the very first thing I look at is my gelatin sizing and hardening materials and technique. Did I take shortcuts? Did I make do with what I had rather than use the correct solutions? Fix this part of your gum technique and you are pretty much assured of eliminating the biggest staining problem. While you're at this thought, you might also consider using a different variety of paper. One more time... simply because it really does prevent the problem of yellow staining most of the time. After you glyoxal-harden your gelatin for 5 minutes, rinse the paper in cool running water for 5 minutes and line dry. Yes, I know, that was more than one change at a time.

Paint

Try duplicating your technique with a different brand of paint. Always use the highest quality watercolors you can buy. Student-grade watercolors often have little quality to speak of and will often end up staining your print or washing out in splotches. Some colors are particularly tough to clear and personally I've had problems with greens. When I want a green I will generally mix a safe primary blue and a yellow rather than opt for the tube green. I will also lean towards greens that I trust and that always clear well, such as, Winsor & Newton's Oxide of Chromium.

Add Pigment

You might want to try adding more pigment to the sensitizer. This often is the first fix I'll attempt and it does work... in spite of the nasty things people on the alt pro discussion groups say about the idea.

Gum Arabic

Another fix is to try using a higher grade (*a more clear variety*) of gum Arabic, or add a little more of it to your sensitizer formula.

Dichromates

Try re-mixing a fresh dichromate in case of contamination, using less dichromate in the sensitizer mix. In my experience, potassium dichromate (which is slower than

ammonium dichromate) demonstrates evidence of staining less than ammonium dichromate.

Changing Exposure Time

You might consider changing your specific color exposure times (*See Tony Gonzalez workflow in this chapter*) for multiple, and shorter, exposures.

Fig 16 – 24 here, (Cig Harvey, *In You I Taste God*, From the Icon Series, 2006 – white gum bichromate and encaustic)

Curve & Color Layer

Try using the custom curve and color layer described in this chapter. Simply having a negative that is less difficult to print will often eliminate the subsequent staining of your image.

The Last Resort

There is a chance that everything you are doing process wise is correct and that you simply need a new negative. Then again, perhaps it's time to wave the white flag and give up on the one you're using for this process. This begs for the Pictorico OHP solution to the problem. Last, but not least, you can be upbeat about the entire experience, think about how much fun gum printing is, and start all over again. You might also consider using the print as a base for another process or a canvas for you to paint, paste, and play on.

First Impressions: Cyanotype First Pass

If you are having a hard time establishing a foundation for your gum print you might want to try one of my favorite techniques... consider making a cyanotype as your first color impression. It provides a strong and finely detailed blue (*or some other color if you tone it*) and gives a fine visual map to work upon. You may also consider making a gum "pass" on top of a platinum or palladium print if you want to raise some eyebrows. Actually, this combination was quite popular with many pictorialists in the early part of the century. The additional gum bichromate step helps bring out and define complex

shadow details and often provides additional depth to the image. If you intend to try this, begin with a brief green or blue gum exposure as Steiglitz did.

To Darken an Image

Perhaps the solution is to simply repeat the negative, in registration, but with a less intensive exposure. You can expose for a shorter time, add a little water to your sensitizer, try a darker paint, a lighter version of the negative... especially if it's a digital negative, just adjust your curves. Also try a complementary color, or a *little* more dichromate in the formula. If you add more dichromate to the sensitizer mix you will experience a reduction of contrast and an increase in your exposure time. Adding more pigment to your sensitizer, which may initially seem like a good idea, may or may not work and the success of this choice will depend on a few other variables.

To Lighten an Image

The easiest solution to this problem is to use a lighter color or to dilute your sensitizer formula with a little water. You can expose your print for a shorter exposure but that really isn't the best approach to the problem because you want the exposure to be complete enough to harden everything in the print that needs hardening. Printing a lighter, or dilute, color is better than under-exposing. Short exposures will often yield more contrast because only the thinnest parts of the negative, your shadows, will react to the hardening effects of UV exposure, i.e., more of the pigment will remain unhardened during the exposure and will wash out during the wash-development.

Using less dichromate in the formula will result in a solution that is slower (*reduced sensitivity*) and has more contrast because only shadows will print-out. You may lighten the entire image by using less pigment in the formula and this will result in less contrast and possibly some unwanted tonalities in your highlights.

The cave person approach to the problem would be to wash the image in very hot water or try using a 5% solution of potassium metabisulfite, or ammonia.

To Increase Shadow Density Without Changing Highlights

The first thing I would do in this situation would be to make sure my negative set would accomplish this task for me. If you're impatient, try decreasing the exposure times of subsequent coatings. You may also try using less dichromate in the formula. Also try adding proportionately less pigment, by half, to each subsequent formula and exposure. This allows shadows to build slowly and may help minimize staining in the highlights. Many alternative gum artists will add more pigment to subsequent coatings to increase contrast. If you have the time, try both methods and determine which works best for you.

To Enhance Highlights Without Blocking the Shadows

Is your gelatin sizing and hardening technique imperfect? This could be a reason your shadows are blocking. Is your negative set right for your formula and exposure time? Those are the first questions I would ask and then I would make a quick print and see if I could fix the problem by adding additional gum to the sensitizer formula. Next, try a decrease in the amount of watercolor pigment you add to your sensitizer and modestly increase the exposure time. Both of these options will result in less contrast in the print. You can also achieve a full tonal range by altering the amount of pigment added to each additional coating but the success of this tactic will be dependent on several other factors.

To Reduce Contrast

Use lighter colors, use potassium dichromate instead of ammonium dichromate in the sensitizer, dilute the ammonium dichromate, use a higher concentration of dichromate sensitizer and decrease the amount of pigment, expose longer, and / or develop for less time. Dilute the sensitizer with gum or water. To tone down colors, try using their complements, instead of immediately reaching for a tube of black watercolor paint.

If the Highlights Will Not Print at All

This isn't unusual, especially if you are using a pinhole camera or making your negative set with ortho film. The first thing I would recommend would be "flashing"

your entire image area without a negative in the contact printing frame... with only a 1:1 sensitizer coating of gum arabic and dichromate. Expose quickly, and you should be able to inspect the exposure (as there is not paint in the formula) looking for a "whisper" in the highlights. Eliminating the color will make your highlights a tan color. And will, if you get the exposure right, give you some highlight definition.

A Full Color Inventory

Some gum artists like to make up their color and gum emulsions in larger batches and store them in Tupperware® or urine sample containers from the local HMO health provider. This allows you to establish a color inventory and save time. Urine sample containers are great since most have an embossed graduate scale on the side and a very secure screw cap. Next time you go in for a physical check-up, pick up a few for free. *Do not add the dichromate yet.* The dichromate is added just before you intend to use the color. Keep the proportions of gum to color the same as when mixing small batches, i.e., 50 ml of gum to a 15 ml tube of watercolor paint. This is not a recipe set in stone. Your gum, and the type of paint that you select, will dictate the proportions, and that will take a little testing. You are seeking a solution, so that when the sensitizer is added, and the exposure is correct, your print will clear quickly and easily with no staining.

Make Color Charts

Each new paper, paint type, sensitizer, sizing, hardener, and emulsion will show you a different look. Write this information on swatches, cut them into slide size shapes, and keep them in a slide sheet to use as a reference chart.

Try Painting on Gum Emulsions

Try painting on gum emulsions in selected areas of the print, i.e. eyes, clothing, lips, and so forth, instead of total paper coverage in the traditional manner. This allows you to add specific areas of color without affecting the entire print. To avoid a hard edge on the selective color, wet a fan-shaped watercolor brush in clean water and lightly drag it along the edge of the recently applied selected color before it dries. This "feathering" creates a softer edge line.

Create Area “Masks” Using Gum

Painting an extra coating of gum Arabic in the areas you do not want completely colored after exposure works quite well. You can also use other masking devices in conjunction with the negative, such as rubylith film or Mylar®. I like gum because it washes out well and can be blended unlike rubylith. The image in the emulsion achieves its tonalities based on the degree of its hardening. The harder it is after exposure, the less of it washes off. The less it is hardened, the more of it washes off. Pay attention to your exposure times.

[Fig 16 - 25 here](#), Carmen Lizardo, *Santo niño de antoche*, 2006 - gum

Exposure

Exposure is controlled by several factors that you can keep in mind when creating print strategy. What is your source of UV light, the color of the pigment in the emulsion, the expected exposure time, the proportion of dichromate to gum, the thickness of the sensitizer, and the humidity?

Some practitioners find that the higher the humidity, the shorter the exposure. Others report the opposite is true in their work... go figure. Best bet in my experience is to keep the humidity above 45% and below 65%. Long exposures will result in less contrast because more of the sensitizer becomes insoluble and refuses to clear in the wash-development. Shorter exposures work in the opposite manner. Use your exposure control as a minor player in this drama.

Your Print Does Not Clear

There are a few things that could have caused this problem. The first, and most common reason, is that the idea of spending time gelatin sizing and hardening didn't appeal to you and so you thought that maybe, just this once, you could make a nice gum print without doing that step. Sorry, if your pigment goes into the paper's fibers, rather than sit on the surface of the hardened gelatin sizing, it will grab on and stain the paper exactly as paint is supposed to do. Other things that could have caused the print not to clear include; over-exposure or you may have used too much hair dryer heat.

Your Print Washes Down the Drain

This is really simple... Only a few things could have gone wrong for the print to completely leave the paper during the wash-development. Nearly 85 % of the time the reason is that your exposure wasn't long enough to harden the dichromate – gum – pigment sensitizer. The other three 5% reasons; you forgot to add the dichromate to the gum and pigment, the emulsion was still wet when you made your exposure, the gum Arabic that you used is impure or rotten... don't forget, it is vegetable matter.

Your Print's Surface Texture...

If your surface looks uneven, you can take a piece of fine sandpaper or steel wool and gently give it a nice matte-luster finish by softly sanding the surface in small circular swirls.

Emulsion Flaking Off

This problem generally happens when you have used too much paint or your sensitized emulsion was too thick when you painted it on. Add a little water to the sensitizing formula to thin it out. This will soften your image for that pass and give you a chance for some fine details.

Streaks in the Print

This generally means that your coating technique needs some work. It isn't fatal. Simply get some scrap paper, say the backs of prints that you don't like, and practice coating them with a non- sensitized mix of gum and paint. You'll be good at it soon. Another reason you might see streaking is that you didn't attend to your print in the wash stage... in other words, it stayed in the water but not necessarily evenly and / or completely.

Random Last Thoughts

Take your time learning gum printing and enjoy the simplicity of the process as well as its often-maddening complexity. Unless you wish to show evidence of working stress on the surface of your print, sometimes you just have to put the print face down in

the water and do something else for a while (*this will make sense later on*). Gum bichromate is different from others in the alternative process genre and it is unhealthy for your creative self to think that there is a perfect way to do it. I write this even though I know of at least six gum printers who claim that their technique is sublime perfection and the "only way" the process can ever be performed. They are wrong. Being dogmatic about how to make a gum bichromate print is like telling a child that only blue crayons are acceptable for coloring a sky. The variables in gum printing are *infinite* and each individual's intentions will never be exactly like another's. Play and practice are the secrets to becoming a good gummist. Play with the myriad elements of gum and practice to make your personal technique compatible with your intentions... so that it works for you.