KEEPING PACE

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The Science and Mechanics of Making Separation Negatives

The possibilities for solving the Dye Transfer situation.

The number one problem is the production of a quality matrix film.
Kodak has decided to quit all production of Matrix Film. This leaves many of us in a dilemma. Kodak has released the formulas for the dyes and other chemical systems such as the Tanning developers and the mordanting and conditioners. The main obstacle is the coating of the matrix film.
I am trying to find a possible substitute company that may be willing to take up the challenge and produce the material for us. The last time I spoke to Kodak" s Laura Jackson, I asked if Kodak would be willing to produce a run of Matrix film on demand, if the entire run would be purchased at once, and she said that the possibility was there.
In the meantime, I have a few leads and I will attempt to find a company that will undertake the job of producing matrix film.
Keep the faith.
I will pursue this avenue and if I get any positive results, then this may be the time for creating a "Dye Transfer Association."

The coating of the sheets of polyester is quite difficult to perform in your own kitchen. The knowledge of silver emulsions must be accounted for, and the method of coating would have to be exact and repeatable.
I am going to assume that all is not lost yet.

So, I will continue with my dissertation on the making of quality **separation negatives.**
Whether or not the process survives, the separation negatives remain to be a viable part of any quality color print process.
The mechanics of the process are as follows:
Contact separation negatives are made by using a variety of different methods and pieces of equipment.
A contact frame, or a vacuum contact platen is the first main tool needed to verify a tight fit between the original transparency and the final separation negative.
The light source can be almost anything incandescent. I prefer a simple 20 volt unit with variable switched and repeatable adjustments. This allows me to pick the optimum light level so that the easiest exposure times can be used.
The one that I have personally used is a 20 volt GE bulb attached to a variable transformer (purchased at any radio shack.) The bulb is virtually a "point light

source." However, do not place the bulb too close to the surface of the exposing area because the bulb has flaws in its manufacture that will cast patterns of the actual filament while it is lit. There are three solutions to this problem.

1. Place the light source more than 5 feet from the exposing area.
2. Diffuse the light source by placing a diffusion sheet between the light and the film plane.
3. Use 110 electricity and a diffused enlarging bulb (such as a #213) and using a simple "Waterhouse" *f* stop system to adjust the light intensity.

I personally prefer the 2nd solution, and have used all three methods in my printing career.

The object is to expose the original transparency through three different color filters (separation filters) in order to be able to make the three printing positives required for the process.

These three sheets of film must be processed to a specific accuracy.

The density level must be such that the shadows of the image are found in the .35 density area. The highlights of the image must be placed around the 1.40 area. The difficulty with any separation process is the fact that the three separation filters have different exposure "factors" which will require different exposure times.

The fact is that the film you choose to use as the separation material must be panchromatic in nature. The sensitivity of the film will further require adjustments in exposure so that all three sheets of film will look similar in density.

Another fact is that the densitometry of the film is different for each color. Different developing times will be required for all three sheets in order to bring the contrast and density levels to the correct degree.

As you know, the transparencies are much too contrasty to just allow them to be exposed and then processed to as low a level of acceptance as needed. By the time the contrast level is reached, the image will have lost it's ability to contain the rich color required for the print.

So, masking was invented. Masking for control contrast was introduced soon after the first transparency was introduced to the commercial field.

By being able to lower the level of contrast in the original transparency, it became simpler to meet the contrast requirements without losing the color strength.

This adventure into masking eventually developed into a sophisticated color correction method.an absolute necessity.

Did I mention Highlight negatives? These were also invented in order to preserve some of the delicacy of the highlight information.

The actual mechanics of the separation process are as follows.

The original transparency is read using a densitometer in order to establish it's high and low areas in order to determine the correct exposure and developing times.

Then the contrast masks (at least two and sometimes more) are exposed through different colored filters, onto Kodak's Pan Masking Film. These are exposed to produce a specific density and then developed to a specific contrast.

Processing the sheets of film in a tray. The chemistry in the tray must be sufficient so that the film can be pulled through the chemistry without scratching the emulsions.

I would actually place the first sheet of film into the developer tray, face down, then up, then down again, before adding the second sheet to the fray, and possibly a third sheet. The shuffling of the three sheets must be done with precision and with accurate timing. The temperature must be precise, and the rate of agitation must be repeatable.

I used to use a musical device called a "metronome" to establish a rate of agita-

tion when my employees were processing. Even when I was in the darkroom.
After the contrast masks were dried, they were placed back in register to the original transparency.
Thanks to people like Warren Condit, the days of registration problems became a thing of the past.
The combination of the mask and transparency had to be aligned in such a way so that the emulsion of the transparency was against the emulsion of the separation negative material. I used Kodak's Super XX, T Max film, Separation # 1, and # 2, as well as films from other manufactures.
The three separation negatives were exposed so that the level of density would be sufficient, and processed so that the level of contrast was equal for all three sheets even though they may have required different exposures and developing times.
It was convenient to add a grey scale to the edge of the transparency so that monitoring of the accuracy of the different steps could be accomplished with relative ease.
Three Highlight Masks were made using all three of the separation filters, however there are times when just one highlight mask can be used. For separated highlights I used Agfa's P. 911 film.
For a single highlight I used Kodak's Kodalith Type 3 film.
These highlight masks are made by contact using the same contact platens used for the masks and separations, but at a much lower level of illumination than before.
The neutral parts of the highlight masks have to be the same density.
These highlight masks are added to the final separations (in register) before exposing any matrices or pigments.
These then, were the mechanical steps required to produce accurate contact separation negatives.
To learn the steps in your own lab will require many attempts at processing so that it becomes second nature. The "how to" mechanics are the first thing you must learn.
Now all you will need is an enlarger in order to produce prints.
What kind of prints?
At this time in photographic history, let us hope it will continue to be Dye Transfer. But if you want to make a "Carbro" print, the separation negatives will still have some value.
Let us now examine the possibilities for making a Dye Transfer print.
When using any enlarger for the Dye Transfer process it makes sense to invest in a registration carrier. Some enlargers come equipped with such a system (Durst and others) but is relatively easy to obtain (Condit.)
The first requirement is to make sure that you place the correct separation in the enlarger when exposing the first matrix film. Using a small film edge punch to mark and identify the separations and also the matrices is a good idea. Although it is possible to determine which one is which, simply use a film punch and make your identifying mark.
Size the image on the easel. I recommend using a vacuum easel. I once worked with a simple easel and held the film down tightly using a sheet of window glass. How times have changed.
Stop the lens down to f 11 or f 16. What will the exposure be? Who knows?

What is needed here is a method of making a strip exposure of the same area of the Cyan negative (The red filter negative) processing the matrix film in the prescribed Matrix tanning developer and after drying it, dye it Cyan, and transfer it to a sheet of paper and examine it and the original transparency through the same red filter used to make the negative.
Compare them visually and find the strip area that closely resembles the density of the original.
Once you have found the desired density, Use an

easel meter (Jobo makes a great one) and record the light level in a neutral area, such as a white shirt or a cloud or a grey scale.
Remove the first negative and replace it with the next negative, and read the same area. If the reading is exactly the same, then so will be the new exposure. If it isn't, then some math will be required. More about this later.
This reading of the same area is done with all three negatives.
If the original chosen area was produced with a 10 second exposure and all of the subsequent readings were the same, then all three matrices would receive the same exposure.
On to the processing of the matrices.
The simple instruction for processing one sheet of matrix film is as follows:
Add the B portion of the tanning developer to the tray. The temperature is most critical. Turn out the lights and work in a safelight environment (red.)
Add the A portion, stir it for ten seconds, then add the one sheet of matrix film to the tray emulsion up, and try to get the sheet soaked evenly.
Keep rocking the tray from side to side and from front to back. This even processing is very important.
At the end of the processing time (I recommend 2 1/2 minutes at 68·° F)
Immediately plunge the processed matrix film into a second tray of 1% acetic acid for 45 seconds. It takes 30 seconds for the chemical action to reach the bottom-most part of the films emulsion. Then place the matrix film into a tray of unhardened fixer. I prefer the fixer used in the C-41 process. When the film appears cleared, place it face up in a tray of hot water (110° F) and rock the tray in all directions. Continue to exchange the hot water and when you think it is completely clean, do it two more times.
You have the option of placing the newly finished matrix film into a tray of dye, or (I prefer) place the wet matrix film into a tray of 2% formaldehyde and 1% acetic acid for 2 minutes then hang to dry.
When dry, the chemical action of the formaldehyde will harden the image quite a bit more so that accidental scratching of the image will be easier to avoid.
Can you process three sheets of matrix film at the same time?
Of course you can.
Place a new sheet of matrix film into the developer, first emulsion down, then up, then down again while constantly rocking the tray.
Place the second and third sheets into the same tray at 15 second intervals. Add them using the same procedure and then go through an interleaving procedure, moving the bottom sheet to the top as often as possible. This may take a little experience. This is not only possible, but preferable.
The mechanics of any process are easy to learn.
After enough time in the selected dyes, remove the matrix, rinse it in a 1% acetic acid solution for 1 minute, then add the same matrix into a second tray with again, a 1% acetic acid rinse, and use this tray as the holding tray.
When you find that the imageneeds to be improved you can lighten, darken, soften the contrast, increase the contrast in any direction and of any color and really make a contribution to improving the overall quality of the image.
If you were fortunate to have landed a job as I did in my youth, I began at the end of the process and worked my way forward. If you should ever get the chance to work at a Dye Lab, ask to start at the end of the process and just try to run the prints. The rest will come to you with much more simplicity.
What about the science of the process?
This is a bit more time consuming to learn. However, if you have mastered the intricate steps involved in making a Dye Transfer print, you are ready for the finer things in life.

Let us begin with the separation negatives.
In order to know how to make the negatives accurately, you must be aware of the first requirement.

How much contrast will your enlarger produce with all other steps being equal?

Obviously, you must recognize the difference in the quality of the prints when a condenser enlarger or a diffusion type enlarger is used to make the image. The condenser enlarger will require a softer negative than will a diffusion type. How much softer a negative will you require?
This is the easy part of the problem.

Place a masked off 21 step grey scale in your enlargers carrier. and project it to fit an 8x10 sheet of matrix film. Make a series of different exposures on a sheet of matrix film, and process it as detailed in the processing of one sheet of film.
Again, dye it cyan, transfer it and examine the print through a red (29) filter.
Find where the highlights and the shadows just begin to show some detail. Mark them.
Remove the grey scale from the carrier and make density measurement of the exact same two grey scale patches. Subtract the lower number from the higher number and the result will be your enlargers exclusive density range requirement needed to make a good negative and show details in both ends of the process, **just** with your enlarger.

Let us assume that a density range of 1.20 is the required DR.
However, your transparency image has a density range of 2.30. In order develop the negative to a working contrast, you would have to would reduce the density required by development to a gamma of 52%. This low developing gamma would contribute to a much lower color contrast than would be recommended. The colors would suffer greatly.
Remember the contrast mask?
Here is how it might be used.
Original——————2.30
Requirements——---- 1.20

A difference of ——1.10
Divide the difference by the original,
1.10 divided by 2/30 produces an answer of .47.
This indicates that a mask of 47% could be made to reduce the original to the correct range.

But, there is one small catch.
We do not normally process our separation negatives to a gamma of 1. Instead we may choose a safe area of Gamma .75.
Safe because the longer developing time required by the blue filter negative, the yellow printer could easily cause a chemical fog. it wouldn't process any further.
So we now have two calculations to worry about.
We must make sure that the contrast derived by adding the mask to the original transparency and then processed to a gamma of .75 be such that it will end up at the correct range of 1.20
Here is how this mathematical part of the procedure is performed.
We know the required density range to be 1.20
We also want the separation negative gamma of development to be .75.

$\frac{1.20}{0.75}$ Equals 1.60

Now the correct **combined contrast mask and transparency** (CMT) density range should be 1.6.

This makes it necessary to make an accurate set of mathematical ajdjustments.

Now our formula for this same original is as follows.
Orig.——————2.30
CMT——————1.60

The difference is ——.70
Now divide the difference by the original and the answer is 30%.
The mask must be devel-

oped to a gamma of .30.

If executed properly, the correct mask when added back to the original, exposed and processed to a gamma of .75 will reveal a fully detailed negative with a 1.20 density that should make a great print.
Take a piece of paper and work out the math and see if it works.

The contrast mask is also a means by which any color in the print can be modified. If the image consists of a red rose, and two masks are to be used, instead, make three masks. The first mask if made by a red filter will increase the saturation of the rose in the cyan layer. This will help to destroy the bright color of the original. However, if the mask were exposed through the red filter for part time and then the green filter for part time, the result would be a brighter red, without affecting the overall contrast reducing masking effect we were after.
The second and third masks could still be the red and the green.
The technical aspects of the exposing of the matrices can be mastered by more than one method.
A simple system has already been described.

Adding a grey scale to the edge of the transparency while making the separation negatives is useful because all aspects of the negative process can be checked for accuracy while proceeding along with the job.
By comparing the readings of the same areas of the grey scale or neutral parts of the image (on the easel) an accurate set of matrices can be produced.
Another great method is to make black and white prints of the subject and make photographic paper images from each separation negative. The images can be folded at the appropriate place where a neutral area is to be found and compared. Make any adjustments required to make a good balance. After a little while, you will be able to make accurately balanced images with complete confidence.
I personally like the little machines that can process a sheet of paper in 15 seconds and require no plumbing or temperature control. You can quickly make enough prints to find a suitable starting point for a color balance.

But suppose you would like to make a Carbon print.

Could you use the same separation negatives? Sure you could, but you would have to first make a positive by contact from each negative, then enlarge this positive in order to make a new negative to the size of the print.
A better way would be to learn how to make enlarged separation negatives so that they could be used in contact with the pigment sheets. Incidentally, my book and video on Dye Transfer details all of the enlarged separation steps.
In this case. the contrast masks and the built in highlight masks should be made prior to making the enlarged negative images.
The same procedure is used to determine the contrast delivered by the enlarger that is to be used to make the matrices, or in this case, the carbon image.
Once you have established the required CMT range, you will be able to make enlarged separation negatives. The highlight masks may have to be built-in, in the same fashion that the masks are. If you wish, a single large sized highlight mask could be used on all three images.
The best way is to make the three highlight masks first, by contact, then add them back to the transparency when making the contrast masks. Then remove them when each mask and transparency are placed into the enlarger carrier.
Make the negatives with the transparency emulsion down, and the separation negative material (Kodak's Sep. #2, T-Max film or the

equivalent) face up.
Call any graphic supply company and ask what kind of continuous tone panchromatic film is available. Better yet, call any qualified color lab that is still making Dye Prints and ask what kind of film they are using. There are many kinds of film being used by the different labs.
For sake of smoothness and evenness, process one sheet at a time in fresh developer.
Make sure to use grey scales attached to the sides of the transparency so that they will appear in the negative. Use these processed grey scales for comparison only and not to try to match the original.

In order to make the image on a sheet of carbon tissue you will need an additional exposing device. A platemaker which can be purchased from any graphic arts supply company. Used systems up to 20x24 can be obtained for under $500. This includes the light source with an intergrator and a vacuum frame.
If you are already making Dye Transfer prints, you will already have all of the other tools, such as a flat surface to transfer the image to a receiver sheet, trays, roller, squeegee, and drying cabinet.
You can follow the lead of Rene Pauli of San Francisco and coat your own pigment sheets.
The book "Modern Carbon Printing" by Luis Nadeau (sold by Light Impressions Co. Rochester N.Y.) can supply you with the formulas and names of suppliers. His book details the process with accuracy.
With the proper registration equipment, you will have no difficulty. My main concern with the newest Carbon processes has been the lack of control that is usually associated with the Dye Transfer process. You will have to make very accurate test prints and make adjustments in exposure in order to make a great print.

However, if you are accurate in your decisions about color balance and contrast, you will have an easier time of it. Exposing the color pigment is a bit trickier than exposing matrix film. The color carbon tissues are not in exposing balance. If 10 seconds was the correct exposure for all three matrices I doubt if the same ratio of exposures would work with carbon tissues.
Tests would have to be made to find the correct "exposure factor" for each color.
This can be done by employing a two sided 21 step grey scale.

Place them end to end in opposition. Make a series of exposures until the correct exposure is found. (They should meet in the center.) This will only be a starting point for you.
You will have to make a series of tests until you achieve the balance you are after.

Here are the steps in making a Carbon print:
You will be working in a safelight environment. I prefer the yellow "bug" bulbs.
The separation negatives must be in register, and a set of holes must be punched in them to fit a set of pins on the vacuum frame.
All of the pigment sheets are kept in closed and safe boxes and only opened in this safelight environment.
The first pigment, (the yellow) is also punched, placed on the vacuum frame, emulsion up. The blue filter separation negative (the yellow printer) is placed on the same set of pins, emulsion down. Close the vacuum frame, and activate the pump. Usually, a small and accurate vacuum gauge is attached to this frame. When it reaches 25 lbs start the timer.
After the exposure is complete, remove the negative and store it. Then remove the yellow pigment sheet and place it emulsion up in a stray of cold water. Also punch a white receiver sheet

and place it in a tray of cold water. After 30 seconds, remove the receiver sheet and place it the pins of a flat transfer table emulsion up, and roll it down.
Then remove the yellow pigment from it's tray and place the leading edge on the pins, emulsion down.
Then carefully roll the pigment sheet down on top of the receiver sheet. Squeegee it a bit to make sure that air bubbles are not trapped in the sandwich.
Remove the sandwich from the transfer table and let it sit.
In the meantime, prepare a tray of hot water at least 110° F and after a few minutes add the sandwich to this tray of hot water. Make sure that the receiver sheet is on the bottom.
After a short while, you will notice a little yellow color oozing out from the edges. This is what we are waiting for. Gently, in fact very gently, lift one edge of the pigment sheet while you are moving the whole tray. In time the top sheet will begin to dissolve and more of the pigment sheet will become dislodged from the receiver sheet.
Eventually, the entire pigment sheet will have become dislodged and you can either discard it or save it for future coatings.
Continue to rock the tray and replacing the water, in the same fashion as you would when processing matrices, except with much more caution.
When you are convinced that all of the unwanted pigment is gone, wash it a few times more to make sure.
Then either hang or lay the receiver sheet on a screen bed and using gentle moving air and heat, dry the first image.
While the first image is drying, remove from the safe box, a sheet of magenta pigment, punch it and place it face up on the same set of pins in the vacuum frame.
Then add to this frame the second separation negative, the green negative (the magenta printer) and close the vacuum frame, activate the vacuum system and begin the exposure.
When though, and if the first image is totally dry, place the magenta pigment sheet emulsion up into a tray of cold water. Then slip the receiver sheet containing the yellow image, emulsion up into a separate tray of cold water.
Again, after a few minutes, remove the receiver sheet with the yellow image and place it face up on the register pins of the transfer table.
Then carefully remove the magenta image from it's cold water tray and place it face down on the register pins.
Position the roller accurately so that mis-registration will not occur. Then roll this sandwich down tightly.
Again, use the squeegee to remove any possible air bubbles.
Wait a few minutes and then slip the entire sandwich into a tray of hot water. Wait a minute or so and look for the telltale signs of color oozing out from the edge of the combined set.
Being extremely careful, rock the try while trying to lift the one edge of the magenta image. Be patient with this procedure. Eventually, the sheet will be loosened enough sao that the sheet can be removed completely and discarded.
Continue to rock the tray while replacing the hot water. In a short time, the two colored image will be revealed.
Again, if you think you are finished with this rinsing procedure, think again. Two more times.
Do the same thing with the Cyan. Just repeat the entire procedure.
If you wish, you can send you transparency to Ever-Color, and they will scan it for you, and when you think the Iris test looks right, they will provide you with a set of screened (450 lines) separation negatives and you can do the rest of the procedure at home.

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