Staining Developers: A Conversation with Some Experts

Compiled by Ted Harris

Nearly twenty-five years ago, in an article on photochemistry, Paul De Mayo said:

"Photochemistry has a long history, but it has only become a mature science in the last ten to fifteen years or so. By 'mature', used in this context, is meant that the major, initial, surprises of discovery are supposedly over, and that the workers in the field have drawn up a provisional set of rules by which to abide: the science, in short, has become respectable. Concomitant with the achievement of respectability come the assertions that the subject has lost its youthful glamour, is by way of being a little staid, and, in fact, is, as the French delicately phrase it, of a certain age. Everything new about the subject, it is implied, has an air of déjà vu."[1]

To some extent, this is largely the case with staining developers.

Staining developers, often lumped together as "pyro," are also known historically as pyrogallic acid, or pyrogallol, or trihydroxbenzyne-based developers. These developers are currently enjoying a renaissance among photographers, and have a substantial, devoted following, including many ultra large format shooters, and traditionalists working with alternate printing processes. During the past several decades, a large body of knowledge — and an even larger body of myth — about these developers has become available to the darkroom worker.

Some of the icons of 21st century large format photography used pyro developers, including Ansel Adams and Edward Weston. Gordon Hutchings, in his book, *The Book of Pyro,*[2] comments on Weston's enthusiasm for pyro. Given the steady interest in staining developers, *View Camera* decided it was time to explore the world of pyro from the perspective of several of the better known inventors of its modern formulas.[3]

We say "modern formulas," because pyro developers are not a new phenomenon; they are as old as photography itself, although their purposes and value have changed over time. In its original incarnation, pyro was not necessarily valued for the same reasons it is today. Procedures to avoid and/or reduce staining from negatives were, interestingly, often discussed. Today, these staining properties are very much valued.

The 1911 *Encyclopedia of Photography* notes of pyro, "It was introduced as a developer by F. Scott Archer in 1851, at which time it was very expensive, the price, six years later, being six shilling a dram. For many years it was the principal developer used in the earlier processes, and later for dry plates."[4] The *Encyclopedia Britannica's* 11th Edition (known as the "Scholars Edition") further states that it was "first produced by Scheele in 1768."[5] This is the same K. W. Scheele who is generally credited with the first recorded photochemical experiments. Standard photography texts used in university programs through the 1940's make reference to pyro, and some have darkroom sessions devoted to its use.

Each of our respondents – Jay DeFehr, Sandy King, and John Wimberley — was asked the same set of questions. Their replies follow, without comment or content editing (apart from correction of typographical errors and helpful punctuation) by *View Camera*.

In 30 words or less, introduce yourself to the *View Camera* readership

***Jay*:** I turned forty in June; father to Kaya, Chadwick and Leaf, and husband of nineteen years to my dear wife, Traci, who is my favorite photographic subject.

John: This is my 40th year as an artist photographing in black and white. My current work is primarily concerned with landscape and First Nation rock art. In 1977, I published the first staining formula for modern films.

***Sandy*:** I am a landscape photographer and work primarily with LF and ULF cameras. I print almost exclusively with alternative processes, including carbon, kallitype, and palladium. I am also a photo historian, and have published several scholarly books on Pictorialism in Spain, two of them in the Spanish language.

Why and how did you become interested in staining developers?

***John*:** Wanting the highest possible quality in my negatives, in 1970, I began experimenting with pyrogallol. At that time, it had virtually disappeared from photography, and, as I soon discovered, the old formulae weren't optimized for modern films. Thus began years of research and testing to get the best possible results.

***Sandy*:** I began using staining developers in 1990. At that time, I was printing with silver VC papers, 5X7 was my only LF format, and Tri-X 320 and Super-XX were my favorite films. I immediately noticed that Tri-X 320 negatives developed in the staining developer were much easier to print than negatives developed in traditional non-staining developers, especially in the highlights. On the other hand, my Super-XX negatives developed in the staining developer appeared to give flat, compressed highlights when printed on VC silver papers. I was intrigued by the difference in results between these two traditional films, but did not have sufficient knowledge or experience at the time to explain it.

***Jay*:** I became a serious student of photography about six or seven years ago, and began to read everything I

could lay my hands on. I became intrigued by the hyperbole used to describe pyro developers, and the mystique surrounding them.

What is a staining developer?

***Sandy*:** A staining developer is one that tans and stains the gelatin. The stain masks silver grain and gives a smoother, less grainy look. When a stained negative is printed on VC silver papers, the stain, which is usually yellow-green or brown, functions somewhat like a low-contrast variable contrast filter, which it resembles in color, resulting in compensation or shouldering in the highlights. On graded silver papers and UV sensitive processes, the stain is seen by the processes as neutral density. A staining developer also hardens the gelatin during development, which reduces the effects of irradiation (scattering of light in the film emulsion) and infectious development (spreading of silver development beyond the exact image boundaries). This results in a more precise and localized reduction, which enhances sharpness.

***Jay*:** A staining developer, or, more precisely, a tanning-staining developer, is one that tans the gelatin, and forms a dye image in proportion to the exposure and silver density.

***John*:** A "staining" developer produces a dye mask that is coincident with the image in the negative and proportional to the silver densities.

What advantages do you think they have?

***Jay*:** There are advantages associated with both tanning and staining. Tanning hardens the gelatin in the emulsion in proportion to the exposure, creating a relief image, and reducing the sensitivity of the emulsion during development, which aids in inspection development and reduces the emulsion's vulnerability to mechanical damage. Tanning can be especially beneficial when using some of the European films, with their characteristically soft emulsions. Tanning also reduces the migration of developer within the emulsion at the boundaries between high and low exposure regions to enhance apparent sharpness.

While the effects of tanning are physical, the effects of staining are optical in nature. The color of the stain makes it more or less opaque to printing papers, so a stained negative is a composite of silver and stain densities, meaning less silver density is required for a given printing density than would be the case with a non-staining developer. Less silver means less grain, and, since stain forms in proportion to silver density, its effect is most pronounced in the regions of greatest silver density, or the highlights, where grain is most apparent. Stain is formed in addition to silver density, increasing the maximum printing density and contrast of which a film is capable, and improving its expansion development potential, which can be especially important with UV self-masking printing processes.

***John*:** The color of the dye mask effectively adds density, allowing the negative to have lower silver densities resulting in finer grain and higher sharpness, plus exquisite tonalities, particularly in the higher values. In addition, pyrogallol hardens gelatin, making negatives more resistant to scratching. Another advantage is that negatives can be developed to higher contrast than with conventional developers.

***Sandy*:** The major advantages for my own work, which is primarily with graded silver papers and alternative printing, are increased sharpness, smoother grain, and the capability of boosting effective printing contrast with the stain beyond what is possible with non-staining developers.

What disadvantages do you think they have?

***John*:** Because the dye mask consists of developer oxidation products, more care is needed when processing to obtain consistent results.

***Sandy*:** Some Pyro formulas produce a lot of general, or B+F stain, particularly when used with thick emulsion, high-speed films, and with old film that has a lot of fog from age. The additional B+F stain can increase printing times by two to three stops, a very serious problem when working with UV sensitive processes like Pt./Pd.

A second problem with stained negatives is that they print with different contrast on graded silver papers and VC papers. If, for example, a negative is developed in a staining developer to print with normal contrast on a grade 2 silver paper, this negative will print with less contrast on a VC paper with a grade 2 filter.

Finally, sensitometry with Pyro staining developers and VC papers is more complicated than with a non-stained negative. However, the stain is not a problem for sensitometry when printing on graded silver papers (including AZO) and on UV sensitive processes, since these processes see stain density as neutral density.

***Jay*:** Most of the disadvantages commonly associated with staining developers are formula-specific, and not characteristic of staining developers in general. All staining developers complicate sensitometry, and those who practice it must learn to overcome those complications. Staining developers are not the best choice for fogged film, as the silver density of the fog is stained proportionally, and the effect amplified.

Do you suggest testing for personal film speed and developing time any differently with a staining developer than with a non-staining developer?

***Sandy*:** I test for personal film speed and contrast with the BTZS system. This system works as effectively with staining developers as with non-staining developers. To practice BTZS with stained negatives, it is necessary to match the spectral sensitivity of the process to the proper densitometer mode: blue filter for graded silver papers, including AZO, blue-green filter for VC silver papers (with some loss of precision), and UV filter for alternative processes.

***Jay*:** No, except where sensitometry is practiced. In that case, an effort must be made to match, as closely as possible, the sensitivities of the densitometer and the printing paper.

***John*:** When testing, it is very important to be consistent in all aspects of processing. If a densitometer is used to determine negative densities, it needs to be a

color densitometer, so that the effective density of the dye mask can be included in density measurements by using the blue channel.

What do you know about using a staining developer for platinum/palladium printing?

***Jay*:** Platinum/palladium are UV processes that require negatives with greater density ranges than silver enlarging papers do, and staining developers can more easily build printing densities with these processes, because the stain image is more opaque to UV than to visible light.

***John*:** The dye mask is much more effective when printing with UV than with visible light. Thus, for platinum/palladium printing, pyrogallol is ideal. Development times need to be increased only slightly beyond those for silver printing. This means that the same negative can be printed either in platinum/palladium, or with silver.

***Sandy*:** Staining developers work well with Pt./Pd. printing, and with other alternative processes as well. The stain is highly actinic and is capable of adding a significant boost to contrast over silver density by itself, a useful characteristic when working with low contrast films in scenes of low contrast.

Another interesting feature of staining developers is that they allow making dual-purpose negatives; i.e., negatives that print well with both silver papers and with Pt./Pd. A stained negative has, in essence, two printing density ranges: one for the blue or bluish/green light, to which silver papers are sensitive, and another for the UV sensitivity of alternative processes. A stained negative will print with UV processes with a much higher effective density range than with silver. This fact has been known for a long time, as we can see in *The Daybooks of Edward Weston* from his stay in Mexico, where Weston wrote that he expected to be able to print his pyro negatives in either platinum or silver.

What health and environmental hazards are associated with these developers? In what respect do personal and environmental precautions differ from those documented for regular developers?

***John*:** Though pyrogallol is a poison, I have used it intensively for 36 years and enjoy excellent health. Simple precautions, such as rubber gloves to avoid skin contact, a dust mask to avoid inhaling the dry chemical, and good darkroom cleanliness are requisite. But, then, these precautions should be employed with all darkroom chemicals. I'm not familiar with any environmental precautions or restrictions. Pyrogallol is an organic chemical and breaks down into simple carbon and other compounds.

***Sandy*:** Although there are some health risks involved in the use of pyro developers, they have been greatly exaggerated. Pyrogallol and pyrocatechin do not present a much greater risk to health than hydroquinone. These three ingredients are very similar chemically, and, if you look at the MSD sheets, you will find that they have about the same degree of toxicity. And yet, you have people who wail about the risks of pyrogallol or pyrocatechin, and think nothing sticking their hands in MQ developers containing hydroquinone.

The primary dangers to photographers are dermal absorption and breathing the dry powder, both of which are easily avoided. To avoid dermal absorption, wear latex or nitrile gloves, and go outdoors or use a vent hood to mix the stock solution from chemicals in powder form. By following these simple procedures, and exercising common sense, the potential health risks associated with using these chemicals for developing film are virtually eliminated.

***Jay*:** The risks associated with staining developers are the same ones associated with non-staining developers, and only differ in degree, so the same precautions that apply to staining developers also apply to non-staining developers.

Do you feel that these developers are any more difficult to use than a non-staining developer? If so, why and how?

***Sandy*:** I do not find pyro developers any more difficult to use than non-staining developers. You should wear gloves to avoid skin contact when using pyro developers, but the same precaution should be used with other developers. Pyro developers are, in fact, actually easier to use than many standard developers. They are very economical, the stock solutions have long shelf life, and the working solutions can be quickly mixed from the stock solutions.

***Jay*:** Traditional staining developers could be difficult and frustrating to use because they were unstable, and varied in performance from one working solution to the next. Among modern staining developers, relative ease of use is formula-specific, and directly proportional to the number of stock solutions a formula requires, and the solvents used. A traditional three-solution water-based developer like ABC Pyro is highly complex and inherently unstable, while a modern single-solution developer that utilizes an organic solvent is extremely stable, and as simple to use as any concentrated one-shot developer; just dilute with water to make a working solution. Two-solution developers fall between the two extremes, and the ones with the solution containing the developing agent(s) made up in organic solvents are the most stable of them. Varying the ratios of the two solutions and their dilution to adjust the working properties of such developers can be very complex, which increases their difficulty of use dramatically, compared to single-solution developers.

With any developer, there is a learning curve, and staining developers exhibit unique characteristics that must be understood to be used effectively. Staining developers are variable in their printing properties with different types of printing papers, which can make them difficult to learn to use, but extremely versatile once learned.

***John*:** Obtaining consistent results, day to day and year to year, requires more care than with conventional developers. This is because the effective density of the dye mask, as I stated above, depends on oxidation of the developer. The most important factors in obtaining con-

sistent results include using distilled water, mixing the working solution just before beginning development, and consistent agitation.

What about scanning a stained negative. Is there anything special that needs to be done?

Jay: Yes and no. Stained negatives can be scanned like any others, but since they are dyed, they present an opportunity to take advantage of the color management capabilities of the scanning software to improve the quality of the scan.

***John*:** I don't have experience with this.

***Sandy*:** Stained negatives scan very well, perhaps even smoother than non-stained negatives. One of the problems in scanning B&W negatives is film grain, especially in the upper mid-tones and in the highlights. This problem is minimized with stained negatives, because a very large percentage of the total highlight density of a stained negative consists of stain image (dye), which has no grain. This diminishes the effect of silver grain and gives the image a smoother look. Moreover, even greater suppression of the appearance of grain can be obtained by bleaching out all of the silver density, so that the scan is made of just the stain. This will give scans that print with virtually no grain at all. Generally, I would recommend scanning a stained negative in RGB, and then looking at the separate layers to see which one gives the best rendering of tonal values.

What films work best with one of these staining developers?

***John*:** Conventional films such as Ilford FP4+ and HP5+, and Kodak Tri-X produce the best results.

***Sandy*:** I have used staining developers with many films, both traditional emulsions and T-grain emulsions. My experience has been that all films benefit to about the same degree from the staining and tanning that one gets with pyro developers. Some people have expressed the opinion that traditional films such as FP4+ and Tri-X 320 benefit more from development in staining developers than from developing them in T-grain emulsions such as Tmax-100 and Tmax-400. I do not agree. What I have found in my own work is that proportional image stain, which is the stain that forms around silver grains, is very similar in intensity with all films. The idea that traditional films appear to work better than T-grain emulsion with staining developers is perhaps due to the fact that the gelatin base of traditional films is thicker, and these films develop more general stain, for the simple reason that there is more gelatin to stain. However, this stain is general B+F stain, not proportional stain, and it adds nothing to the printing qualities of the negative.

***Jay*:** I have never used a film that doesn't work well with a staining developer.

What films might benefit the least from a staining developer?

***Sandy*:** Speaking from the perspective of a Pt./Pd. Printer, there are clear disadvantages in developing some thick emulsion and high speed films in staining developers. These films tend to produce a lot of general stain, or B+F stain, which causes a significant increase in printing times. This problem is compounded by the fact that Pt./Pd. negatives need a lot of contrast, and the long development times needed to develop these films to the required approximate CI result in a further increase in general stain.

***Jay*:** Fogged film would benefit least by the use of a staining developer.

***John*:** Tabular grain films, including Kodak T-Max 100, T-Max 400 and Ilford Delta films, show less advantage with pyrogallol.

What color(s) is/are the typical stain and how does this affect the contrast of the image on graded papers? On variable contrast papers?

***Jay*:** While difficult to quantify, most staining developers produce a green-brown stain with most films. The stain acts to increase contrast with both graded and VC papers, but the contrast of VC papers is attenuated to some degree, providing for some compensation effect. Since the stain is proportionally more intense in the highlights, the effect is similar to exposing the highlights and shadows at different contrast filtrations, which can be a powerful tool in experienced hands.

***John*:** The color of the dye mask can range from brown to yellowish/orangish to greenish, depending on the formula and film combination. The optimum color is in the range of yellowish/orangish, because it acts as the most effective filter with blue sensitive graded papers. The same is true for variable contrast papers, which, in addition to having a blue sensitive high-contrast response, are sensitive to green light to produce low contrast. A greenish dye mask is less effective with variable contrast papers.

***Sandy*:** There are two broad categories of pyro staining developers: those that use pyrogallol as the primary reducer, and those that use pyrocatechin (catechol). Pyrogallol-based developers tend to produce a yellow-green stain, while pyrocatechin developers give a more neutral-looking brown stain.

When printing on graded silver papers, the color of the stain is of little or no consequence, since these blue sensitive papers see the stain as neutral density. In fact, when negatives are developed to the same effective printing contrast, tonal values will be reproduced the same way with both staining and non-staining developers.

With VC papers, which are sensitive to both blue and green, the color of the stain has a big impact on how tonal values, especially upper mid-tones and highlights, are rendered. The yellow-green stain of pyrogallol-based developers, which is similar in color to the low-contrast filters used with VC papers, acts as a continuously variable contrast filter that results in shouldering, or compensation, in the upper mid-tones and in the highlights. The consequences of this type of highlight compensation have both positive and negative implications. The advantage is that it is possible to print high negative densities without burning in the highlights. The disadvantage is that extending the luminance range via compensations results in a flattening, or loss of contrast, in the highlights tones.

The same type of compensation is also seen with developers that give a brown stain, although the effect is

not as great as with developers that give a yellow-green stain. Brown stain blocks green light more effectively than yellow-green stain, giving more contrast but less shouldering and compensation in the highlights. When brown stained and yellow-green stained negatives are developed to the same effective printing contrast for graded papers, the brown stain negatives will print with more contrast on VC papers than the yellow-green stain negative, but with less compensation.

Do you recommend a graded paper or a variable contrast paper for printing with a stained negative? Why?

***John*:** Excellent prints are possible on both graded and variable contrast papers. However, if a greenish-staining formula is employed, it is recommended to use graded paper for the reason stated above.

***Sandy*:** My favorite silver paper is AZO, a graded silver chloride paper.

I recommend graded papers for short-toe films that have long straight characteristic curves, and variable contrast papers for films that have a long toe and a continually increasing slope. Tmax 100 and Tmax 400 are examples of the first type, while Tri-X 320 and Efke PL 100 are examples of the second type. Printing on variable contrast papers with stained negatives on films that have long straight-line curves tends to flatten the highlights more than I consider acceptable.

***Jay*:** I recommend both. Film developers and printing papers are tools to be exploited for the effects they confer on the finished print. Both graded and VC papers offer unique qualities worthy of pursuit. With the number and variety of printing papers diminishing, it makes sense to me to learn to use both types of papers.

Does it matter what type of light source is in the enlarger (cold light, incandescent, etc.)? If so, why?

***Sandy*:** I prefer to print with a cold light head or with some other diffusion-type light sources. And, if using a cold light head, I recommend a light source like the Arista V-54 that is rich in green light. However, good printers can make excellent prints with either diffusion- or condenser-type enlargers.

***Jay*:** The color of the exposing light can affect the contrast of VC printing paper, and the speed of graded papers whether one uses a staining or non-staining developer. I don't know why one type of light source would be superior or inferior to another, once development is adjusted for the light source in use, but there's a lot I don't know.

***John*:** The type of light source is much less important than the color of the dye mask. For many years, I used a cold light, and, at present, I print with an incandescent color head, and the results are equivalent.

What are the typical chemicals involved in a staining developer and what are their functions?

Jay: Traditionally, staining developers were made up of a reductant, or developing agent (pyrogallol), a preservative (sodium sulfite), an accelerator (sodium carbonate), and often a restrainer (potassium bromide), made up in as many as three separate aqueous solutions. The developing agent reduces silver halide to metallic silver to form the negative image; the preservative controls the oxidation of the developing agent; the accelerator controls the activity level of the developer; and the restrainer prevents the development of unexposed silver halides.

The use of an organic solvent like triethanolamine (TEA) permits unique formulations. TEA acts not only as the solvent, but, when mixed with water, it acts as the accelerator as well. TEA-based solutions will not oxidize in the absence of water, so a preservative like sodium sulfite is not necessary, and, since a restrainer is not required in a carefully balanced formula, that leaves only the developing agent and the TEA as requirements for a working developer, as in Pat Gainer's Pyro-TEA.

Catechol requires a higher pH environment than TEA can provide, and is not practical for use in single-solution developers. Catechol can be dissolved in propylene glycol and use a separate accelerator solution. With the exception of the integral accelerator that TEA provides, and the simplicity of a single solution, a glycol-based solution enjoys the same benefits that a TEA-based solution does, permitting the omission of a preservative and restrainer, and the virtual elimination of oxidation. Stain formation can be controlled by the addition of a very small proportion of ascorbic acid, which dissolves readily in either TEA or glycol.

***John*:** The formulae for staining developers are essentially the same as for conventional developers, with the exception of the developing agent. Typical staining developers consist of two solutions that are mixed together just before use. The "A" solution contains the developing agent, usually pyrogallol, and perhaps metol or phenidone, and an acid such as sodium bisfulfite to prevent oxidation and preserve the developing agent. The "B" solution consists of an alkali, such as sodium carbonate, to activate the developer. Some formulae may also contain a fog suppressor, such as benzotriazole, though with pyrogallol, this is normally not necessary. The oxidation products of pyrogallol are antifoggants, and this is usually sufficient, unless very extended development times are used.

***Sandy*:** Development is a process in which a latent image formed during exposure is converted to a visible image. This is done by a process known as amplification, in which the latent images of the exposed silver halide grains are increased in size by as much as a billion times. Developers consist of four main kinds of chemicals:

* The Reducer, or Developing Agent
* The Preservative
* The Accelerator or Alkali
* The Restrainer

The Reducer, or Developing Agent

The process of development is a process of chemical reduction. The primary reducers used in staining developers are pyrogallol or pyrocatechin, usually in combination with a secondary reducer that adds synergism. The secondary reducers most commonly used in combination with pyrogallol and pyrocatechin are metol,

phenidone, and ascorbic.

The Preservative

During the developing (reducing) process, the developing agent becomes oxidized. A preservative must be added to prevent this oxidation, so that the development process remains constant throughout. If it were not, the developer would quickly become exhausted. The preservative most commonly used in staining developers is sodium sulfite. Ascorbic acid, which is substituted for sodium sulfite in some formulas, plays a similar role in restraining oxidation. The sodium metabisulfite used in the stock solution of many two-part staining developers performs a double function: 1) it makes the solution acidic, which gives it greater shelf life, and 2) on mixing with water it releases sulfite, which preserves the working solution, and, in some cases, adds synergism to the solution.

The Accelerator:

Most developing agents require an alkaline, or high pH, environment. As a general rule, higher pH results in more active, faster-working developers. The accelerators most often used in staining developers are sodium metaborate, and sodium or potassium carbonate.

The Restrainer

At the same time that the alkali is facilitating and speeding up development, a restrainer may be needed to slow down the process, to prevent unexposed areas of the emulsion from getting developed, which would cause chemical fog. The restrainers most commonly seen in staining developers are potassium bromide (inorganic) and benzotriazole (organic).

Most of the staining developers in common use today are two-part stock solutions that are mixed with water, just prior to use, to form a working solution. Stock Solution A typically contains the reducers, the preservative, and the restrainer, while Stock Solution B contains the accelerator. Two-part developers offer the maximum in flexibility, since the ratio of the two parts can be changed to optimize use for different films and conditions.

How do you suggest developing film in a staining developer? (open trays, rotary processing, nitrogen burst, etc.?)

***John*:** I have always processed my sheet film in open trays, and believe this to be the simplest and best method, producing extremely even results. Rotary processing usually introduces too much air into the developer, resulting in excessive oxidation that produces uneven results.

***Sandy*:** With some exceptions, such as rotary processing in Jobo and BTZS-type tubes, developing film in staining developers is no different than developing film in non-staining developers. The type of agitation used in processing film is the most important single factor in establishing the best balance between even development and apparent sharpness. Unfortunately, these two characteristics are somewhat antagonistic, because the conditions that favor the former work against the latter. The two extreme types of agitation are continuous agitation, as in rotary processing, and stand development. Continuous agitation is capable of very even development, but it minimizes the development of adjacency effects, and may result in a loss of apparent sharpness. Stand agitation is capable of producing extreme adjacency effects, but at the risk of uneven development. So the key to agitation is to find the precise balance with a given developer and dilution that provides even development over the entire surface of the film, and that also produces good adjacency effects.

The best compromise between the two extremes is, in my opinion, a procedure called minimal agitation. In minimal agitation, the film is agitated at the beginning of development for one minute, and then for ten seconds every two or three minutes thereafter. Minimal agitation has two highly desirable results: 1) greater apparent sharpness, because of the formation of enhanced adjacency effects, and 2) maximum emulsion speed.

There are several good methods for developing film with minimal agitation. A nitrogen burst system is perhaps the most sophisticated method of minimal agitation, but development in slosher-type trays and in tubes in vertical position filled with developer also gives very good results.

***Jay*:** The best method of development for a particular user will depend on many factors, including, but not limited to, the developer in use. Some developers are incompatible with some methods, or perform best with a specific method, while others are more universally compatible. For those considering trying a staining developer for the first time, it will be a more painless transition if they can continue to use a familiar developing method, provided a suitable developer is chosen.

* * *

The formulas developed by our participants and discussed above are not the only formulas available to the "staining development community." We asked Kevin Sullivan, of Bostick & Sullivan, and Bud Wilson, of The Photographers Formulary, two of the leading domestic vendors of photo chemicals, another series of questions about staining developers, from their perspective as photochemical retailers. The questions and their answers follow. As in the forum above, we have not edited their comments.

Which of the staining developers do you sell?

Kevin: PMK, Rollo Pyro, and Pyrocat HD

Bud: staining developers currently in catalog.

01-0100	Windisch catechol dry powder kit
01-0105	Windisch catechol modified dry powder kit
01-0120	ABC pyro Dry powder kit
01-0140	WD2D pyro original formula dry kit
01-0155	WD2D+ PyroMetol Liquid kit
01-5000	Pyro Triethanolamine (TEA) liquid
01-5045	PMK dry powder kit
01-5060	PMK liquid kit
01-5070	ABC Plus Pyro liquid kit

01-5080	Pyrocat HD powder
01-5091	Pyrocat HD Liquid in Gylcol
01-5095	Pyrocat MC liquid in Glycol

Do you sell them pre-mixed or as dry chemicals?

Kevin: People can buy the raw chemicals and mix it themselves if they want, but all of our proper developers are sold as liquid solutions or easy to mix "drypacks" (just add water to the bottle and shake it up).

Bud: As noted above

Do you feel there has been an increased interest in these developers?

Kevin: Actually, I think the major interest in pyro developers has passed, as far as the experimental phase goes. Now, staining developers are simply an accepted part of large format photography, and there is less discussion and controversy. So, there are still plenty of people using the developers, but most of the irrational excitement has dwindled.

Bud: Yes. Lots of variations available, and Internet forum discussions that create interest by just being there and chatting about all of the different formulas.

Do these developers seem more difficult to use than non-staining developers?

Kevin: Some people do seem to have difficulty transitioning from traditional developers to staining developers. But, in general, they seem just as reliable and easy to use as standard developers. In some ways, they are easier to use than non-staining developers, since they generally give negatives with excellent shadow detail and good highlight control.

Bud: No. Maybe different. More sensitive to agitation changes, temperature variations. Consistency in work habits with these or D-76 is the answer.

Do you receive more calls from customers having problems with these developers than non-staining developers? Do some of the formulae seem more prone to problems than others? If so, which one(s)?

Kevin: Several years ago, about 50% of our tech support calls involved pyro developer "problems," even though pyro makes up a much smaller percentage of overall sales. So pyro was disproportionately difficult to support. This has tapered off, and pyro questions probably only account for 10% or so of our tech support calls today.

Bud: No. Not problems with the developers as much as which developer to use. They all are unique; I don't see any one more problematic than any other.

What is the cause of these problems?

Kevin: Generally, pyro negs are harder to read with the naked eye, so this causes some initial confusion. Pyro negs can be extremely dense, even though they look okay in visible light. Long exposure times are a possibility if you are overexposing and overdeveloping. Also, pyro negs are harder to fit into the zone system and BTZS techniques if you don't have the proper UV or color densitometer.

Bud: The overload of Internet information.

What advice do you give people who call and ask about these developers?

Kevin: Try it if you think your negs need improvement. (If it ain't broke, don't fix it.) Spend time familiarizing yourself with the film and developer combo before beginning any large project. Make prints from the negatives to see what's happening; do not rely on eyeballing the negs or densitometry readings alone.

Bud: Advice? Pick 1 or 2 formulas based on some info that you trust from someone that you feel is giving out real information, and try them. Try them on several different films and papers; see what you like or don't like. Then maybe they will want to try 1 or 2 more. It is all Personal Preference. Get *The Book of Pyro* by Gordon Hutchings. Use an Alkaline Fixer like TF-4.

How do you feel these developers work for alt. processes?

Kevin: Pyro staining developers are probably the closest thing to instant gratification for producing alt. process negatives. But it may not match up with everyone's workflow. It is just another tool we can use if it helps.

Bud: All 10-11 of these formulas, and all of the other 40-60 different black and white film developers, will develop film that can be used as negatives for Alternative Processes. What's the difference? That is the difference. They are all different. Couple that with all of the different choices there are in Film, Papers, Processes, and Paper Developers, and the choices become endless. Isn't that what someone wants that goes to the effort to shoot a View Camera?

***

For the reader who is looking for conclusions or a summary, we are sorry to disappoint, but, in this instance, our goal, as stated early in the article, is to serve as a forum to provide information on pyro to our readers, interested novice and experienced user alike.[6]

End Notes

1 De Mayo, Paul, University of Western Ontario, Superficial Photochemistry, Pure & Appl. Chem., Vol.54, No.9, pp.1623—1632, 1982. Pergamon Press

2 Hutchings, Gordon, *The Book of Pyro and the PMK Formula*, Bitter Dog Press, Granite Bay, CA 1992. *The Book of Pyro* is the most comprehensive reference on staining developers available to the contemporary photographer wishing to explore their lore. Sandy King has also published, on the Internet, "An Introduction to Pyro Staining Developers, With Special Attention to the Pyrocat-HD Formula" (http://unblinkingeye.com/Articles/PCat/pcat.html), which contains a wealth of historical and general information, as well as the specifics of the Pyrocat-HD formula.

3 Our thanks to Howard Effner, Ph.D., for reviewing the technical aspects of the article. Dr. Effner teaches chemistry at the University of New Mexico.

4 Jones, Bernard E., editor, *Encyclopedia of Photography*, as reprinted by The Arno Press, New York, 1974, with an introduction by Peter C. Bunnell and Robert A. Sobieszek. Archer was the inventor of collodion-wet plates and, thus, pyro became the developer for these plates.

5 *The Encyclopedia Britannica*, London and New York, 1911.

6 Over the past 18 years, *View Camera* has published a number of articles on staining developers. To the extent that they are still available, they will be republished on the magazine's website.