Darkroom Film Development

This paper is about the practical application of darkroom film development. I will talk about the materials, the chemicals and the scientific background of them. As well as the types of techniques and darkroom manipulation methods. The intended audience of this paper are the people who are very interested in photography, especially film photography. This also includes people who use photoshop or use a darkroom to develop their own photos.

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1 Introduction

In today's times, the 21st century, photography and photo-editing have evolved from two centuries ago. Today people are able to edit and retouch their photos right at their finger tips. Before the invention of digital cameras and Adobe Photoshop, the process to develop photos was more strenuous and done in a darkroom.

2 What is a Darkroom?

A darkroom is a place where photographers and photo developers can go to develop an image. It is a room that is completely pitch black. Meaning that there is no outside light coming into the room from windows, cracks and doors. Usually this room contains no windows and contains a safelight as it's only light source for humans. The best kind of lighting when in a darkroom is no light [1]. A darkroom must have six requirements. These requirements are a source of water, a light tight environment, proper ventilation, a dust-free environment, electricity, and enough space.[1]

2.1 What is a Safelight?

A safelight is a light that is a normal light bulb, but contains a red coloured filter. It is important for the light to emit a red colour because the common photographic paper and materials that photographers handle are orthochromatic. Meaning that the material is insensitive to the black and white electromagnetic waves that red emits. However, there are some panchromatic papers, such as Kodak Panalure, which are sensitive to all colors and require the use of a dark green filter.[1]

3 What Equipment Do Photographers Use?

There are the two most essential tools when performing darkroom photography. These two tools are the enlarger and the chemicals needed for a developer, stop bath, and fixer.

3.1 Enlarger

The vertical enlarger was invented in 1852 by Achille Quinet. This invention helps photographers size their photos onto their canvas or photographic paper to a size they are pleased with and are able to set the exposure and focus of their photograph. To do this, the enlarger contain a lamp inside that illuminates the negative and projects the image onto the canvas evenly [2]. For colored images, there are filters that get placed inside the enlarger to project colored light onto the photo paper. There are also accessories that can be used with the enlarger for different effects. Photographers use the focus finder to adjust the sharpness of their photo. [2]

4 Chemicals

To identify the three common chemicals that photographers use when developing film in a darkroom. Each chemical has a different effect on the outcome of the photo and different reactions with other chemicals so it is important to know the reactions and background of them. Photographers must use a developer, stop bath, and a fixer, in that order. Each of these chemicals have a different chemical reaction and affect the photograph differently. [1]

4.1 Developer

The developer develops the photograph on the photo paper. The chemicals that are commonly used as a developer are ascorbic acid, hydroquinone, metol, or phenidone. After the enlarger, the photo paper is placed into the developer chemical, which then the ”silver hailde crystals are selectively reduced to metallic silver... The more metallic silver in an area of the film or paper, the darker it appears,” [1]. Anchell claims that ”There are many chemcial agents that will reduce silver halide to metallic silver, but developing agents are a special kind of reducing agent because they only act on silver halide that has been exposed to light, ” [1].

4.2 Stop Bath

After putting the photo paper in the developer. The next step is the stop bath. The stop bath provides a buffer between the developer and the fixer. The stop bath first halts the development process. It stops the silver haildes from turning into metallic silver. According to Anchell, photographers can either use an acid stop bath or a running-water stop bath.

If an acid stop bath is used then it will stop the development process in the shortest amount of time. However, it does come with some disadvantages. Anchell explains that "When the sodium carbonate...comes into contact with acid, carbon dioxide gas is released which can cause blistering in the emulsion of both film and paper," [1]. These are known as "pinholes". To prevent pinholes on the photograph, Anchell recommends that two methods:

1) Use developers that contain mild alkali, such as sodium metaborate or borax. Using this kind of developer with an acid stop bath will prevent the creating of carbon dioxide gas.

2) Use a mild acid stop bath or a very gently acting stop bath. This will cause less of a harsh reaction when reacting with the developer.

4.3 Fixer

After the stop bath, the photo paper then goes into the fixer, which then seals the image on the photo paper. Anchell describes the fixation process as the "removal... of unused silver halides, such as silver bromide, from the paper or film... This process involves a series of chemical reactions in which the silver bromide is converted into complex argentothiosulfates, which are then dissolved by contact with fresh fixer and finally washed out of the film or paper," [1]. Acording to Anchell, there are three types of fixers:

1) plain (neutral)
2) acid
3) alkali

There are different outcomes to these three types of fixers. The plain fixer is normally used before toning and can act as a "second bath" in a two-bath system. This type of fixer is not generally used a the "main" fixer because cause stains on the photograph and cause other problems.

The acid type fixer, the most used kind of fixer, is a weak organic acid type of solution. Acids that are used in this solution must be stable. Acids can be mixed in order to create a sulfurous acid.

The alkali fixers tend to be the most efficient and effective. They also have plenty of benefits when used. They have shorter washing times and they require less materials and baths in the process of developing a photo.

5 The Process

The process of film development stresses the importance of timing, light, and temperature. Michael Langford describes the process and the outcomes of photographs when timing, light, and temperature are changed in *The Darkroom Handbook*. Langford explains how it is all about technique and the different techniques to get certain outcomes. Black and white film "can be processed in about 45 minutes," [2]. However, this all depends on "the type of developer you use, its temperature, and the amount of agitation given," [2].

5.1 Getting The Negative Ready

Before the development process starts, the negative must be prepped. Prepping the negative means that the photographer takes the film out of the film roll and uses a magnifying tool to choose the photo that they want to develop. Once they have chosen their negative, they cut it from the film strip and put the negative into a negative carrier. A negative carrier is a component that is apart of the enlarger where it can be removed and used to hold the negative. [4].

Once the negative is prepared, the photographer can now put it in the enlarger and adjust the exposure, aperture, and sharpness of the photo.

5.2 Exposure, Aperture, & Sharpness

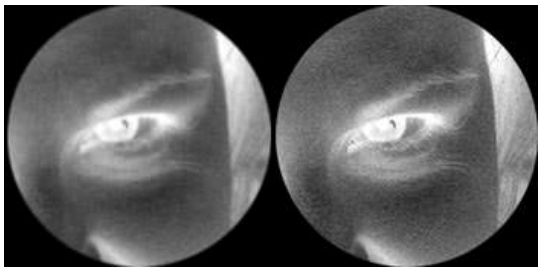
After preparing the negative, the photographer can adjust the exposure, aperture, and sharpness to their liking.

Exposure is defined as the amount of light that hits your camera's sensors. To have a good amount of exposure, or "proper exposure", this means that the bright and dark areas of the photo received enough light that distinguishes the details [5]. Photographers are also able to underexpose their photos, meaning that the dark areas of the photo did not get much light; or overexpose, meaning that the bright parts of the photo received too much light. Underexposing or overexposing loses the details of the image.

Aperture directly effects the exposure of a photo. Aperture is the opening of the lens on the enlarger. Photographers are able to control how much light passes through the lens. Having a large aperture allows more light into the enlarger. This can cause an image to be overexposed. A smaller aperture allows less light to pass through the enlarger. Therefore, this results in a underexposed photo. A medium aperture will let in a normal amount of light which will result in a proper exposure [6].

The sharpness of a photo refers to the clarity and contrast of an image. Photographers adjusted the sharpness of an image by using a focus finder.

They used this and the enlarger together to get their desired setting. To use a focus finder, the photographer or photo developer would place it onto the canvas of the enlarger. They then would look through the focus finder and and adjust a knob on the enlarger to fix the sharpness. The focus finder magnifies the image. As the photographers look through it, they can see how blurry or clear the image is and adjust accordingly [7].



5.3 Test Run

After getting the desired settings for the photo, the photo developer will then do a test run. A test run is an image where each part of the photo paper is exposed under the enlarger in five second intervals.//

The less time under the enlarger, the lighter the photo will appear. This means that for a lighter photo, photo developers would want five to ten seconds under the enlarger. The more time under the enlarger, the darker the

photo will look. This leads to an overexposed photo. To achieve an overexposed photo, the photographer would need to expose the photo under the enlarger for more then 20 seconds.

5.4 Developer, Stop Bath, & Fixer

After exposing the photo paper under the enlarger, the photo developer then wants to move the photograph to the developer bath for 60 seconds, then to the stop bath for 10 seconds, and then to the fixer for 30 seconds. During these chemical baths, the photographer must provide agitation to the photos.

5.5 Agitation

Providing agitiation means that the photo developer must gently shake the tray back and forth in order for the photo paper to get evenly covered with the chemicals. If agitation is not provided, then the photo will not develop evenly or could form bubbles that prevent development in certain areas of the photo.

5.6 Water Bath & Hang To Dry

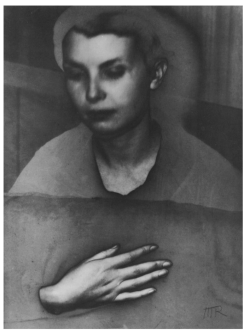
Once out of the fixer, the photo developer then wants to put the image into a water bath. The purpose of the water bath is to filter out the chemicals from the image. In order to do this, the photo developer does not need to provide agitation, but will need to replace the water a few times. This will fully rid the photo of chemicals. Once the image is filtered, can be hung up to dry. It will take eight to ten hours for the photo to fully dry. After the image dries, the photo developer can go back and add effects to the photo, known as darkroom techniques and manipulations.

6 Common Techniques

There are many different techniques to get the different outcomes when it comes to developing film in a darkroom. Jim Stone talks about these techniques in *Darkroom Dynamics: A Guide to Creative Darkroom Techniques*. He explains in great detail about different techniques like the sabattier effect, exposure control, processing control, and toning with bleach.

6.1 Sabattier Effect

Langford describes the sabattier effect as a ”unique positive/negative effect [that] could be obtained by reexposing to light and redeveloping an exposed and partially developed negative or print,” [3].



To recreate this effect, the negative chosen must have a slightly high contrast. The process for this is then followed by a developer, water rinse, and then into another solution that contains 1:10 developer, then fixer, fixer remover, and a water rinse. A safelight is okay to use during this process.

6.2 Exposure Control

Exposure control is about controlling how much light is exposed to the photo paper and specific areas of the paper we want to expose for either a longer or shorter period of time. Methods used are called dodging and burning.

6.3 Processing Control

Processing control is when we select different parts of a photograph and decide the placement of the developer and how long we want the developer to process the image [3].

6.4 Toning With Bleach

Using bleach helped lighten the image. Stone claims that when an image is too dark or over exposed, a bleach mixture after fixing and rinsing helps lighten the image and helps make highlights stand out.

7 Darkroom Manipulation

7.1 Dodging

7.2 Burning

7.3 Color Photos

8 Conclusion

Anchell, Langford, and Stone have studied the process of developing film and its many techniques. Darkroom film developmnent paved the way for modern photo editing. Apps like photoshop and lightroom take many of the same techniques such as exposure control, processing control and processed them digitally.

References

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