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One and many: Wet-Collodion and Woodburytype

Susanne Klein[1], Paul Elter[2], [1]Centre for Fine Print Research at the University of the West of England, Bristol BS32 1JT, [2] Elter Studios, Chelsea, QC. Canada J9B 1K8

Abstract

The invention of photography in the 19th century changed our perception of reality for ever. Without the interpretation of an artist, an image could be recorded within minutes representing 'unfiltered' reality. Besides the scientific challenge how to capture the light and make the image permanent, the distribution of the image material became a scientific and commercial endeavor at the same time. We will present modern reincarnations of two technologies practiced by Walter Woodbury, the inventor of the first commercially successful photomechanical reproduction method: Merging Wet-Collodion photography and Woodburytype.

Introduction

In the 19th century, inventions how to capture photographic images, make them permanent and distribute them to an exited audience were numerous. Most of them are forgotten, mainly because they were too complicated at the time or they were replaced by more reliable and cheaper methods. Two of them are Wet-Collodion photography and Woodburytype, still practiced by expert groups because of their outstanding image quality. Time has not stood still for these technologies. They have been translated into modern materials and processes without losing the features which make them recognizable.

Collodion photography

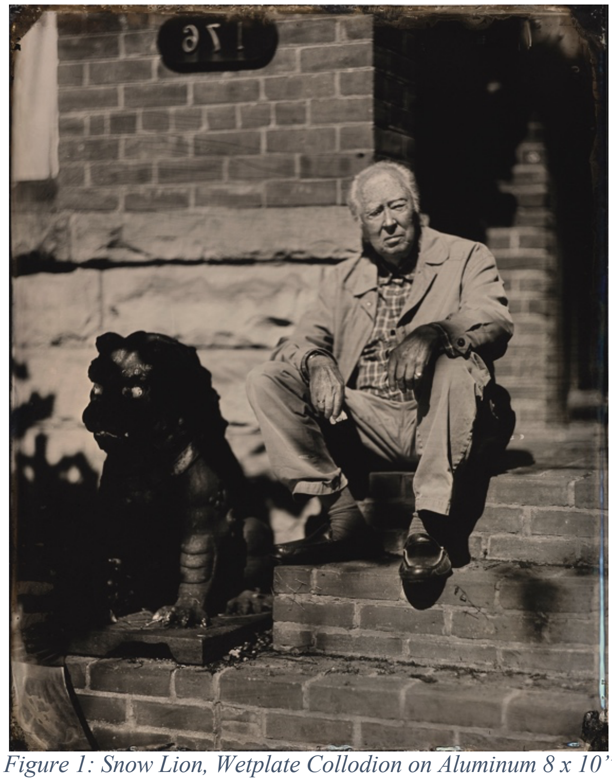

Figure 1: Snow Lion, Wetplate Collodion on Aluminum 8 x 10" image made by Paul Elter.

In March 1851 Fredrick Scott Archer published in The CHEMIST under the chapter heading entitled *II.Chemical Manufacturers and Agricultural Chemistry*, a small abstract of his findings titled – *On the Use of Collodion in Photography*. It was barely 12 years since photography's inception in 1839 with Louis Daguerre and Henry Fox Talbot's inventions and only 24 years -1827 since Nicéphore Niépce's experiments with a type of photoengraving gave us what is now the oldest surviving photograph or as he coined it heliograph, for the term photography was not yet invented. These three forms of photography would change the course of history forever and Archer's invention would forever change the course of photographic history; for this is where the idea of a photographic emulsion had its beginnings.

Figure 2: Shelter in Place, Wetplate Collodion on Aluminum 8 x10" image made by Paul Elter.

Fredrick Scott Archer's formula for capturing and preserving an image permanently onto a surface has become known as Wet-Collodion or Wetplate because the prepared plate must be exposed and developed before the Collodion surface dries out, approximately a 15min window give or take depending on environmental conditions. As well in the next ten years Wetplate Collodion would be replaced by the more convenient emulsion – the Collodion Dry Plate, which ultimately gave way to the Gelatin based emulsions of remarkable speed, by comparison. Archer was looking for a way to improve on the calotype process of Henry Talbot's that had the unique ability to make copies of the original paper negative, but because of the nature of paper manufacturing the fibers of the paper would always add texture to the resulting contact print from the original capture. So how could he create a process that gave the fine detail of Daguerre's process and the ability to make copies from Henry Talbot's process and perhaps boost the speed from a day or more in Niepce's time, an hour or several minutes in the 1840's - to seconds of exposure. It was Archer's formula involving salted Collodion combined with silver nitrate that made it all possible.

Figure 3: Bristol suspension bridge, Woodburytype on silk, 9 x 9 cm. The original file was a digital image, picture taken by Susanne Klein, printed by Josie Argyle.

It is at this point we would like to opine that it also gave to the world, that still to this day, has the highest resolution and the most beautiful continuous tone of any photographic process. For the emulsion of the Wet-Collodion process will record the sharpest detail of any optic placed in front of it and at the largest size a camera can handle all without distortion to the emulsion - as in film grain of all later gelatin based processes or as in dithering, created in both halftone printing and modern printing methods like inkjet. It is with this perfect high resolution photographic emulsion which when married with the most perfect of continuous tone printing techniques invented - the Woodburytype, renders something of a perfect union – never since equaled. It is unfortunate that Fredrick Scott Archer's untimely death just 7 years after his remarkable invention that he would not bear witness to this perfect union. And unlike his two predecessors gave the patent of Wetplate collodion to the world completely free of royalties and died impoverished because of his remarkable gift.

Woodburytype

Woodburytype was the first commercially successful photomechanical reproduction method. In 1852, the age of 18, Walter Woodbury left England for the gold fields of Australia, but turned soon to photography. In 1859 he moved on to Java where he photographed extensively, using Wet-Collodion photography, even though the difficult tropical conditions made the process even more unpredictable. A year after he returned to Manchester in 1863, he patented a method to reproduce photographic images from intaglio molds (British Patent no 2338) [2], later known as Woodburytype. Several steps are required to make a printing plate following Woodbury's patent [1]. A solution of collodion was poured onto a clean glass sheet and levelled.

After the collodion had dried, the photosensitive layer was made by pouring warm, dichromated gelatin onto the collodion. After the gelatin had dried, the collodion/gelatin film was peeled of the glass and a contact print was made, often using a wet-collodion negative, and exposed to the sun. The UV part of the sunlight hardened the dichromated gelatin where the negative was transparent. Under the dark parts of the negative the gelatin stayed soft. The hardening happens form the base, that is the collodion layer, upwards. After the soft gelatin was washed away with warm water, a relief of hardened gelatin became apparent. The relief was relatively flat, according to [1] only 130 μ/m deep in its 'darkest' parts. The gelatin relief was then put onto a lead plate and transferred to a hydraulic press. A pressure of five tons per square inch was needed to imprint the image into the lead [1]. About 6 plates were made form the gelatin relief. They were mounted in presses, similar to modern nipping presses, on a printing carrousel. The plate was oiled, warm pigmented gelatin was poured into the center of the plate, a piece of highly calendared paper was put on top and the press was closed. The carrousel was turned and the same procedure repeated in the next press. By the time the first press was reached again, between 5 to 6 min, the gelatin had set and the print could be pulled. The disadvantage of casting the image onto paper in this way, is that the necessary surplus gelatin is squeezed out of the image area and forms a 'dirty' border which has to be trimmed of. The high water content of the pigmented gelatin solution results into a high shrinkage when the print dries which then demands further hot calendaring of the print to flatten the sheet. After the print was trimmed and flattened it could finally be mounted. The image is continuous tone, i.e. no halftone dots are present, and the greyscale is a function of a pigmented gelatin relief. The prints can be distinguished from silver halide prints, by tiny air bubbles, a just visible relief and cracks, especially in old Woodburytypes. Walter Woodbury sold licenses for his method to three companies, Goupil in France, The Woodbury Permanent Photographic Printing Company in England and to John Carbutt in America. These companies refined the process in such a way, that even with the work intensive post processing, 30 000 prints per day could be pulled [3].

Figure 4: Leon, Woodburytype on photographic inkjet paper, 6 x 6 cm, made by Susanne Klein

Modern Practice and Fusion

Wet-Collodion Process in Ten Easy Steps.

As the name suggests the fundamental aspect of this collodion process is that the coating, sensitizing, exposing and developing MUST be completed during and before the collodion hand poured 'film' dries out, rendering it unusable, - hence as the nomenclature suggests WET-collodion or most often called Wetplate Collodion.

Figure 5: Continental Divide, Wetplate Collodion on Aluminum 8 x10" image made by Paul Elter.

The collodion itself is prepared with various salts, specifically iodine and bromide these being the active or necessary ingredients in the collodion necessary to react with the Silver Nitrate (Ag) to form photosensitive silver halide crystals (AgX) on the surface of the plate, thereby making Silver Bromide (AgBr) or Silver Iodide (AgI) respectively or the place on which, where the latent *"photographic"* image resides.

As you might have wondered where is all this done without exposing the now active silver halide crystals? The real life problem or challenges some might say, is that a darkroom or darkbox must be carried with you where ever you go, along with all the necessary chemistry, for everything is made on the spot – every time.

Step one: Find a subject; compose and setup your camera.

Step two: Prepare your plate, clean and dry thoroughly.

Step Three: Albumenize or "sub" your plate so that your image does not slide off when washing. Let dry.

Step Four: Pour the pre-made collodion slowly onto the plate, evenly coating all corners and slowly pour off the excess, before the collodion begins to set-up.

Step Five: Gently submerge the plate into the bath of silver nitrate, cover and let sensitize for three minutes. Take a brake, Breathe.

Step Six: Get inside your darkbox, with plate holder ready, slowly remove plate from silver nitrate bath, wipe excess and very carefully place face down into the plate holder. Ready to make an image.

Step Seven: Place plate holder into camera - with sensitized surface FACING the subject – any last adjustments, remove dark slide – decide on your exposure, yes that is correct, you must FEEL the light, no exposure meters here, remove lens cap, count…Done, lens cap on, dark slide in, back to the dark box.

Step Eight: Inside the darkbox, remove plate from the holder, ready the developer, steady – pour a consistent and even wave across the plate – watch carefully for the highlights then the midtones of the image to appear on the plate and hit it with water to STOP the development.

Step Nine: After a second water rinse, it is no longer sensitive to light and can be brought out into the light to be fixed. Submerge into a bath of Thiosudium Sulfate and fix for about two minutes. Wash the plate with water thoroughly, let dry.

Step Ten: Varnish the plates with Gum Sandarac varnish in the same way as you did pouring the collodion on the plate – Let dry, and enjoy… for 170 years or more.

Since one of the authors (SK) did not want to wait 170 years or several weeks for the image to arrive (COVID and Brexit has slowed down postal services enormously), we introduced a digital step. The Wet-Collodion image was scanned at a high resolution and the digital file transferred via the internet. The file was then inkjet-printed without introducing any halftoning. Of course, inkjet-printing introduces a grain, which is fine enough to be accepted for a proof of principle.

Modern Woodburytype

The print is pulled from a silicon relief plate made with a photopolymer plate and a process close to the original method.

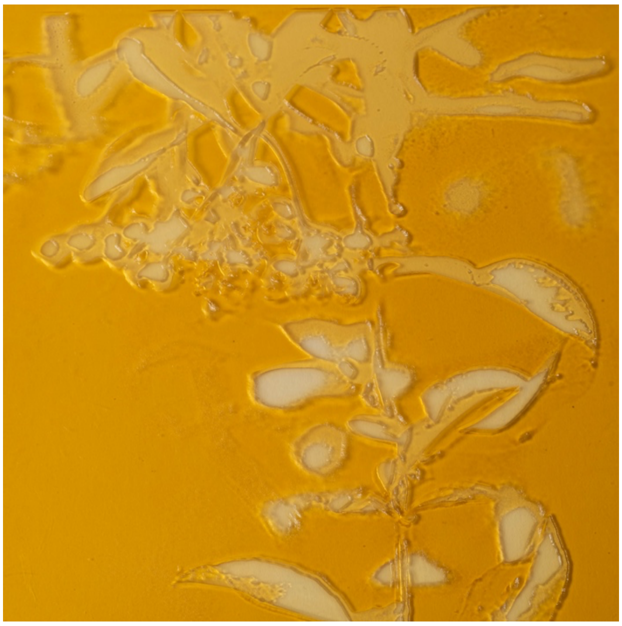

Figure 6: Yellow Berries, Example of a photopolymer plate.

Other modern methods can be found in [4] or [5], but we wanted to follow the original procedure as closely as possible. A negative is brought into contact with the back of, for example, a Toyobo Printight Solar Plate KF95, which has a transparent mylar backing. A similar procedure to the historic one described above will follow using modern materials. The plate is exposed through the substrate hardening the photopolymer from the substrate upwards and creating a relief where the darkest parts of the image form the deepest troughs, equivalent to the historic process. After the plate is developed by washing, dried and hardened again, a silicon cast is taken by pouring silicon onto the plate in an enclosure. It is important that the silicon is leveled and flattened by a glass or steel plate. Otherwise, a meniscus will form and the surface of the silicon, which will be the back of the printing plate, will set preserving the pouring history.

Figure 7: Yellow Berries, Woodburytype, the negative used was a silver halide negative, image made by Susanne Klein

After the silicon has set, the photopolymer plate is separated from the cast. The silicon plate is then transferred to an Albion press or a nipping press. Warm gelatin is poured onto the oiled plate and paper is pressed on it until the gelatin has set. As in the original process, pure white cannot be achieved since even on the highest part of the relief a thin layer of pigmented gelatin remains. After trying, the image is flattened in a heat press. Care has to be taken that the temperature is not set to more than 60°C, above which the gelatin will start to soften and the image will loose definition. The image will appear out of focus. As a substrate, a wide variety of materials can be used. We have printed on photographic inkjet paper, all kinds calendared cotton rag and wood pulp paper, silk, napkins, overhead transparencies and glass. When printing on paper, the surface has to be very smooth otherwise the gelatin will penetrate the bulk of the paper and the contrast will disappear. Strangely enough, this is not the case when we print on fabric. When a lose weave is used, the gelatin sits nicely in the gaps. The treads form a scaffold for a gelatin image.

Conclusion

As can be seen in Figures 1,2 and 5 Wet-Collodion photography lends itself to reproduction by Woodburytype. Pure white of modern gelatin based or digital images are less likely in Wet-Collodion image and the tonal range of a Wetplate is strongest in the midrange as is Woodburytype. To protect the plate, the image was scanned and a transparent film was made which was then used to make a Woodburytype plate following the steps described above. As stated in the beginning of this abstract science and commerce of photography progressed at a rapid pace to one another in their early histories and as new materials and superior ways of working came onto the scene the old processes were rapidly abandoned. So, as we are here in the 21st century digital methods have offered us the ability of transferring files across great distances instantly and digital printing out of these images has provided a convenience that did not exist 160 odd years ago, we chose to introduce a digital step and use modern materials, preserving the tried and true materials of historic excellence with a small aid of digital technology and modern materials. By that we have lifted the two processes from 'living history' into modern practice.

Acknowledgement

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Author Biography

Susanne Klein is an EPSRC manufacturing fellow and an associate professor at the Centre for Fine Print Research. She studied physics in Germany and came as a Royal Society Research fellow to the University of Bristol where she worked on 19th century optics. In 1998 she joined Hewlett Packard Labs and worked on liquid crystal display technology, new materials for 3D printing and optical cryptography. In 2018 she joined the Centre for Fine Print research. Her research interests now are 19th century photomechanical processes and their 21st century incarnations, especially Woodburytype and Lippmann photography.

Paul Elter is a photographer at the National Gallery of Canada who has over the last 18yrs coordinated the capture and archive of visual assets during the transition from analogue to digital. He studied classical animation and photography at Sheridan College, in Canada. Currently a multi-disciplinary artist working in photography, painting, sculpture, drawing and collage, exploring ideas of travel, shelter and place are common themes in his work often incorporating analogue tools and historic practices. www.elter.ca