

Unconventional Photography: The exploration of cyanotype process on various fibers. * various fibers.

การถ่ายภาพทางเลือก: การทดลองกรรมวิธีพิมพ์ภาพ Cyanotype บนไยธรรมชาติชนิดต่างๆ

Anugoon Buranaprapuk อนุกุล บูรณประพกษ์**

บทคัดย่อ

การวิจัยนี้เป็นการทดลองกรรมวิธีการอัดภาพของศตวรรษที่ ลงบนวัสดุที่แตกต่างจากที่ใช้ดั้งเดิม 19 การถ่ายภาพและอัดภาพเริ่มมาในช่วงปีคริสตศักราช 1800 การอัดภาพเกิดขึ้นจากการค้นพบสารเคมีที่มีความไวต่อแสงโดยนักวิทยาศาสตร์ และนักเคมีศาสตร์ ในสมัยนั้นการอัดภาพทำได้โดยการผสมสารเคมี ทางลงบนวัสดุ หรือพื้นผิวที่จะอัดภาพลงไป และจะลงด้วยการล้างสารเคมีที่ไม่โ侗แสงออก เป็นกระบวนการที่ทำด้วยมือทุกขั้นตอน ต่อมานำมาในช่วงศตวรรษที่ การอัดภาพได้พัฒนาเป็นธุรกิจ มีการจำหน่ายกระดาษอัดภาพ 20 สำรีเจรูป (Silver Gelatin) ซึ่งถูกถ่ายเป็นกระแสงหลักในการอัดภาพตลอดศตวรรษที่ หลังจากนั้น 20 วิวัฒนาการของการถ่ายภาพก็ได้เข้าสู่ระบบดิจิตอลในช่วงเปลี่ยนศตวรรษ ประวัติของการถ่ายภาพ และกรรมวิธีดั้งเดิมก็เริ่มที่จะหายไป ถูกเปลี่ยนรูปเป็นรูปที่เข้าถึงยากสำหรับคนรุ่นใหม่ วัตถุประสงค์ของการวิจัยครั้งนี้ ต้องการที่จะอนุรักษ์ และเผยแพร่ ส่วนหนึ่งของการอัดภาพที่อยู่ในประวัติศาสตร์ของการถ่ายภาพ จึงได้เลือกกรรมวิธีที่เหมาะสม นำมาทดลองลงบนพื้นผิวที่แตกต่างจากที่ใช้ดั้งเดิม ซึ่งส่วนใหญ่แล้วจะเป็นกระดาษโดยเฉพาะจาก ไยธรรมชาติ หลังจากนั้นก็ทำการบันทึกและวิเคราะห์ผลการทดลองเพื่อที่จะนำไปสร้างงานต่อไป การวิจัยครั้งนี้ได้ถูกแบ่งออกเป็น ส่วนแรกคือการศึกษาหาข้อมูลทางประวัติศาสตร์ของการถ่ายภาพ และเจาะลึกในส่วนของวิธีการ 3 อัดภาพต่างๆ และศึกษาไยธรรมชาติอื่นๆ ที่เกี่ยวข้อง และมีคุณสมบัติที่สามารถนำมาใช้อัดภาพได้ เช่น ใบผ้า ชนิดต่างๆ ในส่วนที่สอง เป็นการทดลองกรรมวิธีที่เหมาะสมลงบนไยกระดาษ และใบผ้าต่างๆ ประมาณ ชนิด ใน 10 ส่วนที่สามคือบันทึกและวิเคราะห์ผลการทดลอง จากการศึกษาพบว่ากรรมวิธีการอัดภาพของศตวรรษที่ มี 19 ชนิด อย่างไรก็ตาม กรรมวิธีที่ถูกเลือกมาทดลอง ได้พิจารณ 19 อยู่ประมาณจากการทำงานของสารเคมี ที่จะสามารถนำมาใช้กับไยกระดาษหรือใบผ้า ซึ่งกรรมวิธีนั้นๆ สารเคมี จะถูกซึมเข้าไปในไยกระดาษหรือใบผ้า การอัด

* This research article is a part of a Ph.D research titled “Unconventional Photography: The application of historical photography processes integrating with textile work.”

บทความนี้เป็นส่วนหนึ่งของงานวิจัยในหลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาศิลปกรรมออกแบบ (หลักสูตรนานาชาติ) ในหัวข้อ “การถ่ายภาพทางเลือก: การประยุกต์ใช้วิธีการอัดภาพในประวัติศาสตร์ในงานผ้า”

** Ph.D. Candidate in Design Arts at Silpakorn University. Contact: 089-000-1518 Email: anugoon@hotmail.com, Advisors: Assistant Professor Dr. Namfon Laistrooglai, Associate Professor Dr. Pairoj Jamuni

นักศึกษาในหลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาศิลปกรรมออกแบบ (หลักสูตรนานาชาติ) หมายเลขติดต่อ 089-000-1518 อีเมล์ anugoon@hotmail.com, อาจารย์ที่ปรึกษา 1. ผศ.ดร. น้ำฝน ໄลส์ต์รุ่งไกล, 2. รศ.ดร. ไฟโรมน์ ชุมนี

รูปจึงได้รูปภาพที่ฝังอยู่ในไนน์ๆ จากการทดลองพบว่า ไยคือตต้อนละเอียด สามารถให้ผลของภาพดีที่สุด ทั้ง ความชัดเจนของภาพและความเข้มข้นของโถนสี แต่อย่างไรก็ตาม ไยผ้าและกระดาษชนิดต่างๆ ที่ให้ ความ สุนทรีย์ของภาพที่แตกต่างกันไป การทดลองครั้งนี้ สามารถนำไปต่อยอดในการนำผลทดลองพื้นผิวต่างๆ มา สร้างงานตามความงามที่แตกต่างกัน และเป็นทางเลือก สำหรับช่างภาพที่ต้องการความเปลกแยกจากระดับ หลักของโลกดิจิตอล

คำสำคัญ: ความแตกต่าง, การถ่ายภาพ, ไยธรรมชาติ, ประวัติศาสตร์, กรรมวิธี

Abstract

This article is a result of the exploration of a 19th century photographic process on unconventional materials. The beginning of photographic printing traced back to the 1800s. Images were printed with different light sensitive chemicals discovered by scientists and chemists. In that era, the photographs were done by hand from mixing the chemical, preparing the plates or paper to finishing with another set of chemical. In the early 20th century, the photographic printmaking became commercialized with silver gelatin. It became a mainstream throughout the century. After that, the evolution of the digital technology predominates the industry at the turn of the century. Consequently, the history of photography is overlooked and the historical processes are diminishing. They have become rare to the newer generations. Therefore, the objectives of this research are to preserve and reintroduce parts of historical photographic processes, to experiment historical processes on different fibers and to analyze the results. The process of this research is divided into three parts. First, the study of photography history and its processes and the study of fibers' properties are carried out to obtain the appropriate processes and the applicable fibers for the experiment. Second part is the experiment of the selected photographic processes on various types of fibers. Third is to analyze the results from the second part. There were approximately 19 types of historical photographic processes. However, the selected processes are considered by relevant adhesive characteristic of the chemicals to the fibers. Natural fibers are found to have the right properties for the chemicals to be situated. Various types of natural fibers are experimented. The results find that fine cotton fiber is the best in giving richness of tonality and definition of the image. Each fiber gives a distinctive appearance and depth. The data analyzed can benefit those who seek alternative photographic processes and materials for their image making.

Keyword: Unconventional, Photography, Fibers, Historical, Process.

Introduction

“Photography is at the intersection of two quite distinct procedures, one of a chemical order: the action of light on certain substances; the other is of a physical order; the formation of the image through the optical device.” (Roland Barthes, 2000:10) This statement is only valid until the turn of the 21st century. Since the technology of photography has emerged quite rapidly in the 20th century from film to digital. The chemical order becomes irrelevant. As the advanced technology takes place, photography has become more accessible to just about everyone. Everybody can take pictures with the advantages of digital means, the pictures are instant and at the same time the numbers of captures are countless. While photographing with film would take more time after the images are captured, the film has to be processed and photographs have to be printed out in order to view the positive images. As a result, the emergence of digital culture has made photography become superficial. The conscience in capturing photographs has lessened due to the convenience of instant viewing of the images.

The questions arose that what would be the future of photography? Then Christopher James mentioned “The future of photography is in its past.” (Christopher James, 2009). The statement had made a realization of the photography’s value is actually in its history. “Successive processes (historical processes) are genuinely creative methods of image-making.” (Richard Salkeld, 2014:40) It is the becoming of this research. As the chemical aspect of photography has been almost forgotten nowadays, the practice of the old processes should be brought back and be dignified for their significance.

Conventionally, majority of the historical processes are printed on paper, specifically of cotton linters. There were no specific papers made for historical processes. Therefore, acid-free watercolor papers are used typically. With this type of printing, light sensitive chemicals are hand mixed and applied to the surfaces of the paper. “The photochemical takes place in intimate contact with all the substances that are contained in the paper. This distinguishes the iron-based processes from conventional silver gelatin printing.” (Mike Ware, 1995) Since, the chemicals are situated in the fibers of the paper, finding alternative fibers aside from paper is brought up to attention. “Any change of materials or conditions can change all the others.” (Judy Seigel, 1998:1) This research intends to diversify the materials by experimenting different fibers that are applicable. These different fibers can achieve vary aesthetics to the images since the surfaces and the textures are different. This can specify an unconventional approach to photography.

Statement of problems

As mentioned that photography has advanced into an easy accessibility. Currently, many people are taking pictures unaware of its past, not to mention the processes in the 19th century, the black and white of silver gelatin culture in 20th century has became unknown. Moreover, in basic photography classes presently, photography history and its old processes are hardly mentioned or taught. “Photography course is the course that provide the knowledge of how to use digital camera and accessories to record images on to the memory card.” Kriengkrai Jariyapanya, Veerachai Konchoh, Panya Tongnir “Multimedia Technology to teach basic photography case studies Phetchaburi Rajabhat University” **Veridian E-Journal**, Vol.7, No.3 (May-August 2014). Recent photography education in Thailand only provide the knowledge of how to operate the camera and how to capture the images correctly, the history of photography is not particularly included. Consequently, the root of photography is somehow lost in time. Therefore, the problems are positioned as follows:

- The rapid revolution of Digital technology has made photography superficial.
- The history of photography is overlooked.
- Historical photographic processes are diminishing.

Objectives

From the apprehension of declining awareness of photography history, this research is aimed to bring back some of the historical processes into practice. Furthermore, experiment of different material is carried out to obtain unconventional appeal to photography. The objectives of this research can be described as:

1. To preserve and reintroduce historical photography processes.
2. To experiment different applicable materials.
3. To analyze the results of printed historical photographic processes on different fibers.

Research Methodology

This research is an experimental part of the thesis titles “Unconventional photography: The alternative ways of presenting historical photography processes.” The research is processed in three parts as follow:

1. The studies of related literatures, which are divided to two major areas: First area is the photography history and its processes. This study determines the selections of the

processes that are used in the experiment. Second area is the study of fibers properties to find the relevant fibers for printing historical processes.

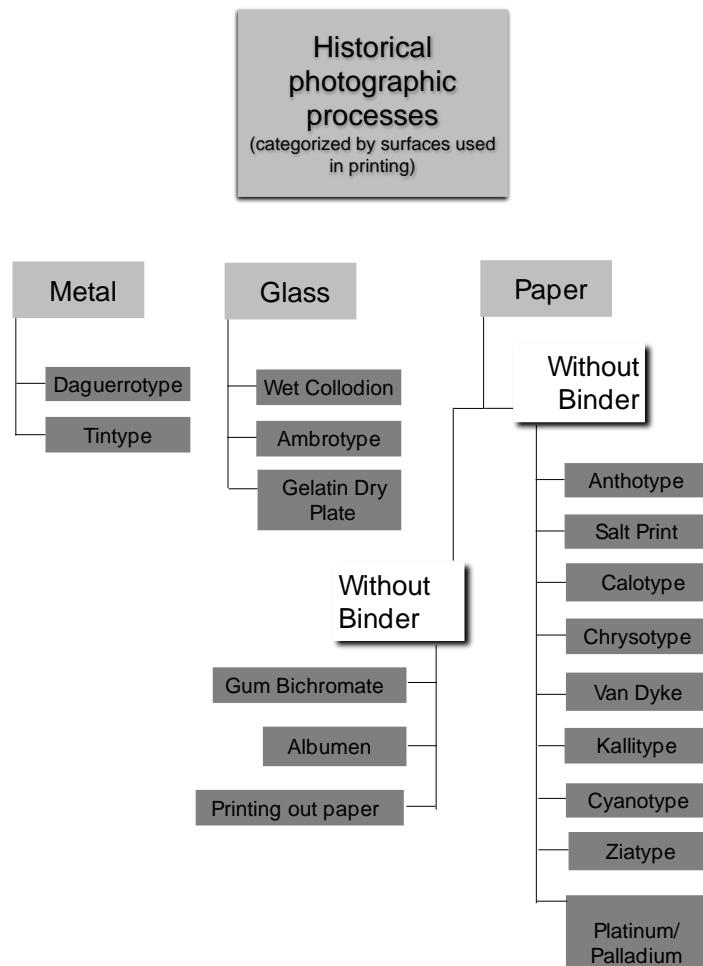


Figure1 Historical Photographic Processes (categorized by surfaces used in printing)

From the study shows approximately 19 types of historical processes discovered and invented in the 19th century. In order to select the appropriate processes to obtain diverse materials, they are categorized by the types of surfaces used in printing. The three main surfaces are metal, glass and paper. The types of surfaces used are depending upon the discoveries, inventions, types of chemicals and the era of the findings. Out of these three surfaces, paper is more diversified and possible to find more alternative since paper is made of fibers. The processes that are printed on papers divided into two groups from the types of chemicals; one type is using light sensitive chemical “with binder” and the other is “without binder”. “With binder” means that the chemicals adhere to the surfaces by binding agent such as Gum Arabic or gelatin. Vastly, gelatin is used in the 20th century commercial paper, which is

called “silver gelatin”. With the stickiness quality of gelatin and gum, it adheres chemicals on the surface of fibers. Gum Bichromate employs Gum Arabic with Potassium Bichromate and color pigment. Printing out paper is closer to silver gelatin since it is used gelatin to bind silver halide onto the surface. Albumen process engages egg white as a binding agent and silver nitrate as a sensitizer.

From figure 1, there are 9 processes that are in the “without binder” group. Without using binding agent means that the chemicals are absorbed into the fiber. “It is a truism that the manufacturers of photographic materials provide contemporary photographers with a narrower choice of monochrome printing papers today than they offered our counterparts in the past.” (Mike Ware, 1990) To some photographers, this is quintessential. When the chemical is wedded into fiber, it gives an intimate appeal and desirable depth to the images. Only these processes, that the chemicals are situated in the fiber, are considered for the experiment. To narrow down the types of processes that will be designated for the experiment, the chemicals used for sensitizers are observed. For Chrysotype process, gold chloride is a main solution. Platinum/Palladium and ziatype employ Platinum chloride and palladium chloride. Gold Chloride and Platinum Chloride are very expensive compounds. Experimenting with these is irrational because substantial quantity will be required. Looking into the silver processes, Silver nitrate is a light sensitive agent and it is extremely corrosive. Experiment with extra caution is suggested. Anthotype is a process that uses natural tincture of plants the results of this process is unpredictable and also the images fade over time. Lastly, Cyanotype is known as a blue print. Cyanotype is the most appropriate process to use for experiment because of the accessibility of the chemicals and as Christopher James mentions cyanotype as, “the absolute simplicity of the nearly fail-safe technique and chemistry and the likelihood of making successful print within a very short time.” (2009:148)

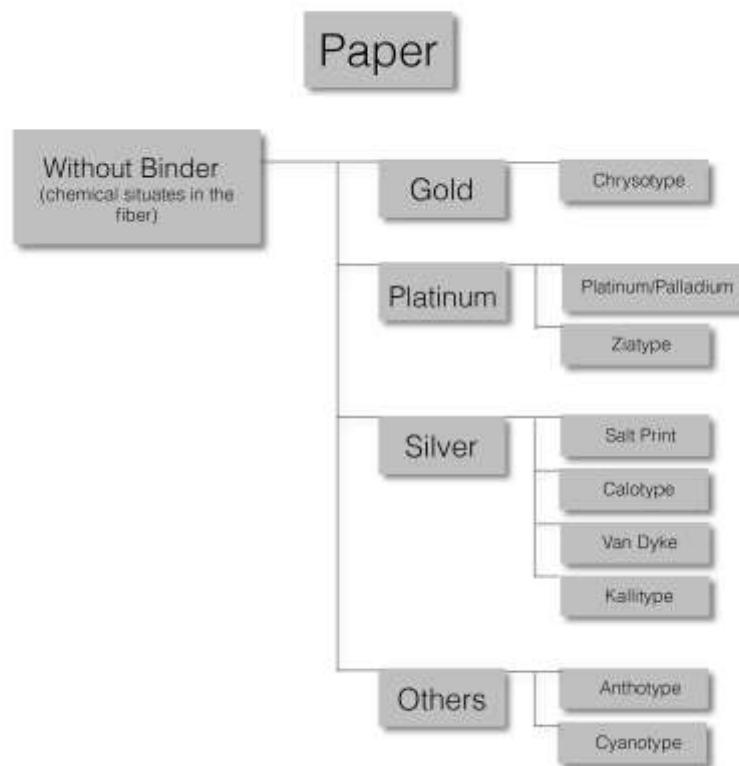


Figure 2 Processes grouped by types of chemicals.

Fibers

Recommended used for historical printing is cellulosic natural fiber, preferably cotton. Because cellulosic fibers are superior in terms of absorbance, the light sensitive sensitizers need to be positioned in the fiber. Therefore, the variety of natural fibers is relevant such as hemp, linen, etc. The durability of fabric fibers is the benefit because of the requirement of the long water process.

Cellulosic fibers are plant fibers. "Cotton is one of the most of all natural fibers." (Clive Hallett, Amanda Johnston, 2014:52) There are also varieties of cotton and cotton blends for example cotton gauze, cotton twill, etc. Like other cellulosic fibers, cotton absorbs moisture and liquid fairly well. This quality is suitable for printing historical processes when the chemical has to situate in the fibers. Another cellulosic fiber that has excellent absorbency is linen. "Linen fiber is hygroscopic, absorbing up to 20 percent of its weight." (ibid:49) Other plant fibers are hemp, ramie and jute.

This experiment of Cyanotype process is done on different paper fibers such as cotton paper, Japanese Washi and newsprint. Japanese Washi is made of Japanese local tree

barks. It is lightweight but tough. Newsprint is newspaper made of wood pulp. Next, the fabric fibers, Cotton varieties and linen are selected to be used.

2. The experiment of selected historical processes on different fibers. It starts with obtaining the negative or film. In this research, analog photography is carried on as much as possible. The image is taken traditionally with a large format camera and traditional film that is processed in conventional darkroom.



Figure 3,4 Taking photograph with a large format camera.



Figure 5,6 Film processing in the darkroom.

Cyanotype is selected for this experiment. The formula of Cyanotype engages two main chemical; Ferric Ammonium Citrate and Potassium Ferricyanide. “The combination of Potassium Ferricyanide and Ferric Ammonium Citrate when exposed to sunlight, it is reduced to ferrous ammonium citrate and potassium ferricyanide, which then formed ferric ferricyanide, the insoluble Prussian blue. (Christopher James, 2009:151) The solutions for Cyanotype process are prepared as;

Solution 1: 24% Ferric Ammonium Citrate

Solution 2: 12% Potassium Ferricyanide

This means 24 grams of Ferric Ammonium Citrate is mixed with 100 milliliters of distilled water and 12 grams of Potassium Ferricyanide is mixed with 100 milliliters of distilled water. The two solutions are mixed in equal parts before coating the fibers. Otherwise, they should be stored separately to extend their shelf life.



Figure 7,8,9,10 Ferric Ammonium Citrate and Potassium Ferricyanide are measured, mixed and stored.

Before applying the chemical, the fibers need to be prewashed to get rid of manufacture starch, this also enhance the absorbency of the fibers. The chemical is dropped onto the fibers and is spread throughout the surface with Japanese hake brush.



Figure 11,12,13 Applying the chemical onto the fiber.

“ Camera images were called ‘sun pictures’.” (Ian Jeffrey, 1981:10) Therefore, all historical processes are contact printed with sunlight or ultraviolet light. Contact printing is done by putting the negative on the light sensitive surface and pressing together with pieces of glass. The exposure time is 15 to 20 minutes on a full sunny day. After exposing, the fiber is taken out and immersed in a tub of running water. The rinsing time is 15 to 20 minutes depending on the thickness of the fibers. After rinsing, the fiber is immersed into diluted 3% hydrogen peroxide. This will restore the blue color that is washed off during the long rinsing time. Each fiber selected for the experiment is printed similarly with the same negative and comparable densities of the sunlight to ensure the same consistency.



Figure 14 Printing by putting out in the sunlight.

3. The results of the experiment are varying depending upon, the types, the weight and the thickness of the fibers.

Fiber	Performance Results	Aesthetic Results
1. Cotton Paper 	Cotton paper: The paper works as well as watercolor previously used but it is slightly more hydrophobic which makes the coating process easy to control. A few drops of chemical can cover a 4x5 inch area. The paper needs double coats of chemical to get better density on the print. Cotton paper can withstand water process very well.	Deep blue color is accomplished well on cotton paper. The brushstroke is shown clearly, this gives a paint-liked image.
2. Japanese Washi 	Japanese Washi paper is the paper made from specific Japanese tree barks. Two types of Washi paper from the old town of Takayama, Japan are experimented. One is in a package of 50 sheets, very thin and translucent. This Washi paper is sometimes called Gampi, which is the name of the tree. It is very lightweight and tissue-liked. It only takes a few drops of chemical with single coat. The water process can rip the paper if not careful.	The image on Japanese tissue gives a delicate feel. The brushstroke is added to be one of the elements of the image. On the translucent piece, the image looks more delicate and less contrast due to the thinness of the paper.

	<p>However, it can withstand soaking in water for the entire process. The other one is sold by sheet, thicker and more yellowish. It is a handmade paper. A few drops of chemical can cover a 4x5 inch area. The absorbency ability is similar to cotton paper. Due to its lightweight, only single coat is required.</p>	
<p>3. Newsprint</p> 	<p>Newsprint is a low cost paper widely used for newspaper and books. It is made from wood pulp. Newspaper is lightweight but can withstand the water process very well. The absorbency ability is similar to cotton paper. Due to its lightweight, only single coat is required.</p>	<p>Newspaper is chosen to test because it is more interesting with the texts, which add more character to the paper itself. The texts become one of the elements as well as the rough edges from the breeding effect of the chemical through fiber. The blue color is more faded than other types of papers.</p>
<p>4. Cotton 375 counts</p> 	<p>Cotton fabric (375 counts) is very fine cotton used for beddings. The threads are woven tightly. The absorbency ability is more than cotton paper because the fibers are more fluff. The image is very fine and it shows the continuous tone of the negatives very well. When chemical is dropped on the fabric it absorbs fairly quickly make it harder to control the areas to be coated. The chemical goes through the other side of the fabric; therefore only single coat is needed. This fabric needs more chemical than paper. This cotton is very easy to print</p>	<p>Luscious tones are presented obviously on this fine cotton because of the high counts of the fibers that allow the chemical to position in full capacity. The deep blue color adds more enigma and ambiguity to the image. Although, the blue color appears deep but the image feels warm and sentimental.</p>

	and it gives superb print quality.	
5. Cotton Hemp	Cotton Hemp is the cotton fiber woven with hemp. While cotton fiber is finer than hemp nonetheless hemp adds more textures to the fabric. This fabric is less absorbent than fine cotton because hemp fiber is tougher. The chemical partially goes through the fabric. It is hard to make the chemical goes in the fiber evenly although the chemical breeds in the fibers rather quickly. Single coat is needed and more chemical applied.	With the surface that is rougher than cotton, the image is not as definitive. However, the brightness is great. The mood of image is cold and dry
6. Linen	Linen is made of stem fiber of flax. It is widely use for clothing. Fine linen has excellent absorbency. When chemical is dropped on linen, it breeds through the fiber rapidly and goes through the other side of the fabric. Linen has a superior quality of drying very fast. The quality of the print is good but the tone is duller than cotton.	Fiber of linen is not as fine as cotton, which allows it to be woven loosely. (Clive Hallett, Amanda Johnston, 2014:51) The gap between the yarn is bigger than cotton, this quality effects the image to be faded and vintage attributes.
7. Local Cotton from Lampoon	Local cotton from Lampoon --This fabric was cut and prepared to be a plate mat. This fabric needs to be washed many times before use. The absorbance is not as good as cotton and linen. It is slightly hydrophobic. The chemical does not go through the fiber evenly; mostly it breeds through the weft yarn. It is suspected that the warp yarn is a synthetic blend. The quality of the print is poor.	The quality of the print is poor. However, it is aesthetically beautiful in its own way. The image appears nostalgic and wistful.

8. Organic cotton from Sakon Nakorn	 <p>Organic cotton from Sakon Nakorn, in the province of Sakon Nakorn, north eastern of Thailand, some population still practice indigo dyeing, some weave there on fabric from natural fiber for indigo dye. The cotton fabric found was for indigo dyeing. The fabric's absorbency is very poor because it was prepared for being soaked in the liquid dye. The chemical does not penetrate well, mostly stays on the surface fiber. If this fabric is used for historical photography printing, a lot of chemical is needed and the soaking technique is needed. The print result is uneven throughout the surface.</p>	The image printed on this fabric seems technically poor. Nevertheless, the melancholy and the ambiguity are appealing.
9. Cotton Silk by Jim Thompson	 <p>Local cotton silk from Jim Thompson, This fabric is woven from silk and cotton. Silk is a protein fiber so the absorbency is a lot lesser than cotton, however the cotton fiber of this fabric is very fleecy, that makes it more absorbance. It needs a lot of chemical and it is very hard to control because the chemical penetrate immediately. It is very hard to print and the quality of the print is poor.</p>	This special fabric is a blend of cotton and silk. The fiber of this cotton is extreme fleecy and fragile, therefore, it is woven with strong silk as a warp yarn. The image appears blotchy due to uneven absorbance. The image feels distance and ethereal.

Conclusion

From the study of historical photographic processes shows there are approximately 19 processes recorded. Each process involves different combinations of light sensitive chemicals and its reaction to sunlight. They are individually unique with their particular aesthetics. However, some processes are not possible to experiment because of various factors such as the harmfulness of the chemicals, the cost and the chemical availabilities. Therefore, cyanotype process is selected because of its simplicity and accessibility. The formulas of cyanotype are various from different sources. Original Herschel's formula (1842)

calls for 20% Ferric Ammonium Citrate and 16% Potassium Ferricyanide. However, this experiment uses 24% Ferric Ammonium Citrate and 12% Potassium Ferricyanide. This formula is modified to the convenience of individual usage and satisfactory results for the photographer. It is found that there is no rule of thumb in this application of process.

The conventional material for printing cyanotype process is paper, preferably of cotton linters. When cotton is mentioned, fabric is thought of inevitably. Therefore, the experiment is performed using fabrics as alternative.

Unconventional photography can be defined as photography that does not follow the mainstream of current photography. In this case, historical process is used on unconventional materials. The results of the experiment show that changes of materials in cyanotype printing can diversify the aesthetic appeals. Disregarding of the technical aspect, none of the images are incorrect. Aesthetically, each material attributes unique impressions. Although they are printed with the same negative, they can be read differently.

Experiment outcome

1. To obtain the knowledge of historical photographic processes. Currently, it is infrequent to see history of photography being taught in classes. Therefore, it is important to know photography's root to have a better understanding.
2. To understand "Unconventional photography" and recognize it as an art, based on the art aesthetic. As John Dewey declares, "Art denotes the process of doing and making." (2005:48) Dewey considers that experience plays a big role in creating and seeing art. From the photographer's point of view, the historical processes involve experience in practicing. "Art is really a first stage of knowledge in which certain human being (artist) bring their image into clarification." (Morris Weitz, 1956) The knowledge in this rare printmaking process, in this case, is the researcher's choice of tool in creating final results for the thesis.
3. To obtain alternative ways of printing and presenting photographs. In the realm of digital media, art photographers seek ways to execute their work out of ordinary. This experiment obtains alternative materials and ways of printmaking. Historical processes are dated but they are the wisdom in the past to keep for the future. (Jiravut Doungin, (2014) Contemporary artist and traditional approaches in kiln design techniques for carbon-trapping amongst southeast Asian ceramicists." **Veridian E-Journal**, Vol.7, No.5 (July-December)

Bibliography

Azahari, Mustaffa, (2011), **Photography: Its Significance Strands and Values in Education**, Malaysia, Univision Press

Barthes, Roland, (2000), **Camera Lucida**, London, Vintage Classics.

Hallett, Clive and Johnston, Amanda, (2014), Fabric for Fashion: The Swatch Book, 2nd edition, London, Laurence King Publishing.

Dewey, John, (2005), Art as Experience, USA, Penguin Group.

Doungin, Jiravut, (2014) “**Contemporary artists and traditional approaches in kiln design techniques for carbon-trapping amongst southeast Asian ceramicists.**” Veridian E-Journal, Vol7, No5 (July-December)

James, Christopher, (2009), **The book of Alternative Photographic Processes**, 2nd edition, USA, Delmar Cengage Learning.

Jariyapanya, Kriengkrai and Konchoh, Veerachai and Tongnin, Panya, (2014), “**Multimedia Technology to teach basic photography case studies Phetchaburi Rajabhat University**” Veridian E-Journal, Vol.7, No.3 (May-August).

Jeffrey, Ian, (1981), **Photography: A Concise History**, London, Oxford University Press.

Salkeld, Richard, (2014), **Reading Photographs**, USA, Bloomsbury Publishing.

Seigel, Judy, (1998), **The world Journal of Post-Factory Photography**, issue 1

Ware, mike, (1995) **Ag+ Photographic** vol 7

Weitz, Morris, (1956), “**The Role of Theory in Aesthetics**”, The journal of aesthetics and art criticism. Vol.XV