WAR WOMEN: A MOTIVATING LEGACY ENHANCED

A Thesis

by

FELICE HOUSE

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

May 2006

Major Subject: Visualization Sciences

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Approved by:

Co-Chairs of Committee,	Karen Hillier
	Carol LaFayette
Committee Member,	Michael Greenwald
Head of Department,	Mardelle Shepley

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ABSTRACT

War Women: A Motivating Legacy Enhanced.

(May 2006)

Felice House, B.F.A., Nova Scotia College of Art and Design

Co-Chairs of Advisory Committee: Prof. Karen Hillier
Prof. Carol LaFayette

Motivated by the need for strong female depictions in our culture, as well as the desire to research and pay tribute to the women workers of World War II, the author initiated the *War Women* project as the focus of this thesis. The objective of the project was to create a series of large-scale paintings of the women defense workers of World War II that could be used to pass down these women's motivating legacy and reveal its contemporary context. To begin the project, nine historical photographs were chosen as source material for an original set of nine paintings. A problem arose when attempting to paint these images because the photographs chosen were low in resolution, leaving them vague and undefined. Though sufficient for creating the basic idea for a painting, the chosen photographs needed to be enhanced and re-created to become useful source material for the series of representational paintings. To enhance the images, props and models were found, photographed, and, in one instance, three-dimensionally modeled to replace their counterparts in the original photograph. Digital techniques like compositing, colorizing, and color correcting were essential tools for reinventing the source material. The resulting images were adequate source material for the series of nine paintings completed for the *War Women* project.

DEDICATION

To my Grandparents, Charlotte and Harry Jackson and Edith and Henry House, and to Dorothy Lucille Paine Gruver who provided the initial inspiration for this project.

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To begin I would like to thank my committee, Karen Hillier, Carol LaFayette and Michael Greenwald. Karen, thank you for your vision and encouragement regarding my artistic career and for your support on a number of different levels. Carol, thank you for your direct guidance as well as your trust in me as an artist. Dr. Greenwald, thank you for your enthusiasm towards this project; I am honored to have the son of a Rosie as the outside member of my committee.

Many thanks to my models, Janean Mann, Kelley Huston, and Miriana Ilieva, who offered not only their time but their heads for use in this project. You are all true friends.

I would also like to thank and recognize my dear friend David Sellers for his help and encouragement since the inception of this project. His belief in me along with his unabashed willingness to live out his dreams have been an inspiration for me in my attempts to pursue my own. Time and time again his insight has challenged me to draw out the real meaning and purpose behind my work.

Most of all I would like to thank my parents, Donald and Lynette House not only for their unceasing encouragement during the course of this project but for their support for everything that I have tried throughout my life. They have been with me through every stage and every step, including my first. For those of you who have not had the pleasure of meeting my parents they are living role models for how to care. I cannot thank them enough for all they have done for me.

Last but not least I would like to thank little Miss Truckee Tahoe for being by my side and keeping me company and making me laugh. She is truly a woman's best friend.

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INTRODUCTION

Though life's ups and downs occur from day to day, what are remembered and recorded in the annals of history are the times of great change. One such time arrived in the 1940s with the onset of World War II.

During the period from1941 to 1945, men were being shipped off to fight the war. The home front was left with a severely depleted labor force to manufacture supplies needed for the military. Planes, tires, parachutes, life rafts, uniforms, and ammunition were needed on a daily basis. The military's non-combatant positions in the US also needed workers. Who was going to take over?

American media had the answer: Rosie the Riveter. She was the new breed of woman. The Depression-era image of women as "evil job stealers" disappeared overnight, replaced with Rosie: patriotic, loyal, dedicated, ready to serve her country in whatever role was needed [1]. "We Can Do It!," shouted posters, like the one shown in Figure 1. Housewives were putting down their bridge cards and joining the work force; at least that is what the newsreels showed [2].

Figure 1 - *We Can Do It!*. [3]
Illustration by J. Howard Miller.

This thesis follows the style and format of *Leonardo*.

Six million women entered the workforce between 1939 and1945 [4]. 4.8 million women worked production jobs in manufacturing industries in 1943 compared with 2.2 million in 1939 [5]. Many of these women were older, experienced workers, single mothers, or minorities [6]. In 1944, two in five African-American women were working as were one in three white women [7].

Though patriotism played a role, accessibility to higher-paying jobs was a huge motivation to enroll in the "hidden army" of war workers. In 1940 a waitress averaged $14 a week while a woman shipyard worker took home $37 a week [8]. Many laundries and restaurants closed during the war because they could not retain workers at the rates they paid [9]. Along with the higher wages, women employed in wartime jobs had access to unions for the first time. Unions had the power to fight on the women's behalf for health benefits, medical insurance, pensions, vacation time, and to deal with racism in the work place [10].

When the men returned home, however, higher wages and plant-supported childcare, common during the war, would become a thing of the past. Though many women voluntarily gave up their jobs as men returned home, many women were involuntarily laid-off from production jobs within a month of the war ending.

As quickly as Rosie stepped into the media spotlight she retreated and was replaced by the image of the happy homemaker. Books like *Your Baby or Your Job*, shown in Figure 2, aided in getting women back in the home. Of course, the propaganda to get women out of the workplace did not consider those women who were breadwinners before the war and could not afford to stay at home. These women would have to continue working in lower paying domestic labor jobs as they had before the war without support networks like the union.

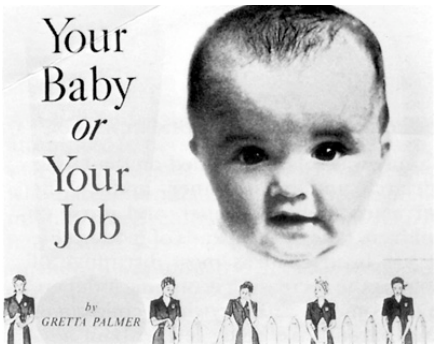


Figure 2 – *Your Baby or Your Job*. [11]

Wartime gave women on the home front opportunities to work in areas that had not been open to them during their pre-war lifetimes. Women were able to prove their independence and resourcefulness by successfully doing "a man's job."

Today women are often expected to play a role similar to that of the women war workers during WWII. Women work outside the home but are still expected to play the traditional role of the homemaker. In a time where so much is expected from women there are few positive societal role models, like Rosie, for women to emulate. The stories and lives of women war workers from World War II could serve as the strong female heroines needed, but women, especially young women, are not educated about their lives or exposed to their images.

Objective

Motivated by the need for strong female depictions in our culture, as well as the desire to research and pay tribute to the women workers of World War II, the author initiated the *War Women* project, which is the focus of this thesis. The objective of the project is to create a series of large-scale paintings of the women defense workers of World War II that can be used to pass down these women's motivating legacy and reveal its contemporary context. Nine historical photographs were chosen as source material for the original set of nine paintings (Figure 3).

A problem arose when attempting to paint these images because the photographs chosen were low in resolution, leaving them vague and poorly defined. Though sufficient for creating the basic idea for a painting, the chosen photographs needed to be enhanced and re-created in part to become useful source material for the series of representational paintings. The digital and photographic processes utilized to create adequate source material for this project are presented in this research to enable painters with insufficient source material to create the paintings they desire.

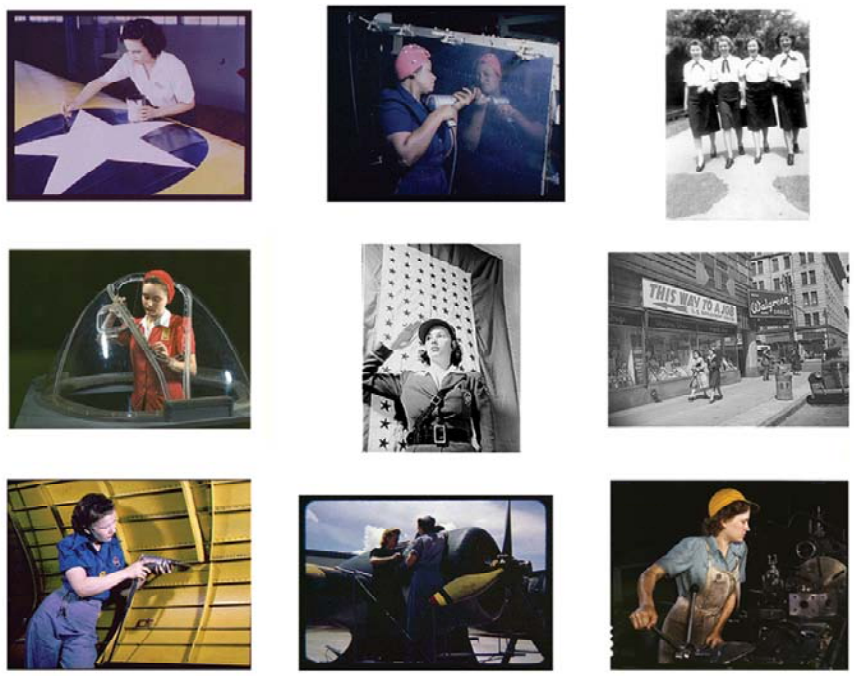


Figure 3 – Original Source Photographs. [12]

BACKGROUND: TO CREATE A BODY OF PAINTINGS FROM INSUFFICIENT REFERENCE MATERIALS

This section provides background information on the topics that surround the question "How does one create a body of representational paintings from insufficient reference material"? In order to explore this question fully some fundamental knowledge of how to create a representational painting is included at the beginning of the section. The discussion leads into why painters use reference material and what types of materials are used. Reference material is discussed from both a historical standpoint as well as through concrete examples of its use by different painters. Throughout the section it is established that reference material is a key element in the creation of successful representational paintings. This leads us back to the question of how to create a body of paintings with insufficient source material. The solution proposed is to modify and re-create available material into a form that would be useful for painting. Different methods available to re-create and enhance pre-existing images are introduced. The basic knowledge necessary to effectively utilize these enhancement and reconstruction methods is also discussed.

Constructing a Representational Oil Painting

This subsection attempts to cover the basic knowledge needed to understand the construction of a representational oil painting. To begin, an appropriate surface must be chosen. The most commonly used surfaces are stretched canvas and boards. The stretched canvas surface is suggested for larger works because boards of any substantial size tend to bow. No matter what surface is used it must be primed before oil paint is applied. The most convenient way to prime a surface is with acrylic gesso. For the surface to be sealed, approximately three coats of acrylic gesso should be applied. Some artists like to have a toned canvas to work from, and if that is the case, light washes of acrylic or oil in the desired color may be applied but should remain transparent.

A good representational painting begins with a solid drawing. The traditional approach would be to use a dark brown like burnt umber for the initial stages of the

drawing. The drawing should layout the major structural elements of the painting. Once the drawing is in place, a value study should be made. The value study, termed grisaille, establishes the value patterns of the painting.

Direct or indirect painting methods may now be employed. In the direct method of painting, also known as alla prima, the artist puts down every stroke of the painting with the intent of letting it stay as it is. This type of painting is worked from dark to light. No retouching or over painting is used after the first layer of paint is dry. The challenge of direct painting is to deal with all of the problems of value, hue, and saturation at the same time [13]. Very few painters are able to achieve a pure alla prima painting; layers are often corrected or manipulated after the painting has dried. Frans Hals (1582-1666), Manet (1832-1883), and Van Gogh (1853-1890) are all excellent examples of alla prima painters. Figure 4 below illustrates four stages in the process of alla prima painter Xiang Zhang's painting from a model at the Breckenridge Fine Arts Center on September 6, 2005.

Figure 4 –Xiang Zhang, *Cowboy Study*.

Indirect painting uses layering to gradually build up paint. In this type of painting, each layer changes but does not conceal the lower level. The optical mixture of this type of application creates a luminance not found in alla prima painting. The two most frequently used indirect painting techniques are glazing- applying layers of transparent films worked light to dark- and scumbling- placing a semi opaque color over a darker one without completely concealing it [13]. Van Eyck (1395-1441), El Greco

(1541-1614), and Rembrandt (1606- 1669) all used indirect painting methods for their work.

Value in artwork refers to the relative lightness or darkness of color and tone. The lightest value is white and the darkest, black. The underlying structure of lights and darks in a painting is known as the value pattern. In a representational oil painting, light is used to direct the viewer's eyes around the painting, making the value pattern an important compositional element of the painting. The pattern of value in a representational painting allows the viewer to understand how lights fall onto the scene. Harsh patterns of light and dark create the impression of a strong, direct light entering the scene, while a painting where the shadows are diffuse indicates a less intense light source.

Light not only affects the value of objects, it also is responsible for the colors that we see. Like the scientists of their time, impressionist painters were studying the effects of naturalistic light through their use of color. Many impressionist painters would study the same scene at different times of the day and throughout different seasons to observe the changes in color due to light [15]. One of the best examples of this type of study is Monet's haystacks, shown in Figure 5.

Figure 5 –Examples of Monet's Haystack Series, 1890-91. [16]

The Importance of Reference Material for Representational Painting

Reference materials for a painter are like architectural plans to an architect. One would not build a house before a clear set of plans had been drawn up and reviewed. The sheer expense of correcting mistakes that would occur would limit this from

happening. Though the risk of time and materials is not as great with a painting, the principle still remains. Throughout the ages painters have been devising ways to create more effective reference material to heighten the success of their paintings. Contemporary representational painters use a variety of reference material including sketches, photographs, collage, and, most recently, digital imaging.

Traditional reference materials for painters include sketches made from life and small-scale compositional studies. The loosely rendered compositional sketch in Figure 6a was one of many created by Michelangelo as a study for the final fresco of Judith and Holofernes, Figure 6b. This particular study was probably one of many preliminary drawings used to work out the placement of these figures. In Renaissance times these smaller preparatory drawings were known as modelli.

a.

b.

Figure 6 –Michelangelo, Creation of the *Judith and Holofernes* Spandrel, 1508-12. [17]

a. Composition sketch, charcoal

b. Final painting, fresco

For large-scale paintings, frescos, and tapestries full-scale preparatory designs called cartoons were made from the preparatory sketches. Cartoons were often full works of art in their own right created on pieced-together paper and painted using distemper, a mixture made from pigment, water, and animal glue [18]. Once the cartoon had gained approval, the drawing would be transferred onto the final surface through a method called pouncing. In pouncing, tiny holes are punched in the preparatory drawing before

a mesh bag of charcoal powder is pressed against the surface, transferring the drawing directly to the final surface [19].

The grid is another important way that artists have been able to transfer their drawings with accuracy, thereby creating effective source material for their paintings. The study shown in Figure 7a by Jacopo Tintoretto (1518-1594) is thought to be a study for *The Assumption of the Virgin* from around 1550. Grid lines have been placed over the image preparing the drawing to be transferred to another surface. The same process, termed "squaring off", can be seen in Figure 7b, a drawing by Robert Polhill Bevan, *Study for a Portrait of the Artist's Wife* dated 1915.

a. b.

Figure 7 – 'Squaring Off' Images. [20]

a. Jacopo Tintoretto, study for *The Assumption of the Virgin*, around 1550

b. Robert Polhill Bevan, *Study for a Portrait of the Artist's Wife*, 1915

The camera obscura began to be used as a painting aid around the fifteenth century but did not gain real popularity until the eighteenth century. It allowed the artist to trace a projection of the image and in this way provided for a quick setup of the painting's fundamental structure. The photograph in Figure 8a created by Abelardo Morell shows a projection from a camera obscura of the city of Boston on a hotel wall. Artists Canaletto (1697-1768), Paul Sandby (1730-1809), and Jans Vermeer (1632-1675) were all known to have used the camera obscura in their paintings [21]. Figure 8b shows a camera obscura once owned by English artist Sir Joshua Reynolds (1723-1792).

a. b.

Figure 8 – Camera Obscura.

a. Abelardo Morell's camera obscura image. 1999 [22]

b. Sir Joshua Reynolds's camera obscura, Mid 18th century [23]

Photography as a Reference for Painters

In 1839 Daguerrotypes made it possible for the first time to fix an image onto a surface [24]. Then in the 1880's George Eastman's development of a camera that used negatives, the Kodak camera, allowed the general public access to photography [25]. At the same time the Impressionist movement in painting began in France. As does a photograph, these painters tried to capture light and motion. There was much debate as to the validity of the photograph as a reference for art making. The sculptor Rodin said, "It is the artist who is truthful and it is photography which lies, for in reality time does not stop…" [26].

Unlike Rodin many artists embraced the photograph as a reference for their art making. Delacroix believed that the daguerreotype, invented during the middle of his career, could be used as a training tool for the artist helping to "correct errors in vision" [27]. He raised the photographic image to lofty heights for the artist by stating, "Truly if a man of genius should use the daguerreotype as it ought to be used, he will raise himself to heights unknown to us" [28]. Delacroix's painting *Odalisque* from 1857, shown below in Figure 9a, clearly references the photograph shown in Figure 8b; he has, however, taken great liberties to "correct" the image [29].

a. b.

Figure 9 – Photographic Reference in Delacroix, *Odalisque*, 1857. [30]

a. Photograph of a female nude from Delacroix's collection

b. Original oil painting

The overall expectation of a painting changed right along with the evolution of photographic practices. Figure 10 illustrates how Impressionist painters around 1860 began to introduce cropped figures and unconventional vantage points into their painting (Figure 10b), reminiscent of photographic views being produced (Figure 10a) [31].

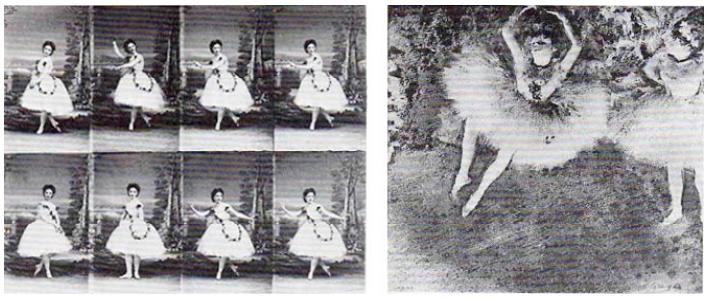
a. b.

Figure 10 – Changes in Viewpoint and Cropping in Painting. [32]

a. Hippolyte Jouvin, *Place des Victories*, photograph, 1860-5

b. Gustave Caillebotte, *Boulevard, Oue D'en Haut*, oil on canvas, 1880

Impressionist painters were known for creating instantaneous moments in time rather than just still life. The photograph consciously or unconsciously had changed the way that they saw. Degas was known to sketch from sequential photographs, like those seen in Figure 11a to develop an understanding of the way his subjects moved [33]. Figure 11b shows *La Pas Battu*, a monotype print layered with pastel, which most likely utilized a photographic reference.



a. b.

Figure 11– The Use of Photographic Reference by Degas. [34]

a. Disderi, *Martha Muraviea in dancing costume*, uncut sheet of carte-de-vistie, 1864

c. Degas, *La Pas Battu*, pastel on monotype, 1879

Manet, in his painting of contemporary event, *The Execution of the Emperor Maximilian* (Figure 12a), sourced a variety of photographs to accurately paint the portraits and uniforms of the main figures [35]. Details of the painting are found along side photographic reference in Figure 12b.

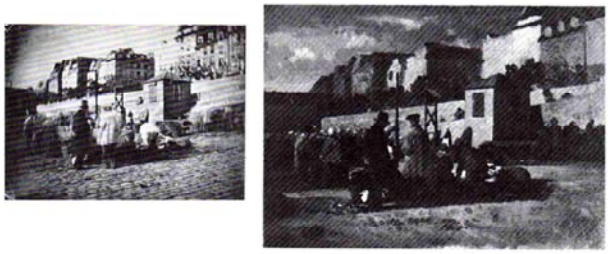
a. b.

Figure 12 – Use of Photographic Reference in Manet, *The Execution of Emperor Maximilian*, 1867. [36]

a. Manet, *The Execution of the Emperor Maximilian*

b. Photographic reference along-side painting details

The feeling of figures being cut out, as well as tonal incongruence and scaling problems, often resulted from sourcing a number of different photographs taken with different light sources for a single painting [37]. For this reason many painters took up photography in order to create their own photographic source imagery [38]. Newton, in his writings to the *Journal of Photographic Society,* wrote about his process of photographing his subject a number of times under different conditions until he created an image that had the quality he was looking for in the group of subjects he was painting [39]. The painter Charles Negre, a student of Delaroche and Ingres, also intended his photography to be final studies for his painting [40]. Negre's painting *Market Scene on the Quais* is shown in Figure 13b along side its photographic counterpart, Figure 13a.



a. b.

Figure 13 –Sourcing Photography Directly. [41]

a. Charles Negre, *Market Scene on the Quais*, Paris, calotype, 1852

b. Charles Negre, *Market Scene on the Quais*, Paris, oil on canvas, 1852

Richter: Sourcing Found Photography in Contemporary Painting

Contemporary painter Gerhard Richter creates work that runs the gamut from photorealism to abstract expressionism. Though he works with some techniques of abstract expressionists, he has a different, more classical approach to painting. Robert Storr, in his book, *Gerhard Richter – Fourty Years of Painting*, said this of Richter's process: "Richter's paintings were not only well 'cooked' but carefully prepared. Richter never simply went at the canvas, brush in hand. For him spontaneous invention always required a foil" [42]. These foils, mostly photographs, found or taken, are documented in Richter's lifelong project, *The Atlas*. *The Atlas* contains over 4,000 images and includes photographs and sketches used for Richter's paintings throughout his entire career. A 1999 installation of *The Atlas* in Barcelona, shown in Figure 14, contained over six hundred panels.

Figure 14– Installation View of *The Atlas*, Barcelona, 1999. [43]

For the fifteen-painting series titled *October 18, 1977* Richter uses newspaper-clippings to produce images of the questionable suicide of the Badar-Mienhof group [44]. Prisoners at the time of their death, this group, which included three women and two men, was the driving force behind the Red Army Faction, a radical German student group turned militant revolutionaries. Painting throughout history has been used to glorify events, places, and people. Richter's choice to paint, rather than pin up, copies of the original newspaper images of this event changed the audience, the scale, and also the cultural status of the images. The act of painting the images personalized the content with the human touch, and the change in scale glorified and emphasized the event. This subject matter relates to his childhood as a German during WWII. Richter allows the viewer to understand his use of the photo in this series by carefully rendering the photographic elements of focus and depth of field. The knowledge of the photographic source allows the viewer to understand that the image is related to an event with an actual time and place. The three paintings *Confrontation 1, 2* and *3* (Figure 15b), shown along with their source photographs (Figure 15a), depict a hopeful glance as caught by news crews from prisoner Gudrun Ensslin as she was being moved to or from her cell [45].

a. b.

Figure 15– Gerhard Richter, *Confrontation 1, 2 & 3*. [46]

a. newspaper clippings, 1977

b. Final paintings, oil on canvas, 1998

Collage as Source Material in Contemporary Painting

James Rosenquist, a contemporary of Richter's, also used photographic sources for his paintings. Unlike Richter, the imagery was not derived directly from the original photographic source but from a number of different photographs meticulously collaged together. Figure 16a shows one such collage created by Rosenquist for *The Swimmer in the Econo-mist (painting 3)* along side the completed painting, Figure 16b. Only minor changes in hue separate the reference collage from the look of the final painting. Penned-in grid lines were drawn over the collage making it possible to enlarge this seventeen-by-twenty-three inch collage, into a thirteen-by-twenty foot monumental painting with very few changes in the drawing. Though visitors to Rosenquist's studio had always been aware of his source material, it was not exhibited publicly until a 1992 show at the Gagosian gallery in New York City. Prior to this time Rosenquist worried that the magazine images might "weaken the impact of the paintings" [47].

a. b.

Figure 16– James Rosenquist, *The Swimmer in the Econo-mist (painting 3)*. [48]

a. Reference collage, mixed media on paper, 17" x 23", 1997

b. Final painting, oil on shaped canvas, 13' 2" x 20', 1997-8

Having commercially painted billboards in the 1950s and 1960s greatly influenced Rosenquist's later work in terms of scale, technique, and content. Unlike the raw consumer messages present in billboard advertisements, Rosenquist's collages are a

digestion of consumer culture. About his collage Rosenquist said, “Painting from fragments is like painting from a contemporary landscape. It’s what’s available” [49]. He likened his subject matter to walking down a street. You might see the back of a woman’s legs, a taxicab fly by, and a bird all in the same glance. He created a similar environment in his studio, as seen in Figure 17a, where reference material was strewn about, placing unrelated images in constantly changing association. His process rejected the improvisational techniques of the abstract expressionists of his time. He said, “I would be a stronger painter if I made most of my decisions before I approached the canvas” [50]. Figure 17b shows Rosenquist approaching the canvas with well-prepared source material in hand.

a. b.

Figure 17– Rosenquist with His Source Material. [51]

a. Working in Broome St. studio, NY, 1964

b. Painting with source material in hand, 1966

The Use of the Computer in the Creation of Source Material

Though Rosenquist collaged his source imagery by hand many artists now choose to do the same using the flexibility of the computer. The book *Photo-Imaging for Painters: An Artists Guide to Photoshop & Elements* by Johnnie Lilliedahl is proof of this trend.

Lilliedahl's book is primarily geared towards helping artists produce source imagery for their paintings, but also touches on issues such as digitally documenting work and using the computer to check value once a painting is underway. One interesting project in this book is to create source material for the painting *Country Girl*, Figure 18c. The process involved compositing a number of digital photographs (Figure 18a) into one cohesive source image (Figure 18b). Image resolution, scaling, and removal of unwanted parts of the image were important to this process. Lilliedahl created a consistent color and lighting scheme for the final reference image by changing the hue, saturation, and value of the various source photographs.

a. b.

c.

Figure 18 –Johnnie Lilliedahl, *Country Girl*. [52]

a. Photographs used to develop source material

b. Final composite source imagery

c. Final painting, 2005

Analyzing and Re-creating Imagery Using Photography and Computer Graphics

Working directly from a model or from a photograph, having something for the artist to reference is key to the creation of representational painting. If adequate source material is not available there are a number of techniques, like the ones described in Lilliedahl's book, that can be used for creating and re-creating imagery. The next subsection examines more of these techniques in the hope that they will be useful in constructing sufficient source material.

Academic researcher Phillip Steadman has gone to great lengths to recreate the paintings of Johannes Vermeer, a seventeenth-century Dutch painter. Steadman, author of the book *Vermeer's Camera: Uncovering the Truth Behind the Masterpieces*, worked with a highly skilled team of graphics professionals to create the environment of Vermeer's studio. Since most of Vermeer's paintings were painted in his studio, the team was able to work out the dimensions of the space using the objects in his paintings. Both the printed map appearing in a number of his works and the floor tiles of the time were created in standardized sizes. Using the measurements Steadman's team devised the British Broadcasting Corporation built a replica of Vermeer's studio. Steadman's team was then able to photographically reproduce scenes found in Vermeer's paintings. According to Steadman the uncanny resemblance of the painting *Lady Standing at the Virginals* (Figure 19a) with the photographic image created by Steadman's team (Figure 19b) stems from Vermeer's use of the camera obscura. With few exceptions, where the camera obscura would have been positioned in the studio to reproduce the exact composition found in the painting, also produced a projection onto the back wall matching the size of the original painting.

a. b.

Figure 19 –Reconstructing Johannes Vermeer, *Lady Standing at the Virginals*, 1673. [53]

a. Original painting

b. Photographic reconstruction

Working as an independent branch of Steadman's team Yasuo Furuichi reproduced the geometry of Vermeer's painting *The Glass of Wine* (Figure 20a) using three-dimensional computer modeling (Figure 20b). Though the geometry of Furuichi's scene is similar to the original painting, it does not succeed in capturing the feel of the original painting. This is primarily due to the discrepancies in color and lighting between the two scenes.

a. b.

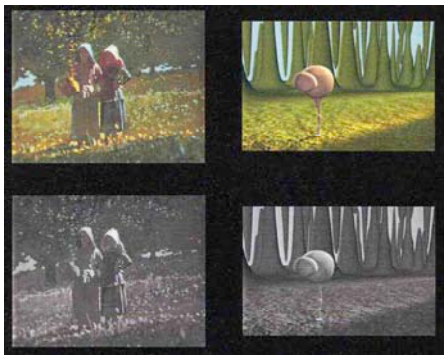
Figure 20 –Modeling Vermeer, *The Glass of Wine*, 1658-60. [54]

a. Original painting

c. Three-dimensional computer model by Yasuo Furuichi

Re-creating Lighting in Paintings Using Computer-Generated Imagery

In her thesis work Cindy Hong re-created the lighting setups of five different paintings using computer-generated imagery. In order to accurately re-create the lighting Hong analyzed the paintings using a series of questions: Is there an obvious light source in the scene? What is the light's color and intensity? What is the position of the light source? What type of light is acting in this manner (high or low key, bounce or rim lights)? What is the quality of the shadows (length, angle, blur, color)? What other lights are needed to create the lighting of the scene [55]? After Hong answered these questions, she began to translate her findings into lighting a basic model in the computer-modeling program *Maya*™. When describing this process she quotes the book *Digital Lighting and Rendering*, which states there are "many situations where imitating the same lighting set-ups used in live-action would not yield the same results [using the computer]" [56]. As seen in Figure 21 Hong found it helpful to compare a black and white version of the original painting with a value pass of the computer graphics image. In order to accurately light her computer models Hong would first establish the value of the light within the scene. Only after the value of the modeled scene (Figure 21b) was similar to that of the original painting (Figure 21a) would Hong move on to adjust the hue and saturation [57].



a. b.

Figure 21 –Computer Graphics Lighting Model of a Painting. [58]

a. Windslow Homer, *Apple Picking*

b. Three-dimensional computer model by Cindy Hong

Compositing / Bluescreening

For a successful image to be created with computer graphics, both the lighting of a scene and the geometry must be taken into account. In order to seamlessly integrate computer graphics images with other images like photographs or traditional painting, compositing is needed. To aid in understanding compositing a brief overview of its history as well as two different applications for its use have been included.

In *The Art and Science of Digital Compositing*, Ron Brinkmann defines compositing as the manipulation of two or more images into a single cohesive result [59]. One of the earliest examples of compositing from 1857 used over 30 glass plates to complete a single image [60]. The image titled *Two Ways of Life* by photographer Oscar G. Rejlander stirred up great praise and controversy. The French Photographic society banned its members from showing images created in this fashion, for the process was thought to endanger the integrity of the picture [61]. Today it would be hard to go anywhere without seeing an image that was created with the use of digital compositing.

Digital compositing has streamlined the traditional photographic process, creating almost limitless possibilities in image combination. We have gone from the optical compositing used to create the 1933 release *King Kong*, seen in Figure 22a, to digital compositing used in Stephen Spielberg's movie *Jurassic Park*, Figure 22b, produced in 1993 [62].

a. b.

Figure 22 –Composite Images from the Big Screen.

a. Image from the motion picture *King Kong* © Turner Entertainment [63]

b. Image from *Jurassic Park* © Universal Studios [64]

The different pieces that make up a composite image are known as elements. Figure 23 contains the elements used to composite one scene out of the movie *James and the Giant Peach*. Brinkman explains the steps taken to put this scene together [65]. The first step was to photograph the model of the peach against a bluescreen (Figure 23a). This method, termed bluescreening, allows for the easy extraction of a model from the background. Lighting is key to the success of the bluescreening process. In this case the lighting on the peach had to match the lighting of the entire scene, and the bluescreen had to be evenly lit so that the blue could easily be extracted. The next element, the sky, was painted on canvas by a scenic artist and then photographed (Figure 23b). A number of identical photographs were taken of the sky and then averaged together to reduce film grain. The mechanical shark and the water were 3-D computer-generated elements (Figure 23c). Other subtle effects like the spray of the water and the steam that comes from the shark's gills were each separate elements. In the final composite (Figure 23d), the sky was animated slightly to give the effect of the clouds slowly passing by. A shadow and a reflection from the peach were also added in the final stages.

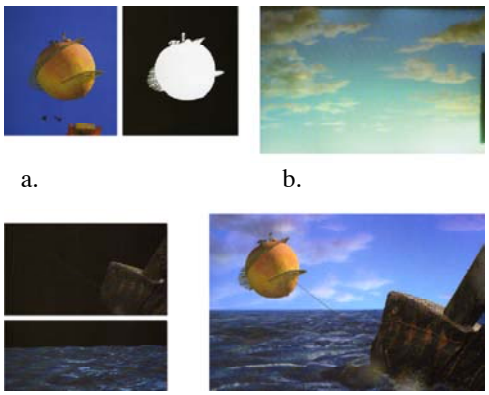


Figure 23 – A Compositing Example from *James and the Giant Peach*, 1996. [66]

a. Peach scale-model bluescreened
b. Matte for the peach
c. Painted sky element
c. Three-dimensionally modeled elements
d. Final scene

In a fine-art context, photographer Jeff Weiss also combines photography with painting through the use of the computer. Weiss' solo exhibition *The Big Boys are Coming*, from May of 2001, showcased eight large-scale color prints created with the use of digital compositing. *Excursion*, a fifteen-foot wide triptych shown in Figure 24, was one of the pieces exhibited in this show. Imagery integrated into *Excursion's* continuous landscape ranges from white-water rafters to a nuclear disaster. Through the use of compositing, ironic situations are posed. Perhaps the most startling is in the lower portion of the middle panel, where staged in an idyllic natural setting, a hunter points a gun at lovers hiding behind a rock.

Figure 24 - Jeff Weiss, *Excursion*. [67]
52"X142" C-print edition of 10, 1998-2001

Successful Image Compositing

Lighting, color and the camera must be examined in order to create effective images using compositing. The next subsection gives a brief overview of these three topics as applied to real-world lighting and how that translates into a computer-graphics system. Image manipulation is also touched on because of its importance in compositing.

Lighting

A basic lighting scenario in film or graphics includes three lights: the key light, the fill light, and the rim or backlight. The key light is the primary source of light in a

scene and is responsible for the main shadows of the scene. In an outdoor situation this light is the sun; in an interior scene the key light might come from an overhead light or a table lamp [68]. The fill light, like the name suggests, fills in the dark areas that the key does not cover. Without the fill light, scenes would have a very high contrast of light and dark. As seen in Figure 25, the fill light is usually placed opposite the key light. Since the fill light is usually much less intense than the key light, the dark areas still appear to be in shadow but read as containing information. The rim light is used to separate the subject from its background. This light provides a highlight around the edge of the figure, pulling the figure out from the background.

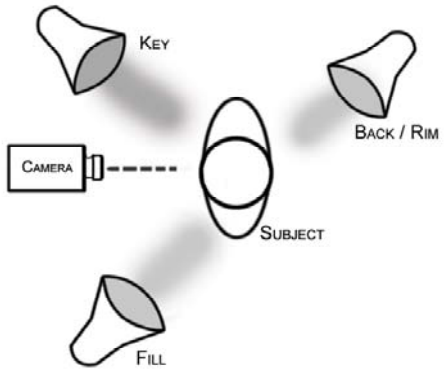


Figure 25 – Basic Three-Point Lighting Diagram.

Match Lighting / Color Matching

Light is imbued with a number of properties. The computer has a number of systems to deal with light. The most intuitive of these systems is the HSV system, which stands for hue, saturation, and value. Hue refers to the color of an object, saturation to the intensity of that color, and value to the relative lightness or darkness of an object. The model for the HSV color space is cylindrical, as seen in Figure 26. In this space a rotation of color would produce a change in hue while any vertical movement would produce a change in value [69].

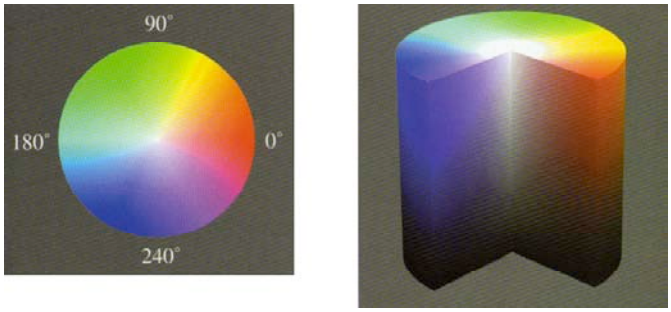


Figure 26 – HSV Color System. [70]

In this system a brightness operation used to change the value is actually considered a color operation because of the way this affects the color [71]. Often paired with brightness, contrast is another important factor to examine. Raising and lowering the intensity of the lights adjusts the contrast of a scene. If the lights and darks of a scene are similar in value they will appear low in contrast while pushing apart these values would make the scene have more contrast. Gamma Correction is a powerful tool used in the computer to adjust the value of a scene without changing where the lightest point and darkest point fall [72].

Match Camera

In order to re-create a scene with accuracy, the lighting as well as the camera must be matched. The process of camera matching requires information about the camera position in the scene being mimicked. Careful records should be kept of the distance of the camera from its subject as well as the height the shot was made from, in order to re-create the scene. Any tilt or rotation of the camera should also be taken into account. The type of lens will greatly affect the way that space is represented. In order for a perfect match to be achieved, it is suggested that the same camera format and focal length of lens be used [73]. Using a stand-in subject while adjusting the lighting setup is also recommended. The closer the stand-in resembles the original object, the easier it will be to match the scene.

Geometric Transformations

When attempting to put an image together using a variety of different sources, geometric transformations can help to adjust discrepancies in geometry that exist between the images. The basic set of geometric transformations includes panning, scaling, rotating, and warping. These manipulations help to integrate a variety of material into one cohesive image. Panning allows an element to move around in the x and y directions within a canvas area. Scaling increases or decreases the size of a specified element within the image. Rotation moves the pixels around a center axis point a specified number of degrees. Three-dimensional rotation of an element introduces a variety of perspective effects [74]. Brinkmann describes warping conceptually as the result that would be produced if an image were printed onto a thin sheet of rubber and then manipulated [75].

METHODOLOGY: WORKING WITH A PHOTOGRAPH

A variety of methods, outlined below, are used to transform incomplete imagery into source material ready to be painted. Image manipulation methods discussed later in this section include compositional rearrangement, image colorizing, and both two-dimensional and three-dimensional compositing.

Analyzing the Photograph

Before beginning any image manipulation it is important to analyze the imagery that will be utilized. Understanding the imagery, where it comes from and who it is representing, helps provide clues for how to proceed with a reconstruction process. There are times when it is hard to determine from a low-resolution photograph what the subject is doing. As an example, the women in Figure 27a is drilling inside an aircraft however, it is hard to tell how long the drill bit is from this photograph. An interview with Texas A&M machinist, Chuck Hale, cleared up the confusion [76]. He explained that this woman is using a very long bit called an aircraft drill bit, seen in Figure 27b. He went on to explain that these bits have a long shaft with the drill fluting falling at the end of the bit, a detail that is important when attempting to paint the image. Aircraft drill bits are used to drill in hard-to-reach places and have many applications in the hull of an aircraft, mainly to create holes in which to run cable and wiring.

a. b.

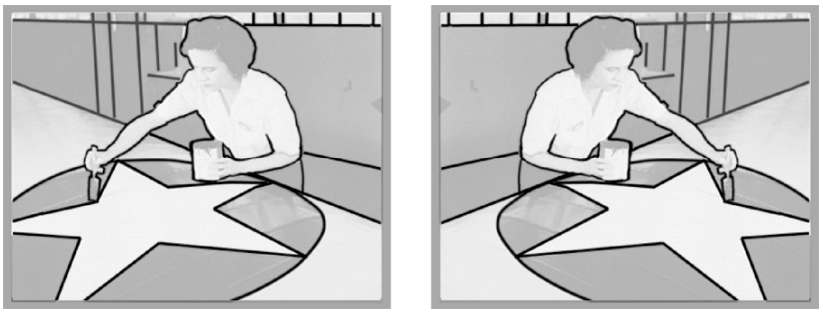
Figure 27 - Analyzing the Photograph.

a. Original image of drill

b. Aircraft drill bit

Compositional Rearrangement

Composition is a key factor in the success of a painting. Sometimes simply cropping or flipping an image changes the focus and enhances the presentation. In Western culture we have been trained to read from left to right. This training is transferred into the way that we read images. Figure 28 illustrates how mirroring the original image, Figure 28a, makes the line of the wing appear to rise rather than fall (Figure 28b).



a. b.

Figure 28 - Mirrored Image.

a. Original composition

b. Mirrored image

Mirroring is only one of a number of geometric transformations that can be useful in manipulating photographs. Figure 29 is an example of how a geometric distortion can help to eliminate three-point perspective lens distortion in a photograph. The three-point distortion can be seen in the vertical lines of the building in the original image, Figure 29a. Though these angled vertical lines of the buildings are seemingly appropriate in the photograph, its reference to the lens would be out of place in a painting. Figure 29b, having had this distortion removed, is a more suitable source for a painting. With the vertical distortion removed, the one-point perspective lines, outlined in Figure 29c, draw the viewer into the image without distraction.

a. b. c.

Figure 29 – Eliminating Lens Distortion.

a. Historical photograph [77]

b. Three-point perspective eliminated

c. One-point perspective examined

As in one-point perspective, where the eye is led into an image with lines that converge at a single point, value pulls the eye through an image through the use of lights and darks. In Figure 30a the dark shadow lines under the ribs have a similar value throughout the image. By adding an adjustment layer over the top of the image that is lighter on the right side and darker on the left, the contrast of the background is decreased. The shadow area on the light side of the image is brightened and the eye is pulled from light to dark. After adding the adjustment layer in Photoshop™ the background calls for less attention, and the figure becomes the area of highest contrast and therefore the focus of the image. The adjustment layer also helps to accentuate the yellow-orange background on the right side, enhancing the complementary color scheme.

a. b. c.

Figure 30 – Value Changes.

a. Historical photograph [78]

b. Value adjustment layer

c. Layered together

Colorizing

Many of the historical photographs of women war workers have a naturally appealing color scheme, making them prime candidates to be painted. However, a large number of the photographs taken during World War II were black and white. A black-and-white source image proves to be an interesting challenge for a painter. There is a crisp clear feel to a black-and-white photograph that tends to be lost in its transfer into paint.

One approach to painting a black-and-white image is to colorize it. Colorizing can take a number of different directions. The colorizing methods adopted for this project include: using chromatic grays to create a rich black and white effect, constructing a palette based on perceived original color, and, finally, using a borrowed palette.

Chromatic grays are grays with a perceivable color, created by mixing complementary colors. Figure 31a demonstrates how the orange and blue below mix to form grey. Figure 31b shows a section of a painting that used chromatic grays to produce a rich black-and-white effect.

a. b.

Figure 31 – Chromatic Grays.

a. Constructing a complementary chromatic grey

b. Chromatic gray being used in a painting

Figure 32a shows the black-and-white historic image that was tinted for use in the *War Women* project. Figure 32b, the tinted image, has the look of a hand-tinted photograph even though it was tinted in the computer with the use of Photoshop™. The traditional process of hand-tinting involves applying thin transparent layers of oil paint or tint over a photograph to color it. A computer tinted photograph uses the same principle, but instead of physical brushes it employs the computerized versions with a reduced opacity to produce a similar effect. The computer-tinted photograph, found in Figure 32b, provided the basic color map from which flourishes were added during the painting process.

a. b.

Figure 32 – Creating a Hand-Tinted Look Using the Computer.

a. Historical Photograph [79]

b. A Computer-Tinted Version of the Original Photograph

The third colorizing method used in the *War Women* project involved borrowing a palette from two distinct source references. Two references that were analyzed to form the color palette used to tint the black-and-white historical photograph seen in Figure 33a. The two sources were, the street scenes of Edward Hopper (Figure 33b) and contemporary photographs of downtown Bryan, Texas (Figure 33a). The historic image colorized using the borrowed palette can be seen in Figure 33d.

a. b. c.

Figure 33 – The Borrowed Palette.

a. Historical photograph [80]

b. Sources used to create a palette

c. Colorized historic photograph

Compositing: Bringing in Outside Material

Compositing brings together previously unrelated imagery offering a large degree of flexibility to the image-making process. Along with the flexibility comes a number of variables that lead to the success or failure of an image. The main variables in the traditional compositing process derive from trying to match the camera, the lighting, and the geometry of the scene. Even with careful preparation and planning postproduction adjustments to composite images are inevitable. Finding and lighting appropriate models to replace the parts of the images was a key element in the success of this project. This was achieved through the use of found photography, the photographing of models, as well as through the use of three-dimensional computer modeling.

Found Photography

A simple scenario of compositing, as was the case in Figure 34, occurs when images needed to create a composite can be found rather than created. The low-resolution head of the woman war worker in Figure 34a, because of the lack of detail, needed a replacement to provide enough information from which to paint. A head found in another historical photograph, Figure 34b, provided a replacement with adequate detail. Only minor adjustments in the rotation and hue of the replacement head were needed to fit it onto the body of the original worker. These changes were made using the Photoshop™ tools Transform, Color Balance and Levels. Adjustments were also made during the final painting process of this image to eliminate harsh shadows found in Figure 34b that did not fit with the original scene.

a. b.

Figure 34 - Finding a Replacement.

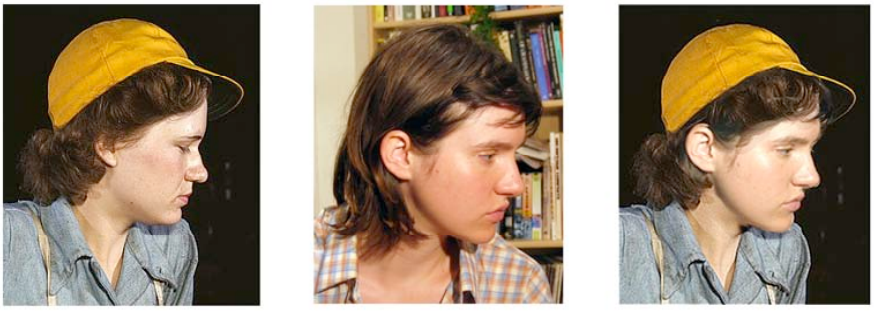
a. Head from the historical photograph

b. Head generously donated by another woman war worker [81]

Posed Material

Though found photography provides an option in the compositing process, the most control can be achieved by purposefully lighting and photographing elements with the intent to composite them within a scene. Conceptually, compositing contemporary women into the historical photographs of women war workers draws parallels between the two groups. This physical connection supports the philosophical intent of the project

to point out the situational similarity between women today and the women workers of World War II. An unexpected affirmation for using contemporary women in remaking the historical photographs came in the uncanny physical likeness of a number of the contemporary women and their historical counterparts. Figure 35 illustrates the basic stages that each contemporary woman went through in replacing a counterpart woman worker. In Figure 35a, the original head of a World War II woman worker has adequate information to be used for painting, but her closed eyes made the image a less than appealing choice to paint. The lighting of the contemporary woman, Figure 35b, was modified slightly from the original in order to bounce more light off her cheekbone, creating a modeled surface from which to paint. The resulting composite of the original photograph and the contemporary women can be seen in Figure 35c.



a. b. c.

Figure 35 –Creating a Replacement.

a. Head from the historical photograph [82]

b. Head photographed in order to composite

c. Final composite image after scale and color adjustments

With the lighting accurately staged, only minor adjustments in the hue (color) of the image are needed to fit it into the original scene. Figure 36 illustrates a particularly tricky color-adjustment process undertaken in this project. The original head of the woman war worker, Figure 36a, has blond hair. When the contemporary model was

chosen for the image she too had blond hair; however, shortly before the shoot she colored her hair darker. Another color issue raised its head when the compositing process started and the realization was made that the red object that the model had been photographed next to had grossly tinted her skin color. An elaborate color-matching process was necessary to make the photographed image match with the original scene. Each separate section of skin, hair, and clothing had to be isolated, and the colors replaced the colors from the original image. Figure 36c is the result of this process completed on the head of the contemporary woman using the Match Color tool in Photoshop™. The colors taken from the original image enable the brunette to become a blond and the red skin tone to become creamy. A red was also added in a new layer and multiplied to the lips of Figure 10c to mimic the dark red lipstick popular during that time.

a. b. c.

Figure 36 – Becoming a Blond.

a. Historical head used for color matching

b. Contemporary woman's head in need of color matching

c. Color-adjusted composite head

Physical Model

The woman workers were not the only undefined pieces within the images collected for the *War Women* project. In some cases props or even entire environments

were in need of replacement. For these cases scale models and computer-generated models became the most feasible solution.

Through a convoluted process, the historical photograph in Figure 37a eventually made use of a scale model. The process began when the contemporary women photographed to replace the historical figures, Figure 37b, did not fit with the original image. Carol Lafayette, a videographer, suggested that the problems occurring in the compositing process were a product of using a different lens for each photograph. Lafayette pointed to the way the objects stacked together in an almost cut-and-paste fashion, an effect stemming from the use of a telephoto lens. Since the contemporary women were photographed with a digital camera lens set around 50mm, there was no way for these two images to fit together harmoniously.

a. b. c.

Figure 37 – Lens Discrepancy.

a. Historical Photograph [83]

b. Composite models

c. Unsuccessful composite attempt

There were two options available at this point: The models could be rephotographed with a telephoto lens, or a model of the plane the women were working on could be photographed with the 50mm digital lens matching the focal length of the photograph of the women. The decision was made to photograph a model of the plane and thereby re-create the entire scene.

Plane enthusiast and model maker Robert Polak first identified the plane in the photograph as a PBY, an amphibious plane used during World War II [84]. Polak's model of a PBY, shown in Figure 38, was eventually photographed and used in the final composite source image for this painting.

Figure 38 – A Scale Model PBY.

Computer Graphics Model

When a physical model of the part of the scene one is attempting to replace is not available, a computer model becomes a useful tool. Figure 39a shows a generalized factory room created using the computer animation package Maya. Basic textures photographed at the Texas A&M metal shop and later manipulated in Photoshop™ provided quick and dirty texture maps to fill the computer-graphics scene. This rough model provided the information to fill in the black background of the original scene, Figure 39b. The harsh edges appearing in a scene such as this one can be softened in Photoshop or during the painting process to appear more lifelike. The key to matching a computer graphics scene to a photograph is keeping a consistent eye level in both of the images.

a. b.

Figure 39– Three-Dimensional Model for Background Composite.

a. Computer model of simple factory

b. Original historical image

Using the Computer to Work Back Into the Images

Even after the painting process begins the computer can prove to be a valuable tool to the painter. Figure 40a below shows a digital photograph taken of a painting in progress; to its right, Figure 40b shows the painted image layered at 50% opacity with the original photograph. Examining the two images side by side in the computer environment helped to determine an appropriate direction for the painted image. In the case of Figure 40a, the comparative assessment pointed to the overly saturated color of the building wall and the background of the sign. The decision was made to create a spotlight effect on the women walking down the street and to desaturate the color of the building and the red orange background color of the sign.

a. b.

Figure 40 - Taking It Back Into the Computer.

a. Intermediate stage of painting

b. Painting layered together with the original photograph

RESULTS

The various image-manipulation techniques of the previous section were used to produce a series of nine thematically linked paintings derived from historical photographs of women defense workers in World War II. This section provides side-by-side comparisons of each of the paintings to the original source photographs. For each painting it also gives a step-by-step description of the path from the historic source photograph to the final painting. An analysis of process, from collection of the photograph to the final painting, is provided to highlight the successes and pitfalls of this project, in hopes of guiding others wishing to work in a similar fashion.

The Wingpainter

a.

b.

Figure 41 – *The Wingpainter*, A Comparison of the Historical Photograph with the Final Painting.

a. Historical photograph [85]

b. Final painting

Figure 41a is the archive photograph of American defense worker Mrs. Irma Lee McElroy hard at work painting an American insignia onto the wing of an airplane. At the time of this photograph, McElroy was a civil service employee at the Naval Air Base, Corpus Christi. This photograph, along with many of the others used in the *War*

Women project was found on the internet in the American Memory collection of the Library of Congress. Photographers hired by the Farm Security Administration - Office of War Information Collection (FSA) took these photographs to document the war effort on the home front. This particular photograph was taken by Howard R. Hollem while working for the Farm Security Administration in August of 1942.

Hollem's photograph provides base source image for *The Wingpainter*, the painting shown in Figure 41b. The lack of detail in this historical image made it necessary to composite a number of images together to create a final source from which to paint. Lack of detail in the head of the woman worker, illustrated in Figure 42, was the main concern when initially accessing this image.

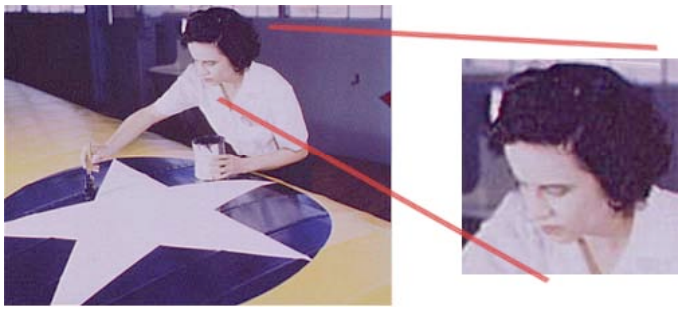
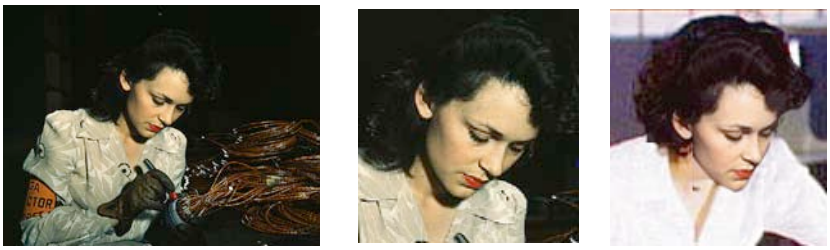


Figure 42 – Lack of Definition in the Original Photograph.

Because the head would inevitably be the focal point of the image, it was necessary to find another head from which to derive detail. Figure 43a shows a photograph taken by David Bransby in June of 1942 of another woman war worker, Her head, Figure 43b, was used as a replacement for the original. Bransby, like Hollem, was an employee of the Farm Security Administration. His photograph, taken at the Vega Aircraft base in Burbank California, shows a woman checking electrical assemblies. An attempt was made to mirror the head of the electrical assemblywoman to fit into the original photograph. However, it made a stronger composition to mirror the original *The Wingpainter* photograph.



a. b. c.

Figure 43 – Replacing the Head.

a. Historical photograph used for the head replacement

b. Detail of the replacement head

c. Composite image of new head into the original photograph

Once a composite image of the historical photograph with its new head was pieced together, Figure 43c, the painting process began. As the painting progressed, it became clear that the hand and arm of the woman painter needed additional information to look convincing in the painting. The photograph shown in Figure 44a was taken to provide a reference to complete the hand and arm, as shown in Figure 44b.

a. b.

Figure 44 – Imagery Used to Paint *The Wingpainter*.

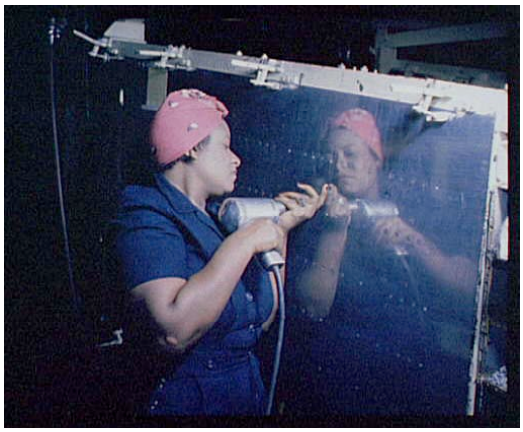
a. Additional hand and arm source image

b. Final composite image

The initial painting of the arms and hands became tight in the initial painting process due to the lack of information. Though the hand and arm photographs helped to fill in this information, the brush marks in those areas still have a searching, rather than a confident, quality. The shirt of the woman worker is problematic as well. Preparatory drawings to work out the underlying structure of the shirt and its connections to the arms would have helped to strengthen the painting as a whole.

Even with these drawbacks it is safe to say that *The Wingpainter*, the first painting completed in the War Woman series, holds the strongest graphic appeal of all the paintings in the series. The high contrast of the star, the bold primary colors, and the sweeping diagonal composition all work together to make this a strong composition. The subject matter is also interesting, because it addresses the act of painting within the painting as well as the creation of identity through symbols. The final painting exudes an optimistic purposeful feel.

Reflection



a.

b.

Figure 45 – *Reflection*, A Comparison of the Historical Photograph with the Final Painting.

a. Historical photograph [86]

b. Final painting

Photographer Alfred T. Palmer captured the photograph shown in Figure 45a, in February of 1943. The woman in the image, whose name is not recorded, is operating a hand drill while working on a Vengeance dive-bomber at Vultee aircraft plant in Nashville, Tennessee.

Though the color has been intensified in the final painting, *Reflection* (Figure 45b), little else had to be changed between the source photograph and the painted image. Because the original photograph had very little detail, the brush marks in this painting were kept large and loose. These large painterly brush marks allowed for the under-painting to show through in a number of places. Figure 46 shows a close-up view of the arm of the woman worker, where the largest area of under-painting is still visible. The deep orange under-painting provides welcome contrast to the neutral background colors and complements the blue in the woman's shirt. The lack of manipulation of the original source image may account for the fresh quality of the final painted image.

Figure 46– Use of the Underpainting.

The Waves

a. b.

Figure 47 –*The Waves*, A Comparison of the Historical Photograph with the Final Painting.

a. Historical photograph

b. Final painting

Women worked in many different facets of the war machine on the home front during World War II. The four women featured in the photograph seen in Figure 47a are WAVES (Women Accepted for Volunteer Emergency Service), a division of the Navy created for women during the war. This photograph was the only source photograph in the *War Women* series not obtained from the Library of Congress. The blond, second from the left is Dorothy Lucille Paine Gruver. This photograph, from Dorothy's personal collection, was obtained through her grandson David Sellers. According to Sellers, these WAVES worked in Virginia at the National Cash Register Company, which was converted during the war to house computers that took up several rooms and had thousands of miles of wires. Gruver worked soldering these wires. This computer was a code-breaking device whose sole purpose was breaking the German Enigma code. Breaking this code eventually lead to the end of the war years earlier than anticipated and saved the lives of millions of U.S. and allied troops as well as Jews and other

Eastern European prisoners. The head woman of Gruver's unit held and still holds the highest rank of any woman in the military.

Gruver came from a family of seven children, and because she was the oldest she had a large role in raising her younger siblings. Taking part in WAVES took Gruver away from home and domestic chores; the war took her on her first adventure. According to her grandson the one thing that his grandmother would not miss was the local monthly meeting of the WAVES. It was one of the great pleasures of her life. The freedom that Gruver recounted to her grandson years later was one of the sparks that initiated the changes in the status and expectations of women that began in the 1940s and continues to the present day.

The original black-and-white photograph was unaltered before the painting began. However, the image was subtly colorized during the painting process, as seen in the final painting, *The Waves*, Figure 47b. The colorizing process involved using complementary neutral grays to mimic a black-and-white effect. These grays, discussed in detail in the last section, bring a warm and cool component to the painting that is not seen in the original photograph. An example of this can be seen in Figure 48; the warm tones on the front leg help it to come forward while the blues on the back leg help it to recede. Some value adjustment was necessary to make the area behind the heads recede; having it too dark flattened out the image while having it too light created a cut-and-paste effect. For the final painted image a middle-value range was chosen for the background with the soft out-of-focus look of the photograph.

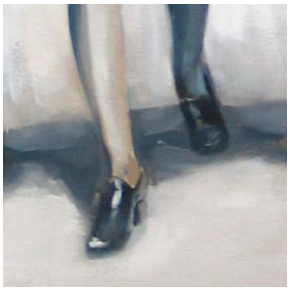


Figure 48 – Colorizing Using Complementary Neutral Grays.

The classic pose of these four women is the strong point of this painting. Arm in arm, these women symbolize the selfless service and dedication to the true spirit of America found in abundance on the home front during World War II.

The Polisher

a. b.

Figure 49 – *The Polisher*, A Comparison of the Historical Photograph with the Final Painting.

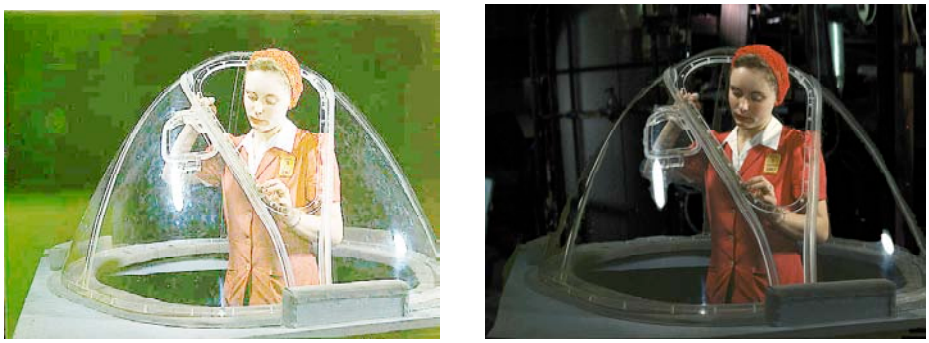
a. Historical photograph [87]

b. Final painting

Photographer Alfred T. Palmer shot the photograph in Figure 49a in October 1942. The woman in the photograph, whose name is not recorded, is posed putting final touches on a bombardier nose of a B-17F navy bomber in Long Beach, California. The B-17F, known as the "Flying Fortress," was a long-range, high-altitude bomber with a crew ranging from seven to nine men. Pictured along side the historical photograph is the completed painting, *The Polisher* (Figure 49b).

The painting problem posed by this photograph is that, although the image of the woman war worker is clear, the background contains very little information. The photographer's flash bulbs brightly lit the woman and the turret in which she stands, while dropping the background into almost total darkness. Though this type of contrast reads well in a photograph it is problematic for a painting because there is no structure

guiding the eye across the image. In order to gain information about the background of the image, a technique called Equalizing was attempted using Photoshop™. Equalizing reshapes the histogram of the image and will often bring forth information found in a dark area. Unfortunately, as seen in Figure 50a, this photograph was of too low a resolution to extract any useful information from the background. Another attempt to add interest to the background of this image can be seen in Figure 50b, where a photograph was added. However, the resulting image seemed visually busy and unfocused.



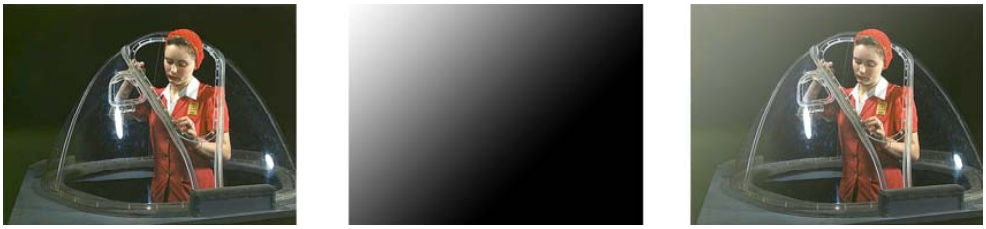
a. b.

Figure 50 – Attempting to Fill in the Background.

a. Equalized

b. Use of a photographic composite

Instead, a simple value change was used to modify the original historical image (Figure 51a). Seen in Figure 51b, a gradient adjustment layer (Figure 51b) was layered over the original image using the blending mode *Multiply* in Photoshop™, creating a diagonal sweep through the middle of the painting, helping draw the viewer from left to right towards the face of the woman worker (Figure 51c). The tonal change, along with helping the eye move across the image, served to distract the viewer from the original weak composition: a centered object in a blank space.



a. b. c.

Figure 51 – Gradient Adjustment Layer.

a. Historical photograph

b. Gradient adjustment layer

c. Composite of original image and gradient adjustment layer

With the background subtly rendered, the figure was able to stand out as the focal point. In the early stages of painting this image, Figure 52a, the skin tone of the woman worker was given a bluish tinge, giving her a detached doll-like quality. Her face also had large visible brush marks that seemed to reduce it to the same importance as the rest of the image. To add to the appeal of this painting, the skin tones of the woman worker were brought in line with the red-orange outfit, and the features were softened with smaller brush marks. A detail of the early stage of the painting in Figure 52a can be compared with the final stage in Figure 52b.

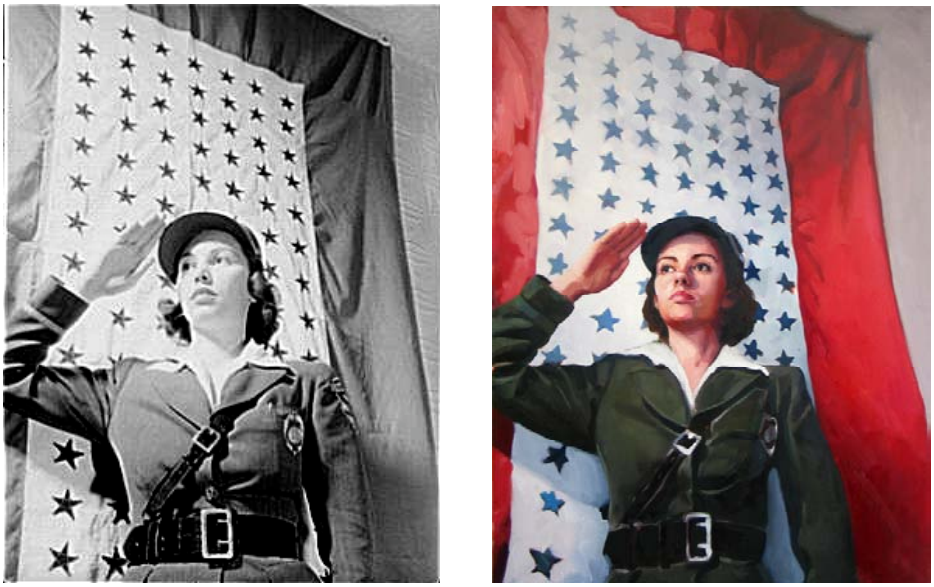
a. b.

Figure 52 – Refining the Paint Handling.

a. Early phase of the painting (detail)

b. The final painting (detail)

Star Spangled



a. b.

Figure 53 – *Star Spangled*, A Comparison of the Historical Photograph with the Final Painting.

a. Historical photograph

b. b. Final painting

The photograph pictured in Figure 53a shows Estelle Hendel, 28, a guard at the Bendix Aviation plant in Brooklyn, giving the correct salute. Shown along side the photograph in Figure 53b is *Star Spangled*, the painting created using its reference. Photographer Ann Rosener took the original photograph in March of 1943. At that time the Bendix Aviation Corporation, a manufacturer of aircraft parts, was the resident inspector of Naval Material. According to the Library of Congress, Hendel is pictured here before the company service flag. It is unclear if Hendel is an employee of Bendix or a member of a female branch of the Navy.

The colorizing and compositing process used to manipulate this historical image was straightforward but offered dramatic results. The photograph was first tinted with

layers of transparent color as shown in Figure 54a. Next, to provide additional detail for the head, model Janean Mann was lit and photographed to match the head of the original woman worker (Figure 54b). Finally Mann's head was composited into the original photograph (Figure 54c). Only minor geometric transformations and value adjustments were used to fit Mann's photograph into the original image.

a. b. c.

Figure 54 – Compositing Together *Star Spangled*.

a. Tinted historical photograph

b. Contemporary photograph for composite purposes

c. Final composite image

Because of the limited number of objects, and the shallow depth of this image, it was a prime candidate for being colorized. The uncanny physical likeness between the historical woman worker and her contemporary counterpart also eased the composite process. The only real mystery regarding this image was what the color of the original uniform would have been. More than likely, it would have been either blue or green, but the actual color is unknown. The decision to color the uniform green was based on aesthetics rather than accuracy, as the green provides a pleasing complement to the red of the flag.

This Way to a Job

a. b.

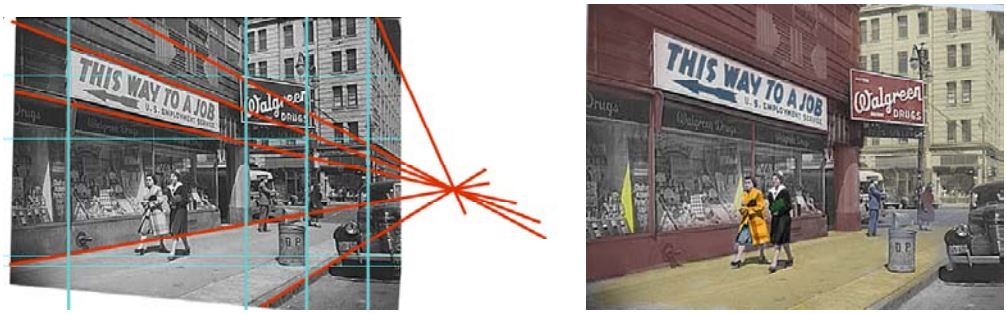
Figure 55 – *This Way to a Job*, A Comparison of the Historical Photograph with the Final Painting.

a. Historical photograph

b. Final painting

Marjory Collins shot the photograph of the wartime street scene seen in Figure 55a, in Buffalo, New York in May of 1943. Collins was, at the time, an employee of the Farm Security Administration. This photograph was utilized in an advertisement to recruit women to work in the war industry. Figure 55b shows the completed painting, *This Way to a Job,* which sources the historical photograph.

As has been already described in the previous section, this historical photograph was taken through two main stages before becoming source material for the painting. First the image was transformed to eliminate lens distortion, as shown in Figure 56a. The resulting image was then tinted, Figure 56b, using a palette borrowed from both the paintings of Edward Hopper and photographic references of downtown Bryan, Texas.



a. b.

Figure 56– Preparing the Image to be Painted.

a. Eliminating distortion

b. Colorizing the image

The actual painting of this image went through numerous stages before a final look was chosen. The first attempt made at painting this image can be seen in Figure 57. In this stage, the women walking down the street, who were intended to be the focus of the painting, could barely be noticed in the sea of color. The sign, "This Way to a Job," instead of complementing the women was high in contrast and therefore overbearing. The value and saturation of this version of the cityscape needed to be adjusted in order for it to successfully tell a story.

Figure 57 – A Beginning Stage of the Painting Process.

Figure 58a shows the second stage of the painting process. In this stage, the building in the foreground was lightened and the background colors were desaturated. The women in this image were starting to become an area of interest, but the colors surrounding them were still too saturated for them to really stand out. The lettered signs, which were distracting in the first painting attempt, were painted out. In order to fix the signage, local sign painter Ken Manthei was called in to assist. Manthei, who has been hand-lettering signs for almost forty years, was able to point out nuances in the style of lettering found in the original photograph and transfer that style back to the painting. Figure 58b shows Manthei using a sharpened piece of chalk and ruled lines to freehand letter the signs. A close-up of this lettering can be seen below in Figure 58c.

a. b. c.

Figure 58 – Hand-Lettering.

a. Painting in the second phase with letters painted out

b. Ken Manthei, the worlds greatest sign painter, in the process of chalking in letters

c. Chalked letters (detail)

The colorizing process for this painting was far more complicated than that for the *Star Spangled* painting. However, because of the struggle put forth to paint this image, there is a layered quality to the paint handling that works with the antiqued look of this image. The layering creates interesting textures and subtle changes that make this painting interesting at a variety of distances.

Though challenging, the experience of attempting to colorize such a complicated image was a useful experience. The knowledge gained was similar to what was learned painting the arms of the *The Wingpainter*: The more complete a plan available before approaching the canvas, the easier the image will be to paint.

Aircraft Drilling

a. b.

Figure 59 – *Aircraft Drilling*, A Comparison of the Historical Photograph with the Final Painting.

a. Historical photograph

b. Final painting

The *Aircraft Drilling* painting began with the photograph in Figure 59a. This photograph, taken by Alfred T. Palmer in February of 1943, shows a woman, whose name is not recorded, drilling at the Vultee aircraft plant in Nashville, Tennessee. The woman is in the process of customizing the interior of a *Vengeance* dive-bomber to house cables or wiring. Figure 59b shows the final painting.

To provide missing detail needed to paint this historical image, model Kelley Huston was posed and lit to fill the place of the woman worker in the original photograph. As seen in Figure 60a, the correct prop was not used during the shoot with Huston, and as a result her hands took on an awkward pose. Due to this, another set of hands was photographed to provide information from which to paint (Figure 60b).

Taking more precautions would have helped the outcome of this photo shoot. A yellow backdrop should have been placed behind Huston to match the interior of the plane and the shirt should have matched the blue one seen in the original image. If the correct colors had been present in the environment of the shoot, the hue of the reflected light would have mimicked that of the original scene. Figure 60c shows the final composite image used to create this painting. Even with the drawbacks of the shoot, the composite image provides an adequate source from which to paint.

a. b. c.

Figure 60 – Contemporizing Aircraft Drilling.

a. Model photographed for use in composite image

c. Additional hand and arm used in composite

d. Final composite image

Ideally, a painting should be worked through, from start to finish, without distraction. Long breaks between painting sessions make it difficult to paint in a consistent manner. This problem occurred with the painting *Aircraft Drilling*. As seen in Figure 61a the paint handling at the beginning stages of the painting was loose and free. After this initial start the painting was put away for a period of months before being completed. The painting that finally resulted had a tighter, less confident quality. Furthermore, the colors mixed in the second and later rounds of painting varied from the original. Figure 61b shows how the discrepancy between the early and late style of brush marks found in the intermediate stages of this painting created a disjointed feel. In

order to resolve these differences, small changes throughout the entire work had to be made to bring the colors and paint application into congruence.

a. b.

Figure 61 –Painting Stages.

a. Example of loose paint handling during the initial stage

c. An intermediate painting stage

PBY Amphibious

a. b.

Figure 62 –*PBY Amphibious*, A Comparison of the Historical Photograph with the Final Painting.

a. Historical photograph

b. Final painting

The historical photograph of Figure 62a was used as source material for the painting, *PBY Amphibious*, Figure 62b. It shows a riveter with her supervisor in the Assembly and Repair department at the Naval Air Base in Corpus Christi, Texas. Howard Hollem took this photograph in August of 1942.

Hollem shot this photograph into shadow causing the original historical figures to have little in the way of detailed information. Because of the lack of detain both of the figures in the image had to be replaced in order for the image to be painted successfully.

To replace the figures in the image, model May Perry was chosen for her chiseled features, distinct jaw line, and her light hair color. The thought was to mimic the original image and have Perry's blond hair color offset the dark blues found in the plane. Unfortunately, before the shoot date arrived Perry died her hair dark brown. Even with the new darker hair color, the shoot went forward with Perry as the riveter model. The author was used as the supervisor model. The models were posed outside when the sun was high, to mimic the lighting in the original scene but without shooting directly into the shadows.

One problem with this shoot was red spill on the faces and clothing of the models from the oil tank and building wall. Figure 63 shows the environment of the shoot and the vibrancy of the reds of the background that caused the red spill on the models.

Figure 63 – Red Spill.

In order to correct for the red cast, the colorizing process discussed in the last section was employed. Figure 64 shows the pieces of both the historical and contemporary women exploded so that they could be colorized individually. The process, as discussed in the last section, used the match-color feature of Photoshop to replace the colors found in the contemporary photograph with those of the historical image.

Figure 64 – Exploded Figures.

a. Historical figures

b. Contemporary figures

After the colorizing process was used on all the sections of the woman workers, the pieces were put back together to form the new colorized models. Figure 65 shows a comparison between the original workers (Figure 65a), the contemporary model photograph (Figure 65b), and the colorized models (Figure 65c). The most dramatic changes between the contemporary figure models and their colorized counterparts are the color of the hair and uniforms of the workers.

a. b. c.

Figure 65 – Colorizing the Models.

a. Original workers

b. Contemporary models

c. Colorized models

Another issue with this image, discussed in the last section, was that the camera lens used to shoot the figure models was different from that used to shoot the original image, making it necessary to reshoot the plane to match with the figures. In order to replace the plane, a scale model PBY plane was acquired from model builder Robert Polak. This scale model was photographed in direct sunlight (Figure 66a) and in shadow (Figure 66b) at the same angle and with a similar lens to the one that the figure models were shot with. These two photographs were then combined to form the a more accurate image for the figures to be placed over (Figure 66c).

a. b. c.

Figure 66 –Scale-Model PBY.

a. Model in direct sunlight

b. Model in the shade

c. Models together in a composite image

The workers were then layered over the image of the model plane, and the plane image was color adjusted to fit with the workers. The propeller, scaffolding, and sky were incorporated from the original photograph and enhanced using computer based painting. A few discrepancies in the composite image shown in Figure 67a still had to be dealt with during the painting process. These included how the feet of the workers touched the scaffolding and what was happening behind the plane on the ground. To deal with this, the choice was made to make these areas very low in contrast as seen in Figure 67b, thus hiding the problem.

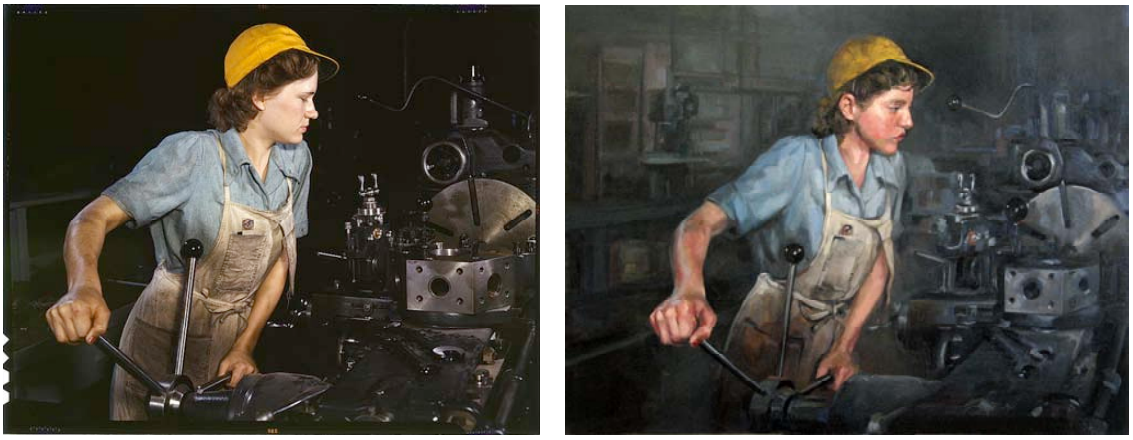
a. b.

Figure 67 – Composite Stages.

a. Initial composite of figures and model

b. Final composite

The Lathe Operator



a. b.

Figure 68 – *The Lathe Operator*, A Comparison of the Historical Photograph with the Final Painting.

a. Historical photograph

b. b. Final painting

Figure 68a shows the historical photograph used as the initial source material for The Lathe Operator, the final painting in the *War Women* series (Figure 68b). The woman worker in the original image, whose name is not recorded, is using a lathe to machine parts for transport planes at the Consolidated Aircraft corporation plant in Fort Worth, Texas. Photographer Howard Hollem shot this image in October of 1942.

This historical photograph had two main problems. The eyes of the female lathe operator were closed, and there was no information in the background of the image.

In order to correct the closed eyes in the original photograph, a replacement head was necessary. For this purpose, model Miriana Ilieva was photographed in similar light to the historical woman, and her head was placed into the scene (Figure 69a).

With Ilieva's profile correcting for the problem with the eyes, the background of the image was ready to be addressed. In order to see what was needed, the foreground area was isolated using the mask seen in Figure 69b. The plan was to place the extracted

foreground, Figure 69c, over a background created using a three-dimensional computer model.

a. b. c.

Figure 69 – Extracting the Foreground.

Since a computer model can be rearranged and manipulated more easily than constructing a physical set, its use was an important addition to the compositing process used in the War Women project. Figure 70a shows the preliminary computer model that was created in the three-dimensional modeling program Maya™ for the background of the historical image. Though this initial model was a good starting point, it had a number of consistency problems: The interior scene did not fit with the style of architecture that would have been found in the 1940s, the column was not parallel with the sides of the building, and the eye level of the background was inconsistent with the eye level of the foreground. As indicated in Figure 70b the eye level of the extracted foreground falls in the top quarter of the image while the eye level of the computer model fell closer to the mid-point of the image. The eye level of the historical image was found by tracing back the receding lines of the lathe to their convergence at the vanishing point, a point falling on the eye-level line. The eye level of the computer model is at the height where the horizontal lines on the back wall are parallel with the base of the picture.

a. b.

Figure 70 – Eye Level Incongruence

In order to interactively place the computer graphics background model, the foreground was brought into the modeling scene. Having the woman worker viewable during the modeling process aided in properly placing the figure in the scene and adjusting for the correct eye level. Since both the foreground and background images were present in the scene, the final composite shown in Figure 71 was rendered directly from Maya™.

Figure 71 – Final Source Image Rendered directly from Maya™.

Throughout the process of painting from the final source image it was important to incorporate colors from the foreground into the background to create the feeling that the figure was in, not pasted over, the background. The technique of using *lost and*

*found edge*s around the figure was used to help to unify the figure with its environment. Figure 72 illustrates the use of lost and found edges. The hand on the right blends into the background as it moves away from the machine, creating a lost edge and helping to push it back. The hand on the left side of the image has a crisp edge where it meets the background, bringing it forward. In addition the warm colors of the hand on the left were exaggerated in order to bring that hand forward. This painting was greatly enhanced by use of these more advanced painting techniques.

Figure 72 Lost and Found Edges.

CONCLUSION

Project Summary

The nine final paintings created for the *War Women*, shown in Figure 73, provide an avenue for their viewers to create personal connections with the stories and lives of strong, capable, and skilled women. The paintings fulfill the initial objective of the project, to pass down the motivating legacy of the women workers of World War II.

The computer proved to be an ideal tool for re-creating and enhancing the historical photographs chosen for this project so that they could provide adequate source material for painting. The process used to create the *War Women* project can serve as a guideline to be used by painters with insufficient source material to create the paintings they desire.

A number of the processes used in the project were more effective than others at creating a pleasing result. The colorizing of a black-and-white image with a shallow depth like that of *Star Spangled* took little effort to create a dramatic result. Strong graphic elements, like the star found in the American insignia on the wing in *The Wingpainter* coupled with the organic form of the figure, created a pleasing combination. The powerful working hands of the woman in *The Lathe Operator* help to reinforce the image of the dedication and skill of the women defense workers. The use of the bold primary colors red, yellow and blue throughout the series create a visual link between the painted images when they are viewed as a series.

The compositing process used throughout the project could have been streamlined by paying more attention to detail during the various photo-shoots. Placing colors around the model to mimic those of the original scene would have ensured that the accurate colors were reflected onto the replacement props and models. Assuring that the camera eye levels and camera lenses were matched would also have saved a lot of extra effort. The final result of this project, nine paintings of the women workers of World War II, can be seen, in their final form in Figure 73.

Future Work

This project has the potential to be expanded to represent other roles women played during the Second World War. The processes of photographic compositing and three-dimensional modeling used to reconstruct the *War Women* photographs could also be used independently to create unique source images for other series of paintings.

Final Comments

In conclusion, the *War Women* project pays tribute to a generation of American women whose work, done alongside men, opened doors for generations of women to follow. The act of compositing contemporary women into the roles of the historical workers sends the message that, despite the fact that so many of these women's stories have never been told the impact they've had on later generations of women is beyond measure. Rosie shows us that with hard work anything is attainable; she is a role model and a hero in the truest sense because the stories and lives of the women she represents are real. The paintings created for the *War Women* project are a visual reminder of the dedication and service these women rendered, not only during their time but for generations to come.

Figure 73. The Final Paintings.
a. Original hand-lettered sign by Ken Manthei

Figure 73 (continued)
b. *The Wingpainter*, oil on canvas, 42" x 32"

Figure 73 (continued)
c. *Reflection*, oil on canvas, 38" x 29"

Figure 73 (continued)
d. *The Waves*, oil on canvas, 30" x 44"

Figure 73 (continued)
e. *The Polisher*, oil on canvas, 42" x 32"

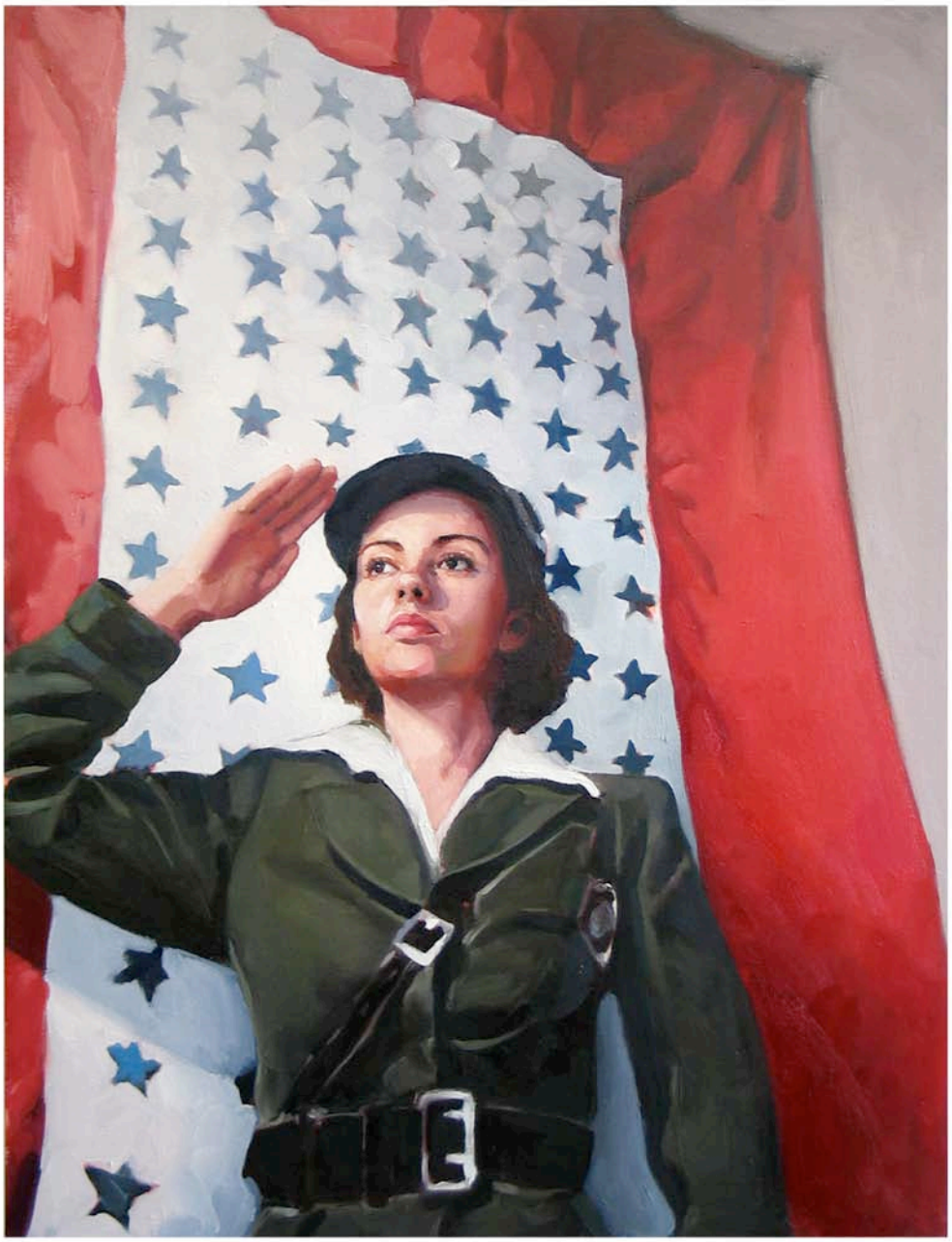


Figure 73 (continued)
f. *Star Spangled*, oil on canvas, 32" x 42"

Figure 73 (continued)
g. *This Way to a Job*, oil on canvas, 40" x 30"

Figure 73 (continued)
h. *Airplane Drilling*, oil on canvas, 42" x 32"

Figure 73 (continued)
i. *PBY Amphibious*, oil on canvas, 42" x 29"

Figure 73 (continued)
j. *The Lathe Operator*, oil on canvas, 42" x 32"

NOTES

1. J. Sealander, As Minority Becomes Majority: Federal Reaction to the Phenomenon of Women in the Work Force, 1920-1963, (Westport, CT: Greenwood Press, 1983) p. 95.

2. Miriam Frank, Marilyn Ziebarth, and Connie Field. *The Life and Times of Rosie the Riveter: The Story of Three Million Working Women During World War II*. (Emeryville, CA: Clarity Educational Productions, 1982).

3. J. Howard Miller. 1943. "We Can Do It!" The Powers of Persuation: Poster Art from World War II. The US National Archives. [Online] http://www.archives.gov/exhibits/powers_of_persuasion/its_a_womans_war_too/its_a_womans_war_too.html [NWDNS-179-WP-1563]. [accessed July 2004]

4. Emily Yellin, Our Mother's War, (New York: Free Press, 2004) p. 39.

5. United States Department of Labor & Bureau of Labor Statistics, "Postwar Turn-Over Among Women Factory Workers" *Monthly Labor Review* 64 (January-June, 1947) p. 413.

6. K. L. Endres, Rosie the Rubber Worker, (Ohio: Kent State University Press, 2000) p. 68.

7. J. Litoff & D. Smith, *American Women in a World at War: Contemporary Accounts from World War II*, (Wilmington, DE: Scholarly Resources Inc, 1997) p. 176.

8. Yellin [4] p. 41.

9. Yellin [4] p. 41.

10. Miriam Frank, Marilyn Ziebarth, and Connie Field. *The Life and Times of Rosie the Riveter: The Story of Three Million Working Women During World War II*, (Emeryville, CA: Clarity Educational Productions, 1982) p. 34.

11. Frank [10] p. 12.

12. The Library of Congress, American Memory Collection. United States Library of Congress Prints and Photographs Division. Office of War Information. Washington, DC [Online] http://memory.loc.gov/ammem/index.html [accessed June 2004].

13. Reed Kay, *The Painter's Guide to Studio Methods and Materials*, (Englewood Cliffs, NJ: Prentice Hall, 1983) p.76.
14. Kay [13] p. 79.

15. David Parrish, *3D Lighting and Compositing*, (Cincinnati, OH: Premier Press, 2002) p.7.

16. Michael Douma, curator. "Monet's Colors." Color Vision & Art. 2006.WebExhibits. Institute for Dynamic Educational Advancement, Washington, DC. [Online] http://webexhibits.org/colorart/dh.html [accessed September 2005]

17. Pierluigi De Vecchi, *The Sistine Chapel: A Glorious Restoration*, (New York: Harry N. Abrams, 1994) p. 13.

18. Kay [13] p. 137.

19. De Vecchi [17] p. 21.

20. Victoria and Albert Museum, "Making Copies." Cheating? How to Make a Perfect work of Art. [Online] http://www.vam.ac.uk/images/image/5225-popup.html [accessed October 2005].

21. Victoria and Albert Museum, "Camera Obscura." Cheating? How to Make a Perfect work of Art? [Online] http://www.vam.ac.uk/collections/paintings/cheating /obscura/index.html [accessed October 2005].

22. Abelardo Morell, 1999. "Camera Obscura Image of Boston's Old Custom House in a Hotel Room." Cheating? How to Make a Perfect work of Art. Victoria and Albert Museum. [Online] http://www.vam.ac.uk/images/image/5548-popup.html [accessed October 2005].

23. Victoria and Albert Museum, "Sir Joshua Reynolds's Camera Obscura Manufactured in England Mid 18th century." Cheating? How to Make a Perfect work of Art: Camera Obscura. [Online] http://www.vam.ac.uk/collections/ paintings/cheating/obscura/index.html [accessed October 2005].

24. Jean-Claude Lemagny, and Andre Rouille, *A History of Photography*, (New York: Cambridge University Press, 1986) p.20.

25. Paul Myers, The History of Photography. 2001. Museum Pieces of Science. The Franklin Institute Science [Online] http://fi.edu/pieces/watson/hist.htm [accessed October 2005].

26. Kirk Varnedoe, "The Ideology of Time: Degas and Photography," Art in America Vol. 68 (New York, 1980) p.99.

27. Aaron Scharf, *Art and Photography*, (Baltimore: The Penguin Press, 1969) p. 89.

28. Scharf [27] p. 90.

29. Scharf [27] p. 94.

30. Scharf [27] p. 94.

31. Scharf [27] p. 113.

32. Scharf [27] p. 117.

33. Scharf [27] p. 156.

34. Scharf [27] p. 157.

35. Scharf [27] pp. 42-44.

36. Scharf [27] pp. 42-47.

37. Scharf [27] p. 82.

38. Scharf [27] p. 83.

39. Scharf [27] p. 84.

40. Scharf [27] p. 84.

41. Scharf [27] p. 84.

42. Robert Storr, *Gerhard Richter: Forty Years of Painting*, (New York: The Museum of Modern Art, 2002) p. 71.

43. Gerhard Richter, 1999. "The Atlas on exhibit in Barcelona, Spain." The Contemporary Art Institute. [Online] http://www.gerhard-richter.com/art/atlas.php [accessed May 2005]

44. Storr [42] pp. 74-5.

45. Storr [42] pp. 74-5.

46. Storr [42] pp. 210-211.

47. Sarah Bancroft & Walter Hopps, *James Rosenquist: A Retrospective*, (New York, NY: Solomon R. Guggenheim Foundation, 2003) p. 19.

48. Bancroft [47] p. 305.

49. Bancroft [47] p. 21.

50. Bancroft [47] p. 20.

51. Bancroft [47] pp. 16, 19.

52. Johnnie Liliedahl, *Photo-Imaging for Painters*, (LaPorte, TX: Liliedahl Publications, 2005) pp. 174-188.

53. Phillip Steadman, *Vermeer's Camera: Uncovering the Truth Behind the Masterpieces*, (London: Oxford University Press, 2001) pp.114-115.

54. Phillip Steadman. *Vermeer's Camera: Uncovering the Truth Behind the Masterpieces* 2001. [Online] http://www.vermeerscamera.co.uk/home.htm [accessed April 2005]

55. Cindy Hong, *Lighting Studies: Interpreting Lighting Styles from Traditional Media in Computer-Generated Imagery*, M.S. thesis, Texas A&M University, College Station, TX, 2002 p. 36.

56. Hong [55] p. 10.

57. Hong [55] p. 37.

58. Hong [55] p. 85.

59. Ron Brinkmann, *The Art and Science of Digital Compositing*, (San Diego: Academic Press, 1999) p. 2.

60. Brinkmann [59] p. 4.

61. Scharf [27] p. 81.

62. Brinkmann [59] p. 6.

63. Brinkmann [59] p. 7.

64. David Parrish, *3D Lighting and Compositing*, (Cincinnati, OH: Premier Press, 2002) p. 137.
65. Brinkmann [59] pp. 269-270.

66. Brinkmann [59] p.12.

67. Jeff Weiss. 2001. *The Big Boys are Coming*. Laurence Miller Gallery. [Online] http://www.laurencemillergallery.com/weissexhibition.htm. [accessed May 2004].

68. Parrish [64] p. 59.

69. Brinkmann [59] p. 43.

70. Brinkmann [59] plate 6

71. Brinkmann [59] pp. 36-38.

72. Brinkmann [59] p. 41.

73. Brinkmann [59] p. 207.

74. Brinkmann [59] p. 56.

75. Brinkmann [59] p. 58.

76. Chuck Hale, personal interview, 15 December 2005.

77. Marjory Collins, May 1943. *This Way to a Job*. America from the Great Depression to World War II: Black-and-White from the FSA-OWI, 1939-1945. [Online] http://memory.loc.gov; [fsa 8b08374]. [accessed June 2004].

78. Alfred T Palmer, February 1943. *Aircraft Drilling*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a35374; [fsac 1a35374]. [December 2005].

79. Ann Rosner, March 1943. *Star Spangled*. America from the Great Depression to World War II: Black-and-White from the FSA-OWI, 1939-1945. [Online] http://memory.loc.gov/cgibin/query/D?fsaall:24:./temp/~pp_JXyR::@@@mdb=fsa; [fsa 8b08374]. [accessed June 2004].

80. Nicholas Pioch, curator. “Edward Hopper: Street Scenes” 2002. WebMuseum World Wide Web exhibit. The Web Museum [Online] http://www.ibiblio.org/wm/paint/auth/hopper/street/ [accessed May 2005].

81. David Bransby, June 1942. *Woman Aircraft Worker*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a34456; [fsac 1a34456]. [accessed June 2004].

82. Howard R. Hollem, August 1942. *The Lathe Operator*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a34951; [fsac 1a34951]. [accessed September 2005].

83. Howard R. Hollem, August 1942. *PBY Amphibious*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a34923; [fsac 1a34923]. [accessed September 2005].

84. Robert Polack, personal interview, 10 November 2005.

85. Howard R. Hollem, August 1942. *The Wingpainter*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a34899; [fsac 1a34899]. [accessed June 2004].

86. Palmer, Alfred, T. February 1943. *Reflection*. America from the Great Depression toWorld War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/cph.3d02219; [cph 3d02219]. [accessed June 2004].

87. Palmer, Alfred, T. February 1943. *The Polisher*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a35360; [fsac 1a35360]. [accessed September 2005].

REFERENCES

Bancroft, Sarah & Hopps, Walter. *James Rosenquist: A Retrospective*, (New York, NY: Solomon R. Guggenheim Foundation, 2003).

Bransby, David. June 1942. Woman Aircraft Worker. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a34456; [fsac 1a34456]. [accessed June 2004].

Brinkmann, Ron. *The Art and Science of Digital Compositing*, (San Diego: Academic Press, 1999).

Carpenter, E. *They Became What They Beheld*, (New York, NY: Outerbridge & Dienstfrey, 1970).

Collins, Marjory. May 1943. *This Way to a Job*. America from the Great Depression to World War II: Black-and-White from the FSA-OWI, 1939-1945. [Online] http://memory.loc.gov; [fsa 8b08374]. [accessed June 2004].

De Vecchi, Pierluigi. *The Sistine Chapel: A Glorious Restoration*, (New York: Harry N. Abrams, 1994).

Douma, Michael, curator. 2006. "Monet's Colors." *Color Vision & Art*. WebExhibits. Institute for Dynamic Educational Advancement, Washington, DC. [Online] http://webexhibits.org/colorart/dh.html [accessed September 2005]

Endres, K. L. *Rosie the Rubber Worker*, (Ohio: Kent State University Press, 2000).

Frank, Miriam, Marilyn Ziebarth, and Connie Field. *The Life and Times of Rosie the Riveter: The Story of Three Million Working Women During World War II*. (Emeryville, CA: Clarity Educational Productions, 1982).

Hollem, Howard, R. August 1942. *The Lathe Operator*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a34951; [fsac 1a34951]. [accessed September 2005].

Hollem, Howard, R. August 1942. *PBY Amphibious*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a34923; [fsac 1a34923]. [accessed September 2005].

Hollem, Howard, R. August 1942. *The Wingpainter*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a34899; [fsac 1a34899]. [accessed June 2004].

Hong, Cindy. *Lighting Studies: Interpreting Lighting Styles from Traditional Media in Computer-Generated Imagery*, M.S. thesis, Texas A&M University, College Station, TX, 2002.

Kay, Reed. *The Painter's Guide to Studio Methods and Materials* (Englewood Cliffs, NJ: Prentice Hall, 1983).

Lemagny, Jean-Claude and Rouille, Andre. *A History of Photography*, (New York: Cambridge University Press, 1986).

The Library of Congress, American Memory Collection. United States Library of Congress Prints and Photographs Division. Office of War Information. Washington, DC [Online] http://memory.loc.gov/ammem/index.html [accessed June 2004].

Liliedahl, Johnnie, *Photo-Imaging for Painters*, (LaPorte, TX: Liliedahl Publications, 2005).

Litoff, J. & Smith, D. *American Women in a World at War: Contemporary Accounts from World War II*, (Wilmington, DE: Scholarly Resources Inc, 1997).

Morell, Abelardo. 1999. Camera Obscura Image of Boston's Old Custom House in a Hotel Room. Victoria and Albert Museum. Cheating? How to Make a Perfect work of Art. [Online] http://www.vam.ac.uk/images/image/5548-popup.html [accessed October 2005].

Myers, Paul. The History of Photography. 2001. Museum Pieces of Science. The Franklin Institute Science [Online] http://fi.edu/pieces/watson/hist.htm [accessed October 2005].

Palmer, Alfred, T. February 1943. *Aircraft Drilling*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a35374; [fsac 1a35374]. [December 2005].

Palmer, Alfred, T. February 1943. *The Polisher*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/fsac.1a35360; [fsac 1a35360]. [accessed September 2005].

Palmer, Alfred, T. February 1943. *Reflection*. America from the Great Depression to World War II: Color Photographs from the FSA-OWI, 1939-1945. [Online] http://hdl.loc.gov/loc.pnp/cph.3d02219; [cph 3d02219]. [accessed June 2004].

Parrish, David. *3D Lighting and Compositing*, (Cincinnati, OH: Premier Press, 2002).

Rosner, Ann. March 1943. *Star Spangled*. America from the Great Depression to World War II: Black-and-White from the FSA-OWI, 1939-1945. [Online] http://memory.loc.gov/cgibin/query/D?fsaall:24:./temp/~pp_JXyR::@@@mdb=fsa; [fsa 8b08374]. [accessed June 2004].

Scharf, Aaron. *Art and Photography*, (Baltimore: The Penguin Press, 1969).

Sealander, J. *As Minority Becomes Majority: Federal Reaction to the Phenomenon of Women in the Work Force, 1920-1963*, (Westport, CT: Greenwood Press, 1983).

Steadman, Phillip. *Vermeer's Camera: Uncovering the Truth Behind the Masterpieces*, (London: Oxford University Press, 2001) pp.114-115.

Steadman, Phillip. *Vermeer's Camera: Uncovering the Truth Behind the Masterpieces* 2001. [Online] http://www.vermeerscamera.co.uk/home.htm [accessed April 2005].

Storr, Robert. *Gerhard Richter: Forty Years of Painting*, (New York: The Museum of Modern Art, 2002).

United States Department of Labor & Bureau of Labor Statistics, "Postwar Turn-Over Among Women Factory Workers" *Monthly Labor Review* 64 (January-June, 1947).

Varnedoe, Kirk. "The Ideology of Time: Degas and Photography." *Art in America* 68, no. 6 (1980) pp. 96-110.

Victoria and Albert Museum. Cheating? How to Make a Perfect Work of Art. [Online] http://www.vam.ac.uk/collections/paintings/cheating/index.html [accessed October 2005].

Weiss, Jeff. 2001. *The Big Boys Are Coming*. Laurence Miller Gallery. [Online] http://www.laurencemillergallery.com/weissexhibition.htm. [accessed May 2004].

Yellin, Emily. *Our Mother's War*, (New York: Free Press, 2004).

VITA

Felice House
2512 Oak Circle
Bryan, TX 77802
www.housepaintings.net
info@housepaintings.net

M.S. in Visualization Sciences
Texas A&M University, College Station, TX (Spring 2006)

B.F.A. in Fine Art
Nova Scotia College of Art and Design, Halifax, Nova Scotia, Canada (Summer 2000)

In the spring of 2002, while working on her masters Felice taught drawing at Texas A&M University. In late 2003 she started Housepaintings Studio, an artists' space in downtown Bryan, Texas and began to teach regular drawing and painting classes. Housepaintings offers studio space to local artists and provides a venue for the biannual community art show *The Art Step*.

She exhibits her paintings regularly in Austin, Fort Worth, Houston and Bryan/College Station. For additional information about Felice and her work please visit her website, www.housepaintings.net.