

1. Cover Page

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2. Final Performance Progress Report

A. Project Activities

The primary purpose of this project was to digitize and contextualize a series of garments relevant to the history of fashion. The specific aims of the project were as follows.

1. Develop a working pilot of a web-based digital collection of garments and their component parts.
2. Experiment with the application of photogrammetry (photographic 3-D modeling) in augmenting digital access to costume and fashion collections.
3. Explore appropriate terminology for describing garments and their component parts.

The primary purpose and its aims were met, and each of the activities as outlined in the work plan of the original grant was accomplished. Specifics follow.

During *phase I (May to August 2016)* of the project, the project directors, Dr. Saiki and Ms. Birk, with the assistance of board member and military historian Phyllis Zimmerman evaluated the historic garments in the Beeman Historic Costume Collection. With hundreds of garments related to WWII in the Beeman Collection, finding garments that have interesting construction details and historical significance was a crucial to the success of the project. After preliminary research of the collection, 20 significant historical pieces were selected. Dr. Saiki and Ms. Birk researched each garment selected in detail, including identifying the provenance and historical significance and analyzing in-depth the garment construction and design. In addition, two donors were interviewed on collection pieces (see Appendix A for spread sheet of garment data collected).

During *phase II (August to December 2016)*, the garments were analyzed for how to remake the original patterns. Ms. Birk and 14 undergraduate students enrolled in FCFA 300 Flat Pattern drafted patterns from the historic garments. The undergraduate students were paired in seven groups with two participants per group. Each group was assigned two garments to pattern (see Appendix B). The students found recreating the patterns to be challenging. Thirteen of the 20 garments were successfully recreated as patterns; however, some adjustments were needed to the student patterns. For the next stage, a graduate student made 10 of the 13 garments out of muslin fabric from the patterns to see if the patterns fit together as smoothly as anticipated. The fit was very good, meaning the patterns were ready for digitizing. Because not all the patterns were completed during phase II, work on them continued into the next phase(s). Five more garments were patterned by additional undergraduate students.

During this time, Dr. Saiki, as part of research time with the university, completed research on techniques in photography and photogrammetry and attended a workshop offered by Cultural Heritage Imaging (<http://culturalheritageimaging.org/>). Dr. Saiki and Ms. Birk presented the project at the Digital Humanities Start-up Grant Director's meeting in Washington D.C. (see Appendix C), and they assessed and purchased the primary equipment for photogrammetry. The equipment included lighting, a DSLR camera, and a tripod on wheels with the option to move the camera at different height levels (see Appendix D). Related organizations were contacted at this time to understand the equipment needs, including a local camera store and Ball State's Institute for Digital Intermedia Arts. The garments were analyzed further, assessing construction details as well as each textile's fiber content (e.g., burn testing) and fabrication method (e.g., weave type).

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During *phase III (January to May 2017)*, Dr. Saiki and an undergraduate honors student assistant experimented with photogrammetry. They also made the photographs that form the basis of the photogrammetry images and they related the dimension data to selected garments. Dr. Saiki and Ms. Birk examined references for labeling historic costume. They sent the related information to Digital Corps. Digital Corps made a working template for the website in WordPress and tested it. Jim Bradley from Ball State University's library was consulted to assure quality standards of the photographs were met (see Appendix E and F). A sequence variation from the original grant occurred at this time. Specifically, the pattern pieces, having been drafted in a first course, were digitized and edited by students and Ms. Birk in a second course, this one focused on Lectra Modaris software. The final patterns were converted from Modaris into a non-proprietary PDF format.

During *phase IV (May to October 2017)*, the website template was completed. The photogrammetry images were assessed and redone where needed by Dr. Saiki and a student assistant. Ms. Birk checked the quality of the patterns. A student assistant made the photographs for the website – a front view of each garment – using standards sent by Jim Bradley (see Appendix E). The final process of labeling the garments was identified, and an assistant reviewed the garment descriptions a second time to assure the labels followed this protocol. A glossary of garment terms and their definitions was made (see Appendix J). In the fall, as part of funds from an undergraduate honors fellowship, a second assistant checked the garment labels and edited the website as needed.

Assessments were completed throughout the entire grant period by the project directors (Dr. Saiki and Ms. Birk) with assistance from the project advisors and hired assistants. They checked the quality of each component: 1) the patterns were measured and rechecked prior to uploading to the website; 2) the photogrammetry images were checked through visual inspection, examining and compiling various photograph characteristics (e.g., f-stop, etc.) and comparing measurements of the photogrammetry image to the actual garment; and 3) the words used to describe the garments were checked by at least two individuals to assure consistency. Digital Corps conducted usability testing of the web site completed as a shell before the content was added. The completed website was also attached to Google Analytics to track visits to the website and the project directors completed assessments of the final website and its components. Students in the pattern making course were surveyed on their learning experiences.

Project changes

Indicate the reasons for omissions and changes in project activities. As outlined above, there were no significant omissions or changes to the project activity. Minor changes included making the patterns over two courses rather than one course. Checking the metadata was not a specific step noted on the original plan, but it was required. Re-checking the metadata extended past phase III and could continue after the grant period. During phase IV, instead of hiring a programmer, a general assistant was hired who understood fashion and photography to assist with uploading the information to the website. The website template was completed early, which helped accommodate the unexpected amount of extra time on processing the components (i.e., quality checking, gathering, uploading).

If project performance was affected by changes in key project personnel, explain why the changes were made and how performance was affected. Key project personnel did not change.

3-D Modeling for Textile Collections

When federal matching funds were a component of the award, summarize fund-raising experiences and the major factors believed to be responsible for success or failure in raising third-party support. Federal matching funds were not a component of the award.

For projects involving computer applications, describe any changes that were made in the method of data entry, the specific data to be encoded, software, hardware, file systems, or search strategies. With regards to the computer-related parts of the project, there were no major changes to the method of data entry, data encoded, software, hardware file systems, or search strategies. As indicated in the grant proposal, the method of data entry and file uploading was done through a template in WordPress, an open-source content management system that uses a PHP server-side script language for web development. The website was placed on the Ball State University web server at no additional cost. As proposed in the grant proposal, the data encoded included photogrammetry images of the garments, the garments' patterns, and descriptions of the garments using controlled vocabulary. Agisoft software was used to make the photogrammetry images, and Lectra Brand hardware/software was used to document the patterns.

Specific processes were discovered during the project, one set for the patterns and another for the photogrammetry images. Specifically, the patterns made with Lectra hardware/software were translated to a PDF file to enable open source access to the information. The photogrammetry image of each garment was uploaded in two file formats: OBJ and PDF. The OBJ file enables a user to view the photogrammetry image directly on the website. The photogrammetry image was also placed within a PDF so a user can measure the image. Another PDF was included, this one with instructions on how to measure that image within a PDF.

To make high quality photogrammetry images with Agisoft, a new computer was purchased with greater memory. The new computer was purchased with Ball State University computer funds with 65 GB of RAM as opposed to the standard 8 GB. The file system was completed as proposed. Files of patterns and images were collected on a computer that is password protected. These files will be sent to Ball State library storage system for further preservation of the data.

Briefly describe any efforts that were made to publicize the results of the program.

An article on the project was written for *Ball State Magazine* (see Appendix G). This article was circulated to Ball State employees, students, and alumni. In addition, two presentations on the project were made at the International Textiles and Apparel Association (see Appendix H): "Exploring Methods to Make 3-D Images of Historic Clothing Using Photogrammetry" and "Engaging Students by Developing Patterns from Historic Costume". Educators from the University of Nebraska have requested Skype presentation on photogrammetry to a clothing and textiles museums studies courses.

B. Accomplishments

Compare the accomplishments of the project in quantitative and qualitative terms with the objectives proposed in the application.

The primary purpose of the proposal was to digitize and contextualize a series of garments relevant to the history of fashion. The following discussion identifies the specific aims of the project and related accomplishments.

3-D Modeling for Textile Collections

- 1) Develop a working pilot of a web-based digital collection of garments and their component parts.

Digital Corps made a functional template for the website using WordPress (see Appendix F for screen shots). The website was placed on the Ball State University web server. The website was designed to be viewed on the larger screens of laptop computers as well as the smaller screens of smart phones. The website features several pages, including a main title page, a gallery page, an about page, and a contact information page. A link from the about page opens a PDF of a glossary of garment terms. The main gallery page displays a front-view photograph of each garment. Click or tap on a garment and a quick view appears. It's a pop-up window with the same photograph, sometimes larger than the prior one, and text providing basic identification of the garment. Click or tap the "view details" link in the pop-up window and a page loads in which the largest view of the same photograph appears, along with a greater amount of textual information and links to related files: an OBJ file of the photogrammetry image (named "3D model") and PDFs of 1) a photogrammetry image for measuring, 2) instructions for how to measure, and 3) the garment patterns. Every web page includes the statement "copyright Ball State University".

The initial plan was to digitize 15-20 garments from the Beeman Historic Costume Collection that reflect WWII. In this project, 20 garments were selected and analyzed. Within that set, 15 were captured as photogrammetry images and 13 were reconstructed as flat, digitized patterns. The number of patterns were limited by the number of students enrolled in the related course. Photogrammetry images were limited to garments with texture and opaque fabrics.

- 2) Experiment with the application of photogrammetry in augmenting digital access to costume and fashion collections

Photogrammetry was experimented with in several ways to ensure quality images. Photogrammetry images of 15 garments were successfully produced. As noted in the grant proposal, several research questions regarding photogrammetry (PG) were explored. These included a) the process of making the photogrammetry images (e.g., What are the best ways to display clothes (e.g., dress form) using PG?), b) sharing the images online (e.g., How can PG be used to display clothing artifacts online? What are the best ways to display clothes (e.g., dress form) using PG? What are the best means to place PG data online (e.g., videotaping)?); and c) assessment and limitations of the results of the photogrammetry images (e.g., What types of clothes (e.g., particular fabrics) are best suited for PG display and measuring capabilities? Which measurement points provide useful historical data?).

a) The process of making the photogrammetry images

As noted in the proposal, standards from committee member Jim Bradley were consulted for photography guidelines. The training seminar at the Cultural Heritage Imaging center provided the foundation for the process, which included taking three sets of photographs at different heights, changing the camera direction per each set of photographs taken, and using calibrated scale bars for measuring. Table 1 highlights the results of initial trials with two garments from the Beeman Historic Costume Collection.

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Table 1. Result of various set-ups for taking photographs to build photogrammetry images.

Trial	Back-Ground	Direction	Distance (inches)	Focus	Garment	Lens	Lighting	Result	Scale Bars
1	BCG	W	55	M	PD	ST	S	PNR	ASU
2	B	W	55	M	MJ	ST	S	PNR	ASU
3	B	W	55	M	MJ	ST	R;S	D	ASU
4	C	A 15	55	M	MJ	WI	R	CD; H	ASU
5	C	A 15	75	M	MJ	WI	R;S	SI	ASU
6	C	A 20	55	M	MJ	WI	R;S	S; B	ASU
7	C	A 20-24	55	M	MJ	ST	R;S	SU	ASU
8	C	A 20-24	55	A	MJ	ST	R;S	B	ASU
9	C	A 20-24	55	M	PD	ST	R;S	SU	ASU

Codes: Background (B = Black only, BCG = Black backdrop with contrasting white edges, C = Classroom); Direction (A = Photographs taken around the garment, W = Camera faced garment against a wall, 15 = 15 images, 20-24 = 20-24 images); Focus (A = Auto, M = Manual); Garment (MJ = military jacket, PD = pink dress); Lens (ST = Standard, WI = Wide); Lighting (S = Studio Lights, R = Room Lights); Results (B = Blank spaces – under arm or shoulders, CD = Cannot detect scale bars, D = Too dark for photograph to be taken, PNR = Photographs not shown around figure in software, SI = Scattered image, SU = Successful); Scale bars (A = Above, B = Back, F = Front, S = Side, U = Underneath)

After these initial trials, we determined that the best set-up taking photographs for building a photogrammetry image of high quality that processed well in the Agisoft software was to do the steps listed below. The images were processed in Agisoft as outlined by the Imaging Cultural Center. No variations from these steps were made.

1. *Background* – Ensure the background has texture. In the classroom, chairs created texture. Initially, only the background color was varied: black, grey, then bright green. None of these choices produced a successful photogrammetry image. Although they contrasted with the color of the garments, the background colors all had a smooth texture.
2. *Direction* – Move the camera around the garment instead of having it stand opposite the garment against a wall. The “flat” images did not process correctly in the Agisoft software.
3. *Distance* – Position the camera 55 inches from the garment. A greater distance resulted in photographs that lacked sharpness.
4. *Focus* – Use manual focus instead of auto focus.
5. *Garment* – Arrange the garment on a dress form. Stuffing the garment with polyester batting prevents garment movement and also enables photographs to be taken under the arm.

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6. *Lens* – Use standard angle lens instead of a wide angle one.
7. *Lighting* – Use studio lights along with existing, overhead classroom lights. Place the studio lights at the front and the back of the garment.
8. *Scale bars* – Use two scale bars, placing one placed horizontally at the top and the other vertically at the side of the garment. Scale bars were purchased from the Cultural Heritage Imaging- http://culturalheritageimaging.org/What_We_Offer/Gear/Scale_Bars/.
9. *Other: Number and spacing of photographs* – Capture 20 views around the garment, overlapping the views around the sides to ensure sufficient surface area is available for building the photogrammetry image. Initially 15 views were captured and these views were evenly spaced.
10. *Other: Tape markers* – Place bits of tape on the floor to mark where the camera is to focus for each image. Position the markers around the circumference of the garment in increments of 15 degrees (24 total). Include additional markers at the sides of the garment because sleeves are more narrow than the front or back of a garment.
11. *Other: Exposure* – Set the SLR camera to ISO 100, f-stop 3.5, shutter speed 1/40 second. These best settings were found by comparing various settings used in building photogrammetry images of the garments.

b) Sharing the photogrammetry images online

Because of the limitation of the file size that the web site can handle and that visitors can access, the file size for each photogrammetry (3-D) image had to be reduced while maintaining a high image quality. The process we found was to do as follows. Reduce the number of tie points in the 3-D image in Agisoft by decimating the mesh through an available option. Decimating the mesh drops the number of faces. Once the 3-D image has 100,00 faces or less, as recommended by Agisoft, the image has the best success rate. The photogrammetry image was exported from Agisoft and published on the web site in two forms, as explained earlier: an OBJ file and a PDF file. The first is viewed directly on the web site. The second is viewed within a PDF and can be measured.

c) Assessment and limitations of the results of the photogrammetry images

The process was attempted with 20 garments. Only 15 were successful. The success of the photogrammetry image was determined not only by the process as discussed above, but also by the fabric of the garment. Garments with shiny, plain, and sheer fabrics did not produce clear photogrammetry images. Several unsuccessful attempts were made with these garments, including making additional photographs of the shoulder and underarm and changing the background setting. The best garments were made from fabrics with stripes, subtle variations in textures, and prints. The measurements were found to be accurate: length wise, crosswise, and in the round (see sample measurements in Table 2 below).

Table 2. Sample measurements of actual garment versus photogrammetry image (cm)

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Location	Jacket: Actual	Jacket: Photog.	Dress: Actual	Dress: Photog.
Center front length	17.5	16.8	28.8	28.8
Pocket width	15.0	15.0	14.8	14.8
Around sleeve hem	39.5	39.2	30	30.6

3) Explore appropriate terminology for describing garments and their component parts

Several sources were consulted to discover the appropriate terms to identify garments and garment parts. These sources included apparel construction books and online resources as outlined on the Costume Core website made by Arden Kirkland (<http://www.ardenkirkland.com/costumecore/>). Given the measurement capabilities and construction information on the proposed website, the focus of developing standardized words was on specific descriptions of the garment construction features. General categories as found in the Beeman Historic Costume Collection cataloging software Pastperfect software were selected, including the accession number, classification, and object type (see Appendix I).

Next, specific clothing fields were made that were similar to the Costume Core Cataloging page. A procedure to standardize the descriptions within these fields was developed. The four sources were 1) Brown, P. & Rice, J. (2013). *Ready-to-Wear Apparel Analysis*. New York: Pearson; 2) The Getty Research Institute. (2017). *Getty Art and Architecture Thesaurus (AAT)* ® Online. Retrieved from <http://www.getty.edu/research/tools/vocabularies/aat/>; 3) Kirkland, A. (2016). *Costume Core Controlled Vocabularies*. Retrieved from <http://www.ardenkirkland.com/costumecore/wp-content/uploads/2016/05/Costume-Core-Controlled-Vocabularies-4th-draft-May-2016.pdf>; and 4) A textiles book was also used to identify the fabrics, namely *Textiles* by Sarah Kadoph (2007). This process produced a list of terms and definitions that were used consistently to describe the garments on the website (see Appendix J).

When project goals were not achieved, indicate what plans there are to complete the project after the grant period, how project activities will be funded, and when they are likely to be completed.

The goals of this project were completed. While a minimum number was achieved of photogrammetry images of the garments, exploring methods to make photogrammetry images of garments with shiny, sheer, and plain fabrics is needed. An honors fellowship was awarded to an honors student to work on these issues. As part of this fellowship, the student is examining the photographic meta-data of successful photogrammetry images and exploring methods to successfully make photogrammetry images with these types of garments and other dress items (e.g., accessories).

C. Audiences

Describe the audiences for the project. Indicate the nature, size, geographic reach, sex and age of the audience and assess the impact that the project had on this audience. What kinds of new or previously underserved audiences did the project attract? It is particularly important to compile quantitative information for this section of the report. Please include data on all screenings and broadcasts, if applicable.

The target audience of this project includes museum professionals, post-secondary educators of fashion, students enrolled in fashion programs, costume historians, apparel product developers and designers, and theater designers. Publicity to this audience has been limited to board members and post-secondary educators who teach fashion. Two presentations on the project was made to about 50 post-secondary and museum professionals at the International Textile and Apparel Association Annual Conference (see appendix H). Dr. Saiki presented through skype to students enrolled in a museums study course at the University of Nebraska in spring 2018. Students at Ball State University enrolled in fashion classes (n = 100) are aware of the project.

How much of an increase in visitor flow or membership did your organization experience as a result of the project?

Because the web site was made as a working pilot, it is too early to assess change in visitor flow. However, publicity about the grant project has increased the amount of donations to the Beeman Historic Costume Collection, from ordinarily two to three donations a year worth less than \$1000 to ten donations worth well over \$100,000.

In the case of grants whose purpose was to affect a number of other institutions, include in the report a complete list of participants and appropriate statistical profiles that show the impact of the project by geographical region (if possible), kind of institution, and level and type of participant. Not applicable.

D. Evaluation

Was the project evaluated? If so, briefly describe how it was evaluated and by whom.

The website was evaluated throughout its development as follows: 1) Digital Corps consulted with the project directors and end users to develop the website template; 2) fashion students and professionals assessed the website after the data upload was completed with a survey of open-ended questions, and 3) the project directors and Digital Core reviewed Google Analytics, which tracks website visits. The 2-D photographs were analyzed by two professionals for clarity through open-ended analysis. The photogrammetry images were assessed by 1) asking open-ended questions of museum professionals, fashion students, and the project directors; 2) examining the meta data of the photographs (e.g., f-stop, ISO, DPI); and 3) comparing measurements of actual garments with measurements of the photogrammetry images. Students in the pattern making course were surveyed as well to understand how much they learned upon drafting a pattern from a historic garment and the skills they used in the process of flat pattern.

To assure quality of some of the website features, the parts were examined several times by the project directors and assistants. The patterns were analyzed for accuracy after the class exercise. The project director with expertise in pattern making (Ms. Birk) reanalyzed them for

accuracy. The words used to describe the garment construction were analyzed by two separate individuals. If there was discrepancy in the term used, the two individuals discussed the terms with a project director (Dr. Saiki) until agreement was reached.

Describe the results of the evaluation and your own assessment of the program. Discuss both the weaknesses and the strengths of the program. A discussion that includes how problems were dealt with will be more helpful to NEH staff than one that focuses exclusively on the project's successes.

Survey responses from university students and museum/design professionals regarding the overall assessment of the website were positive. The participants said the website was easy to use and had a “clean” design. The project directors and Digital Corps decided on a simple design to emphasize the garments, rather than the website. The survey participants (n = 30) said they would use the website for a course or research. Several said they would use it to understand a garment and its measurements. The participants noted the website would be useful for museum work, flat pattern, costume design, design research, construction, and shopping. Google Analytics revealed a limited number visits to the website (n < 100). The photogrammetry images were viewed positively in the survey. The participants noted that the advantages included seeing the details of the garment, the 3-D view, measurement capability, and accessibility of the garment. A less common advantage mentioned included seeing how a garment has changed in shape from when it was made to when it is viewed decades later. One of the professionals noted the edges of the 3-D model could be “more clean.” Some of the participants wanted more garments posted online. The students said this technology could be used in research, courses, designing, and selling garments online. A technical expert noted the toggling of the 3-D image could be improved for better navigation of garment details.

In the pattern making course, the undergraduate students typically come up with a garment idea and then work toward creating it. This time, they were given a completed garment and challenged to create a flat pattern for it. This deconstructive method seemed to give students a better understanding of seam structure, how gores work, how darts function, and the application of collars/cuffs. Almost all the students felt comfortable with the pattern making process after they finished their final projects. An additional, motivational benefit was the patterns were needed for a real-world purpose. Because there was not time to evaluate each of the patterns by recreation, they were evaluated on neatness and manipulations. In continuation of this project, spreading the work over two semesters would be helpful: one semester, create the patterns, another semester, create the garments in muslins to check and fix measurements and methods, such as pleats versus darts, gores versus fullness, and so on.

The project directors' assessment of the web site is similar to the assessment data collected: it's sleek and user-friendly. The project directors would like to work on making the meta data or words searchable. Throughout the site's development, the project directors found, through discussion with other professionals in the fashion field, that 3-D capability is innovative and new. A useful foundation in making measurable 3-D (i.e., photogrammetry) images for a website was discovered. There were limitations in the quality of the 3-D images, including rough edges and holes under the arms. In addition, there were limitations in the types of fabrics that could be photographed successfully. The fabrics needed to be opaque and have texture. When further developing the web site, the project directors would likely add more time to the process for quality checking the various content (e.g., photographs, patterns, and wording). Furthermore, increasing the website's library of patterns in number, variety, and era, such as expanding from

WWII to additional decades, would have several benefits: users would have more choices of what to view, comparisons could be made between construction methods, such as by different designers and time periods, and designers would have more options for recreating garments.

How did the public respond to the project? What did they like or not like? What anecdotes, statistical summaries, feedback from web sites, viewer remarks, or examples of media coverage can you provide that would help to assess the project's success?

The public response thus far has been limited. The audience at a recent presentation at the International Textile and Apparel Association seemed to see it as a new, innovative approach to examine and catalog apparel online. Several professors in the field around the country requested access to the website as well as presentations to their museum classes via Skype.

E. Continuation of the Project

Indicate if there are any plans to continue the project after the grant period because of the success of the program and the interest it has generated.

There are plans to continue the project. We received funds to hire an undergraduate student. This student analyzed the camera settings data of the sets of photographs used to make each photogrammetry image, looking for which settings produced higher quality photogrammetry 3-D models. The student is currently using the better camera settings to photograph additional dress artifacts (e.g., jewelry) in various set ups (e.g., lay the garment flat, take images of the inside of the garment) to pursue how to produce high quality photographs to make a photogrammetry model. A second honors fellowship was rewarded to this undergraduate student for the 2018-2019 school year to write a publication on the process of making photogrammetry models of historic costume. The project directors applied for Ball State University's Digital Scholarship Lab fellowship. During the 2018-2019 school year they will be Associate Fellows working with the university's Digital Scholarship Lab for methods to view the 3-D models (e.g. merge the patterns with the 3-D model). In addition, the project directors plan to apply for funding both internally and externally to expand the website, develop standardized words to describe clothing artifacts, and refine photogrammetry techniques. An apparel design faculty at Ball State University has shown interest in using and testing photogrammetry in apparel design and garment fit. An undergraduate student has expressed interest in testing photogrammetry in online merchandising for his t-shirt business.

When there was a commitment on the part of the grantee institution to continue a program after the grant period, explain how the commitment will be honored. If the program will not be continued, provide a detailed explanation for the change in plans. Not applicable.

What kinds of new collaborative partnerships were formed (or strengthened) between your institution and other organizations (for example, museums, historical societies, schools, universities, community groups, special interest groups, etc.) as a result of the project? Will these new partnerships continue and, if so, how?

The project resulted in a strong relationship with Cultural Heritage Imaging and Ball State University's digital entities, including Digital Corps. These relationships will likely continue as

the website develops. Relationships with other universities were also discovered. For example, Dr. Saiki will be presenting to a museum studies course at the University of Nebraska.

F. Long-term Impact

What kinds of long-term impact (such as spin-off programs, use in the classroom or other indicators of continuing interest) will result from the project? How did the project affect your institution's ability to attract additional non-federal financial support, either for the project or for activities that grew out of the project?

There are many spin-off programs from this project, grouped into three primary long-term projects. 1) The use of photogrammetry in digitizing historic garments is very new to the field. The method developed during this grant will be shared through a research paper. In addition, other methods can be explored for how to successfully make photogrammetry images from garments that were either not attempted (e.g., accessories, like jewelry) or were not successful in their rendering. For example, sheer fabrics may need to be held with a solid molding to provide some opacity. Workshops could be offered on these new methods. 2) The standardizing of words to explain garment construction could be developed further, because currently a resource of standard words to describe garment construction does not exist. Relatedly, the same process employed in this project could be used to analyze garments from other periods for additional construction elements. Also, a nomenclature-type book could be written to help guide descriptions of garments in a digital format. 3) The web site was developed, as intended, as a pilot and to reach its full impact it needs to be developed into a robust resource. A particular focus could be to expand the library from one decade (WWII) to many, offering the visitor an even larger scale of garments to learn from. Future plans for this project include applying for grants that help with all three contributions. Finally, the project has helped attract additional non-federal financial support, such as several times more the typical number of annual donations to the Beeman Historic Costume Collection (10 donations instead of 2 to 3).

What effect did the project have on the public's perception of your institution and on your plans for future projects?

The project helped direct its future path. Ms. Birk and Dr. Saiki plan to continue to add garments to the working pilot. They will continue experimenting with photogrammetry to refine the method for making images from various fabrics and types of dress items (e.g., accessories). They will further explore standardizing the words to describe the construction of garments.

G. Grant Products

Indicate what grant products were produced during the course of the project and any future publication or distribution plans for materials resulting from grant activities. Provide the URL for websites.

The main product from the grant was the website. The link for this website is https://apso.bsu.edu/2017/fashion_fusion/gallery/. Additional products from the process include the course syllabus (see Appendix A) and two presentations at the International Textile and Apparel Association Conference in November 2017. Abstracts will be developed into a peer-reviewed paper to be submitted to an academic journal (see Appendix H).

Appendix A – Spreadsheet with facts pertaining to the 15 garments

#	Acco No	Garment type	Donor	Gender	Description	Designer/manufacturer	Stitch category	fabric	Label Information	neckline	seams	sleeve	waistline	patches	Closure	Pockets	shaping/decoration	Hem
1	C2003.001.0002	day dress	Frances Searge	female	Pink floral day dress	None	machine 301 (stitch class)	Cotton - print	none	flat collar	plain	highcap	seam		buttons, thread finish button holes	none		folded hem
2	1988.006.008	silk blouse with geometric design on the chest	Ruth Smith	Saks Fifth	Female	Saks Fifth Avenue, Fabric by Stonecutter - history of stone cutter mills: http://pcomway.web.unc.edu/files/2016/01/barth_murrell.pdf	301, machine	Cotton- plain weave; printed flowers; plastic buttons; metal snap and zipper; zipper tape is cotton, twill weave	Saks Fifth Avenue, Fabric by Stonecutter - history of stone cutter mills	Single faced Plain layer; Flat collar extends in front	Plain seams, folded finish	Set in sleeve; placket, slashed; open cuff; button;	none	none	back, buttons, thread finish button holes	none	Thread in many colors on front and along cuff	left raw
3	C000.005.001	dress	Ester Bruner - taught home health care; little bit of everything	female	Floral, cotton day dress, blue flowers skin length	Jane Walker - individuality, 40. Another tag - "This garment cut to N.R.A approved standard Dimensions	machine, 301 (stitch class)	weave	Jane Walker	Surged seam	Low cap 3/4 length ruffle at the end		seam	None	side snaps	None	Front bib decorations with knife pleat ruffles all around it and the sleeves; looks like there was a belt	Wide hem, rolled finish, blind hemming
4	C1992.001.016	dress	George Jones	female	Light green dress,	Party lines by Dome- Made in California	Machine	Chiffon, taffeta ; solubility test - it is acetate; Light green is likely rayon; leno weave outside fabric; light green under fabric is a rib weave. Calendaring finish, think solution dyed; overlay may not be even dyed; zipper tape is cotton twill - metal zipper and hook and eye- label is silk, raw, satin weave	none	binding scoop	plain and french	Steeveless - chiffon ruffles,	waistline seam	none	Zipper, lapped side left		darts, flounces	
5a	CX 0161 ABC - yes this is it	dress	none	female	Rayon yellow and grey striped dress; stripes are in a zig zag shape; tie belt	None	Machine	Rayon fiber, plain weave, slub yarns, zipper tape is cotton twill, metal zipper	None	bias facing V - back is bound; halter style d edges	Plain unfinished edges	no sleeves, straps	Waist seam, darts, and skirt panels	None	metal centered zipper, back		shirring center front	long full skirt narrow rolled hem
5a	CX 0161 ABC	dress	none - checked out	female	Yellow jacket with hood	None	machine	linen loose basket weave	None	hood with grey and yellow fabric as dress for lining	Plain, unfinished, enclosed hood	low cap set in - inverted pleats at shoulder, full shoulders, short sleeves, narrow hem	Bound	none	zipper center front		three shoulder release tucks, release tucks at binding - 3 and it looks like someone made one large one over these tucks (in front); Back has two of these as well. Pleating in hood too	folded hem
6	C1992.009.005	dress	Dorothy Burkhardt, yes	female	Lace pink dress; sheer lace with pink slip underneath.	Harvey Berlin; Designed by Karen Stark; http://vintagefashionguild.org/label-resource/berlin-harvey/ - good designer	machine	lace, chiffon, Chiffon is silk, plain weave; Rayon lining skirt, mummy, crepe weave plain weave; Rayon lace, generic point de gaz, page 134; fabric Glassary 4th edition, rayon for label, bodice underlining, ribbed weave, callendering; crepe and chiffon; back fabric is rayon; crepe; think the pink mesh is silk? zipper, cotton; solution dyed; piece dyed	Karen Stark; "Harvey Berlin designed by Karen Stark; imported French Lace Hand Applied to Silk	hemmed scoop	Plain, chiffon has French seams	Steeveless - hemmed	Seam	None	back zipper covered buttons down zipper for decoration		Shirred shawl, accordion pleats in skirt under lace	folded hem
7	1940.2 - yes	dress	none	female	black dress	none	machine	crepe and chiffon; back fabric is rayon; crepe; think the pink mesh is silk? zipper, cotton; solution dyed; piece dyed	None	V-neckline, decorative bound	Plain	set-in sleeves; low cap; 3/4 length; hemmed with decorative chiffon/lace trim in contrasting pink	waistline seam	none	short metal centered zipper at back		Shirring at the shoulder; pleats/release tucks at waist and into the skirt (2 on each side) back pleats (4)	folded hem
8	1940.39; C1902.014.002, 1941-8 1943	dress	many cramer	female	brown garment, false diamond buttons; straight knee/skin length dress;	Paul Sargent Original; PAT 2.300.460	machine	Plain weave; Rayon; rayon tag	Paul Sargent	Single-rolled, stand	Plain seams, pinked	Hi cap, set-in - in the round; cuff with placket, diamond-like buttons (same down front) open cuff	internal waistline,		Side zipper, metal, lapped	Patch pocket on left breast, patch has folded cuff area, topstitched	Shoulder shirring - front; two shirring patterns at the waist, decorative diamond-like buttons down center front, Three tucks back neckline; Release tuck/inverted pleat-two at either side of back; panels for skirt; large ones	Deep folded hem, blind stitching
9a	C1988.006.004a.br	suit	Ruth Smith Estate	female	suit jacket	none	machine	basket weave suit wool? Bright pink lining; Leno weave (after microscope)-grey fabric; assume silk lining - could not tear apart to get a fiber	Meme; Exclusively for L.S. Ayres & Co. Indianapolis	3 piece rolled-notched	Enclosed	High cap, sewn in the round; Tailored placket - expensive one with 3 buttons and fake welt pockets.	hemmed, enclosed in lining	none	5 CF buttons with welt button holes	L.S. Ayres & Co. Indianapolis	CF cut out that comes down on each side in inverted triangle with button at end and seam across breast; another triangle CF with fake button into welt buttonhole; back has vent; panels	Deep folded hem, blind stitching
9b	C1988.006.004abc	suit	Ruth Smith Estate	female	suit skirt	none	machine	Bright pink lining; Leno weave (after microscope)-grey fabric; assume silk lining - could not tear apart to get a fiber	Meme; Exclusively for L.S. Ayres & Co. Indianapolis	None			none				Deep folded hem, blind stitching	
10a	CX 0151AB	suit	None	female	jacket part of suit	Adel Simpson	machine	plain weave, wool, different colors - tan and purple fibers twisted with tan ones; crepe lining; Rayon	Adel Simpson	hemmed; blind stitched	plain, hem finish	Set in the round; inseam placket- expensive with button	Hem, blind stitched		4 buttons with welt button holes	2 single-welt pocket at each breast	2 darts from waist; paneled back with shoulder darts; partial lining	Deep folded hem, blind stitching
10b	CX 0151AB	suit	CX0151AB	female	jacket	Adel Simpson	machine	plain weave, wool, different colors - tan and purple fibers twisted with tan ones; crepe lining; Rayon	Adel Simpson	Hem, blind stitched	Plain pinked;	n/a	none		Lapped zipper with 2 hook and eye	inverted pleats from waistband; partial lining	none	Deep folded hem, blind stitching; straight waistband
11a	c202.007.016ab	suit jacket	Audrey Garrich Lewis	female	Matching skirt, light grey	None	machine	Wool, weave suit, lining fabric maybe a crepe Rayon	none	3 piece rolled, lapped	plain, enclosed	Set in the round; darts at elbow; hemmed sleeve	Hem enclosed in lining;		Button openings; welt - only 2	fake pockets with flaps	Cut outs to shoulder, darts from fake pockets; back princess line seam	Deep folded hem, blind stitching

Appendix A – Continued

11b	c2002.007.016ab	suit skirt	Audrey Garrich Lewis	female	a-line skirt match above	none	machine	Wool, weave suit, lining fabric maybe a crepe, Ray	none	none	plain, pinked	none	curved waistband	none	zipper side, metal	darts at waist	Deep folded hem, blind stitching
12a	CX 362ab	suit jacket	Irene Belcher	female	jacket par top suit	Nelly Don RG USA, https://en.wikipedia.org/wiki/Nelly_Donnelly_Reed	machine	Ribbed weave, wool and rayon	Nelly don?	1 piece rolled, lapel	plain and pinked	3/4 length set in flat, hemmed; turned under finish; blind stitch	lace; large scallops around waist	none	CF buttons- when buttoned there are 2 buttons next to each other; thread finish button hole	Shoulder tucks/pleats around sleeve hole over shoulder; let loose into bust area; princess seams; edge of collar and hem has maroon lace.	
12b	CX 0362b	suit skirt	Irene Belcher	female	straight slightly flaired skirt		machine	Ribbed weave filament fibers; wool and rayon	Nelly don?	none	plain and pinked	n/a	straight waistband dk/ large	none	CS centered zipper	panels, straight, 3/4 length	Deep folded hem, blind stitching
13a	CX 0155AB	suit jacket	unknown	female	pin striped suit	Jerlain Florida; Industria Argentina, check this name is it Bealls?	machine	wool; pinstripe. Acetate lining fabric	Jerlain Florida; Industria Argentina	3-piece rolled	Enclosed, plain	set-in the round; tailored inseam placket	folded hidden in lining	none	3 buttons in front	Inverted tucks in striped design firm tip to hem in the front; and back	Deep folded hem, blind stitching
13b	cx0155ab	suit skirt	unknown	female	pin striped suit, skirt	Jerlain Florida; Industria Argentina	machine	wool; pinstripe. Lining fabric	Jerlain Florida; Industria Argentina	none	plain, pinked	n/a	curved waistband; folded with blind stitch	none	back centered zipper, metal	panel skirt	Deep folded hem, blind stitching
14a	CX0366ABC	dress	Ruth Smith Estate - database	female	dress with matching belt, jacket	Leonard arkin	machine	taffetta, crisp, silk or acetate black fabric	Leonard Arkin	bound/h/ rthaped	Plain pinked	sleeves; faced with neckline, combination facing	waist seam	left side zipper; metal	In seam shallow pockets in what looks like a pleat	Inverted pleats (3 each side on front) on back; bodice darts;	Deep folded hem, blind stitching
14b	CX0366ABC	jacket	Ruth Smith Estate	female	short jacket	Leonard arkin http://vintagefashionguild.org/label-resource/arkin-leonard/	Machine	crisp taffetta, silk and/or acetate; pink lining;	Leonard Arkin	3 piece rolled	enclosed	Kimono with underarm gusset; extended turnback cuff (separate piece)	hem	None	button; Vertical button hole has button on top	French darts, front; two back darts at waist	Deep folded hem, blind stitching
15a	C2000.015.008AB	jacket, suit	Carol Sue Smith	female	pattern weave suit with fur trim at lining - skirt and jacket	Imported fabric - 100%Cotton - lining and garment - mink fur, exclusively for Sam Siberstein- 2nd label Coat and suit industry National very board 666050	machine	fancy weave, printed floral pattern	none	3-piece rolled collar with fur trim sewn on it	Enclosed	High cap set in; hemmed	Hem enclosed in lining;	none	3 centerfront covered buttons; welt button holes	Fur on collar; flap towards the back; back has a belted area that gathers the back at the waistbanding a seam; that has inverted pleats going upwards; 2 darts at neckline back; long seams from waist to chest	Deep folded hem, blind stitching
15b	C2000.015.008AB	skirt, suit	Carol Sue Smith	female	pattern weave suit with fur trim at lining - skirt and jacket	Imported fabric - 100%Cotton, exclusively for Sam Siberstein- 2nd label Coat and suit industry National very board 666050. https://books.google.com/books?id=nzSAQAAAAIA&pg=RA9-PA83&pg=RA9-PA83&dq=Sam+Siberstein+appear+1940&source=bl&ots=rcdoXAG8U-b&sig=7c-9YTMx0Kzcn779q9p9M9D0B&hl=en&as_sdr=dr&id=HtLwIw0F60Y_GANLpwY4M4He2QDBIQ6AEIRDAHivonepage&q=Sam%20Siberstein%20appear%201940&f=false And link - http://vintagefashionguild.org/label-resource/national-recovery-board/	machine	fancy weave, printed floral pattern	none	none	plain and pinked	none	Straight waistband	zipper metal; button, tread finish		Darts	Deep folded hem, blind stitching
16b	1940.5	coat	Unknown	female	Coat	none	machine	Wool (crepe weave), acetate (plainweave)	none	3-piece rolled	Enclosed	Straight, long. Darts at armhole; set in; hemmed; lining finish	None	Covered buttons; loops; braided decoration	Two patch pockets at the breast;	Braid on patch pockets; at buttons and for button holes	Deep folded hem, blind stitching
17	CX 0367	morning jacket	unknown	female	morning jacket	none	machine	chiffon	none	none	Surged	Raglan	tie at neckline	none	accordian pleating	narrow folded hem	
18	1940.1M	military jacket	unknown	male	long military jacket	various patches, written G.A. Case 175.1	machine	Wool weave, Twill pocket bag and partial lining	Wool weave, Twill pocket bag and partial lining	3-piece rolled collar, faced	3-piece rolled collar, faced	lapel	2 piece set in, no placket	plain with binded edges, lapped; engosed in sleeve	3/4, binded edge	Long cut, with waist dart; back band, vent; princess cut in back	
19	1940.07	military jacket	Mrs. Eileen McKinley	male	short, eisenhower style jacket	Single gold bar, 2nd lieutenant; Cross Flags: Army Signal Corps officer badge; Cross flag; multicolored pin bar? Eisenhower style	Army Jacket	twill weave	none	3 piece rolled collar, faced	lapel	high cap set-in	bande	single gold bar, cross flags, multi colored pin	buttons CF, thread, keyhole	Eisenhower cut	bande
20a	1940.14	suit	Dr. and Mrs. Robert Linson http://www.findagrave.com/cgi-bin/fg.cgi?page=g&GRid=906829	male	pinstriped suit	jacket	machine	lining, twill, satin lapel, plainweave front, main fabric	After Six by Rudolfer; Smities "In the village" muncie	Extended rolled, stand 3-piece	Extended rolled, stand 3-piece	High cap, 3 piece	Enclosed	buttons, thread finish	welt pockets	front darts	narrow folded hem
20b	1940.14	suit, pants	Dr. and Mrs. Robert Linson - president	male	pinstriped suit	none	machine	Same plain weave as the suit, no cuffs, satin trim down side leg.	After Six by Rudolfer; Smities "In the village" muncie	n/a	plain	Lapped and plain with thread finish	waistband curtain, suspended buttons	metal zipper, button at top;	Closed inseam pockets front; back welt pockets with button, double welt	front pleats- 4 (2 on each side) back darts	

3-D Modeling for Textile Collections

Appendix B – Related syllabus sections and assignments from the pattern making course

FCFA 300, Flat Pattern
Fall Semester 2016

COURSE OBJECTIVES

1. Design a garment utilizing appropriate techniques for either mass-production or couture inspired garments.
3. Master manipulation of structural lines to include a variety of design possibilities.
4. Create a design idea into a flat pattern using the computer.
5. Utilize suitable fabric in execution of original garment

CURRENT TEXT AND MATERIAL

Prentice Hall. Hollen and Kundel, *Pattern making by the Flat Pattern Method*

You will also need: Ruler, pencil, scotch tape, poster board, 1004-Vogue basic garment pattern, sewing supplies and fabric/notions needed to completed

METHODS OF EVALUATION

Assignments with the following grade scale:

A = 93%, A- = 90%

B+ = 87%, B = 83%, B- = 80%

C+ = 77%, C = 73%, C- = 70%

D+ = 67%, D = 63%, D- = 60%

3-D Modeling for Textile Collections

Appendix B – Continued

WEEKLY SCHEDULE

Aug 22-26	Introduction to Flat Pattern, Sloper Assignment
Aug 29 -Sept 2	Pattern manipulations
Sept 6 -9	Pattern manipulations continued, no class on Labor Day Sept 5
Sept 12-16	Pattern manipulations continued, I will be out of town on the 15 th
Sept 19-23	Pattern manipulations continued
Sept 26-30	Pattern manipulations continued one
Oct 3-7	Pattern manipulations continued, notebook with pattern manipulations due on October 7
Oct 10-14	No class during Fall Break October 10-11, no class October 13 gone for conference
Oct 17-21	Creating pattern for historical garment
Oct 24-28	Creating pattern for historical garment
Oct 31 – Nov 4	Creating pattern for historical garment, no class November 3 & 5 gone for a conference
Nov 7-11	Creating pattern for historical garment
Nov 14- 18	Creating pattern for historical garment, patterns are due on November 18
Nov 21-25	Explanation and assignment of final project, no class during Thanksgiving Break November 23-25
Nov 28-Dec 2	Work on final project
Dec 5-9	Work on final project
Dec 12-16	Dec 12, Monday classes, last day to finish final project, Finals begin Dec 13

Appendix B – Continued

Final Design Project Description – Flat Pattern, Assignment #2

Assignment Objectives:

1. apply flat pattern skills to replicate a historic garment
2. record the measurements needed to successfully replicate a historic garment
3. critically evaluate patterns made from a historic garment

Related Course Objectives:

1. demonstrate how to manipulate pattern pieces to create style lines or shape into garments via flat pattern methods
2. translate a design idea into a flat pattern

Procedure:

- 1) In assigned pairs, decide what pattern pieces are need for the assigned garments
 - a) Make a list of the construction features of each garment assigned (e.g. darts; sleeves; ruffles; facings; lining; cuffs, button holes, plackets)
 - b) Analyze how each garment assigned was made (note top stitching, under stitching, potential alterations, etc.)
 - c) Identify which slopers are needed to pattern each garment assigned.
 - d) Next, identify what part of the basic sloper the garment assigned requires
 - e) Reanalyze each garment assigned for particular construction details. Be sure nothing has been missed and to include all peculiarities of each garment.
- 2) Measure each garment assigned – see measurement sheet
- 3) Recheck measurements – make sure that there are not more measurements needed for each particular garment assigned to successfully complete the patterns. Be sure to include supporting fabrics (e.g. facings, underlining) and seam allowances, hems, etc. *Make sure seams match.*
- 4) Make the patterns for each garment assigned - Alter the sloper according to the measurements and the construction details in the garment.
- 5) Alter the patterns to resemble the original garments assigned as discovered from the fitting garment.

Appendix B – Continued

Name _____
Score _____

HISTORIC GARMENT 1 EVALUATION
100 POINTS

Appearance-20

____ Clean, looks good, easy to read, and folded nicely

Measurement-60

____ 20 seam allowances were equal at 5/8"

____ 20 seams looked equal in length

____ 20 measured historic garment accurately

Details added-20

____ cuffs, pleats, darts, gathers, collars added

THESE TECHNIQUES MUST BE EXECUTED PROFESSIONALLY AND HAVE THE LOOK OF WELL CONSTRUCTED GARMENT. THESE MUST BE DISCUSSED WITH THE TEACHER AHEAD OF ACTUAL CONSTRUCTION. IF YOU HAVE AN IDEA THAT IS NOT LISTED ABOVE, PLEASE ASK ME FOR THE COMPLEXITY OF THE IDEA TO DETERMINE WHICH GRADE THAT DETAIL FALLS UNDER.

Appendix C – Presentation, NEH Project Director’s Meeting

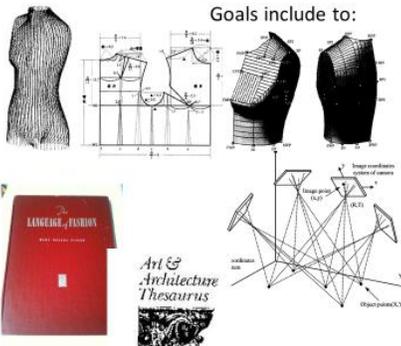
3D Modeling for Textile Collections



Diana Saiki
Val Birk
Ball State University
Muncie, IN



3D Modeling for Textile Collections



Goals include to:

- Experiment with the application of photogrammetry in augmenting digital access to costume and fashion collections
- Explore appropriate terminology for describing garments and their component parts



3D Modeling for Textile Collections

Goals include to:

- Digitize and contextualize a series of garments relevant to the history of fashion
- Develop a working pilot of a web-based digital collection of garments and their component parts



Appendix D - Equipment for photogrammetry



Appendix E – Guidelines for making photographs from Ball State University Library

TEXT-based materials (Books, pamphlets, etc.)

	Master / Adjusted TIFF	Access JPEG	Thumbnail JPEG
Bit Depth	1 bit bitonal 8 bit grayscale 24 bit color	1 bit bitonal 8 bit grayscale 24 bit color	1 bit bitonal 8 bit grayscale 24 bit color
Spatial Resolution	300 - 600 ppi (400 ppi and up for OCR purposes)	No lower than 150 ppi	Not Applicable
Spatial Dimensions	100% of original	100% if possible, No less than 1,000 pixels across the long dimension. Use legibility as your guide.	150-200 pixels across the long dimension

Originals as PHOTOGRAPHS

	Master / Adjusted TIFF	Access JPEG	Thumbnail JPEG
Bit Depth	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color
Spatial Resolution	300 ppi minimum; 5000 to 10000 pixels across the long dimension	No lower than 150 ppi	Not Applicable
Spatial Dimensions	100% of original	100% if possible, No less than 1,000 pixels across the long dimension.	150-200 pixels across the long dimension

Originals as MAPS

	Master / Adjusted TIFF	Access JPEG	Thumbnail JPEG
Bit Depth	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color
Spatial Resolution	300 ppi minimum; 5000 to 10000 pixels across the long dimension.	No lower than 150 ppi	Not Applicable
Spatial Dimensions	100% of original	100% if possible, No less than 1,000 pixels across the long dimension. Use legibility as your guide.	150-200 pixels across the long dimension

Originals as GRAPHIC MATERIALS (Broadsides, sheet music, etc.)

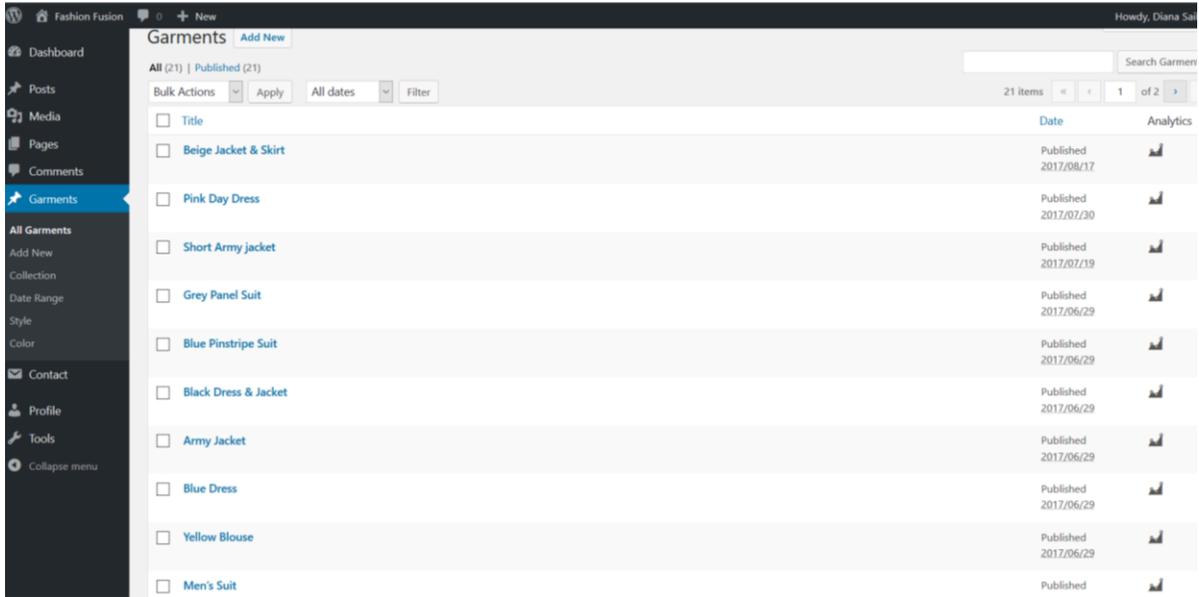
File Format	Master / Adjusted TIFF	Access JPEG	Thumbnail JPEG
Bit Depth	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color	8 bit grayscale 24 bit color
Spatial Resolution	300 ppi minimum; 5000 to 10000 pixels across the long dimension	No lower than 150 ppi	Not Applicable
Spatial Dimensions	100% of original	100% if possible, No less than 1,000 pixels across the long dimension. Use legibility as your guide.	150-200 pixels across the long dimension

Items are frequently not scanned at a fixed ppi resolution, but instead at a fixed number of pixels across the long side, resulting in two differently-sized prints from one negative yielding similarly-sized digital files. The appropriate resolution is determined by dividing the desired number of pixels (e.g. 5000) by the number of inches of the long side of the photograph (e.g. 10" for an 8x10 photo). In this case $5000 / 10 = 500$, so an 8x10" print should be scanned at 500ppi or higher.

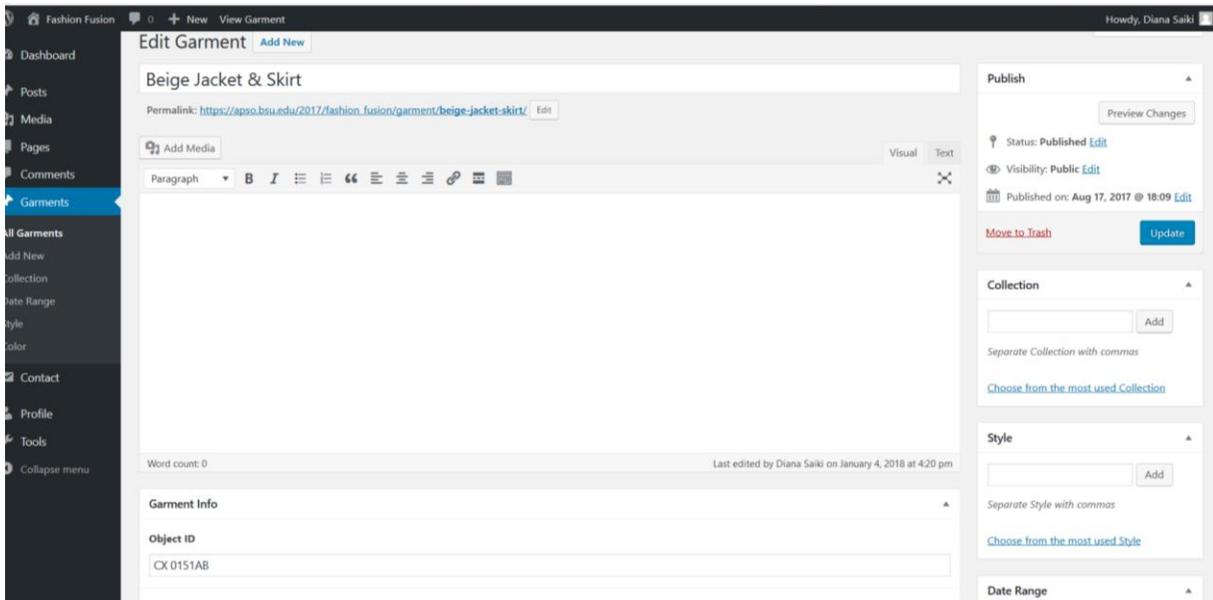
In general, all photographs should be scanned as 24-bit RGB color. Although black & white photographs can be scanned in 8-bit grayscale, it is preferable to scan them in color, thus preserving, for example, age or sepia-toning. Also, the presence of three separate channels will allow for better image adjustment in the restoration of damaged or faded images.

Appendix F – Screenshots of website template as built in WordPress

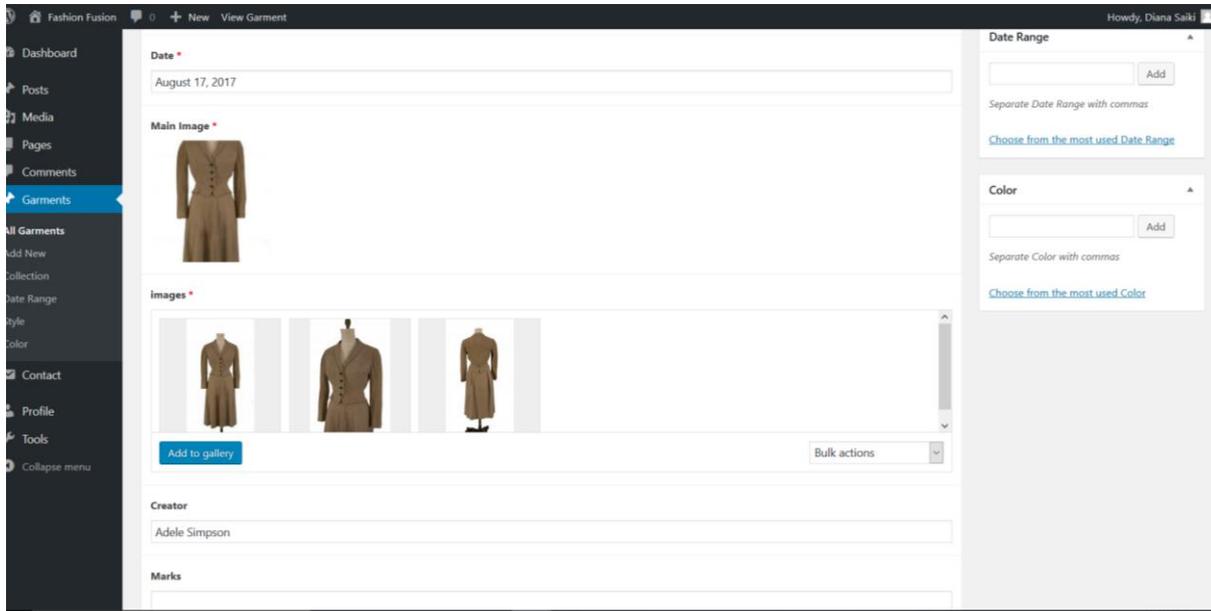
Garment posting section



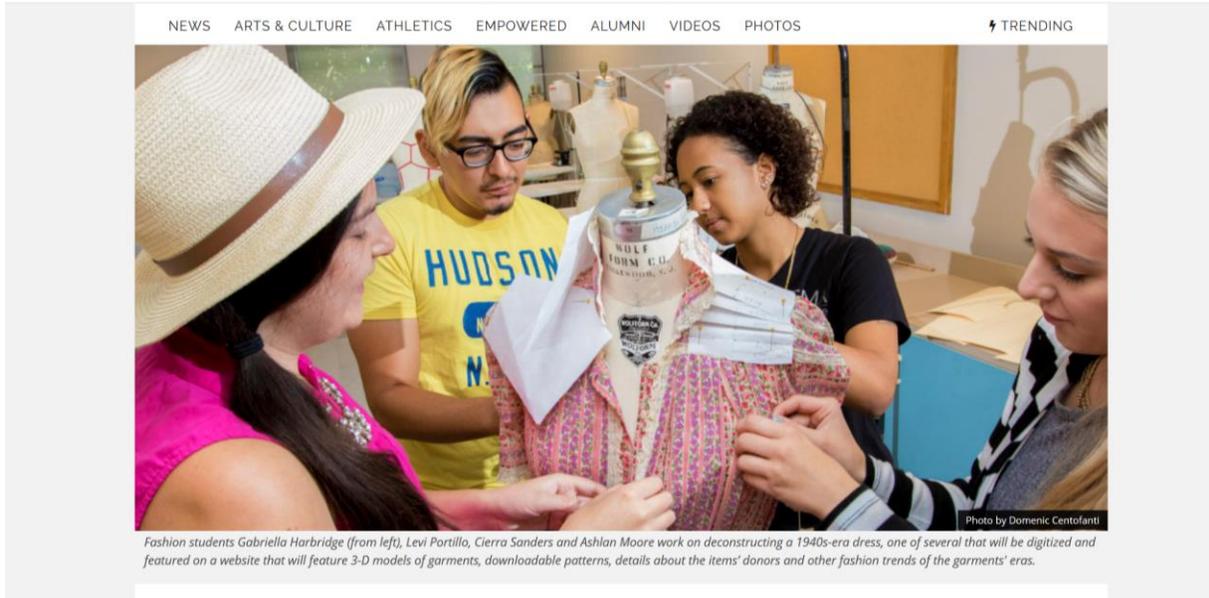
Garment meta-data uploading pages



Appendix F – Continued



Appendix G – Publicity



NEWS ARTS & CULTURE ATHLETICS EMPOWERED ALUMNI VIDEOS PHOTOS TRENDING

Students Give WWII-Era Threads a 21st-Century Refresh

BY GAIL WERNER
11.15.16

Tucked away on the second floor of the Applied Technology Building is the Beaman Historic Costume Collection, a trove of tailored suits, military uniforms, feathered hats, ball gowns and other garments that tells the history of fashion.

This academic year, 15 items of World War II-era clothing from the collection are undergoing a 21st-century alteration, thanks to Ball State's Diana Saiki and Valerie Birk.

With a digital humanities grant from the National Endowment for the Humanities, the veteran educators are leading students in developing a website that will feature 3-D models of the garments accessible to researchers and educators nationwide.

"We applied for the NEH grant four times, so to finally receive it was incredibly validating," said Birk, an instructor who teaches apparel design in the Department of Family and Consumer Sciences (FCS). "So many of the items in the

Students Lindsey May (left) and Stevie Jarrett work on an assignment to re-create a woman's blouse for the project, which is being funded by a grant from the National Endowment for the Humanities. (Photo by Domenic Centofanti)

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Latest stories

- Architecture Teams Sprint to Finals in DOE Race to Zero
- Senior's Post-Graduation Plans Grew from Honors College Experiences
- Students Create Museum Exhibit Plan for Historic Delphi Opera House
- Ball State Graduate Student Part of Pulitzer Prize-winning Team

Appendix G – Continued

NEWS
ARTS & CULTURE
ATHLETICS
EMPOWERED
ALUMNI
VIDEOS
PHOTOS

Sciences (FCS). "So many of the items in the Beeman Collection we don't have the space or resources to display, so this is an excellent way to bring them into the limelight and introduce them to a broader audience."

Using a technique called photogrammetry, which generates 3-D information from photographs and measurements, FCS students will help turn hundreds of images of the 15 garments into 3-D models that will be featured on the website when it launches next summer, said Saiki, an associate professor whose expertise includes the study of historical clothing.



Background information about the garments also will be shared, including details about the items' donors, other fashion trends of the era and downloadable patterns being constructed this fall by students in Birk's flat pattern class, a course required for all apparel design majors.

Students weave vintage garments into own designs

Levi Portillo, a junior who is double-majoring in apparel design and fashion merchandising, is one of Birk's students. His group is responsible for creating a pattern from one of the dresses selected for the project, a '40s-era frock covered in tiny pastel flowers.

Fingering the delicate pleating covering its bodice, the Indianapolis resident said, "The

bodice, the Indianapolis resident said, "The details of this dress are so intricate, it's going to be nearly impossible to re-create, but that's part of the challenge. ... It's exciting seeing how designers in the past made things. When you start inspecting the pieces in this collection, you realize how much work went into them."

The goal of Birk's flat pattern class is to teach students how to deconstruct garments, a skill that informs their own fashion designs.

Junior Olivia Cash is glad the items they're creating patterns from date to the '40s and '50s. "The style at that time fits so well with my personality."

Of the website, she said, "I think it's a chance for our department to pay it forward and help other universities and students."

Project distinctive in higher ed

Birk and Saiki said creating the website is a chance for Ball State's fashion program to stand out at a national level. While some museums have begun using 3-D scanning to digitize their costume collections, the trend has yet to make its way to colleges and universities.

It's that kind of distinction that made the project so appealing to junior Ashlan Moore, a LaPorte, Indiana, native also double-majoring in apparel design and fashion merchandising.

"I'm really looking forward to seeing how everything turns out. This is something that's never been done by our department before, and using the (NEH) grant for a project like this is not



only innovative, it's a great opportunity for us students."

The photogrammetry phase of the project will get underway this spring, with work on the website to be completed next summer with help from Digital Corps students.

Birk said she and Saiki would love to then apply for a second grant. "Our goal is to get 50 pieces online. For now, we're taking it one at a time."

About the Beeman collection

The Beeman Historic Costume Collection contains more than 3,000 pieces of men's and women's apparel dating to the 1700s. The grouping began in the 1930s, when the Frank C. Ball family presented Mary Beeman, head of what was then the Department of Home Economics, with a steamer trunk full of garments.



Apparel design instructor Valerie Birk (left) and Diana Saiki, an associate professor whose expertise includes the study of historical clothing, spent last summer selecting which garments from the thousands in the Beeman collection to include in the project. (Photo by Gail Werner)

COLLEGE OF APPLIED SCIENCES AND TECHNOLOGY
DEPARTMENT OF FAMILY AND CONSUMER SCIENCES

GRANTS

SHARE






GAIL WERNER

Gail, '04, is a contributing writer to Ball State Magazine and a media relations strategist for the university, and in her free time enjoys reading, writing fiction, photography and cooking in her retro kitchen. Her favorite magazine sources for inspiration include Time, The Atlantic, Vanity Fair and Smithsonian.

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Appendix H – ITAA presentations

2017 Proceedings *St. Petersburg, Florida*



Exploring Methods to Make 3-D Images of Historic Clothing Using Photogrammetry

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Key Words: Photogrammetry, Costume, Preservation, Technology

Introduction: Photogrammetry is a method to make a digital three-dimensional (3-D) image of an object by combining photographs. This process also results in a digital image that enables measuring capabilities. The technological tool is used in various fields; such as geographic mapping and preservation of heritage and archeological objects. Measuring capabilities of the tool enables assessing the scale of an object and tracking the size of a deformity (e.g. Remondino, 2011). The method has been used in the apparel and textile industry to understand fit by capturing photographs of dress forms or individuals wearing bodysuits (Percoco, 2011).

Significance/usefulness: Photogrammetry has potential for a plethora of uses in the apparel field, such as analysis and preservation of historic garments and garment fit. However, further exploration is needed to understand the method. The purpose of this abstract is to research how photogrammetry can be successfully applied to documenting historic clothing. To achieve this purpose, a series of experiments were conducted to identify the procedures that resulted in the highest quality and most accurate measurements of historic clothing.

Method: Two contrasting garments from a historic costume collection were selected for this research. The first garment was a man’s tailored World War II military jacket made from wool, while the second garment was a patterned cotton day dress of the same era. The garments were documented using photogrammetry within guidelines by the Cultural Heritage Imaging (personal communication, 2016) by taking three sets of photographs at the top, middle, and bottom of the garments with a prescribed camera setting. Guidelines allowed for varying physical and digital settings given the subject. These possibilities included: 1) background; 2) direction of the camera; 3) distance from subject; 4) focus; 5) garment; 6) type of lens; 7) lighting; and 8) scale bar position. The process was documented given these variations. After the digital 3-D image was made, the actual garments were measured at points in each direction of the garment (e.g. top of a pocket; center front; around hems, waist, etc.). These measurements were compared to measurements from the image made using the computer software.

Results: A DSLR camera with settings ISO 100, F-Stop 3.5 and shutter speed 40 was used.

Table 1. Sample measurements of actual garment versus photogrammetry image (cm)

	Actual.	Photog. Image	Actual	Photog. Image
CF length	17.5	16.8	28.8	28.8
Pocket width	15.0	15.0	14.8	14.8
Around sleeve hem	39.5	39.2	30	30.6

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Table 2. Result of taking photographs varying the set-up to build photogrammetry images.

Trial	Back-ground	Direction	Distance	Focus	Garment	Lens	Lighting	Result	Scale bars
1	BCG	W	55"	M	PD	ST	S	PNR	ASU
2	B	W	55"	M	MJ	ST	S	PNR	ASU
3	B	W	55"	M	MJ	ST	R:S	D	ASU
4	C	A 15	55"	M	MJ	WI	R	CD; H	ASU
5	C	A 15	75"	M	MJ	WI	R:S	SI	ASU
6	C	A 20	55	M	MJ	WO	R: S	S: B	ASU
7	C	A 20	55	M	MJ	ST	R:S	SU	ASU
8	C	A 20	55"	A	MJ	ST	R: S	B	ASU
9	C	A 20	55"	M	PD	ST	R:S	SU	ASU

Codes: Background (B=Black only, BCG=Black backdrop with contrasting white edges, C=Classroom, G=Grey only); Direction (A=photographs taken around the figure, W=Camera facing subject against a wall, 15=15 images, 20 = 20 images); Focus (A=Auto, M=Manual); Garment (MJ=military jacket, PD=pink dress); Lens (ST=Standard, WI=Wide); Lighting (L = Studio Lights, R = Room Lights); Results (B=Blank spaces – under arm or shoulders, CD=cannot detect scale bars, D=Too dark for photograph to be taken, PNR=Photographs not shown around figure in software SI=Scattered image, SU=Successful); Scale bars (A=Above, B=Back, F=Front, S=Side, U=Underneath)

Discussion/Conclusions: The results provide a guide on the process to document historic clothing using photogrammetry. The method that achieved the best results included: 1) 20 photographs taken around the garment; 2) camera 55" from the garment; 3) photographs taken closer together at the side of the garment; 4) additional photographs taken at the side, under, and top of the arm; 5) illumination of the garment with studio lights; 6) photographs taken using a standard lens. By doing this, the measurements of the photogrammetry images were close to the actual garment, particularly vertical and horizontal lines.

Photogrammetry is a tool that has been used to document some types of material culture artifacts (e.g. statues). Results demonstrate this tool has potential for assisting with preserving and providing further understanding of historic costume. Measurements could be used to track deterioration of artifacts (e.g. the size of a tear) and to conduct research on garments, such as tracking changes in waist sizes overtime. Further research could examine how to achieve the best results given different fabrics (e.g. grey, shiny) and accurate measurements in fabric folds.

Percoco, G. (2011). Digital close range photogrammetry for 3D body scanning for custom made garments. *Photogrammetric Record*, 26(133), 73-90.

Remondino, F. (2011). Heritage recording and 3D modeling with photogrammetry and 3Dscanning. *Remote Sensing*, 3, 1104-113.

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Engaging Students by Developing Patterns from a Historic Garment

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Key Words: Patterns, Historic, Teaching, Construction

Apparel construction courses provide opportunity for hands-on activities (McKeatchie, Pintrich, Lin, & Smith, 1987) and using a historic costume collection. Hands-on learning activities in apparel construction courses that incorporated history of costume has been found to enhance students' critical thinking and analysis of skills (Banard, 2015). These skills are valuable in the fashion industry (Banard; Weaver, 2011). A hands-on teaching assignment was developed in which a flat pattern class made patterns from historic garments to prepare for the digitizing process and the proposed steps in product development.

Purpose/Objective of Strategy

The purpose/objective of this teaching strategy was to:

1. apply flat pattern skills to replicate a historic garment,
2. record the measurements needed to successfully replicate a historic garment,
3. critically evaluate patterns made from a historic garment,
4. demonstrate how to manipulate pattern pieces to create style lines or shape into garments via flat pattern methods, and
5. translate a design idea into a flat pattern.

Implementation of the Strategy

Using clothing from the university collection, a group of 14 students reproduced authentic patterns from observation, by measuring and implementing their basic flat pattern skills. The students were paired in groups of two and worked together to re-create two garment patterns per team. There were both fashion merchandising and apparel design students that participated in the class. Up to this point, all students had completed the same amount of construction classes. To develop the assignment, previous investigation and expertise from the instructors (apparel design and museum studies) was required. For preparation of the assignment, the instructors completed a literature search and conducted research on the textiles from the historical garments, consulted experts from a focus group, created preliminary pattern samples and analysis of the process needed to replicate the garments. The instructors chose garments from the 1940s era and then the assignment was created.

The assignment began with the selection of two garments assigned to each of the seven groups participating in the flat pattern class. The first problem in the assignment began with the analysis of the garments each group of students were given. The students analyzed unique aspects and the construction details of their assigned garments. Garments ranged from tailored suits to dresses. The students were assigned garments based on difficulty level.

The students used critical thinking to analyze the garments. Pattern analysis also requires technicians to measure each piece of the garment. Each piece included details such as yokes, sleeves, collars, and facings. The pieces of the garment were redrawn to create patterns with notches for

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fitting and seam allowances. To assure proper alignment of the garment, each piece was analyzed for accuracy. After the patterns of the garments are made, they were checked (re measured). To ensure quality of the patterns, a muslin for each garment was constructed.

In another computer patternmaking class, the pattern pieces were digitized into a data base using Lectra brand hardware and software. The pattern pieces were laid on the digitizing table. Using a digitizer mouse and table, pattern pieces were digitized (outlined) into a file titled group number 1. This process was repeated until the pattern pieces from the entire garment are recorded and grouped. The digitized patterns were changed from Lectra format files to PDF files necessary to print from most plotters.

Description of Effectiveness and Plans for Continuation

There were problems that occurred while making the patterns. First, the students needed to learn the basic flat pattern manipulations. They had only been exposed to very basic pattern manipulation in a previous beginning construction class. The students worked six weeks of a 16 week semester to learn the basic pattern manipulations. This left 10 weeks to re-create two historical garment patterns and a final garment of their own design that showed influences of the historical garments. It taught the students time management, teamwork and a sense of a corporate environment due to deadlines that needed to be met.

The students shared their experiences with the course by answering a survey regarding the effectiveness of their learning during the course. Some of the responses included:

1. they had never made patterns before this course,
2. they had no idea how precise they needed to be in their measurements of both the garment/body and the pattern itself until they had this experience,
3. some students struggled and thought that creating a fitting garment after the garment was made would be helpful,
4. they did not realize how many flaws clothing had until they learned to create a pattern from ready-made clothing,
5. creating these patterns helped the students learned to fit the body more efficiently by learning so much about patternmaking,
6. students wanted to be more creative than the exercise allowed.

The investigators plan to use the information gained from this project to incorporate into future curriculum and create an immersive learning opportunity for students. The activity could be altered in several ways, such as having students make a portion of a garment to use in their own creative design or vary the historic era of the original garments. Related courses where the project can be incorporated include history of costume, computerized apparel design, and apparel design technology presentation.

Banard, D. S. (2015). *Analysis and critical thinking skills: A line-for-line copy draping project*.

International Textile and Apparel Association Annual Conference Proceedings, Paper 79.

http://lib.dr.iastate.edu/itaa_proceedings/2015/posters/79/

McKeachie, W. J., Pintrich, P. R., Lin, Y. G., & Smith, D. A. (1987). *Teaching and learning in the college classroom: A review of the literature*. Ann Arbor, MI: National Center for Research to Improve Postsecondary Teaching and Learning, The University of Michigan.

Weaver, E. (2011). *How to excel in the fashion industry* (Unpublished honors thesis). The University of Rhode Island, Kinston, RI.

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Appendix I – Classification categories for each garment

Classification categories used to identify elements of each garment are as follows. These categories appear on the public website if there is information provided in the space allotted within the wordpress framework.

General Information

Collection: Beeman Historic Costume Collection

Object Type: Pink dress

Date : 1940s

NEXT PAGE: Artifact Specific Visual Information (built from Costume Core and garment observations)

Main Color:

Material:

Material location:

Material fabrics:

Material fibers:

Technique:

Technique location:

Grain:

Size:

Overall measurement: (not used, because of the available photogrammetry image)

Overall Silhouette:

Neckline:

Torso:

Waist:

Sleeve Type:

Arms eye:

Shoulder:

Cuff:

Skirt:

Pants:

Hem:

Pockets:

Seams

Lining:

Closure:

Closure Type:

Closure Placement:

References

Kirkland, A. (2016). *Costume Core Controlled Vocabularies*. Retrieved from

<http://www.ardenkirkland.com/costumecore/wp-content/uploads/2016/05/Costume-Core-Controlled-Vocabularies-4th-draft-May-2016.pdf>

Appendix J – Glossary of terms and definitions for garment construction plus sources

Definitions and Illustrations Glossary

A

A-line

A silhouette shape characterized by its smaller measurement towards the top and widening measurement at the hem, as if in the shape of an A.

Standardized from: CC

Acetate

“A manufactured fiber in which the fiber-forming substance is cellulose acetate.” (Kadolph, 2007, p. 460)

Standardized from: AAT, CC, PA, TXT

B

Bias

“45-degree angle to the lengthwise and crosswise grains of woven fabrics.” (Brown, P. & Rice, J, 2013, p. 162)

“A cut made diagonally, usually at a 45-degree angle, against the weave of a fabric.” (Ambrose, G. & Harris, P., 2007, p. 36)

Standardized from: CC, PA, VDFD

Blazer

A jacket style typically characterized by its professional appearance, usually featuring a notched lapel collar.

Standardized from: AAT, PA,

Blouse

A silhouette of a garment typically used to describe a shirt or jacket characterized by its looseness and box-like shape.

Standardized from: AAT, CC, VDFD

Bodice

The torso part of a dress, top or jacket typically including the space between waist and neck on front and back, excluding sleeves.

Standardized from: AAT, CC, VDFD

Bound buttonhole

A buttonhole finish characterized by its multiple layers of fabric which are turned and stitched to finish the raw buttonhole edge.

“Rectangular hole in the garment fabric that is bound or faced and backed with narrow strips of fabric that meet like lips to cover the opening.” (Brown, P. & Rice, J, 2013, p. 460)

Standardized from: PA

Buttons

“A small disc or knob-shaped device attached to an article of clothing for utilitarian or decorative purposes.” (Ambrose, G. & Harris, P., 2007, p. 60)

“Used as garment closures since the Middle Ages; both decorative and functional.” (Brown, P. & Rice, J, 2013, p. 310)

Standardized from: AAT, CC, VDFD

Side buttons

Buttons along the side of a garment.

Standardized from:

Appendix J – Continued

Buckles

Center bar usually has a prong that engages with eyelets to adjust the belt to various circumferences; typically made of plastic, wood, metal, or shell.

Clasps or catches used to fasten the ends of a belt, sometimes ornamented with designs. (AAT)

“Used as both functional fasteners and as decorative details.” (Brown, P. & Rice, J, 2013, p. 318)

Standardized from: AAT, CC, PA

Button front

A means of closing the front of a bodice by using buttons and button holes on either side of the split front to close the garment.

Standardized from:

Button loops

A way of shutting a button closure by using loops of fabric attached to the edge of a garment rather than holes in the garment for the button to go through.

“Loops are made of narrow tubes of bias fabric; strips of cording, braid, or elastic; or thread chains.” (Brown, P. & Rice, J, 2013, p. 311)

Standardized from: PA

C

Center back

Where two pieces of fabric are stitched together in the center of the back of a garment.

Standardized from: CC

Chiffon

“A sheer, very lightweight, balanced plain-weave fabric using fine-crepe twist yarns of approximately the same size and twist both in warp and in filling.”

Standardized from: AAT, CC, TXT

Appendix J – Continued

Closures

A way to bring two pieces of fabric together to keep them attached temporarily, as in cases of putting on and taking off garments. Different from a fastener, a closure closes the two pieces of fabric completely.

“Fasteners that secure garment openings.” (Brown, P. & Rice, J, 2013, p. 308)

Standardized from: AAT, CC, PA

Collars

A piece of fabric which attaches to the neck of a garment and may or may not close in the front, encompassing part or all of the neck.

“Part of a shirt or blouse that fastens around the neck.” (Ambrose, G. & Harris, P., 2007, p. 70)

Standardized from: AAT, CC, PA VDFD

Convertible collar

A collar which can either be worn buttoned or unbuttoned, typically used on button front garments.

“The neck button can be worn either fastened or unfastened.” (Ambrose, G. & Harris, P., 2007, p. 70)

Ex: (PA 181)

Standardized from: CC, PA

Appendix J – Continued

Crew collar

Ex: (PA 180)

Standardized from: CC, PA

Flat collar

Lies flat or nearly flat against the garment all around the wearer's neck. (PA 179)

Standardized from: PA

Notched collar

A collar which attaches to a jacket or coat front and forms a v-like cut out with the lapel.

Standardized from:

Shawl collar

A collar characterized by its shape which looks similar to a lapel without a notch. A piece of fabric is attached to the front of a garment and extends completely around the neck and down the front of the other side of the garment.

Standardized from: CC

Three piece collar

A collar characterized by its use of an upper collar and under collar, as well as a collar stand.

Standardized from: PA

Appendix J – Continued

Two piece collar

A collar characterized by its use of an upper collar and under collar.

Standardized from: PA

Contour waistband

A waistband attached to pants or a skirt which curves down in the middle and back, and then curves up again at the hips.

Standardized from:

Conventional Zipper

Most common in ready-to-wear-apparel; one end of the zipper remains attached when it is unzipped. (Brown, P. & Rice, J, 2013, p. 314)

Standardized from: PA

Cotton

“Refers to several fibers belonging to the genus *Gossypium* used to produce commercial and craft textile products.” (Kadolph, S., 2007, p. 465)

“The most widely used apparel fiber in the United States.” (Brown, P. & Rice, J, 2013, p. 517)

Standardized from: AAT, CC, PA, TXT

Cropped

A silhouette which features a garment cut off at the waist when the garment would usually extend past the waist, or pants which are cut at the ankle when they typically would not be.

Standardized from:

Cuffs

The part of a sleeve at the bottom nearest the hands, can be either an edge finish or finished with a separate piece of fabric in a variety of styles.

“Banded-or turned-back finishes at the lower edges of sleeve and pant legs.” (Brown, P. & Rice, J, 2013, p. 181)

Standardized from: AAT, PA, VDFD

Appendix J – Continued

Angled

A cuff shape characterized by its angled edges instead of corners at the opening.

Ex: (**VDFD 82**)

Standardized from: VDFD

Barrel

A cuff characterized by its wide and un-open shape.

“A straight, open-band cuff style.” (Brown, P. & Rice, J, 2013, p. 183)

Ex: (**PA 183**)

Standardized from: PA

Flared

A cuff style that extends outward from the wrist in an expanding shape, widest at the hem.

Standardized from: PA

Straight (ex: **VDFD 82**)

Standardized from: VDFD

Turnback

Cuffs designed to be turned back and pushed up the arms.

Ex: (**PA 183**)

Standardized from: PA

D

Darts

A shaping method which pinches a piece of fabric together and stitches it in an angled direction, with the point facing a full part of the body.

“A triangular fold stitched to shape the flat fabric to specific curves of the body.” (Brown, P. & Rice, J, 2013, p. 164)

“A sewn fold in the construction of a garment to shape fabric to the curves of the body such as the bust, waist, and hip areas.” (Ambrose, G. & Harris, P., 2007, p. 87)

Standardized from: AAT, CC, PA, VDFD

Contour

A dart which starts at a point and expands, then extends at the other end to another point. Typically used on the fronts of dresses to contour to the hips and chest area.

“Two single-pointed darts joined at the wide ends to form one continuous dart.” (Brown, P. & Rice, J, 2013, p. 166)

Standardized from: PA

Double-pointed

A dart that expands from one point to a wider shape and then back down to a point.

Standardized from: PA

Elbow

Used in sleeves to tailor the shape to the elbow.

Standardized from: CC

Fisheye

A dart that expands from one point to a wider shape and then back down to a point.

Standardized from:

French

A dart which extends from the side seam at the waist towards the bust area.

Standardized from:

Appendix J – Continued

Horizontal

A dart typically used in the chest area of a bodice, with the fullest part of the dart in the middle of the chest.

Standardized from: CC

Neck

A neck dart may be used to create a neckline which lies more flat to the body. Eliminates some fullness in the neck and chest area.

Standardized from:

Side

Similar to a French dart in its placement, but separate in that this style dart uses a curve, rather than a straight line.

Standardized from:

Waist

A dart usually in the waist are of pants or a skirt which helps the garment contour to the waist better.

Standardized from:

Double welt pocket

A pocket which features two strips of fabric bracketing and finishing the opening of the pocket.

Standardized from:

Dropped waist

A style of cutting a garment so that the waist, or thinnest part of the garment shape, falls slightly below the natural waist.

Ex: (PA 180)

Standardized from: CC

E

Ease

A shaping method characterized by loosely stitching the edge of a wider garment piece, pulling the threads to gather the excess, then sewing the two pieces together.

“Imperceptible fullness that is incorporated on one side of a seam and stitched in place.” (Brown, P. & Rice, J, 2013, p. 168)

Standardized from: PA

Eisenhower jackets

Waist-length army jackets of a particular style and khaki color, resembling jackets worn by U.S. General Dwight D. Eisenhower during World War II. The jacket became standard issue for U.S. troops beginning in November 1944.

(AAT)

Standardized from: AAT,

Elbow length

A sleeve style that ends at or near the elbow.

Standardized from: CC

Enclosed seam

Occur only at edges, where they appear as a line with no visible stitches along the edge.

Sewing the fabric plie face sides together near the edge, opening out the plies, and turning the back sides together to encase the seam allowances. (Brown, P. & Rice, J, 2013, p. 368)

Standardized from: PA

Appendix J – Continued

F

Fastener

A way to bring together two pieces of fabric to attach them temporarily. Different from a closure, a fastener does not typically close the garment completely.

Devices that fasten or hold together separate parts. (AAT)

Standardized from: AAT, VDFD

Field jacket

An army jacket typically worn on leisure time.

Ex: (PA 178)

Standardized from: AAT

Flap pocket

A pocket style which closes when a piece of fabric, which is sewn above the opening, folds over the opening and attaches to the front of the pocket.

“A patch pocket with a utilitarian closure.” (Brown, P. & Rice, J, 2013, p. 184)

“Flap of fabric above the pocket that extends down over the pocket opening.” (Brown, P. & Rice, J, 2013, p. 185)

Standardized from: PA

Flight jacket

Army jacket typically worn while traveling, especially on foot.

Standardized from:

Floor length

A skirt length which brushes or lies on the floor.

Standardized from: CC

Fly front

A button or zipper closure which is covered and hidden by a piece of fabric.

Standardized from:

G

Gathers

A shaping mechanism similar to ease, but which takes in much more fullness and features actual cases of fabric overlapping itself, whereas with ease the fabric typically is just bunch slightly.

“Drawing together of a series of small folds of fabric.” (Brown, P. & Rice, J, 2013, p. 168)

Standardized from: AAT, CC, PA

Gore

A separate part of a skirt. Gores are used to create ease and shape in a skirt. A gore is indicated by a seam which goes from top to bottom in the skirt.

Vertical divisions within a garment, usually tapered panels seamed together to add shape to a garment. (Brown, P. & Rice, J, 2013, p. 167)

Standardized from: AAT, CC, PA

Grain

“The alignment of fibers in a textile giving it a certain appearance and texture.” (Ambrose, G. & Harris, P., 2007, p. 126)

A term to describe whether the length/height of the object is cut on the straight of grain (lengthwise or crosswise) or on bias. (CC)

“Orientation of the yarns that make up the fabric.” (Brown, P. & Rice, J, 2013, p. 160)

“Refers to the natural surface characteristic of leather and is related to the species of animal. It also describes the relationship of warp to filling yarns in a woven fabric.” (Kadolph, S., 2007, p. 472)

Standardized from: AAT, CC, PA, TXT, VDFD

Appendix J – Continued

H

Hem

The bottom of a garment. Also includes sleeves and pants cuffs.

The edge of a piece of cloth or garment folded up and sewn down in order to enclose the cut edge so that it cannot unravel. (Ambrose, G. & Harris, P., 2007, p. 132)

Any finish at the bottom edge of a garment. (Brown, P. & Rice, J, 2013, p. 378)

Standardized from: AAT, CC, PA, VDFD

Weighted

Used when fabric is lightweight and prone to flying up or sticking to itself.

Standardized from:

Flared

A hem style which is typically much wider than the waist. Differs from A-line styles, as this is more extreme.

Standardized from:

Herringbone

“A broken twill-weave fabric created by changing the direction of the twill wale from right to left and back again.

This creates a chevron pattern of stripes that may or may not be equally prominent. Herringbone fabrics are made in a variety of weights, patterns, and fiber types.” (Kadolph, S., 2007, p. 473)

Standardized from: AAT, TXT

Hidden zipper

A zipper that is sewn in such a way that it looks as though it is within a seam and not visible from the outside.

Ex: (PA 314)

Standardized from:

Hook and bar

A fastener type which features a loop and a long straight stick-like bar. /

Standardized from:

Hook and eye

A fastener type which feature a loop and a small curved component, which latch.

“Two interlocking parts: a hook and an eye.” (Brown, P. & Rice, J, 2013, p. 316)

Standardized from: AAT, CC, PA

Horizontal dart

A dart that extends out horizontally from a seam or across a neckline.

Standardized from: CC

Horizontal placket

“Constructed in a horizontal direction, parallel to the opening; provides a low-cost opening.” (Brown, P. & Rice, J, 2013, p. 389)

Standardized from: PA

Appendix J – Continued

I

Inseam pocket

A pocket whose opening lies along a seam line.

A pouch sewn in right at the side seam. Ex: (PA 184)

Standardized from:

Inverted box pleat

Similar to a box pleat, apart from the direction the two separate pleats face.

Standardized from:

J

K

Keyhole neckline

A neckline style featuring a keyhole or circular shaped cutout at the neckline, with a button fastener at the top.

Standardized from: CC

Knee length

A garment length which ends at the knee.

Ex: (PA 179)

Standardized from: CC

L

Lace

“An openwork fabric with yarns that are twisted around each other to form complex patterns or figures.” (Kadolph, S., 2007, p. 475)

“Fabric structure resulting from twisting and knotting yarns around one another.” (Brown, P. & Rice, J, 2013, p. 251)

Standardized from: AAT, CC, PA, TXT

Lapped zipper

A zipper which is sewn like a hidden zipper, except the stitching is visible from the outside, and is not necessarily in a seam.

“Only one line of visible stitching on the outside of a garment.” (Brown, P. & Rice, J, 2013, p. 408)

Standardized from: PA

Linen

“The bast fiber produced by the flax plant.” (Kadolph, S., 2007, p. 471)

Standardized from: AAT, CC, TXT

Lapel

The part of the jacket which extends out from the center front.

“The two triangular pieces of cloth that extend from the collar of a suit jacket.” (Ambrose, G. & Harris, P., 2007, p. 150)

The two parts of a garment folded back on the chest, especially a continuation of a coat collar. (AAT)

Standardized from: AAT, CC, PA, VDFD

Appendix J – Continued

Peaked lapel

Similar to a notched lapel except this style is slanted upwards.
Standardized from: CC

Lining

The layer of fabric under an outer shell which hides seams and often creates a more comfortable skin to cloth relationship.

Near replica of the garment, constructed of lightweight fabric and sewn inside the garment with seam allowances reversed to provide a finished inside appearance. (Brown, P. & Rice, J, 2013, p. 172)

Standardized from: CC, PA

M

Maxi length

A garment which falls either at the floor or just above the floor.

Standardized from: CC

Midi length

Ex: (PA 179)

A garment length which falls slightly below knee, slightly above tea length.

Standardized from: CC, PA

N

Natural waist

A waistline which falls at the most naturally thin part of the body.

Standardized from:

Neck dart

A neck dart may be used to create a neckline which lies more flat to the body. Eliminates some fullness in the neck and chest area.

Standardized from:

Neckline

The part of a garment around the neck, usually referring to the front portion especially.

“The part of an upper body garment that circles the neck of the wearer.” (Ambrose, G. & Harris, P., 2007, p. 176)

A term to describe the structural characteristics of the neckline. (CC)

Standardized from: AAT, CC, PA

Halter

A neckline style which extends up from the bust and goes around the neck, attaching again at the bust.

Ex: (PA 180)

Standardized from: AAT, CC, PA

Appendix J – Continued

Keyhole

A neckline style featuring a keyhole or circular shaped cutout at the neckline, with a button fastener at the top.

“A tear-shaped or round cutout that fastens at the front or back neckline.” (Ambrose, G. & Harris, P., 2007, p. 176)

Ex: (PA 180)

Standardized from: CC, PA

Notched collar

When a collar and a lapel come together but have a triangular cut out shape, like the bottom of a ‘W’.

Scoop

A neckline which is characterized by the shape of a “U” around the front of the neck.

“A u-shaped neck that falls towards the bust, often showing significant cleavage.” (Ambrose & Harris, 2007, p. 176)

Ex: (PA 180)

Standardized from: AAT, CC, PA,

V-neck

Characterized by the shape of a “V” around the front of the neck.

A neckline style which appears to be v-shaped, with the point near the chest and the widest part at the neck.

“An open yoke forming a V shape in the bodice.” (Ambrose, G. & Harris, P., 2007, p. 176)

Ex: (PA 180)

Standardized from: PA

O

Outer shell

The outermost layer of a lined garment.

Standardized from:

Overlay

The outer layer of a garment, typically partially see-through.

Standardized from: AAT

Over the shoulder

A yoke which attaches to the front and back of a garment as a separate and third piece of fabric.

Standardized from:

P

Patch pocket

A pocket formed by attaching one layer of fabric to another.

“A pouch sewn on the outside of a garment.” (Brown, P. & Rice, J, 2013, p. 184)

Pencil skirt

Similar to a straight skirt except this style is slightly less wide at the hem, creating a tailored silhouette.

Standardized from:

Plain seam

“Simple superimposed seam.” (Brown, P. & Rice, J, 2013, p. 367)

Standardized from: PA

Appendix J – Continued

Plain weave

“The simplest weave structure in which two sets of yarns at right angles to each other pass alternately over and under each other to form the maximum number of interlacings.” (Kadolph, S., 2007, p. 480)

Standardized from: CC, PA, TXT

Pleat

Way of shaping fabric by pinching and sewing together a piece of fabric so that it stays folded over itself.

“A fold of doubled fabric that is secured in place.” (Ambrose, G. & Harris, P., 2007, p. 194)

“Decorative, unstitched folds or fabric that often serve as dart substitutes, creating shape and releasing fullness.” (Brown, P. & Rice, J, 2013, p. 170)

Standardized from: AAT, CC, PA, VDFD

Box pleats

“A pleat which features two separate pleats facing inwards towards one another to form a box shape.” (Ambrose, G. & Harris, P., 2007, p. 176)

“Two knife pleats folded away from one another.” (Brown, P. & Rice, J, 2013, p. 187)

Standardized from: AAT, CC, PA, VDFD

Ease pleats

“Added to linings of jackets and coats to provide adequate room for movement across the back and shoulders.” (Brown, P. & Rice, J, 2013, p. 450)

Standardized from:

Edge stitched knife pleats

Knife style pleats which lie flat due to the top of them being edge stitched.

Ex: (PA 186)

Standardized from: PA

Inverted box pleats

Similar to a box pleat, apart from the direction the two separate pleats face.

Ex: (PA 186)

Standardized from: PA

Knife pleats

Pleats which are layered on top of one another neatly, and are extremely straight and which lie flat.

“These are sharp and narrow. A series of knife pleats are normally used for gathering material in a garment.” (Ambrose, G. & Harris, P., 2007, p. 194)

Ex: (PA 186)

Standardized from: AAT

Partially sewn knife pleats

Knife pleats which are sewn on the edge but only partially down the pleat.

Ex: (PA 186)

Standardized from:

Side pleats

A pleat which is in the sides of a garment, likely pointing horizontally.

Standardized from:

Appendix J – Continued

Princess

Where two pieces of fabric, (a side panel and a center panel) are stitched together on the bodice part of a garment. The edge of the side panel is smaller than the edge of the center panel, and as the two are eased together, they create a more conforming shape for the garment.

Standardized from: CC

Q

R

Rayon

“A manufactured fiber composed of regenerated cellulose in which substituents have replaced not more than 15 percent of the hydrogens of the hydroxyl groups.” (Kadolph, S., 2007, p. 482)

Standardized from: AAT, CC, PA, TXT

Ruffles

A decorative method of shaping fabric which is achieved by making small layers of fabric in a similar way to making a flared skirt, and cutting each succeeding layer shorter.

“Hemming the long edge of a single ply of fabric to make a single-layer ruffle, or by folding a piece of fabric in half lengthwise to make a double-layer ruffle.” (Brown, P. & Rice, J., 2013, p. 188)

Standardized from: AAT, CC, PA, VDFD

S

Satin

“A strong, lustrous, medium-weight to heavyweight, filament-yarn satin-weave fabric.” (Kadolph, S., 2007, p. 483)

Standardized from: AAT, CC, PA, TXT, VDFD

Seams

The point at which two or more pieces of fabric are joined with stitching. Alternatively, the point at which fabric is joined to itself with stitching.

Standardized from: AAT, CC, PA, VDFD

Sheath

A silhouette style which is fairly straight up and down, apart from a more fitted waist.

Standardized from: CC

Sheath dress

A dress with a mostly straight silhouette apart from a more defined waist.

“A slim, straight dress without a waistline.” (Ambrose, G. & Harris, P., 2007, p. 220)

Standardized from: AAT, CC, VDFD

Shirt dress

A silhouette which features a fairly straight up and down shape and looks similar to a shirt.

Standardized from:

Shoulder pads

Pieces of foam or fabric placed at the shoulder of a garment to add shape and create a stronger look.

Sometimes used as a shaping device in tailored jackets and coats. (PA 324)

Standardized from: AAT

Side panel

A separate piece of fabric attached to a center panel, typically to form a more tailored shape.

Standardized from:

Side zipper

A zipper which is along the side, typically in the seam of a garment.

Standardized from:

Appendix J – Continued

Silhouette

The shape of a garment.

“Outline or shape of a garment.” (Brown, P. & Rice, J, 2013, p. 176)

Standardized from: AAT, CC, PA, VDFD

Silk

“A fiber produced by several varieties of caterpillars, including *Bombyx mori*, *Antheraea mylitta*, and *Antheraea pernyi*.” (Kadolph, S., 2007, p. 484)

From silkworm cocoons. (Brown, P. & Rice, J, 2013, p. 518)

Standardized from: AAT, CC, PA, TXT

Single welt pocket

A pocket style which features a strip of fabric along the top of the pocket to finish it.

“Single lip usually no more than about ½ inch wide.” (Brown, P. & Rice, J, 2013, p. 185)

Standardized from: PA

Sleeves

An arm covering which extends from the armseye or shoulder area of a garment.

“A covering for the arm that is attached at or near the armhole, or armscye, area of the garment.” (Brown, P. & Rice, J, 2013, p. 180)

Standardized from: AAT, CC, PA

Bell sleeve

A sleeve shape characterized by its bell shape near the cuff.

Standardized from: CC, PA

Cap sleeve

A sleeve style which is typically characterized by its shape, which covers just the shoulder, and typically doesn't close or attach to itself under the arm as a one piece sleeve usually does.

Ex: (PA 182)

Standardized from: CC, PA

Elbow length sleeve

A sleeve style which ends at the elbow.

Standardized from: CC

One-piece sleeve

A sleeve which simply attaches to itself in one seam under the arm to form a barrel shape.

Standardized from:

Puffed sleeve

A sleeve which features prominent volume in the shoulder area, achieved through gathers.

Ex: (PA 182)

Standardized from: CC, PA

Raglan sleeve

A sleeve style which connects the sleeve to the bodice in such a way that eliminates the shoulder seam by attaching the sleeve to the garment along a diagonal line extending from the neck to the underarm.

“Diagonal seam, which runs from the underarm to the neckline of the garment.” (Brown, P. & Rice, J, 2013, p. 181)

Standardized from: CC, PA

Set-in sleeve

A sleeve which is put into the shoulder seam using ease.

A tube hanging from the armhole (Brown, P. & Rice, J, 2013, p. 181-82)

Standardized from: PA

Appendix J – Continued

Sleeveless

A garment which does not have sleeves.

Standardized from: PA

Two- piece sleeve

A sleeve style which uses ease to bring together a larger and smaller sleeve part, creating a more tailored look.

Standardized from: PA

Snap

A closure which uses two pieces of plastic or metal, one of which squeezes shut to fit inside the other, then expands once inside, forming a locked closure.

Prevent garment openings from gaping and can be used to hold temporary garment pieces in place. (Brown, P. & Rice, J, 2013, p. 316)

Standardized from: AAT, CC, PA

Split front

“A round neck cut with a small V in the center.” (Ambrose, G. & Harris, P., 2007, p. 176)

Standardized from: VDFD

Spaghetti strap (camisole)

“A very thin shoulder strap used on garments such as camisoles, cocktail dresses, and evening gowns.” (Ambrose, G. & Harris, P., 2007, p. 224)

Ex: (**PA 178**)

Standardized from: AAT, CC, VDFD

Stitching

Different ways in which to weave and loops threads through fabric to decorate or attach fabrics together.

Refers to portions of thread left in fabric or another material by the in and out movement of a threaded needle through the thickness or surface of the material. (**AAT**)

“Stitching applied to finish an edge or for ornamental purposes; does not join fabric pieces together as do seams.” (Brown, P. & Rice, J, 2013, p. 559)

Standardized from: AAT, PA, VDFD

Topstitch

“A decorative row of stitching close to the garment seam or edge on the outer side of the fabric to create a strong seam.” (Ambrose, G. & Harris, P., 2007, p. 225)

“Visible, decorative stitching done on the outside of a garment.” Brown, P. & Rice, J, 2013, p. 401-2)

Standardized from: PA, VDFD

Blanket stitch

A stitch used around the edges of a piece of fabric to finish it characterized by its crisscross shape.

Buttonhole stitches worked on the edge of a blanket or other material too thick to be hemmed. (**AAT**)

Standardized from: AAT

Blind stitch

“Joins layers of fabric without the needle thread fully penetrating the top layer, and it should be imperceptible, or nearly so, from the outside of the garment.” (Brown, P. & Rice, J, 2013, p. 341)

Standardized from: PA

Appendix J – Continued

Chain stitch

“Made using only a needle thread with no underthread.” Brown, P. & Rice, J, 2013, p. 340)

Connecting loop stitches that form links, as in a chain. (AAT)

Standardized from: AAT, PA

Lockstitch

“Composed of a needle thread interlocked with a bobbin thread.” Brown, P. & Rice, J, 2013, p. 342)

Standardized from: PA

Safety

“Combine a row of overedge stitches with arrow of straight lockstitches or chain stitches.” Brown, P. & Rice, J, 2013, p. 349)

Standardized from: PA

Straight lengthwise

Runs parallel to the selvage. Brown, P. & Rice, J, 2013, p. 140-1)

Standardized from: PA

Straight skirt

A skirt silhouette which stays the same width and shape from waist to hem.

“Do not conform to the natural curves of the body.” Brown, P. & Rice, J, 2013, p. 447)

Standardized from:

Straight waistband

A waistband attached to a skirt or pair of pants which does not curve with the shape of the waist or hips.

“Do not conform to the natural curves of the body.” Brown, P. & Rice, J, 2013, p. 447)

Standardized from: PA

Strapless

A bodice style which does not have sleeves or straps attached.

Standardized from: CC

T

Taffeta

“A general term that refers to any plain-weave filament-yarn fabric with a fine, smooth, crisp hand.” (Kadolph, S., 2007, p. 486)

Standardized from: AAT, CC

Tea length

A skirt length which hits somewhere around mid-calf.

Ex: (PA 179)

Standardized from: PA, VDFD

Thread buttonhole

A buttonhole finish which features threads which finish the raw edges of the buttonhole.

Ex: (PA 459)

Standardized from: PA

Twill weave

“A weave in which each warp or filling yarn floats across two or more filling or warp yarns with a progression of interlacings by one to the right or to the left, forming a distinct wale.” (Kadolph, S., 2007, p. 488)

Standardized from: AAT, CC, PA, TXT

Appendix J – Continued

U

Underskirt

The underneath layer(s) of a skirt. Different from a lining, as an underskirt is typically at least partially visible through the outer skirt.

Standardized from: AAT

V

W

Welt pocket

A slit allows access to a pouch in the lining; single lip usually no more than about ½ inch wide.

(PA 184)

Standardized from:

Waist

The thinnest part of a shirt, dress, or jacket, or the top of a skirt or pair of pants.

Standardized from: AAT, CC, PA

Waist treatment

The way in which a waist is finished or defined.

Standardized from:

Waist peplum

A short, flared piece extending outward from the natural waist.

Standardized from:

Waist seam

A seam which connects the bodice of a garment with the skirt of a garment.

Standardized from:

Waist length

A garment which ends at the waist.

Standardized from:

Wool

“Refers to fiber from various animals including sheep, Angora and cashmere goats, camel, alpaca, and llama.”

(Kadolph, S., 2007, p. 490)

Standardized from: AAT, CC, PA, TXT, VDFD

X

Y

Yoke

A shaping method which brings a larger and smaller piece of fabric together using ease, pleats, or gathers.

“Horizontal divisions with a garment; they are usually small, flat panels of fabric at the shoulder, waist, or midriff.”

(Brown, P. & Rice, J, 2013, p. 167)

Standardized from: AAT, CC, PA, VDFD

Z

Zipper front

A closure which features a zipper in the front of a garment, such as a jacket or pants.

Standardized from:

Appendix J – Continued

Sources for the standardized words

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AAT = The Getty Research Institute. (2017). *Getty Art and Architecture Thesaurus (AAT)*. Retrieved from <http://www.getty.edu/research/tools/vocabularies/aat/>

CC = Kirkland, A. (2016). *Costume Core Controlled Vocabularies*. Retrieved from <http://www.ardenkirkland.com/costumecore/wp-content/uploads/2016/05/Costume-Core-Controlled-Vocabularies-4th-draft-May-2016.pdf>

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