EXPLORING THE CONCEPT OF A “LEGACY” COLLECTION:
A STUDY ON GERMAN WWI PAPER TEXTILES AT THE NATIONAL MUSEUM
OF AMERICAN HISTORY

Kathleen E. King
The George Washington University
Submitted as Fulfillment of the Museum Studies Program Writing Requirement

Originally Submitted for MSTD 6502: Directed Research
Spring 2016
Introduction

What happens when objects in a museum’s collections cease to fulfill the museum’s mission statement? Should they be deaccessioned or discarded, or might they still find a place of value and significance within their current museum? Through work and research at the Smithsonian National Museum of American History (NMAH), such a dilemma has become apparent. This museum has in its possession a multitude of collection objects that are carryovers from the institution’s earlier days in its iterations as the United States National Museum (established in 1858) and as the National Museum of History and Technology (established in 1957). But now, as the National Museum of American History (established in 1980), one must call into question the value of keeping objects that no longer support the most current mission statement, or if objects accessioned into the collection ever did.

This paper does not aim to firmly answer such a tough question, as a multitude of factors and stakeholders are involved with such a decision, but rather the purpose is to bring this matter to the fore of collections management issues, to explore best practices, and to examine if such best practices are being readily followed.

---

The following pages will discuss a group of surplus German military objects from the First World War, which were accessioned into the museum in 1923. Their materiality, history, manufacturing process, and significance will be explored in an effort to build context around the objects in order to question their occupancy within NMAH. These objects are currently housed in the work and industry collection of the museum, and it could be argued that they demonstrate a rather unique manufacturing process and product that would fit quite nicely within this particular collection. But the fact that they are German-made and have never been used in an American context complicates such reasoning. What information may be gleaned from keeping these objects, or is there another institution out there for which these objects would be better suited?

Description of German Paper Textiles

General History

These objects are especially unique from a materiality standpoint as they provide tangible examples of textile objects that were made from woven paper, and from an economic standpoint as it demonstrates human ingenuity in extreme wartime situations. Germany by no means was the first to manufacture textiles from paper, although Emil Claviez, a German inventor in the late 19\textsuperscript{th} and early 20\textsuperscript{th} century, patented machinery designs and processes for such products.\textsuperscript{3,4} But even before the start of the 20\textsuperscript{th} century, paper textiles were being introduced to Europe, the first documented instance being the


World Exhibition in Vienna in 1873 in which Japanese paper textiles were showcased, perhaps sparking a novel interest in the Western world’s minds.⁵

Paper-based textiles have been around for centuries in various countries, most recognizably in Japan⁶ and China, but there were also endeavors made in the United States, the United Kingdom, and Scandinavian countries well before Germany’s efforts.⁷,⁸,⁹,¹⁰ Before the First World War, Germany recognized the ingenuity of paper textiles, but like their foes during and after the war, the country did not look upon them as a necessity since cotton, jute, wool, and linen were still in ready supply via international imports.¹¹ It was only during the war that paper textiles became a necessity, and German scientists and inventors were employed to quickly find supplementary materials to replace those that had been blocked by foreign trade embargoes, lest their army be extremely ill-equipped for combat, not to mention the civilian population.¹²,¹³,¹⁴

After the war, the rest of the Western world became fascinated by the Central Powers’ use of paper textiles for the war effort, and Germany delivered. In Germany, the

---

⁶ Ibid.
⁷ “A Textile Substitute,” The Board of Trade Journal 100, no. 1107 (February 14, 1918): 180.
⁹ West, “Reading List on Paper Yarns and Textiles,” 42.
Third German Fiber Exposition—held in Leipzig in August 1918—showcased the newly defined “substitute fiber” industry, and was met with great acclaim. In the United States, there was even a traveling exhibit of such paper-based products organized by the Office of the Bureau of Foreign and Domestic Commerce at the Custom House in New York City in January 1919, showing the extent to which paper was used as a substitute for various textiles in Europe during the war. The objects included in this exhibit may comprise at least some the subjects of this paper.

The German Economy and the Industrialization of Paper Textiles

Despite being cut off from imported sources for its textile industry, Germany actually preserved its economy to a certain extent by repurposing textile factories to work with paper yarns. By keeping such factories open, thousands of civilians were able to continue working throughout the war and produced staggering amounts of paper textiles for the war effort. This was the first time in history that paper textiles had been manufactured on an industrial scale, emerging from great necessity and inspired


inventiveness. Others followed in Claviez’s footsteps, producing and improving new ways of paper yarn manufacturing, thus creating an industrial “machine” for the war effort, but instead of weaponry it took the form of textiles.

Materiality

The paper textile objects found in this collection have previously been identified, although not confirmed, to be a product called Zylolin (spelled “Xylolin” in some sources: see West 1921, 42; Leitner 2007, 59). This is the patented product invented by Emil Claviez in the late 19th century. Zylolin, to put it simply, is the product of a patented system of chemically processing paper strips to form yarn with which machinery could then weave together to form fabric for textiles.23 Wood pulp, cotton rags, and miscellaneous fiber waste could be used in this process.24 “Kraft” paper, pulped from Canadian spruce or pine trees,25 is cited as being the superior choice from which the paper yarn is spun, as the resulting yarn was shown to be 20-25% stronger than those produced by the aforementioned products.26

Combing through various resources from the time period, it would appear that Zylolin was considered somewhat of a miracle product in the early 1900s. It is described as being tough but not hard, elastic, lightweight, moderately moisture proof, washable, bleachable, dye fast, and was considered an acceptably cheaper alternative to cotton, jute,

26 Ibid.
wool, and linen-based textiles.\textsuperscript{27,28,29,30} The quality of such paper yarn was considered to be the equivalent of jute, but at a fraction of the cost, especially because wood pulp could be locally sourced in Germany, as opposed to importing jute from India.\textsuperscript{31}

**Manufacturing Processes**

The manufacturing process consisted of placing sheets of paper into a machine, which then cut the sheets into thin strips—anywhere from three to eight millimeters wide (although three millimeters was most desirable)—then moistened and twisted in order to form paper yarn or thread.\textsuperscript{32,33,34} Depending on what company was processing these yarns, the chemical treatment process of the paper and paper strips would differ, as Claviez’s Zylolin was not the only patented product on the market.\textsuperscript{35} The paper yarn could then be placed on existing textile looms and woven as such with minimal adjustments needed.\textsuperscript{36} Zylolin was considered a valid mimic of woolens, linens, and

\begin{itemize}
\item \textsuperscript{27} Bauskett, “Making Cloth from Paper,” 688-89.
\item \textsuperscript{28} “Making Paper Into Cloth,” *The World’s Paper Trade Review* 47, no. 23 (June 7, 1907): 44-45.
\item \textsuperscript{29} James Cooke Mills, “Paper,” in *Searchlights on Some American Industries* (Chicago: A.C. McClurg & Company, 1911), 129-30.
\item \textsuperscript{30} “Clothes From Wood,” *Star*, December 30, 1907, Evening edition, sec. 2.
\item \textsuperscript{31} Winchell, Jr., ed., “Preparation of Textile Thread from Wood,” 28.
\item \textsuperscript{32} Ibid.
\item \textsuperscript{33} Ibid.
\item \textsuperscript{34} Christina Leitner, “Industrially-Produced Paper Yarn,” in *Paper Textiles* (2\textsuperscript{nd} ed), (London: A&C Black, 2007), 59.
\item \textsuperscript{35} Talbot, “Paper: The Textile of the Future,” 32. It should be emphasized that Zylolin was not the only paper-yarn being developed and used. Other similar paper-based yarns were developed in Germany (and other parts of Europe, U.K., and U.S.), most notably Textileose, Textilit, and Textilon. Patents for such were obtained by Carl Kellner and Gustav Türk in 1892, and Rudolf Kron (also spelled “Krohn” or “Crone”) in 1901, among others (West 1921, 42; Durgin 1919, 580).
\item \textsuperscript{36} “Clothes From Wood,” sec. 2.
\end{itemize}
cotton-based fabrics, at least before the war.\textsuperscript{37} International opinion would change over the following decades, as will be discussed later.

**Uses and Experimentation**

For Germany, the prospect of substituting paper for textile manufacturing seemed to be a cure-all for the impending shortage of clothing and supplies for both military and civilian needs. Textile manufacturing plants were repurposed and new innovations in paper processing were developed with great haste to support the country.\textsuperscript{38} Unfortunately, there was a hierarchy in this process, meaning that the military received paper-based clothing and supplies first and the civilian population received nearly nothing.\textsuperscript{39,40} Nevertheless, the uses for such products seemed endless both in Germany and abroad. Experimentation took place before, during, and after the war. Some of the successes among the researched uses included: undergarments, bags and sacks, a leather substitute, horse harnesses, ropes, canvas, truck tents and curtains, uniforms, shoes, blankets, and belting.\textsuperscript{41,42,43,44,45,46} Paper undergarments and clothing were particularly interesting as they were shown to have 10\% greater protection against coldness than their

\begin{itemize}
  \item \textsuperscript{37} “Clothes From Wood,” sec. 2.
  \item \textsuperscript{38} Neumann, “Status of German Fibre [sic] Substitutes,” 25.
  \item \textsuperscript{39} Research Division, Bureau of Foreign and Domestic Commerce, “German Textile Substitutes,” 366.
  \item \textsuperscript{40} A.G. Durgin, “War Uses of Pulp and Paper,” *Pulp and Paper Magazine of Canada*, June 19, 1919, 579.
  \item \textsuperscript{41} Mills, “Paper,” in *Searchlights on Some American Industries* 128-29.
  \item \textsuperscript{42} Durgin, “War Uses of Pulp and Paper,” 579.
  \item \textsuperscript{43} Matthews, ed., “Paper Textiles in Europe,” 88.
  \item \textsuperscript{44} Neumann, “Status of German Fibre [sic] Substitutes,” 25.
  \item \textsuperscript{45} “Paper Yarns: Their Manufacture…,” 118.
  \item \textsuperscript{46} Stephenson, “An Exhibit of the War Uses of Pulp and Paper,” 504.
\end{itemize}
standard equipment counterparts, as determined by the Bureau of Standards in the United States.47

**International Opinion**

The development of the paper textile industry was no doubt a triumphant solution to a wartime problem, primarily for Germany and the Central Powers. But research into its uses for the Allied countries—both during and post-war—were deemed not worth the effort and expenditures. It is interesting to compare and contrast attitudes toward the burgeoning paper textile industry.

The pre-war mentality considered paper textiles to be a novel, fascinating product to the entire world. Excitement over the possibilities flourished, and they were considered a worthy competitor to conventional textile materials. During the war, paper textiles became a necessity to the Central Power countries, but to the rest of the world it remained an interesting although unnecessary and arguably inferior foray. After the war, former Allied countries reexamined the prospect of using paper textiles after seeing what Germany did, but professional and public opinion squashed the idea of widespread paper textile manufacturing.

**The Collection at NMAH**

**Museum Accession Information**

Now that the context has been set for these objects, it would be useful to explain specifically what this collection includes. According to the accession file, 60 paper-based

objects were brought into the museum in 1923, and are documented as being part of the aforementioned exhibit of German military paper textile objects that toured the United States in 1919\(^{48}\) (see the Appendix for images of some of the objects). They were salvaged, unused samplings gathered by the American Expeditionary Forces and deposited at Fort Myer in Virginia.\(^{49}\) They include: German army ammunition pockets, trench shovel carriers, hatchet carriers, bridle and driving reins, webbing for horse blanket girths, saddle cloths, truck covers, saddle bags, nose bags, and shelter tent ropes, among other items.

In a memorandum to William deC. Ravenel (Administrative Assistant, United States National Museum from 1902 to 1918; Administrative Assistant to the Secretary in Charge, United States National Museum from 1918 to 1925\(^{50}\)) from the then-Curator in the Division of Textiles at the museum, F.L. Lewton justifies the acquisition of such objects as follows: “Believing that two or three specimens of each of the articles which were not too large in size would be of value to the industrial collections as showing the uses of paper in emergency…laid aside in a special pile and marked for the National Museum.”\(^{51}\) From these few words, one can see the reasoning behind the acquisition and probably agree with it when thinking with the mindset of a national museum in the early 1920s, in a world recovering from war. The idea of the museum acquiring a war-related collection was documented in other correspondence to and from Ravenel as early as

---

\(^{48}\) F.L. Lewton, memorandum to William deC. Ravenel, May 10, 1923.

\(^{49}\) Ibid.


\(^{51}\) Lewton.
These museum representatives were right in asserting that such objects would be a unique addition to a museum collection in order to study both their materiality as well as their societal impact.

But one must remember that Germany was not the only country manufacturing paper textiles: they were simply one of the few countries that used them out of necessity, capitalizing on the German peoples resourcefulness. The U.S. made several endeavors into the paper textile manufacturing world—and well before the war—namely rugs, mats, sacks, and bags.

Should U.S.-made examples of such objects be sought out instead? Is there even a need or desire from a research standpoint for these objects to remain where they are? It is important to note that these objects have been transferred among the different collections within the museum: starting in the military collection, then transferred to the textiles collection, and ultimately ending up in the work and industry collection. Why the transfers? Because the other departments had no use for these objects or they did not fit within their individual collection scopes. This of course begs the question: do these objects fit within the work and industry’s collections scope?

**Preservation Concerns**

Accepting the fact that, for now, these objects are at NMAH, it is important to explore not only their intellectual value but also their physical care and needs. Paper in

---

52 Theodore T. Belote, memorandum to William deC. Ravenel, June 5, 1918, Record Unit 192, Box 194, Folder 2, World War 1914-1918, Smithsonian Institution Archives.

53 William deC. Ravenel, memorandum to Mr. Henderson, October 19, 1918, Record Unit 192, Box 194, Folder 2, World War 1914-1918, Smithsonian Institution Archives.
any form from the late 19th to early 20th century is guaranteed to be highly acidic due to the deterioration of lignin, a naturally occurring substance in wood. Especially when using wood pulp, such as the aforementioned Kraft paper, the material becomes acidic during its processing.54 High acid content in a particular object can not only render itself weak and brittle, but can also have deleterious effects on objects stored in the same space. The paper textile objects in this particular collection are all housed in the same cabinet, although there are both metal and leather aspects of many of the objects, both of which can be adversely affected by a low pH environment. It is currently not known with certainty if the paper textiles are actively exhibiting high acidity levels, although the metal grommets on the truck covers are showing iron corrosion (see Figure 4 in the Appendix for an image), which is caused by exposure to an acidic environment. It would be useful to test the cabinet environment using pH indicator strips to establish if there is a possible issue.

Light is also a major conservation concern, as it can cause further deterioration of acidic paper objects when exposed for even a short amount of time. Right now, the only covering these objects have are the drawers they are in: anytime one is open to take an object out, all other objects in the same drawer are being unnecessarily exposed to a light source.

Relative humidity and temperature must also be closely monitored. It is recommended that each object receive not only extra support in rehousing but also a

54 National Park Service, “How to Preserve Acidic Wood Pulp Paper,” Conserve O Gram 19, no. 24 (June 2001). This resource gives general details on the chemical processing of wood pulp to turn it into paper, not unlike the processes used in the late 19th to early 20th centuries in Europe for the development of paper textiles. Although it is written in the context of conserving paper documents, details regarding conservation concerns for wood pulp-based objects are applicable to the discussion of paper textiles.
covering, either in the form of a box or sturdy Tyvek, which can block out light as well as moisture.

Beyond ambient environmental concerns, there is also the need for rearranging some of the objects, most notably the truck covers, which are currently folded up and set in a drawer with no further protection. A plausible solution to these would be to treat them like textiles: roll them on an archival tube lined with acid-free tissue or muslin, covered with Tyvek, and set within the drawer with brackets on either side to suspend the tube. Or, if space does not allow for this and the truck covers must remain folded, it would be beneficial to place them in an archival box with a lid and folded with padding throughout in order to avoid harsh fold lines.

A major reason people donate objects to museums is that they trust that they will be taken care of in a better way for posterity; museums are to be good stewards of such objects. Museums must remember this when considering accessions as well: do they have the time, manpower, and resources to properly take care of these objects? It is extremely important to consider conservation aspects when bringing new objects into a collection and when considering deaccessioning: not being able to physically care for an object is an acceptable reason for deaccessioning.

The Idea of a “Legacy” Collection

Returning to questions posed in the introduction, it is assumed that these same questions have been asked within NMAH over the years; not only about the paper textiles discussed above, but regarding an abundance of other objects that have come into the museum over the last century and a half, arguably with little regard to the adherence to
institutional mission, collections scope, or management best practices. This is not an isolated instance: perhaps most museums around the world struggle to deal with objects in their collections that just do not quite fit in. In an attempt to answer these questions, NMAH has unofficially proposed the idea of a “legacy” collection. What this means is that various objects acquired by the museum throughout all of its metamorphoses may be kept, as it provides a tangible legacy of the museum’s collecting activities throughout its lifetime. This may sound like a nice, nostalgic idea, but in actuality it may be argued that accessibility becomes limited and collections management best practices are being ignored in at least two ways:

1. Objects that do not fit within the mission of a museum may never see the light of an exhibition. Such objects will remain in storage and will only be accessible to researchers who think to search the collections of an unlikely institution.

2. Pairing this scenario with the very real lack of funding for collections care and management in the museum field, this presents an undue burden on those few that do hold collections-related positions. This also affects curatorial staff, as they may be inheriting a collection that is muddled with inconsistent objects, but there is no time to be discerning of such or perform research.

Is this just a way to avoid the deaccessioning process? If so, why is deaccessioning so frequently avoided? In general, it is a healthy habit to which museums find difficult to commit: it reduces financial and time-related stress on collections, conservation, and curatorial staff, it makes room for new accessions that will carry out the museum’s
mission, and it allows more befitting institutions to care for these objects, increasing their accessibility and interpretation potential.

Legacies are born out of documented stories and actions. What NMAH has here—as is the case with other museums in similar situations—are intellectually (and in some cases physically) neglected objects, hardly what one would call legacies.

Conclusion

The best way to support a museum’s mission is through its collecting activities. These German military paper textiles are undoubtedly significant to world and military history, material science, and industrial history; they are truly a testament to humankind’s resourcefulness in the face of adversity and deserve to be accessible and researchable. But is NMAH the best place to house them given their historicity? How do these objects support the mission statement, collecting scope, and legacy of the museum?

The legacy of this museum lies within its documentation: collection accession and deaccession information, administrative records, exhibition plans, publications, and educational programming history. Conveniently for NMAH, these types of materials are already housed within the Smithsonian Archives.

Museums need to become more comfortable with deaccessioning objects that do not fit into their missions and collecting scopes, thereby easing some of the burden on collections and curatorial staff, and making room for new, relevant accessions. In most cases, deaccessioning does not equal destruction: deaccessioned objects simply find a more appropriate home where they can more readily be accessed, researched, and
exhibited. The cornerstone of any museum is its mission statement; not following it will lead to unfocused collecting, curating, interpretation, and management, which would be a great disservice to the public.
“A Textile Substitute.” The Board of Trade Journal 100, no. 1107 (February 14, 1918): 180.


Belote, Theodore T. Memorandum to William deC. Ravenel. June 5, 1918. Record Unit 192, Box 194, Folder 2, World War 1914-1918, Smithsonian Institution Archives.


Ravenel, William deC. Memorandum to Mr. Henderson. October 19, 1918. Record Unit 192, Box 194, Folder 2, World War 1914-1918, Smithsonian Institution Archives.


SUGGESTED READINGS

Paper Textile History


Processing and Manufacturing of Paper Textiles


World War I and Paper Textiles


“Germany’s Washable Modern Clothes.” *Literary Digest* 58 (1919): 135.


APPENDIX: OBJECT IMAGES

Figure 1: German Army shelter tent ropes woven from paper yarn. (Image taken by author.)

Figure 2: German Army hatchet carriers made from woven paper yarn and leather straps. (Image taken by author.)
Figure 3: German Army truck curtain/cover made from woven paper yarn, partially unfolded. (Image taken by author.)

Figure 4: Detail of German Army truck curtain/cover grommet exhibiting iron corrosion. (Image taken by author.)
**Figure 4:** German Army sacks/bags made from woven paper yarn and leather. (Image taken by author.)

**Figure 6:** German Army trench shovel carriers made from woven paper yarn and leather. (Image taken by author.)
Figure 7: Detail of a loose paper textile fiber found on one of the Germany Army truck covers. (Image taken by author).