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Whose Artifacts? Whose Stories? Public History and Representation of Women at the Canada Science and Technology Museum^{2a}

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Abstract: *Whose Artifacts? Whose Stories?* explores uses of public history to tell stories of women's relationship with science and technology at the Canada Science and Technology Museum, one of Canada's national museum. The article examines how stories of women, which have been long overlooked by curators who in the past considered technological artifacts through the lenses of type collecting and history of science and technologies methodologies, are now being framed in the context of public history and hence are coming to the forefront of museum collecting and interpretation.

Keywords: *Thesaurus: museum collections; exhibitions. Author keyword: gender and museums; women and technology; public history.*

¿De quién son los objetos? ¿De quién son las historias? La historia pública y la representación de la mujer en el Museo de Ciencia y Tecnología de Canadá

Resumen: *¿De quién son los objetos? ¿De quién son las historias?* explora el uso de la historia pública para narrar historias de la relación de la mujer con la ciencia y la tecnología en uno de los museos nacionales de Canadá. Este artículo analiza cómo las historias de las mujeres fueron ignoradas por los curadores de museos, quienes en el pasado categorizaron dispositivos tecnológicos con criterios como tipo de colección, historia de la ciencia y metodologías de la tecnología. El artículo se centra en cómo ahora estos mismos objetos se enmarcan en el contexto de la historia pública y por lo tanto se ubican a la vanguardia de la colección e interpretación en museos.

Palabras clave: *Palabras clave autor: colecciones de museo, género y museos, mujer y tecnología, exposición de museo, historia pública.*

Os artefatos de quem? As histórias de quem? A História Pública e a representação das mulheres no Museu de Ciência e Tecnologia do Canadá

Resumo: *Os artefatos de quem? As histórias de quem?* explora os usos da história pública para contar as histórias da relação das mulheres com a ciência e a tecnologia no Museu de Ciência e Tecnologia do Canadá,

^{2a} The article is a result of in-house curatorial research (not a major research project), conducted with no special funding.

um dos museus nacionais do Canadá. O artigo examina como as histórias de mulheres, as quais têm sido por muito tempo desconsideradas por curadores que no passado avaliavam os artefatos tecnológicos através das lentes das metodologias de coleção de tipo e história da ciência e tecnologia, agora estão sendo enquadradas no contexto de história pública e, portanto, estão na vanguarda de coleções de museus e interpretação.

Palavras-chave: *Palavras-chave do autor: coleções de museus, exposições, gênero e museus, história pública, mulheres e tecnologia.*

Introduction

For over a decade, the curators at the Canada Science and Technology Museum (CSTM), Canada's national museum located in the capital city of Ottawa (Ontario), adopted the practice of public history—the history conducted with the participation of the public and to the advantage of the public—to better meet the institution's mandate and achieve the goals and values set forth in their Collection Development Strategy.¹ This article, divided into two sections, looks at uses of public history methodologies at the CSTM. It first explores the evolution of the Museum towards the practice of public history. It then looks at examples of the positive impact that these methodologies have had on collecting and telling women's history at a national science and technology museum. In doing so, this paper seeks to share the Museum's experiences and contribute to the fruitful discourse surrounding public history and feminist museology.

1. Towards Public History at the Canada Science and Technology Museum

The Canada Science and Technology Museum (CSTM) is one of Canada's nine national museums. It was created by Canadian Parliament in 1967 as part of the National Museums of Canada Corporation. In 1990, the National Museums Corporation was dissolved, and CSTM became a state-owned but self-governing corporation, mandated to preserve Canadian scientific and technological heritage, with the federal government being its largest stakeholder and funder.² The Museum collects and conducts historical research in areas of astronomy, communications, domestic technologies, energy, graphic arts, industrial technologies, medicine, mining and metallurgy, physical sciences and transportation. The earliest preserved technologies date to the 12th century, while most artifacts are from the 19th and the early 20th century. The Museum also collects new technologies to preserve current scientific and technological developments for future researchers.

Although eight curators all bring their own methodologies ranging from communication and technology and society theories, to mobility studies, and gender and accessibility models, the Canada Science and Technology Museum is a public institution at heart. One of our core values is the belief that the Museum has broad social impacts on audiences that visit our institution in

1 Canada Science and Technology Museum Corporation, *Collection Development Strategy* (Ottawa, ON: Canada Science and Technology Museum Corporation, 2006). The *Strategy* is a guiding document that sets the collection acquisition and research activities at the Canada Science and Technology Museum Corporation—the corporate body which overlooks the Canada Science and Technology Museum. The *Strategy* also defines thematic approaches to all products including physical exhibitions and digital offerings of the Museum Corporation.

2 *Museums Act, Statutes of Canada (1990, c.3 13-14)* (Canada: Minister of Justice, 2014). Available from Canada. Department of Justice Law <<http://laws-lois.justice.gc.ca/eng/acts/M-13.4/>>.

person and online. Our ultimate goal, set out in the Museum's mandate, is to increase the level of historical, scientific and technological literacy among Canadian society at large.³ Our historical enquiries go beyond the model adopted by traditional academic historians. Although, similar to academics within the university, we ask important questions, study the context around these questions, and formulate an answer based on historical evidence. Working within the framework of public history, we extend this model to place the public's engagement at the forefront of the process of inquiry. Therefore, we ask historically relevant questions in a socially relevant manner. A museum curator formulates an inquiry, evaluates the level of public understanding of the issue, assesses how the public benefits from this research, and finally decides how to best disseminate the results of the research to engage and inform defined audiences. In a museum setting, this process is central: from an acquisition of an artifact, through the collection-based research and visitor evaluation studies; to the final museum products such as exhibitions, educational programming, special events and digital content.⁴

Public history methodologies, applied at CSTM, create a dynamic junction between history (both material objects and the past), society and individuals working in museums. For example, an artifact acquired by a museum is assessed in terms of historical significance —if it is representative of the broader socioculture context that created and used it— and also in terms of individual and personal provenance —how it speaks to the story of the person who donated the object to the Museum. The acquisition file, which is paired with the artifact, is created as an active collaboration between the curator and the donor. The donor, be it an individual or an institution, is given their own voice alongside that of the curator. As the number of these voices grow with each artifact acquisition, the perceptions, values and opinions of the society at large become a dynamic, vocal expression in the historical interpretation of an artifact. We recognize that amassing stories of people who interacted with an artifact before it became accessioned into the national collection is a crucial element in museum research, without which we could not adequately represent the history of Canada's scientific and technological past.

However, the approach of recognizing, valuing, and representing the diversity of Canada's population in and through our collection has not always been the case at CSTM. Established in 1967 to house the national collection of technologies related to all fields of science and engineering in Canada, the Museum was "born" during a period of grand narratives and framed its collection areas within a fairly traditional understanding of technology. During the first twenty years of the operations, predominately male curators at the Museum, trained as scientists, engineers and technicians, who enjoyed long commercial or academic careers before joining the institution, focused on "type collecting." The curators assembled a collection of technologies that represented different *types* of engines, rolling stock, industrial machinery, agricultural implements, and so on, produced and used in Canada. They researched the function of the machinery, how they worked internally, and the transformation of mechanisms and gears that lead to new and improved technologies. The cultural

3 Since 1990, CSTM went through several rebrandings, re-visionings, and name changes, in *Museums Act*. However its official mandate, set by the Museums Act, has remained unchanged.

4 For more on the evolving role of a museum curator see Natasha Hoare, *et al.*, *The New Curator* (London: Laurence King Publishing Ltd., 2016); Timothy A.M. Ewin and Joanne V. Ewin, "In Defence of the Curator: Maximising Museum Impact." *Museum Management and Curatorship* 31, n. ° 4 (2016): 322-330, <https://doi.org/10.1080/09647775.2015.1060865>; and Elise Coralie Edwards, "The Future of Curators." *Papers from the Institute of Archaeology* 18, S1 (2007): 98-114.

issues and the complex role that science and technology plays in societies were largely unnoticed. In the late 1980s, a new group of curators and historians, brought with them new methodologies. Applying the actor-network approach, Social Construction of Technology (SCOT) practises and consumption-junction methods, they refocused the collection on provenance research.⁵

As they acquired artifacts, the new generation of curators and historians asked questions such as: who manufactured and used the technologies, and what do these technological artifacts tell us about the transformation of the Canadian society? This provenance research, based on an understanding of material culture that highlighted the social context of scientific enquiries and technological endeavour, invited first attempts at social engagement at CSTM. Although still retaining a strong control over content, curators and historians began to work with inventors, innovators, scientists and manufacturers of technological artifacts to understand processes behind the making of these technologies. During the late 1980s and in the 1990s, the theme of *People, Science, and Technology*, was identified as one of leading research subjects. At this time, researchers also turned their attention the user.⁶ We asked who used the collected technologies and what evidence did the users imbedded over time in these artifacts? The questions asked and methodologies employed in conducting provenance research formed a solid base to understand the importance of engaging the public in historical inquiry and facilitated the shift towards public history at CSTM.

The public history approach, which emerged in North America in the 1970s, focuses on two key elements: relevance and application.⁷ Public history stresses the relevance of historical research to the real-world issues. The practice is inclusive of communities and audiences and is directed outwards: from the research institution, such as a museum, into the communities, to engage with audiences. Public history is applied history; it is history put to work in society through a broad range of deliverables from professional publications, to museum exhibitions, to social events, and virtual products. The field links the intellectual qualities of academic history with the activism of community-based work, both of which are highly valued in Canadian society. It brings together academic interests of a historian, and self-directed interests of his\her subjects and audiences.

Public history values allow the CSTM research staff to adopt an eclectic approach to the history of science and technology. In this approach, the traditional historical research and artifact material culture studies are complemented with visitor and audience evaluations, inclusive research and feminist methodologies. Because of its outwards focus, public history methodologies enable us not only to better understand the goals of our work, but also the results of our work, the actual impact that the historical inquires which we conduct have on communities and on the society. Rather than asking how a technology works and how it transforms Canadian society, today we

5 See Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford: Oxford University Press, 2005); Wiebe E. Bijker, Thomas P. Hughes, Trevor Pinch, eds., *The Social Constructions of Technological Systems* (Cambridge: MIT Press, 1987); Ruth Schwartz Cowan, "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology," in Wiebe E. Bijker, et al. *The Social Constructions of Technological Systems* (Cambridge: MIT Press, 1993), 253-272.

6 For user-oriented focus, see Henry Glassie, *Material Culture* (Bloomington: Indiana University Press, 1999). See also the journal *Material History Review* (Ottawa: National Museum of Science and Technology, 1991-2005).

7 The term "public history" was first introduced by Robert Kelley in "Public History: Its Origins, Nature, and Prospects," published in *The Public Historian* 1, n. ° 1 (1978): 16-28, <https://doi.org/10.2307/3377666>. The *Public Historian*, co-owned by the University of California Press and the National Council on Public History, remains the most influential magazine in the field.

ask socially significant questions. Whose artifacts are we collecting for the national collection, and whose artifacts are not being preserved? Whose stories are we telling in our exhibitions, and whose stories are we omitting? To whom are we telling history, and who does not have access to our work? Who benefits from the knowledge and interpretations that we create, and more importantly, who is excluded from these benefits? Is the history we produce relevant to the public?

2. Towards Women's History at the Canada Science and Technology Museum

In applying public history methodologies to thinking through the questions that had been framed by our predecessors, we have identified important gaps and silences in the collection, in our research plans, and in products of the CSTM. One such omission was the representation of the contributions that Canadian women have made to the development and growth of science and technology in this country. Applying public history methodologies to evaluate our collection, research and exhibition priorities, we discovered that although women were and are significant contributors to Canada's scientific and technological past and present, as well as important audiences for our products—in fact the majority of adult visitors to CSTM are women—their material histories and oral stories were almost nonexistent in our collection, and our interpretation of women was appallingly stereotypical (See Figure 1).⁸ How was it possible that in the previous four decades the Museum had not realized such a paucity of stories related to Canadian women? Or failed to recognize the central role that women have had in the development and use of technology, both now and in the past?

2.1. Identifying Donation Patterns

An analysis of the scope of the national collection and artifact acquisition patterns offered the first glimpse at the extent of the problem, and a potential explanation of why such an obvious area of inquiry and interpretation had been overlooked. The vast majority, over 90%, of artifacts in the collection of the Canada Science and Technology Museum comes through donation. Many of these donations are initiated by a potential donor, either a private individual or a representative of an institution, who approaches the Collection and Research staff with an offer. Curators and historians assess the donation and decide to accept or reject the offered objects. The accepted objects and their histories collected during the acquisition process constitute an important base of research conducted at the museum; one which is used to tell the stories of the relationships Canadians have and have had with science and technology. We start the research process by reviewing the collection,

8 There is very little written on women and science and technology museums. Most of the findings described in this article are based on original research and analysis undertaken by female staff of the CSTM. Dr. Gabrielle Trépanier, Audit and Evaluation Officer, conducted visitor research to understand statistical distribution of genders among visitors to CSTM. See: Gabrielle Trépanier, "CSTM Visitors 2007-09. Profiles from the CSTMC Summer Surveys," *Report*, 2010, <<https://documents.techno-science.ca/documents/CSTMCVisitors2007to2009.pdf>>. Anna Adamek, Curator of Natural Resources, conducted research on depiction of women in CSTM exhibitions, 1995-2008. Emily Gann looks at gender representations and technology in science museums. The research remains unpublished. For more information about these projects, contact the authors at the Canada Science and Technology Museum, Ottawa, Canada.

examining artifacts and reading stories from the preserved material culture. Therefore, the majority of historical inquiries are directed by objects that are offered to and acquired by the Museum.⁹

Figure 1. *Connexions*, 1995



Sources: Anna Adamek, photography *Connexions* (1995), *Connexions* Exhibition Fond, Library and Archives, Canada Science and Technology Museum, Ottawa, Canada.¹⁰

9 Canada Science and Technology Museum Corporation, "Collection Development Strategy, Approved by CSTMC Management Comm.: 2006/01/24," <http://collect-connect.cstmweb.ca/wp-content/uploads/2013/05/collection_development_strategy_2006.pdf>. All statistical data on acquisitions, provided in this article, come from an analysis of artifact records conducted by Anna Adamek in KE Emu Collection Management System used by CSTM to manage the national collection. The analysis was conducted in 2014 and re-confirmed in 2017. KE Emu records include information on donors/vendors; the way in which artifacts were acquired for the collection via either donation or purchase; by whom they were acquired; the provenance of artifacts; and their historical and technological significance.

10 The *Connexions* exhibition (1995) depicted women as somewhat whimsical users of communication technologies. Here, a housewife helps her dog listen to a cat meowing through the telephone receiver.

Since 2009, when more women joined the Collection and Research group at the CSTM in decision-making positions, we began to pay close attention to the role that women play in the artifact donation and acquisition process. With data sets gathered over about five years (2009-2014), we started to conduct analysis of female donation pattern to the Canada Science and Technology Museum's collection.¹¹ To better contain the scope of the analysis, we chose to focus on natural resources, the subject area, which includes energy, mining and metallurgy, and industrial and domestic technologies, and is curated by the Curator of Natural Resources.¹² First, we retrieved from the collection database the donation statistics sorted by gender. To ensure the validity of our analysis, we used two data sets: one for artifact lots acquired between 1999 and 2003, and the second set for artifact lots acquired between 2004 and 2008.¹³ Undeniably, the majority of the donors who offered artifacts to CSTM were men. Overall, during the studied periods, 67%-75% of artifact lots donations to the Museum collection originated from men. A smaller number, 25-33% of donations offers come from women. This data showed that women were indeed involved in the donation process, although in a much smaller number than men.¹⁴

Next, we looked broadly at the type of artifacts that men and women donated to the national collection in order to determine if there was any kind of pattern between gender and type of donation offer. We asked: do the donated objects speak to the donor's personal relationship with Canada's scientific or technological past, or to someone else's (family member's, friend's, co-worker's) relationship with Canada's scientific or technological past. An analysis of the donor field in the artifacts collection database showed an emerging pattern: women donated artifacts that relate to their male relatives; women donated artifacts that relate to their female relatives;

11 The analysis of female donation patterns in the collection was conducted by Anna Adamek between 2009 and 2014, with the final acquisition data gathered and reconfirmed in 2017. This challenging project was done in stages. First a thorough analysis of KE Emu pre-2009 donation records was conducted to understand passive collecting donation patterns; interviews with donors were conducted between 2009-2010, planning and implementing the active collecting campaign to improve artifact acquisitions related to women's work was done between 2010 and 2014, and finally analysis of KE Emu post-2009 donation records to understand the success or failure of active collecting was undertaken in 2014, with statistics reconfirmed in 2017.

12 Conducting an analysis of the donor field in a collection management system is challenging. It is not enough to know the system, and understand the cataloguing procedure and database fields. It is important to be familiar with acquired technologies and their provenance to understand which relate to housework versus professional work. For example a sewing machine could be used by a housewife to make clothes for her family or by a professional tailor or seamstress. Therefore looking at the donor field and an object field in the database without understanding the artifact provenance may produce false results. It is then recommended to narrow the scope of work to the set of data with which the curator is the most familiar.

13 The analysis looked at artifact lots donated to and accepted by CSTM versus singular artifacts. A lot is a donation that may contain one or more artifacts and is offered to CSTM by the same person on the same date and with the same provenance for all objects. While a lot may, and often does, contain multiply objects, since the donor and the provenance of the objects are the same, it was decided that the number of objects in a lot was not a key element for this analysis.

14 The dataset for 1999-2003 showed that out of 144 artifact lots accepted to the CSTM collection, 108 (75%) were donated by men and 36 (25%) were donated by women. The dataset for 2004-2008 showed that out of 57 artifact lots accepted to the CSTM collection, 38 (67%) originated from men and 19 (33%) were donated by women. In Anna Adamek, "KE Emu Collection Management System Analysis, 2014, 2017," Canada Science and Technology Museum.

men donated artifacts that relate to their own work; men did not (or very rarely) donated artifacts that relate to their female relatives.¹⁵

This general pattern together with the earlier statistics suggests that in fact, women *did* participate in the artifact donations process and, in doing so, contributed to the national science and technology collection. These initial quantitative findings were reassuring. Certainly, if women donate artifacts to the collection, we should have a good, representative variety of stories that we can communicate to the public to showcase women's roles in the development of scientific and technological work in Canada! Finally, we proceeded with a detailed analysis of donation offers based on gender in the national science and technology collection. Here we looked at what exactly men and women were donating to the collection. This further analysis uncovered a rather troubling pattern:

- Women donated artifacts reflecting men's professional work.
- Women donated artifacts reflecting female housework or domestic roles such as cleaning, cooking and motherhood.
- Women did not donate artifacts related to their own or other females' professional work.
- Men donated artifacts reflecting their own professional work.
- Men did not (or very rarely) donate artifacts related to female housework or domestic roles.
- Men did not donate artifacts reflecting female professional work.¹⁶ (See Figure 2 and Figure 3).

To summarize, both men and women donate artifacts associated with men's professional lives, but no one was donating artifacts associated with women's professional lives, their careers and their achievements. In light of this, and because focusing on women in science and technology was not an active priority, a problematic gap was created in our collection. Further studies confirmed the extent of the problem. Among hundreds of artifacts collected in the natural resources fields, prior to 2009, none represented women's professional careers. Literally, there was not one artifact donation in this large curatorial subject area that would tell the story of women miners, geologists, metallurgists, electrical engineers, trades specialists, construction workers, etc. Women were being left out of the documentation, research and interpretation of the history of Canadian science and technology in an institution mandated to tell their stories.

If the museological approach of the CSTM research staff had still been centered on "type collecting," and understanding of inner workings of technologies, or even broad manufacturing factors, women would most likely have remained underrepresented at the Museum. Applying public history questions allowed us to recognize the established silences in the collection. Once these gaps were identified, CSTM implemented a series of measures to improve the representation that the collection offered. Yet again public history methodologies, especially its focus on audiences, became key elements of a successful mitigation strategy.

15 The dataset for 1999-2003 showed that 90 donations related to men's professional careers (72 came from men, and 18 from wives or daughters) and 54 donations related to domestic technologies used by women (49 donated by women, and 5 by men). The dataset for 2004-2008 showed that 38 artifacts related to men's professional careers (34 came from men, and 4 from wives or daughters) and 17 donations related to domestic technologies used by women (15 donated by women, and 2 by men). This dataset also included 2 artifacts donated by men and used by these men to do housework. Adamek, "KE Emu Collection Management."

16 Both datasets (1999-2003 and 2004-2008) show zero artifact lots donated to and accepted by CSTM in the area of natural resources related to women's professional work. Adamek, "KE Emu Collection Management."

Figure 2 & 3. Examples of Technologies Donated by Men and Women



Sources: Anna Adamek, photography *Examples of Technologies Donated by Men and Women* (2018), National Collection, Canada Science and Technology Museum, Ottawa, Canada.¹⁷

2.2. Understanding Donation Patterns

To understand why, among hundreds of donations offered to us annually, we lack those that tell the stories of women's work, we consulted the public. In doing so, we asked women why they were not inclined to donate artifacts that related to their professional lives to the national collection.¹⁸

The first set of data that helped us understand the gender dynamics in acquisitions came from visitor evaluation studies. It is surprising how little has been published on the perceptions on science museums among female visitors. Some research has been conducted at the Science Museum in London in the mid-1990s. There, Linda Blud observed that women were less engaged than men in exhibitions and reported less interest in scientific principles presented in museum displays.¹⁹ She did not however, provide a thorough explanation for the lack of engagement that she noted. Sandra Bicknell mentioned in her work "Engendering Equality: A Look at the Influence of Gender on Attitudes to Science and Technology," that by the age of nine, boys showed more confidence in visiting science exhibitions than girls. Bicknell's studies also concluded that at the Science Museum in London, male visitors were interested in the "how does it work" question, while women asked "what does this mean to me?" Whereas men were interested in technological

17 In the Figure 2, tools of trades such as a plane and a lathe, and innovations such as this sound structure generator, are among items commonly donated to the collection by men. As can be seen in Figure 3, women usually donate to the collection domestic technologies such as this kettle, iron and refrigerator.

18 The reasons why men do not contribute to preservation of stories of their female colleagues and relatives is a topic for a separate research project, which may be undertaken by CSTM in future.

19 Linda M. Blud, "Social Interaction and Learning among Family Groups Visiting a Museum." *Museum Management and Curatorship* 9, n.º 1 (1990): 43-51.

objects, women tended to be more interested in the social interaction around an exhibition or artifact in a science museum.²⁰

The visitor behaviour data collected at our museum supports Bicknell's findings. Women are the majority of our visitors. They come to the museum with their children or with school groups, rather than as independent visitors. As a general rule, women are more familiar with our exhibitions than men are, but their main reason for visiting the museum is to spend quality time with their families. They come to the Museum in their roles as mothers and caregivers rather than in their roles as scientists, engineers, or other professional positions connected to the fields of science and technology. At the same time, typically the objects displayed have depicted men's achievements in science and technology fields. It should not come as a surprise then that our female visitors would leave exhibitions thinking of offering to the collection technologies created and used by their fathers and husbands, and not the technologies related to their own professional careers.

The next set of data came from interviews with donors. Over five years, whenever we worked with a male donor or worked on a donation related to the career of a man, we made a point of asking the female relative if she ever thought of donating the technologies that she made or used to the Museum. Most often, we heard two answers: women did not perceive their professional work as important enough to be preserved at a national museum ("Why would you want my stuff?"), and women identified themselves with their domestic roles.

In these answers, demographics were at play, but only to a certain point. Women, aged sixty to eighty, who often left paid-employment once they were married, felt compelled to explain that they did not have objects related to their professional lives. They would tell us that it was so long ago that they left work to take care of the family.²¹ They justified the lack of any work-related artifacts by the fact that they moved often because of husband's work, or because these artifacts were no longer relevant to their roles as wives and mothers. Younger women working in the fields related to natural resources would stress the importance of their domestic lives, and the work-home balance. One mine manager, who asked to remain anonymous, expressed this well: "I work two weeks on, two weeks off shifts; managing a household is still the most important and the most difficult job that I have."²² Older women would explain that they do not donate artifacts because it has been so long since they worked; younger women would explain that they do not donate artifacts that relate to their work because domestic life is on top of their minds.

Since the above conversations were taking place in the context of an acquisition, the women were already thinking about artifacts and donations. It was therefore important to extend the sample to the public. The third set of data came from interviews with female visitors to the Museum, which took place inside our Museum. We expected that the most common response in this group would be along the line of *it never even occurred to me; I never thought of donating to the Museum*. However, the results of the survey were surprising. Out of thirty-two responses only six

20 Sandra Bicknell, "Engendering Equality: A Look at the Influence of Gender on Attitudes to Science and Technology," in *Here and Now: Contemporary Science and Technology in Museums and Science Centres* (London: Science Museum, 1997), 205-213.

21 Out of approximately 80 to 90 spouses of male donors, all, except one, indicated that they did not have any artifacts related to their work.

22 Jane Doe (Mine Manager), in discussion with the author, October 30, 2012. The interviewee did not give permission to release her name.

women said that they never thought of donating objects to a museum. One third of respondents assumed that technologies they use at work were not important enough to donate to the national museum. Five respondents thought that women identify themselves with housework rather than professional work, and a few gave us other answers: donating to a museum would make them feel old, women were more interested\involved in arts than science; they would prefer to pass on the object to someone who can still use it.²³

The results were and are concerning. They clearly show how persistent stereotypes surrounding women and science and technology still exist amongst our audiences and society. The answers we collected suggest that there is a multilayered disconnect between museums, collections, and a gendered understanding of scientific and technological work, one which most often excludes women. These perceptions are physically manifested in the lack of donations, and have a serious impact on our curatorial work and our role as public historians. In light of this disconnect, when it comes to collecting women's history, we have to be proactive. It is our job to ensure that the material artifacts which tell important stories are preserved in the national collection, and we have to make an effort to ensure that these stories include women's contribution to science and technology. We can interpret, what we call "silences" in the collection —the lack of artifacts certainly tells a story— but to truly contribute to the body of knowledge, we needed to improve the representation of women's professional lives in our collection.

Over the years, we've tried various techniques to improve the representation of women's professional contribution to Canada's scientific and technological past and present. Along the way, we have encountered some failures and some successes. For example, general appeals to the female public in the way of an educational campaign to make women aware of the gap in the collection did not work. Although the media was interested in working with the Museum to appeal to women to donate artifacts to the national collection, radio and magazine campaigns yielded very few responses from the targeted public. For instance, out of over 200 articles published in various press media across the country calling for donation, we received a reply from one woman.²⁴ The most successful tactic was a personal approach. If indeed women were (and are) more interested in what technologies mean to Canadian society, what we learnt was that, as a rule, they also want to know why a curator would like to acquire their artifacts for the collection, and what a curator thinks these artifacts tells researchers about women's lives. While this might seem like a generalization, in our experience we discovered that we cannot simply ask women to donate artifacts to the collection. We have to tell them why we are asking them to donate artifacts to the collection.

23 The interviews were conducted at the Canada Science and Technology Museum, Ottawa, Canada, on June 1, 2012.

24 I do not have the access to past issues since this was done in 2010-2011, but we can use the following as a footnote - for the full list of newspapers and community newsletters, which published the call for donations, contact the authors of the article. The only female respondent was Margaret Kalin, a professor at the University of Toronto and President of Boojum Research Ltd., who read the call on the website of the Canadian Institute of Mining, Metallurgy and Petroleum and offered maps produced by her company. The maps were accepted to the CSTM collection on October 19, 2012. Margaret Kalin, in discussion with the author, January 28, 2012.

Women are a lot more inclined to donate technologies when they are active participants in the conversation about the meaning of these technologies.²⁵

2.3. Improving Interpretation

Collected artifacts tell stories, and each story presents an opportunity to discredit yet another stereotype surrounding women and science and technology. The more stories we gather, the better equipped we are to showcase the authentic experiences of women's work in the fields of science and technology through our museum exhibitions and educational programming.

As in the national collection, women were underrepresented in exhibitions at the Canada Science and Technology Museum. The lack of artifacts that carried stories of women, their actual work and achievements, meant that, for several decades, the imagery found in our exhibitions replicated and further reinforced the male semantics of science. The exhibitions focused foremost on the male inventor of a technological artifact and framed technology and science through the masculine lens. The idea of a male creator, who conquers science and gives birth to a technological innovation, was juxtaposed with an image of a female user: a telephone operator; a secretary using a typewriter; a housewife pressing shirts with an electric iron; and a young beauty drying her hair with an electric hair dryer. In general, the gender questions were neither posed nor answered in often outdated exhibits curated by former engineers and based on "type collected" artifacts. Men and women in these displays served only as personifications of gendered perceptions on human interactions with science and technology. In a literal sense the exhibits depict *the roles* that we believed men and women played in the world of science. The most prominent personification was *The Operator*, a representation of women's natural abilities: precision, dexterity and communication skills. The Operator ran the technologies invented by men, but had no role in their conception.

The second most visible representation of women in the Museum was *The Housewife*: a female consumer of cleaning, cooking and child rearing technologies designed by men to make her domestic work easier (See Figure 4). The exhibitions were populated by the Beauties, and by the Frails, personifications of feminine allure and fragility, who used technologies to enhance their attractiveness and to perform their roles within the home. One exhibition even included the icon of social determinism, the Victim, Sarah Melville a murdered subject of a forensic science exhibit. Gender was only a sketch, an outline, and a background illustration to the story of science and technologies. It was used to reinforce a problematic understanding of male and female social roles in the past, and therefore our perceptions of what these roles are now and will be in the future.²⁶

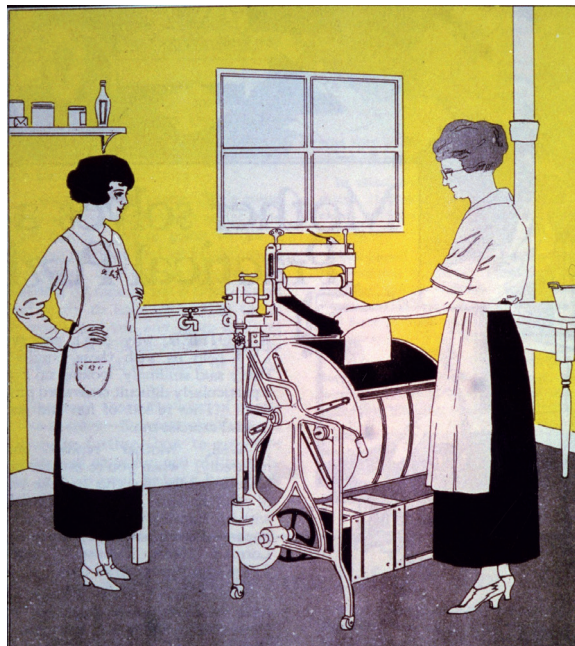
With the adoption of public history approaches —and with the increase in the number of female curators— women in all positions and roles (inventors, innovators, users and consumers, artists,

25 This personal approach, although time-consuming allowed us to increase the artifact acquisitions related to women's professional work to 20 % of all the objects collected in the natural resources subject area. Although not a large number, 20% is representative for the sector, where the women employment ranges on average from 16% to 27%. Anna Adamek, "KE Emu Collection Management System Analysis, March 31, 2017," Canada Science and Technology Museum.

26 Unfortunately nothing has been published on this topic. Physical exhibition files such as interpretive plans, exhibition texts, and selection of images, which document past approaches described in this article, are archived at the Library and Archives, Canada Science and Technology Museum, Ottawa, Canada. See: *Love, Leisure and Laundry*, 1996, Exhibition Fond, and *Connexions*, 1995, Exhibition Fond. See also *Autopsy of a Murder*, Travelling Exhibition, 2008, Montreal Science Centre.

academics and industrialists) became important and valued actors in the story of Canada's history of science and technology which the Museum shared with its audiences.²⁷ Public history curators sought collaborations with groups such as Women in Mining, Women in Nuclear, and Women of Steel to give the voice to female workforces. The approach to exhibiting their stories changed. Rather than talk about, or for, women, the new exhibitions gave direct voice to women across the technological landscape. *From Earth to Us* exhibition —one of six new galleries at a fully refurbished Museum, opened in November 2017 and dealing with the natural resources industries in Canada— is a good indication of the public history approach to telling women's stories within the context of science and technology. The exhibition looks at resources and materials that we extract and produce to satisfy the needs and wants of our society. Traditionally, the natural resources sector is perceived in Canada as a male domain and it may come as a surprised to the museumgoers that women are significantly contributing to mining, metallurgy and material science. Therefore, the *From Earth to Us* exhibition team, which incidentally was almost entirely made up of women, decided to pay special attention to the role that women play in the resource industry.²⁸

Figure 4. Women Using a Washer For authors



Sources: *The Hydro Lamp*, 3, n ° 4 (February 1925). Front Cover, LLL Fond, Library and Archives, Canada Science and Technology Museum, Ottawa, Canada.²⁹

27 John H. Baldwin and Anne W. Ackerson, *Women in the Museum: Lessons from the Workplace* (New York: Routledge, 2017).

28 The senior exhibition team members included Anna Adamek, Curator; Sylvaine Champaign, Project Manager; Dawn Hall, Interpretive Planner; and Sunniva Geurer, President of BouwDesign.

29 A typical image selected for the Love, Leisure and Laundry exhibition depicting women as consumers, not active creators, of predominately domestic technologies.

For example, a display titled *Women who Mine, Rock!* juxtapositions historical images of women working in the mining industry in 1700s with stories of contemporary female miners, inventors and entrepreneurs such as Alicia Woods of Covergalls, and Susan Rubin and Alison Farrell of Tiga Workwear, who design and manufacture mining personal protective equipment (PPE) for women. After successful careers in mining —Alicia ran sales of mining heavy equipment, and Susan and Alison managed mines all around the world— these entrepreneurs established their own companies.³⁰

They used their experiences, consulted with women miner, listened to concerns, and came up with PPE technologies that suit the female body. Covergalls include snaps at wrists, and an adjustable waist, but also a rear opening flap for a somewhat easier trip to the bathroom at the worksite. Tiga work boots are reinforced with a composite material rather than with steel, which makes them lighter than the traditional steel toe safety boots. This seemingly small improvement makes a big difference to female geologists and prospectors who walk for many hours during field work. Each garment that they design tells their stories, but also stories of the women who contributed to making these products better. In displaying Covergalls and Tiga Workwear, we worked directly with Alicia, Susan, and Alison, and their clients to give voice to female miners. The *Women who Mine, Rock!* also features profiles of female Inuit, Canadian northern aboriginal employees of Agnico Eagle, a large Canadian mining company. In our research we talked to the women and to Agnico Eagle to gather two perspectives, individual and corporate, on their work. The women told us about their training and lives in Canadian Arctic and the company explained their operational roles. These truly inspirational women are essential to the successful operation of the company in remote and environmentally challenging Canadian Arctic.³¹ Not only are they great miners, they know the North, and are at home in the harsh arctic conditions. While preparing *Women who Mine, Rock!* the curator and exhibitions staff had to relinquish the idea of full control over the display, and share authority over the content with external partners whose expertise and opinions we highly valued and respected. This makes the exhibition accurate and authentic and also more relevant to the communities it features.³²

The renewal of the Canada Science and Technology Museum was also an opportunity to examine the relationship between gender and technology through our exhibitions; a topic and approach that had been historically omitted from the Museum's exhibition spaces. The literature surrounding gender and technology, specifically works relating to or emerging from Feminist Technology Studies, offer a dynamic and rich understanding of the influences that both gender and technology play on one another. A relatively new field of study which grew out of the 1980s and also from the works of scholars like Ruth Schwartz Cowan (1983)³³, this field has explored the gender question in science and technology, and has

30 *From Earth to Us: Women who Mine, Rock!* Permanent exhibition, Canada Science and Technology Museum, Ottawa, Canada. *From Earth to Us* exhibition files are available to the public via CSTM Open Heritage, <<https://documents.techno-science.ca/en/index.htm>> under keywords *Transforming Resources*, which was the exhibition's working title.

31 As Canada's most northern territories open to mineral exploration and mining, the companies wanting to operate in the Arctic face challenges such as access to the remote mineral locations, lack of infrastructure, and little understanding of northern environment. Strong cooperation between the mining companies and aboriginal Inuit communities is the key to success and is a point of on-going discussion in the Canadian society. See, for example, Chris Southcott, ed. "Resources and Sustainable Development in the Arctic." [Special Issue], *The Northern Review*, n. ° 41 (2015).

32 *From Earth to Us: Women who Mine, Rock!* Ottawa, Canada.

33 Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Heart to the Microwave* (New York: Basic Books, 1983).

gone from understanding technologies as having an oppressive role in women's lives, to seeing them as tools of liberation, to (now) understanding gender and technology as having a conjointly constitutive influence on one another. In this way, both gender and technology are seen as fluid and changing, rather than fixed and procedural. They act and react to each other, and, in so doing, are entered in a reciprocal relationship where each can inform and expand our understanding of the other.

The *Technology in Our Lives* exhibition at the Canada Science and Technology Museum explores the relationship between gender and technology through various household appliances, from the end of the Second World War to the present in Canada.³⁴ These spaces vary in size and engage with gender in overt or subtle ways. They recognize that gender is a performed social construct that has changed over time, and that technology can be used to see the physical manifestation of these understandings. In this way, the technologies that were chosen for this exhibition space are interpreted as tools that, while performing specific technological functions, also served as devices that reinforced or established sociocultural attitudes towards gender. Domestic technology toys, washing machines, and a kitchen space equipped with reproductive, child rearing, and domestic labour artifacts are the main points of entry in this exhibition's exploration of the relationship between gender and technology.

Children's toys reflect a great deal about the culture that produces and uses them. The history of domestic technology toys, in particular, reveals changing ideas about gender roles in society. Recognizing the depth of this history and the strength of our collection, the exhibition team for *Technology in Our Lives* tested the public's interest level on this topic. Overwhelmingly positive, our testing suggested that the majority of visitors polled thought that this was an interesting subject to present in the Museum and were encouraging of any discussion surrounding gender and technology as it was seen as topical and educational. Keeping our audience in mind, this exhibit space, aptly called *Toy Shop*, uses domestic technology toys designed primarily for young girls to examine changing attitudes towards female gender roles during three periods: the 1920s to the 1960s, the 1970s to the 1990s, and the 1990s to the present.³⁵ These periods were selected because, as is reflected in the toys on display, attitudes towards gender roles changed during these times.³⁶ By interpreting the naming conventions, style, color and associated trade literature that accompanies these toys, visitors can see how: 1) during the 1920s to the 1960s, gender roles were very traditional (men worked outside of the home and women took care of the home and the children) and domestic technology toys were used to reinforce these views and values; 2) for a few decades from the 1970s to the 1990s, the gendering of children's toys was nonexistent as domestic technology toys were offered in a wider range of colors and marketed towards both girls and boys; and 3) since the 1990s, the gendering of toys has remerged but now in more subtle ways, through the use of color and not through the naming of these toys. By interpreting the collection in this way, our exhibition pushes past the traditional museological approach of

34 See *Technology in Our Lives*, Permanent exhibition, Canada Science and Technology Museum, Ottawa, Canada, 2017, interpretive plan at. While the exhibition approaches and interprets the collection with other lenses, gender plays a predominant role in this space.

35 The exhibition team felt it was important to provide a strong historical framework for this display. In order to do so, the team agreed that the historical timeframe for *Toy Shop* could, and should, extend outside that of the rest of the *Technology in Our Lives* exhibition. It is for this reason that *Toy Shop's* content begins in the 1920s, yet the exhibition's focus is post-1945.

36 For more information on the history of gender and children's toys, see: Elizabeth Valerie Sweet, "Boy Builders and Pink Princesses: Gender, Toys, and Inequality over the Twentieth Century" (PhD diss., University of California, Davis, 2006).

explaining to visitors how technology works, and asks visitors to think about how these tools reinforce sociocultural understandings of gender.³⁷ (See Figure 5)

Figure 5. Toy Shop



Sources: Pierre Martin, photography *Toy Shop*, *Technology in Our Lives* (2018), at Canada Science and Technology Museum, Ottawa, Canada.³⁸

Another element of the exhibition looks at advances in washing machine technologies and how these tools did, or, as is the case, did not resonate with Canadian women. Pulling from Joy Parr's article "What Makes Washday Less Blue? Gender, Nation, and Technology Choice in Postwar Canada" this exhibit, which digitally simulates a text conversation between a 1950s Canadian made wringer washing machine and a 1950s American made automatic washing machine, explores the reasons why the new automatic washing machine was not an instant hit with Canadian women and in Canadian homes. While a comparative exhibition approach is not new in public history methodology, this discussion does allow the Museum to explore diverse female stories through their interactions with these domestic appliances. Typically, and as has been noted earlier in this paper, the Canada Science and Technology Museum had depicted housewives as a uniform entity; a group of people that shared the same values, performed housework in the same way, and had a common understanding of their roles in society. It is important to present the public with diverse representations of women, and in this case the "housewife," in order to begin to deconstruct traditional and problematic stereotypes of women. It is also important to continue to show women whose relationship with technology is based on the work that they do inside the home. Their work is just as valid and has the same importance as

³⁷ The toys are part of the Domestic Technology collection, a major collecting area of the Museum. The Domestic Technology collection contains artifacts that speak to housework: cleaning, cooking, raising children, making and mending clothes, and so on. However, traditionally this collection was not interpreted through public history and gender methodologies, but rather was perceived as evidence of electrification of Canadian households and construction of urban and rural infrastructure and their impacts on Canadian women's work at home.

³⁸ Toy Shop displays children's domestic technology toys from the 1920s to the present. They include four toy ovens, and a toy blender, toaster and dishwasher. These toys reflect a great deal about North American views surrounding gender, technology and work.

achievements of women who work outside of the home in fields related to science and technology. We must be mindful not to create a hierarchy of women “in” science and technology that gives these who work in professional jobs a higher social status than those who work at home.³⁹

Whose Dream Kitchen? is a large module in the *Technology in Our Lives* exhibition (See Figure 6). It incorporates 2D and 3D artifacts to examine 20th century representation of women and the home and looks at how a technology, the birth control pill, contributed to second-wave feminism and changing gender roles during the 1960s. Graphic design and layout, images, trade literature, artifacts and text, work independently and collaboratively to bring visitors through this space and access the curated content. As in *Toy Shop*, gender is interpreted as being fluid. Whereas the toys are technologies that reproduce existing attitudes towards gender and gender roles in society, the birth control pill is a technology that facilitated a change in sociocultural attitudes and understandings of gender. By allowing women the opportunity to better plan their families, the birth control pill, alongside other factors, made it so that women could attend post-secondary institutions and/or take-up paid employment outside of the house; endeavours and spaces previously reserved for men. While there is literature that argues that the birth control pill was not an entirely liberating technology for women, interpreting it as a technology that facilitated change, as we have done in the exhibition, allows for yet another way to see the interplay between gender and technology. This, in turn, provides for more and broader representations of women and science and technology in the public sphere.⁴⁰

Figure 6. Whose Dream Kitchen?



Sources: Pierre Martin, photography *Whose Dream Kitchen? Technology in Our Lives* (2018), at Canada Science and Technology Museum, Ottawa, Canada.⁴¹

39 Joy Parr, “What Makes Washday Less Blue? Gender, Nation, and Technology Choice in Postwar Canada.” *Technology and Culture* 38, n. ° 1 (1997): 153-186.

40 “Technology in Our Lives.”

41 This image shows the main entrance into Whose Dream Kitchen? This space uses artifacts such as a package of birth control pills, a baby bottle warmer, hand-held kitchen tools and irons to tell the story of women’s changing gender roles during the 1960s.

Conclusion

Through the case study of conducting women's history at the Canada Science and Technology Museum, we attempt to show that applying public history methodologies allows us to refocus the interpretation of technological artifact to better represent the female Canadians in the way that is more relevant to the public today. Public history methods informed our analysis of the gender patterns in the donation process. Rather than ask what we acquire and how the acquired technologies work, we asked who donates artifacts; whose stories these artifact tell us; whose stories are not present; and how we can improve gender balance in the collection. By way of public history, the Museum can put forefront diverse audiences. Our acquisitions, research and interpretations must be directed outwards. We have to consciously invite the public into our work. Furthermore, we have to involve the public with these aspects of curatorial duties, such as artifact acquisitions, which traditionally were based on curatorial connoisseurship and research, which was often perceived as an activity that required undivided attention and was therefore best conducted in solitude.

We work to increase the level of scientific and technological literacy among the general public, and in order to stay relevant to that public, we must engage with donors and visitors, with scientists, inventors, engineers, manufacturers, and users of technologies as broadly as possible. The public must be able to see themselves in the content we display and the collections we develop and preserve. This includes women as well as men. As shown in this article, it is not an easy task. Therefore, as women working in a public history institution, we need to be activists, which means that rather than passively respond to, for example donation offers, we have to be active and engaging in developing our collections, gather stories and prepare inclusive exhibitions. We need to be ready to share authority over the content of our historical inquiries and current museum products. In doing that, public history methodologies allow us to define our historical work as democratizing, deeply political and socially relevant.

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