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Gender, work and technology in the information workplace: from typewriters to ATMs

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We consider the relations between gender and technology in the workplace, focusing on clerical work in the information workplace, especially the finance and insurance sector. Our goal is to excavate a 'hidden history' of how clerical work and the artifacts which sustain it have been understood and deployed under different cultural and economic circumstances. We employ an analysis of technosocial relations developed in Science and Technology Studies in which meanings about 'technology' and 'society' are mutually constitutive, changeable, and in need of maintenance in order to sustain their conceptual coherence. By drawing on examples from the USA and Canada, we argue that at various points over the twentieth century particular office technologies became 'feminized', or associated with characteristics coded as feminine, as a means of shaping spatial practice and social relations in the workplace.

Key words: gender, technology, office work, feminist science and technology studies.

Introduction

Office technologies can be 'strategically engendered' in particular ways. Certain technologies, and the tasks they help accomplish, get associated with certain feminine (or masculine) codings. Feminist analyses of design and technology 'reveal the cultural uses and meanings of the manufactured world' (Lupton 1996: 57). We take up and extend Ellen Lupton's observation by addressing how technology, femininities and spatial practices shape and are shaped by the workplace. We focus on clerical work, which was an important part of the twentieth-century Canadian and US economies. Drawing on examples from both countries, we analyze the strategic engendering of office technology in the information services sector during the twentieth century.

Our study is based on a range of historical and contemporary material. We tracked trends over time using the Canadian and US Census. We conducted textual analyses of Canadian and US newspapers and magazines, as well as documents gathered from archives of Toronto and Montréal-based companies in the finance and insurance sector. And we performed a secondary analysis of oral histories gathered in

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the mid-1980s with women clerical workers in a Mid-Western US city.[1]

Our paper has four parts. After framing the theoretical underpinning of our work we turn to an analysis of gender, technology and the workplace during three periods spanning the twentieth century. First, we consider how typewriters and clerical work came to be feminized in the early twentieth century and how certain groups of women were drawn into office work. Second, for the mid-century period, we look at how information-based industries like banking and insurance used the 'modernity' and the technological sophistication of workplaces to 'sell' clerical work to middle-class women. Third, we address the post-1970 period and the proliferation of office technologies and new forms of work in the booming information sector. As an illustration of the continuity of the 'female-machine' we focus on gender narratives associated with the introduction of Automatic Teller Machines (ATMs).

Theorizing gender, work and technology

Our paper is part of the ongoing effort to better understand technosocial relations, and of particular interest to Geographers, the ways technology shapes and is shaped by spatial practices. We join with other Geographers whose research has already enlivened exchanges between Geography and Science and Technology Studies, notably Trevor Barnes (2001), Michael Curry (1998), Mei-Po Kwan (2002), Nadine Schuurman (2002), and Gill Valentine and Sarah Holloway (2001). Our contribution to this larger project is to highlight and advance the linkages between Social and Feminist Geography and Feminist Science and Technology Studies.

A vibrant area of scholarship within Social and Feminist Geography is exploring how gender is (re)produced in and through the workplace and the spatiality of gendered divisions of labor (see e.g. Brown 2004; England 1993; England and Lawson 2005; Hanson 2003; McDowell 1997; Pratt; 2004). A similar theme for feminist scholars in Science and Technology Studies (hereafter STS) is how technology shapes and is shaped by gender relations and gendered divisions of labor (Bray 1997; Cockburn and Ormrod 1993; Gorenstein 2000; Grint and Gill 1995; MacKenzie and Wajcman 1985, Wajcman 1991, 2004; Webster 1996). Feminist STS scholars illuminate the ways that cultural ideas about gender get 'built-in' to technology at the design phase (Cockburn and Ormrod 1993; Oudshoorn, Rommes and Stienstra 2004) and how technology is co-constitutive of gender in and beyond the workplace (Bray 1997; Gorenstein 2000; Lupton 1996; Webster 1996).

In our endeavor we are particularly influenced by Judith Wajcman's careful theorization of gender–technology relations (MacKenzie and Wajcman 1985; Wajcman 1991, 2004). Our work is also informed by Callon (1991), Latour (1988), Law and Hassard (1999), among others, who understand concepts of 'the technical' and 'the social' not as exclusive, but rather as mutually defining concepts. Likewise, we argue that these concepts are in need of maintenance and monitoring in order to retain their conceptual coherence. We further understand gender not as a predetermined category, but rather, after Judith Butler (1990), as an achievement enacted and brought into being through repetitive spatial and technosocial practices.

Another important theoretical influence for us is the conceptualization of technosocial relations emerging from Actor Network

Theory (ANT). Viewing technoscience through ANT leads to more dynamic investigations of agency. Geographers have been part of this conversation, and are producing a rich literature on the role of non-human organisms and bio-assemblages (trees, animals, climate) as a way of theorizing agency in a more-than-human world (Castree and Brun 2001; Demeritt 2001; Whatmore 2002). However, while drawn to the theoretical openings ANT enables, we do approach it with some caution. For one, as Wajcman (2004) notes, workplaces have not garnered much attention in the widespread adoption of ANT. Second, as Law and Hassard (1999) have observed, ANT tends to reinforce the analytical categories that are important to the actors under review. So if structures of social power such as gender, race or class, for example, are not important to the actors (typically white, male scientists and inventors) then these structures typically get missed. Because ANT resists appeals to the processes of capitalism, racism, or patriarchy as explanatory frameworks, there is often less concern with the engendering of technosocial relations (but for exceptions see Cockburn and Ormrod 1993; Whatmore 2002).

Third, we are mindful of the status of gender analysis in ANT scholarship more generally. Again Wajcman is instructive. She notes:

> within the mainstream—even malestream—bodies of work in technoscience, the ways in which technological objects may shape and be shaped by the operation of gender interests or identities have not been a central focus. This is as true of recent developments like actor network theory as it is of earlier work. (Wajcman 2004: 40)

She goes on to comment that 'Feminists' traditional concerns with women's access to technology, the differential impact of technology on women, and the patriarchal design of technologies have sat uneasily with (the ANT) analysis of technology' (Wajcman 2004: 42). In short our concern is that because the engendering of technosocial relations has not been a major focus for STS scholars working with ANT, neither has it been for similarly inspired work in Geography.

That said, we take from ANT an interest in everyday technologies, the entwining of technosocial relations, and a sensitivity to the potential agency of non-human actants (such as typewriters and ATMs) to shape the technosocial systems in which they are embedded. But regarding the human component in our story, to paraphrase feminist STS scholar Joan Fujimura (1991: 222): 'In contrast to Latour, (we are) still sociologically (and geographically) interested in understanding why and how some human perspectives win over others in the construction of technologies and truths'. Thus we seek to draw on ANT in a way that does not sidestep issues of gender difference or gender-based power differentials.

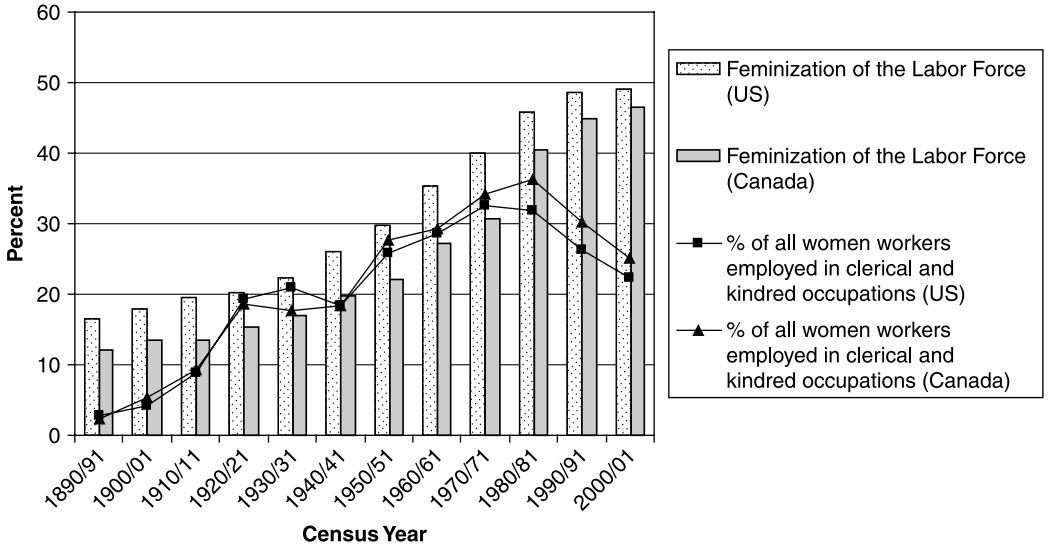
Women in the early information technology workplace

> When I began work as a clerk at [a big insurance company], my dad was thrilled I was making something of myself, being from a farming background. He thought that office-work was real grand. He was so happy that I didn't go into domestic service or factory work like most girls … He and my mom, you know, for them being a stenographer was a good job. (Betty, born in 1922)

After the invention of the typewriter in the 1870s, office work ballooned. Growth in clerical jobs in the USA and Canada remained very strong until the 1980s, at which point the

rates began to slow. In the late nineteenth century clerical work was seen as 'men's work', by the early twentieth century that was changing. As Figure 1 indicates, in 1890/91, women held only 17 per cent of clerical jobs in the USA (up from 5 per cent a decade earlier) and 14 per cent in Canada, but by 1930/31 they held about half. The small percentage of women clerical workers in the late nineteenth century does reflect that few women were engaged in waged work and that clerical work, whether by women or men, accounted for a relatively small proportion of the workforce.[2] Women in paid work were mostly likely to be in domestic service, farming or factory work. However, with each passing decade clerical workers were increasingly likely to be women. By 1935 *Fortune Magazine* declared that a woman's place was—not at home—but at the typewriter (Davies 1982), which is where Betty was in the late 1930s to the delight of her father. By 1950 clerical work accounted for at least one-quarter of all women workers. By 1970 it reached one-third, and 70–75 per cent of all clerical workers were women.

During the first half of the twentieth century North America became a global center of the modern information 'revolution' with the mass diffusion of the typewriter, Hollerith and Dictaphone, and the subsequent expansion of networked commerce, such as branch banking for instance (Lowe 1987). Automation did not just change the size of the clerical labor market, but the very nature of the work itself (Davies 1982; Lowe 1987; Webster 1996). In the nineteenth century clerical work was done by



	1890/91	1900/01	1910/11	1920/21	1930/31	1940/41	1950/51	1960/61	1970/71	1980/81	1990/91	2000/01
% of clerical and kindred jobs held by women (feminization of clerical work) in the USA	16.9	26.5	35.9	48.4	52.0	52.6	60.2	67.8	74.6	80.1	79.8	79.0
% of clerical and kindred jobs held by women (feminization of clerical work) in Canada	14.3	22.1	32.6	41.8	45.1	50.1	56.7	61.5	68.9	77.8	76.8	76.5

Figure 1 Women in paid labor force over time, USA and Canada.

hand, and functioned—for men—as an apprenticeship for management positions. The more automated clerical work became the less it functioned as a stepping stone up the management hierarchy. STS scholars suggest this transition be understood as a shift from 'democratic technics' (individual workers have a high degree of control over the pace and quality of their work) to 'authoritarian technics' (the work process is more standardized and hierarchical), a process also associated with the feminization of work, especially clerical work (Grint and Woolgar 1997; Mumford 1964).

Although the processes of feminization and automation of office work occurred simultaneously, we are not suggesting that technological change *per se* caused change in the gendering of clerical work. Rather, we argue change resulted from the ways new technologies were deployed within existing and evolving relations of labor, as well as gender, class and race-based inequalities. Financial services firms began hiring women to get white, educated, middle-class workers (who did not have to be promoted) for the price of working-class male wages. As this continued, women began to be associated with modern office technologies (especially the typewriter and Dictaphone), while typewriters became interpreted as a 'feminine' technology.

Our argument is that gender and technology (or more accurately technosocial systems) are co-constitutive, so artifacts like the typewriter or Dictaphone (actants in the language of ANT) are 'both a source and a consequence of gender relations' (Wajcman 2004: 7). As a new occupation in the late nineteenth century, typing was gender-neutral. For example, we found that the very early print advertisements for typewriters (1880s and 1890s) usually showed only the machine, but when the typist was included they were only slightly more likely to be a woman. However, the Remington Company decided to train young women to demonstrate their new machines to potential buyers. They explicitly linked typing to the supposedly feminine characteristic of manual dexterity, drawing on existing discourses about the 'nimble fingers' of women textile workers (Zunz 1990). Furthermore, subsequent print ads likened typing to piano playing, and linked typing to middle-class gentility by displaying typewriters in the home (Boyer 2004). For a while Remington even sold 'domesticated' typewriters painted with flowers (see Figure 2) intended for use in middle-class homes. Viewed through the prism of ANT, thus designed, this actant very much 'suggested' a female operator.

Although most typewriters were used in office settings rather than homes, the choice to locate this technology in the home for advertising purposes associated it—and

Figure 2 Sholes and Glidden typewriter, 1874, sold by Remington. Source: Smithsonian Institute <http://inventors.about.com/gi/dynamic/offsite.htm?site=http://www.officemuseum.com/typewriters.htm>.

thereby clerical work itself—with the 'proper' place for middle-class women. On the one hand, such advertising drew on existent gender roles, and is an example of the 'strategic engendering' of an artifact as a way of changing spatial practices. Defining typewriting (and the clerical workplace) as an appropriate space for middle-class women was a way to draw them into this sector. On the other hand, such advertisements also stabilized and reinforced a certain vision of white, middle-class femininity—i.e. that home *was* where middle-class young women belonged (as opposed to out traveling, or living on their own). The association between clerical work and middle-class femininity also worked in a feedback loop; once this link was made, employment in this sector served to reinforce a middle-class feminine identity.

Yet if the feminization of typewriters is both a consequence and source of gender relations, there was nothing predetermined about the way this process unfolded. For instance, decisions to decorate typewriters with flowers and discursively link them with middle-class pursuits and spaces resulted from an increased supply of young, educated, middle-class women and labor market inequalities limiting job opportunities for those women (factory work and domestic work were deemed inappropriate work for daughters of the middle class). This made it profitable for employers in the information sector to hire white, middle-class women into clerical jobs, instead of middle-class men. But as always, things might have been otherwise. The intended gender coding of designers and marketers do not always 'stick'. For instance, the first microwave ovens were marketed to 'bachelors' (presumed to be uninterested in cooking) and sold alongside televisions and radios as a 'brown good' (Cockburn and Ormrod 1993). Likewise, in the 1880s most stenographers were men, suggesting that typing and the engendering of the typewriter might, under different circumstances (and perhaps especially under a different gender regime), have developed differently.

As clerical work and the technologies enabling it came to be understood as feminized, it was a white, middle-class femininity that was evoked.[3] Relative to factory or domestic service work, clerical work had shorter hours, was less physically demanding, and was based in technologically sophisticated, clean workplaces. For these reasons clerical work carried higher social status than other work available to women, and reinforced class- and race-identity. Employers were also keenly aware of the backgrounds of women they hired, believing that their employees' actions and character outside the workplace reflected on the company (Boyer 1998). For example, early twentieth-century employment applications to Canada's Bank of Nova Scotia and Sun Life Insurance Company were asked what kind of associates the applicant had and how they comported themselves outside of business hours. Likewise, letters of recommendation for women typically spoke to the applicant's character, often referring to convent training or membership in specific religious congregations or parishes.[4] As one Canadian bank manager noted, 'character is the cornerstone of all the bank does' (quoted in Dodds 1929: 103). 'Character' for young women at that time was a judgment about conduct and especially sexual conduct: chastity (real or perceived) was absolutely vital in maintaining one's standing as a 'good girl' (Boyer 1998). Both the idea that (certain) women's place is 'at the typewriter' and that clerical work is the right job for 'good girls' were durable formulations for many decades.

Technology, the dream teller and the 'selling' of clerical work

> I started work in 1943 when everything was paper work and our typewriters were old manuals. I'd say 80 percent of the work in the premiums department was paper work. It was monotonous sitting there all day doing nothing but stuff premiums into envelopes. Today that is all machine done. We also had to figure out the auto rates on each card and we had huge stacks to do each day. That's all done on computers today. (Flora, born about 1928)

Clerical work grew rapidly in the post-World War Two 'Golden Age', an era marked by rapidly increasing productivity, rising real wages and declining wage inequality. As global, economic and political power concentrated in North America, Canada and the USA became increasingly dominated by large, bank-financed firms and corporations with national and international markets. Alongside this was a proliferation in paper (as Flora suggests): written records, invoices, memos and so on (often in duplicate and triplicate). In his classic book, *White Collar*, C. Wright Mills (1951: 189) used 'The Enormous File' as a metaphor for the office which 'produces the billions of slips of paper that gear modern society into its daily shape'. That the 'enormous file' was increasingly filled with what Mills (1951: 200) called 'white-collar girls' is reflected in Figure 1 which shows the increasing feminization of clerical work and the increasing occupational clustering of women into clerical work.

The 'enormous files' were large companies often with purpose-built open-plan offices with machines, desks and tasks organized around William H. Leffingwell's office adaptation of efficient, rational, time and cost-saving 'scientific management'. Office technology sales skyrocketed after the Second World War: machines for book-keeping, tabulating, billing—and as office work increased so more machines were invented or improved. This was when Flora began working, calculating premiums and stuffing them in envelopes. 'Most startling perhaps are the new electronic calculators', Mills (1951: 194) remarks, 'which store up one thousand units of information on a quarter of an inch of magnetic tape'. He then describes such a machine in an insurance office that checked policyholders' records for their premium paid to date, computed their interest and typed out cheques. These are the sorts of machines and computers Flora referred to. Electric typewriters were increasingly common and the typewriter–woman technosocial relation endured. Remington-Rand ran an advertising series during the early 1950s featuring actual executive secretaries for major American corporations: 'Top secretary and thousands like her prefer the Remington Electri-conomy' (in our searches we only found one male secretary featured). A few years later Royal Electric ran adverts promoting its new redesigned, lightweight, cost-saving electric typewriter—'make your typing dollar go further' announced one. It was available in several pastel colors, including pink.

Scholars in Geography and STS argue that workplaces are an important site for the (re)production of gender identities and gender relations. In company magazines we found examples of this through the marketing of certain kinds of machines and workspaces within the organization as women's territory. For instance, the Summer 1956 staff magazine of the Bank of Nova Scotia ran the story, 'The all-girl boiler factory' about the employees in the Clearing Department.[5] This department dealt with cheques, deposits and credit items for the

Toronto region, noting that 'As you look about you're struck by the fact that … there isn't a man in the whole department' (1956: 4). The department was dominated by '50 girls' operating nine IBM and five NCR proof machines. The reader is invited 'to stand behind the girl at the IBM machine' and watch as she inserts bundles of cheques and simultaneously uses a keyboard 'simultaneously is the right word—the hand is quicker than the eye in the operation!' (1956: 4). Other tasks described often reference keyboarding; although the language of women's 'nimble fingers' is not in the text, it is certainly implied. Clearly, the 'all-girl' department was something to be remarked upon. There are several other instances in the staff and trade magazines from the 1950s focusing on the increasing presence of women. A piece in *The Canadian Banker* suggested that a key factor in 'the hiring of female staff has been the introduction of machines. By their make-up, both physical and mental, they seem equipped to do routine machine jobs with a higher degree of efficiency than is the case with men' (Lund 1953: 122). These examples suggest some of the ways companies in the information sector strengthened the 'female–machine' connection while naturalizing the idea that women were 'better suited' to routine work (and men better suited to analytical work).

For many large companies, the increase in (routine) clerical work meant an increasing demand for more women to fill jobs. Print advertisements aimed at women became an important hiring strategy. We found a selection of promotional booklets dating from the 1950s aimed at prospective women employees, especially those about to graduate from High School. A central theme was highlighting the modern, 'technological sophistication' of their workplace. For example, Montréal's Sun Life Insurance Company booklet, 'Where are You Going, my Pretty Maid?' informed potential employees that: 'By deciding to become associated with the Sun Life of Canada you will be linking up with a modern organization which takes pride in providing congenial and healthy surroundings for its employees'.[6] The brochure proposes that the direction these (seemingly direction*less*) 'pretty maids' should go is towards Sun Life which is 'sold' as a modern, comfortable workplace in a cosmopolitan setting. The brochure notes the extra-curricular activities offered by Sun Life. Rather than focusing on work alone, the brochure describes the kind of lifestyle that work afforded: employment in a prestigious international company by day, shopping and partaking in the city's entertainments by night, with friends—and potential suitors—conveniently culled from the mixed-sex workplace itself.

'Where are You Going, my Pretty Maid?' also highlights the technical side of work at Sun Life. Grint and Woolgar (1997) argue that modernity in the workplace is often expressed through technology. Certainly Sun Life's modernity is emphasized through repeated references to the latest technology, shown in the booklet via photographs of women stationed at bookkeeping machines, Dictaphones, a Hollerith machine, and, of course, typewriters (see Figure 3). Even the kitchen is described as 'ultramodern', and the hospital room includes 'special technical equipment such as short-wave and sun-bathing' machines, complete with a photograph of a young woman in a towel and sun-glasses in the machine. Potential employees are promised they will learn more about 'the many modern mechanical devices used in the various departments of the Company', during their introductory tour of the Head Office. This brochure underscored the ultramodern, technically sophisticated nature of this workplace as a

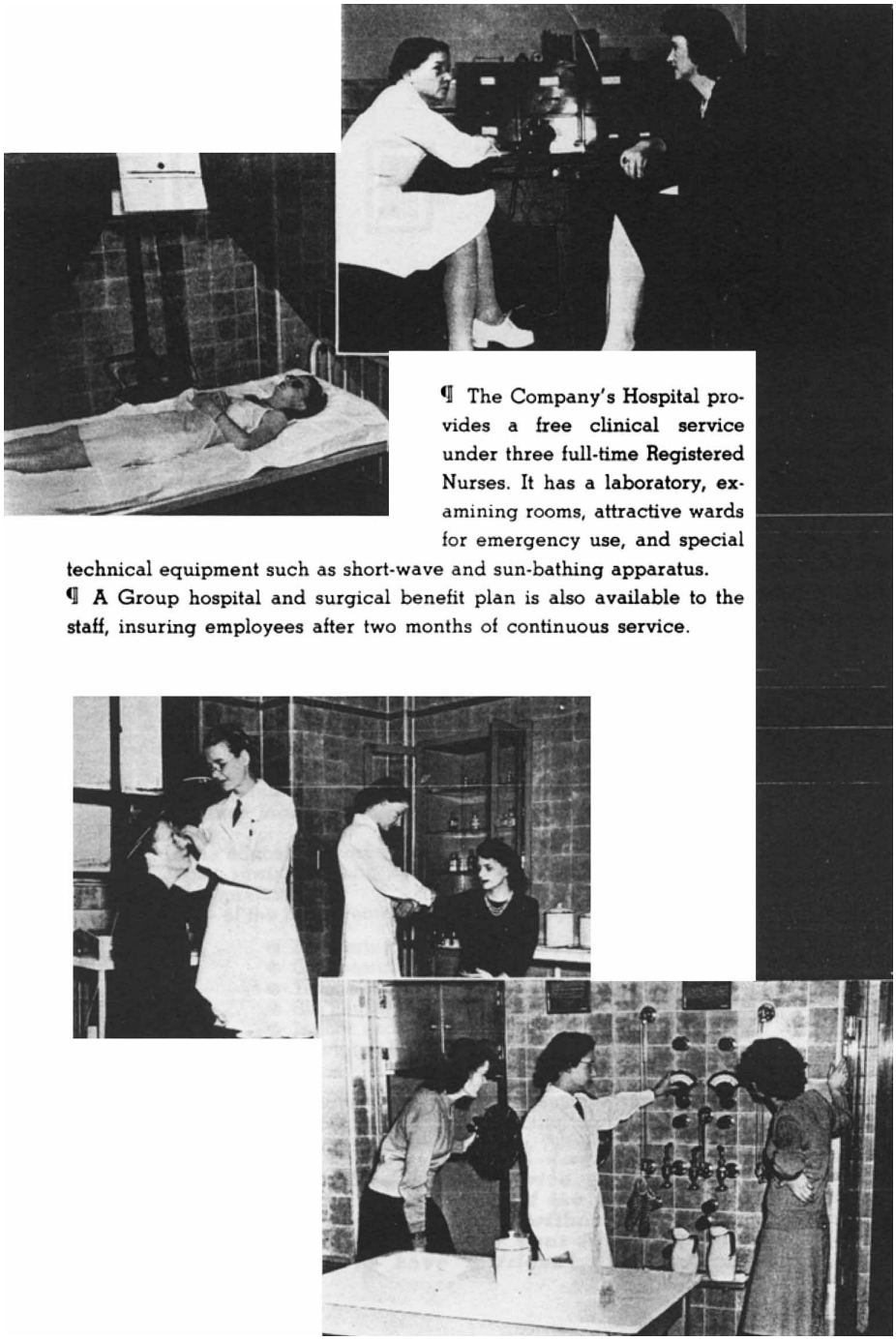


Figure 3 *Sun Life* promotional booklet, circa 1955. Source: Sun Life Insurance Company of Canada.

way to attract 'pretty maids' to Sun Life. In doing so, it drew on, and reinforced ideas that this was the right kind of workplace for forward-thinking, young middle-class woman.

From working at a typewriter, to eating in the space-age cafeteria, to subjecting one's self to the vintage tanning machine, Sun Life is portrayed as a workplace in which employees could enjoy a high level of physical integration with technology. This effort cannot be separated from the important detail that by the 1950s manufacturing jobs paid higher wages to women, not clerical work as in earlier decades (Sangster 1995). Instead the advantage of clerical work was the social status gained by being associated with modern—indeed 'ultramodern'—companies on the technological cutting-edge, in ways that other workplaces were not. Promotional brochures and advertising advanced the idea that work in the information sector provided distinct social and cultural advantages, and offered the technological sophistication of the white-collar office as a benefit that presumably outweighed the higher wages available in other lines of work.

'Telling' it like it is?: gender, ATMs and the new information economy

> In my first job we typed out cards on typewriters. Now that's all on computers, but that means clerical work that's been eliminated. Due to all the computers today you don't have all the mistakes like when I started. That's one place I agree with progress. But it means a lot of people can't get those clerical jobs today. As time went by and that work was taken over by computers, I started typing and became a clerk-typist. I've just recently learned how to operate a word processor. Oh it's just great. I won't ever go back to straight typing. (Barb, born about 1932)

A whole host of new technologies support the contemporary information economy—not least of which are personal computers and advanced telecommunications. Taken together, and as in earlier eras, technology again contributed to changes in the practices and meanings of clerical work in the last decades of the twentieth century. As Barb suggests, new technologies meant some office jobs disappeared, but others emerged, not only 'clerk-typists', but, for instance, call center agents and data entry operators. Geographers have traced through how recent technological innovations help change the spatial dynamics of office location, allowing back-office clerical functions (such as data-entry, payroll, billing, and claims processing) to be spatially separated from front-office aspects of office work that require face-to-face contact with clients, and located in suburbs or overseas (England 1993; Freeman 2001; Mullings 1999; Patel 2006).

Wajcman's (2004) claim that 'technology is both a source and a consequence of gender relations' suggests possibilities for agency. Our analysis of employee magazines reveals ruptures in representations of clerical work starting in the early 1970s. For instance, Sun Life Insurance's staff magazine included articles that asked 'Unfair to the fairer sex?' (Hardy 1972) and 'The secretary: status symbol or able assistant?' (Long 1973). In these cases, the established technosocial relation between clerical workers and typewriters was challenged by women themselves. Sun Life secretary, Phyllis Cox, said administrative assistants were 'not just extensions of the typewriter', and deserved to be given more responsibilities and opportunities for advancement (Long 1973: 8). Blatant stereotyping in advertising was also challenged. In the early 1970s the Royal Bank of Canada employed an actress as part of its promotion of the bank as friendly and efficient: 'Mary—a dream teller' appeared in print, radio and television

advertising (McDowall 1993). Mary called forth a particular kind of womanhood: helpful, efficient, and non-threatening, a helpful hostess mediating the boundary between the bank and the public. Mary became one of the best known advertising personalities in Canada, but also unintentionally drew attention to the shortcomings of actual clerical work.

Increased education (fueling women's personal ambitions and expectation of waged work), shifts in family structure (more divorce and more employed mothers), and the increasing cost of living, led to increased women's employment. These factors, together with second-wave feminism, combined to finally draw widespread attention to workplace inequities of the sort that Royal Bank's Mary highlighted. In the USA and Canada, occupational segregation, pay equity and workplace discrimination were on the public agenda: front-page news (even in the business section) and the subject of court cases and new laws. Whereas twenty years earlier the prospect of working at a typewriter, Dictaphone or Hollerith machine was successively used to lure applicants into the information workplace, by the 1970s the limits of those jobs were clear. We view these challenges as efforts to disrupt and reinterpret the strong semiotic link created between women clerical workers and the machines they used.

As in previous eras, technological innovation and new forms of automation occurred in tandem with changes in technosocial relations. The introduction of the ATM is one example of the host of new technosocial relations enabling the contemporary information economy, and we use it as yet another reinscription of the 'female machine'. In the USA, early ATMs were sometimes associated with feminine characteristics to soften the market to this new device. Introduced in the late 1960s (the earliest were in the UK), the ATM presented banks with potential advantages by reducing the number of employees required in branches (and introducing ATM surcharges). However, these benefits would only accrue if customers used the new technology. For the ATM to catch on, it had to appear user-friendly and non-threatening. As the *New York Times* reported, 'Deep-seated attitudes and habits must be altered. Trust must be fostered. What one banker called "Man vs. machine confrontation" must be defused' (Milletti 1977: 37). More specifically, after the effort financial institutions invested in defining the dream teller as a young woman, they now had to re-define that dream. Some decided to defuse the 'man vs. machine confrontation'—and get a return on investments already made—by transposing specifically feminine characteristics on to the ATM.

In 1973, for example, the Chicago Savings and Loan Association named their ATMs 'Ernestine', promising customers that 'If you should suddenly decide to fly to Fiji on a Friday night or have the crowd in for red caviar and Slivowitz at four in the morning ... visit Ernestine the Cash Machine for money the minute you need it' (cited in Miller 1973: 219). Similarly, in another *New York Times* article entitled 'Machines: the New Bank Tellers', ATMs were referred to as 'the ugliest teller', but with the advantage that they 'never get pregnant' (Miller 1973: 219). By 1977 The Exchange Bancorporation in Florida featured 'Miss X—the sleepless teller' and First National Bank of Atlanta not only named their ATMs—Tillie the Teller—but even promoted 'her personality', claiming 'she's a bubbly, giggly kind of character' (Milletti 1977: 37).[7] As with Mary of the Royal Bank, First National hired an actress to promote 'Tillie the Teller', and look-alikes actually assisted customers with 'Tillie' (it was not

uncommon, even in the 1990s, for banks to have tellers stand in branch foyers to assist customers unfamiliar with ATMs).

Though playful in tone, these ads were aimed at defusing the 'man vs. machine confrontation'—and speed this technology's adoption—by encouraging customers to transfer feelings about flesh-and-blood tellers on to automated ones. Thus the campaigns drew on, and reinforced an already-established understanding of female tellers as friendly, trustworthy, and non-threatening. Such efforts to interpret ATMs as feminine by giving them women's names and feminized 'personalities' raises the figure of the cyborg, or human–machine hybrid (Haraway 1991). Indeed the ads we describe invite customers to think of Ernestine, Tillie and the other ATMs as *versions* of flesh-and-blood tellers, except they are open all the time, never get pregnant, and just happen to be machines. From the ANT perspective, ATMs exert a powerful influence on the way customers do their banking, shifting it from inside a branch with a human being to curb-side with a machine. Like the association between typewriters and middle-class femininity in the early twentieth century used to attract women to white-collar workplaces, the feminization of ATMs can be viewed as part of a broader effort to change the social and spatial practices of banking.

As ATMs and later online banking became more common, the gender dynamics of information work changed. Partially as a result of automation and technological advances such as the ATM, the century-long growth of clerical work slowed and began to decline in the 1980s (Glenn and Feldberg 1982; Menzies 1996) (see Figure 1). The introduction of ATMs and on-line banking meant some jobs were replaced by new technologies; since fewer bank tellers are needed when more customers use electronic banking options. Some even suggest this has benefited men who tend to dominate the newly created, highly skilled, technical and professional jobs like computer programming (Glenn and Feldberg 1982; Menzies 1996).

Yet it is important to note that the ATM and its effects on financial services is just one component of the larger story about the gender dynamics of work in the information economy. Alongside automation, new kinds of jobs at every skill level have been created within the information economy, from data-processing and call center work to accounting and computer programming, some of which have invested considerable value in feminine-coded traits such as 'people skills' or 'soft skills'.[8] Without taking a Panglossian view of this sector as a whole, we want to signal that it has generated a wide range of opportunities—as well as new obstacles—for both women and men workers.

The 'feminine ATM' angle in advertising lasted some time, but is uncommon today. However, the fantasy of the she-cyborg teller has not gone away. In the last several years NCR has developed and tested 'Stella the Teller'. Identified as 'she', Stella uses biometrics (iris scan) and speech recognition and synthesis to greet the customer by name, recall the usual type of transaction made, and even knows and acknowledges their birthday (Johnson and Coventry 2001). In early 2007, Canada's Royal Bank introduced 'May', an interactive 3-D 'virtual agent' who literally talks online customers through complex banking processes (Perkins 2007). Like Ernestine and Tillie before them, Stella and May 'make you feel more comfortable doing business with [the bank] by creating agents that look and talk like your friends' (Perkins 2007). Stella and May also minimize calls to call centers and teach customers to use extra online services. Indeed, the she-cyborg teller even

appears in American popular culture. The 2004 re-make of *The Stepford Wives* cast American country music singer Faith Hill as a hyper-feminine automaton capable of issuing money ATM-style through her mouth. 'Dream tellers' for the new millennium; Stella, May and Faith Hill-as-ATM suggest the durability of the figure of the female teller, and our continued fascination with the 'female machine', even as each generation interprets it anew.

Conclusion

We have argued that the relational construction of technologies and gender shape spatial practices in the workplace. Some key artifacts of the twentieth-century information technology workplace, such as typewriters and ATMs, have been associated with feminized traits; at the same time as these artifacts have shaped gender dynamics. We drew on ANT to employ a more expansive understanding of agency, but acknowledge the way in which social-technical assemblages can perpetuate extant social power asymmetries. The gender encodings discussed here are not random, but rather, reflect strategic efforts to shape spatial practices. In the early twentieth century the typewriter was interpreted as an appropriate technology for middle-class women (and the office was coded as an appropriate workplace for middle-class *working* women), as a means of attracting women into the information workplace as employees. In turn, 'feminized' typewriters suggested women typists. The woman clerical worker and the rhetorical connection between her and the technologies she used were durable formulations throughout the century. So much so that the icon of the feminized teller was sometimes transposed on to actual machines like the ATM. Feminized ATMs changed the space of day-to-day banking and the quality of this experience, as well as reinforcing the concept of the friendly, helpful woman teller.

The choice of casting ATMs in feminine terms built on existing semiotic linkages: the feminization of earlier information-processing technologies; the invocation of the technologically-sophisticated office to lure middle-class women into jobs; and using women as a firm's public face in advertising. In a darkly ironic twist, while financial companies drew on the trust and positive feelings customers had developed for female tellers to soften the market for ATMs, the mass-diffusion of this technology may well have cost flesh and blood tellers their jobs.

Into the new millennium the landscape of information processing continues to change shape in response to technological innovation. Advances in computing have allowed front-office and back-office functions to be stretched even farther to capitalize on low-wage, highly educated labor pools both within North America and off-shore in India, Ireland, Jamaica, and Singapore; into privatized back-office spaces where employees are invisible, and where information work is often feminized anew (Mullings 1999; Freeman 2001; Patel 2006). We propose that as the spaces of information processing continue to expand; gender relations, technology and the lived-experience of work continue to shape one another in ways that warrant continued study.

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Notes

1 Although our analysis focuses on the information economy in North America, we want to signal the broader scope and scale of this entity and qualify our findings accordingly. While our findings may extend beyond the North American context, additional research would be required to verify this.

2 An array of women's paid (and unpaid) work was not counted in the census: farming, taking in laundry and sewing, looking after borders. Yet this work was crucial to the economic survival of working-class families in the nineteenth and early twentieth centuries.

3 We found that major Canadian financial services firms did not hire many women of color until after mid-century. This was echoed in the USA, with the exception of companies catering to minority clients (Kwolek-Folland 1994).

4 Personnel Files #16, #45 and #91, Bank of Nova Scotia Archives; Stenographer's Book, Bank of Montreal Archives.

5 No author is listed for this article; Vol. 5, No. 2, Summer 1956, pp. 3–6. Bank of Nova Scotia Archives, staff magazines box.

6 Sun Life Archives, box 713, employment matters. Presumably the pamphlet takes its name from a popular nursery rhyme of the same name.

7 Notice how the idealized teller represented in such ads (bubbly and giggly) is very different from her predecessor who was obliged to furnish evidence of her propriety and 'character' to obtain work.

8 We thank one of the anonymous reviewers for this point.

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Abstract translations

Le genre, le travail et la technologie dans le milieu de travail informatisé: de la machine à écrire au guichet automatique

L'étude que nous avons menée sur les relations entre le genre et la technologie dans le milieu de travail porte sur le travail de bureau dans le milieu de travail informatisé, et plus particulièrement sur le secteur des finances et assurances. Notre but est de faire la lumière sur «l'histoire cachée» de la façon dont le travail de bureau et les artefacts qui le soutiennent ont été compris et utilisés selon les différentes conditions culturelles et économiques. L'analyse effectuée sur les rapports techno-sociaux découle des Études en science et technologie dans lesquelles les sens donnés aux termes «technologie» et «société» sont mutuellement liés, modifiables, et dépendent d'une mise à jour constante pour maintenir dans le temps une cohérence conceptuelle. S'inspirant d'exemples des États-Unis et du Canada, nous soutenons que tout au long du vingtième siècle, certaines technologies bureautiques se sont «féminisées», ou sont liées aux caractéristiques codées en tant que féminines, comme moyen d'influer sur la pratique spatiale et les relations sociales en milieu de travail.

Mots-clefs: genre, technologie, travail de bureau, études féministes en science et technologie.

Género, trabajo y tecnología en el lugar de trabajo de información: desde máquinas de escribir a cajeros automáticos

Consideramos las relaciones entre género y tecnología en el lugar de trabajo, centrándonos en el trabajo administrativo en lugares de trabajo de información, en particular en el sector financiero y en el de seguros. Nuestro objetivo es revelar la 'historia ocultada' de cómo el trabajo administrativo y los artefactos que lo sostienen han sido entendidos y empleados bajo diferentes circunstancias culturales y económicas. Empleamos un análisis de relaciones tecno-sociales dearrollado en los Estudios de la Ciencia y de la Tecnología en el que los significados de 'tecnología' y 'sociedad' son mutuamente constitutivos y cambiantes, y hay que mantenerlos para preservar su coherencia conceptual. Utilizando ejemplos de los Estados Unidos y Canadá, sugerimos que en varios momentos durante el siglo veinte ciertas tecnologías de ofimática llegaron a ser 'feminizadas' o asociadas con características codificadas como femininas, como modo de dar forma a la práctica espacial y las relaciones sociales en en lugar de trabajo.

Palabras claves: género, tecnología, oficinista, el estudio feminista de la ciencia y de la tecnología.