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Technology in Canada Through the Lens of Labour History

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Article abstract

This is an extended review essay which examines contributions of recent labour history to the history of Canadian technology. It argues that three recent books: Heron's *Working in Steel*, Sager's *Seafaring Labour*, and Parr's *Gender of Breadwinners* have bridged the longstanding gap between the two sub-disciplines. The review suggests some future directions for a more 'complete' history of technology which incorporates both the social and technical aspects of production.

TECHNOLOGY IN CANADA THROUGH THE LENS OF LABOUR HISTORY

John Lutz[1]

ABSTRACT

This is an extended review essay which examines contributions of recent labour history to the history of Canadian technology. It argues that three recent books: Heron's **Working in Steel**, Sager's **Seafaring Labour**, and Parr's **Gender of Breadwinners** have bridged the longstanding gap between the two sub-disciplines. The review suggests some future directions for a more 'complete' history of technology which incorporates both the social and technical aspects of production.

RESUMÉ

Cet essai critique examine trois contributions récentes de l'histoire du travail à l'histoire de la technologie canadienne: **Working in Steel** de Heron, **Seafaring Labour** de Sager et **Gender of Breadwinners** de Parr. Ces ouvrages comblent le fossé qui existait entre deux sous-disciplines. Nous suggérons également diverses pistes de recherche pour une éventuelle histoire "complète" de la technologie qui incluerait tant les aspects sociaux que techniques de la production.

There is no doubt that technology has had an enormous impact on work and workers over the past century. But what about the effect of workers on technology? While the literature on the technological transformation of work has literally become a sub-section of the social sciences (the 'labour process' literature), the impact of labour on technology is little studied or understood. As a result, little is known about labour's contribution to the shaping of Canadian technology, a contribution which has taken two main forms. First, labour has had a direct and critical impact on the technology in its implementation and improvement.[2]

Production technology is created with one eye on the profit margin and the other on labour: the cost of labour it will replace, the labour force desired to operate

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2 Nathan Rosenberg has drawn attention to 'the most important long-term contribution to technical progress ever made .... the steady accretion of innumerable minor improvements and modifications' which places a heavy emphasis on workers' contributions to technological change. See Nathan Rosenberg, **Inside the Black Box: Technology and Economics** (New York, 1982), 4-7; Philip Scranton, 'The Workplace, Technology, and Theory in American Labor History,' **International Labor and Working Class History** 35 (Spring 1989), 10.

it, and the probable response of labour to its introduction.[3] We know that managers, in calling for new technology, and engineers, in designing it, have factored-in a certain labour force and its response to the changes, even if the technology is not directly aimed at replacing labour.[4] In this way the specific characteristics of the labour force affect the design of specific production machinery, indirectly, through the media of the manager and the engineer. In Canada the literature that recognizes this form of labour's impact on technology is small, relatively recent and predominantly from the pens of labour historians.

Previously, the academic division of labour has ensured historians of technology largely focused on the technical, and to a degree, economic aspects of the production process. Labour historians focused on the social aspect of production, the impact of workplace technology. Each specialization has proceeded, as this essay confirms, without making much reference to the other. The recent literature on the history of the 'labour process' breaks from the this tradition and links the two subdisciplines together by exploring the indirect impact of labour on the origins of technology. This new work has revealed the limitations of studying the technical and social components of the production process separately. In so doing it suggests a rationale and potential for bridging the gap between the two subdisciplines.

In an attempt to widen this little-used bridge between the two subdisciplines this paper surveys recent contributions of Canadian labour history to the history of technology.[5] It does this in four parts. First it looks at some of the reasons why the two subdisciplines have been estranged. Second, it briefly reviews the Canadian labour historiography of the last decade for its direct contributions to the

3 We know that profit margin is only one consideration and the militancy, power or gender of the workforce is another in the design and implementation of new technologies. See, for example, from Robert Ozanne, **A Century of Labour-Management Relations at McCormick and International Harvester** (Madison, 1967) that McCormick Harvester Company introduced moulding machines in 1886 to break a strike of its skilled workers, even though it knew the machines to be less profitable than hand labour (20-25). David Noble's classic 'Social Choice in Machine Design: The Case of Automatically Controlled Machine Tools' in Andrew Zimbalist, ed. **Case Studies in the Labor Process** (New York, 1979) argued convincingly that the more expensive numerical controlled machine tools were selected over the record-playback system because they were intended to eliminate skilled labour. For the influence of the gender of the workforce on technology see the discussion of Parr's book, below.

4 See, for an example Wayne Lewchuk's discussion of how Ford designed its British plants differently from their American counterparts to take into account the different characteristics of the labour force in **American Technology in the British Vehicle Industry** (Cambridge, 1987).

5 For a survey of the American labour literature see Philip Scranton, 'None-too-Porous Boundaries: Labor History and the History of Technology,' **Technology and Culture** 29:4 (October 1988), 722-43.

history of Canadian technology. Next, it looks in more detail at three recent books that exemplify the contributions of the new labour history to the history of technology, which, incidently, have dominated the major prizes in the Canadian historical profession: Craig Heron's *Working in Steel: The Early Years in Canada, 1883-1935* (Toronto, 1988), Eric Sager's *Seafaring Labour: The Merchant Marine of Atlantic Canada, 1820-1914* (Kingston and Montreal, 1989), and Joy Parr's *The Gender of Breadwinners: Women, Men, and Change in Two Industrial Towns, 1880-1950* (Toronto, 1990). It concludes by examining the potential for expanding the link between the two fields.

I

The two subdisciplines, the history of technology and labour history, have had an obvious meeting place for their research, amidst the clattering machinery on factory floors everywhere; but they have tended not to show up at the same place, at least not on the same day. Until recently when technology appeared in the writings of labour historians and sociologists it was as a device used by greedy capitalists to take skills and power away from workers.[6] In the hands of historians of technology, technology was a way of improving efficiency, productivity and social welfare. When workers appeared, which they did rarely, they were either passive respondents to change or they were reactionary forces holding back real progress. Historians of technology tended to down-play the effect of the technological change on the workers in the industries that they study.[7]

Why has there been such a gap of understanding between these specialists in over-lapping fields? In a recent article Philip Scranton suggests that a major factor is the distance between the social origins of the practitioners in the respective fields; a social distance that is accompanied by ideological differences, different agendas, different questions asked from different perspectives. Historians of technology have tended, (though there are important exceptions) to regard technological change as progress, and inventors as the key agents in improving standards of living. This, Scranton argues, reflects the origin of many of these writers as 'lapsed' engineers or scientists. In contrast labour historians tend to be 'lapsed

6 See for example Norman Ball's review of Wallace Clement, **Hardrock Mining: Industrial Relations and Technological Changes at Inco** (Toronto, 1981) in **HSTC Bulletin** 7:1 (January 1983), 45-7, for example.

7 This was the conclusion of John Staudenmaier **Technology's Storytellers: Reweaving the Human Fabric** (Cambridge, Mass., 1985), 176-177.

leftists,' sympathize with the working class and, with important exceptions, regard technological change as something suspicious. Technology, in this view, is something aimed at exploiting workers, more efficiently.[8]

Admittedly, these characterizations have a large element of caricature to them but as broad generalizations the evidence supports them. John Staudenmaier's review of the contents of *Technology and Culture*, one of the key journals in the field, highlighted the Pollyanna-ish tone to technology and the lack of concern about the effect of technological change on labour.[9] Scranton examined the American labour process literature and found that technological change was assumed to be a negative for the workers. James Hull identified this gap in this journal when he concluded his review of a collection of labour process essays with: 'it would have been far more useful if the authors had paid greater attention to the work of historians of technology.'[10]

The different approaches to technology have carried their own value-laden definitions of technology into the scholarly arena. In the mainstream history of technology literature, technology is nearly synonymous with progress. Melvin Kranzberg, co-founder and former president of the Society for the History of Technology and long-time editor of the journal *Technology and Culture* exemplifies this view: 'though I am opposed to the Whig interpretation of when applied, say to political history it is perhaps inherent in the subject matter of the history of technology.' We historians of technology, Kranzberg says, 'fall in love with our subject, and as the case with romantic lovers, we tend to overlook the imperfections which are so obvious to everyone else.'[11]

On the other hand, technology's imperfections' were emphasized by Marx in *Capital* and have since formed a major plank in the Marxist and 'leftist' critique of technology. The case was made most forcefully by Harry Braverman in his

8 Scranton, 'None-Too-Porous-Boundaries,' 731-2.

9 Staudenmaier studied the journal from 1950-1980. In the decade since Staudenmaier's study of the journal in **Technology's Storytellers**, 11 articles on technology and labour have appeared in the journal, all but five in a single theme issue on labour and technology. This observation from Robert Griffin, 'Cultural Technology or Technology in Search of a New Meaning: A Brief Consideration of Staudenmaier's Vision of **Technology and Culture**,' unpublished paper, University of Victoria, History Department, 1991.

10 Scranton, 'Workplace, Technology and Theory'; Review of Craig Heron and Robert Storey, eds., **On the Job: Confronting the Labour Process in Canada**, by James P. Hull, **Scientia Canadensis** 13 (1987), 141.

11 Melvin Kranzberg, 'Lets not get wrought up about it,' **Technology and Culture** 25:4 (1984), 735, 738.

1974 classic *Labor and Monopoly Capitalism* subtitled *The Degradation of Work in the Twentieth Century* (New York). In both Marx and Braverman technology is narrowly defined as machines and a machine is a device that 'performs with its tools the same operations that were formerly done by the workman with similar tools.'[12] Defined in this way a machine is, *ipso facto*, a device that 'steals' workers tools and deskills them. Needless to say the wide divergence between these definitions have led their adherents into the workplace via different entrances.

II

Canadian labour process literature has largely followed through the door opened by Braverman. Braverman related technology to control and to wider questions of class and conflict. In focusing on the use of machinery to replace labour skill and reduce labour power he identified one of the reasons why capital introduces machinery into the productive process and really focused scholarly attention onto the problem of labour- and skill-displacing technology. Braverman was eagerly seized upon by the left in the 1970s and 1980s, both for these insights and because he showed a way out of the technological determinism that had previously dominated the Marxist literature. In focusing on the conflict between capital and labour he directed others to the fact that modern capital intensive industries are very vulnerable at the point of production -- the shop floor.

Yet, at its core, Braverman's notion of a skilled craftsman was a romantic one. The approach assumed that *homo sapiens* was really *homo faber* and that skill was as essential ingredient for human dignity. To deskill, was to dehumanize. Marx vividly presents this view, that the division of labour by manufacturers 'converts labour into a crippled monstrosity, by forcing his detail dexterity at the expense of a world of productive capabilities and instincts; just as in the States of La Plata they butcher a whole beast for the sake of his hide or his tallow.'[13] No one will argue against the proposition that factory work is often stultifying or that many skilled jobs were lost in the first or second industrial revolutions. These were clearly aspects of the industrializing process. Braverman, however, by focusing on the nineteenth century skilled craftsman, limited his focus to the only segment of the workforce that was facing deskilling, and diverted a generation of scholars away from the burgeoning demand for semi-skilled workers drawn from

12 Karl Marx cited in Braverman, **Labor and Monopoly Capitalism**, 185.

13 Karl Marx, **Capital** (New York, 1967), I, 360.

the formerly unskilled. The romance in Braverman lies in the implied assumption that skilled workers numerically dominated the pre-industrial workforce and their economic power, skill levels and workplace discretion were typical of the era.

Braverman's romanticism carried over into the Canadian labour process literature which has focused on the effect of workplace technological innovation on the skilled workforce and, until recently, ignored the unskilled and semi-skilled who were affected very differently by technological change. The literature on Canadian labour history and the labour process is vast but most of it takes the level of technology as 'a given' and thus has little to add to the understanding of the development of technology. In the survey that follows I have selected those works that have directly considered the shaping of workplace technology.[14]

One of the pioneering and still one of the best studies of the interaction between technology, labour and capital was Gregory Kealey's *Toronto Workers Respond to Industrial Capitalism, 1867-1892* (Toronto, 1980). Kealey compares the different responses of skilled labour in four different industries to the new technology of 'industrial capitalism': shoemaking, cooperage, metal working and printing. He demonstrated that the application of new technology and the distribution of benefits was largely dependent on the relative power labour and capital prior to its introduction. Workers faced different types of technological transformations and fought different battles over technology in each respective industry. The shoemakers and coopers opted to resist its implementation but they did so from a weak bargaining position and were totally displaced. The moulders were fairly well organized and had some influence in structuring their work environment. The printers were well organized and chose to accommodate the new technologies if they could control them -- a bargain the divided employers had to accept. Kealey explored the characteristics the industries, the employers, the workers and their effect on the outcome of battles over workplace technology.

More contemporary aspects of the labour process were explored by Wallace Clement the following year with his *Hardrock Mining: Industrial Relations and Technological Changes at Inco* (Toronto 1981).[15] Clement examined the connec-

14 For a recent general survey Canadian labour history see Joanne Burgess, 'Exploring the Limited Identities of Canadian Labour: Recent Trends in English Canada and Quebec,' **International Journal of Canadian Studies** 1-2 (Spring-Fall 1990), 149-173. For a fuller survey of the Canadian labour process literature see Craig Heron and Robert Storey, 'On the Job in Canada,' in Heron and Storey, eds., **On the Job: Confronting the Labour Process in Canada** (Kingston and Montreal, 1986).

15 Reviewed by Norman Ball in **HSTC Bulletin** 7:1 (January 1983), 45-7.

tion between the nature of the industry, management decisions to mechanize and the response of labour. He focused on technological change at the Inco underground and open-pit mines in the late 1970s although, he considered earlier innovations in some passages. His approach is pure Braverman but this places him in an awkward position because his evidence argues against his conclusions. Clement provides detailed job descriptions of workers before and after the introduction of new technology. He finds that, overall, new technology had resulted in the decline in the percentage of unskilled workers employed, workers experienced increasing levels of training, wages have been high and workers have taken a passive approach to technological change. Yet he concludes that: 'overwhelmingly technology has been used by management as a weapon in the class war' (356).

Ian Radforth moved the Canadian labour process literature ahead a great deal with his *Bushworkers and Bosses: Logging in Northern Ontario, 1900-1980,* (Toronto, 1987).[16] Radforth was able to draw on the literature that had developed in response to Braverman, notably Richard Edwards, *Contested Terrain: The Transformation of the Workplace in the Twentieth Century* (New York, 1979) and Michael Burawoy's *Manufacturing Consent: Changes in the Labor Process under Monopoly Capitalism* (Chicago, 1979).

Radforth stepped away from the focus on the skilled labourer and looked at technological innovation and work among the bushworkers. He rejects a simplistic deskilling notion. On one hand, he argued that it was actually 'factors relating to the natural environment and the characteristics of the staple itself' (244) that determined the technology of the industry. On the other, that the social organization of the work, in this case piece work, made it advantageous for workers to adopt technology to increase production. It was the workers themselves that introduced the gas powered chain saw into the woods. He concludes that management introduced new technology, not to deskill, but in response to labour shortages. Ironically the new technology required skilled operators which were at least as scarce so, as Radforth demonstrates is often the case, the intentions of the innovators did not match the results.

Radforth is quite taken by Edwards' phrase 'contested terrain' and has a chapter, 'Bushworkers in Struggle,' to chronicle the contest. Undoubtedly there was a lot of contested terrain in the relationships of workers and capital in the bush but technology seems not to have been one of them. Radforth, reluctantly it seems, finds that the little conflict over technological change was largely uncon-

16 Reviewed by James Hull in **Scientia Canadensis** 13:1 (Spring-Summer 1989), 64-7.

scious of class dimensions (242). Management introduced technology, not to deskill but to overcome bottlenecks, or reduce costs (190-1, 242-3) and 'overwhelmingly, woods workers and their union spokesmen welcomed the new logging equipment and many of the new methods' (222).

In addition to these monographs there have been a smattering of scholarly articles that have linked the history of labour and technology. Contested terrain was taken up as a theme in the collection *On the Job: Confronting the Labour Process in Canada* (Kingston, Montreal, 1986) edited by Craig Heron and Robert Storey.[17] Heron and Storey's introductory essay 'On the Job in Canada' is a concise review of the major changes to labour process in Canada over the past 200 years. It contains suggestions for future directions including an injunction to widen the scope of the labour process literature. Some of the eleven other essays examine aspects of the labour process in Canada from the 1850s to the present, including examination of work in railyards, coal mines, auto factories and fast-food restaurants. John Foster's study of longshoring confirms Kealey's conclusion that the share of the benefits of technological change is closely related to the pre-existing labour-capital power balance. Mercedes Steedman's look at skill and gender in the Canadian clothing industry 1890-1940, has some insights on how technology is gendered.[18] Graeme Lowe's article 'Mechanization, Feminization, and Managerial Control in the Early Twentieth-Century Canadian Office' is an excellent study of the timing of technological change, its rationale, and its effect on the Canadian workplace.[19] Kealey's work on printers, Radforth's on logging, discussed above, and an article by Heron and Storey on the Canadian Steel Industry (much of it amplified in Heron's book discussed below) round out the collection.

A survey of the two main journals in Canadian labour history and the history of technology, respectively, *Labour/Le Travail* and *Scientia Canadensis* over the past decade yields only one article each that connect technological and labour history in more than a one-dimensional fashion. Joel Novek's 'Grain Terminal Automation: A Case Study in the Control of Control,' *Labour/Le Travail* 22 (Fall 1988), 163-80, examines the managerial decisions that brought automation to the Cargill Grain Terminal at Thunder Bay. Workers at the plant were receptive to technological change so long as they could continue to control the work they

17 Reviewed by James P. Hull in **Scientia Canadensis** 10:2 (Autumn-Winter 1986), 140-2.

18 In other words, how a certain technology becomes identified with a single gender and how certain systems of production become either 'men's work' or 'women's work'.

19 This article is expanded in Graham Lowe, **Women in the Administrative Revolution: The Feminization of Clerical Work** (Toronto, 1987).

were doing prior to the implementation of the change. Noteworthy about this situation was that the new automated system required a computer controller to direct the flow of grain inside the plant (the unions traditional preserve,) as well as onto ships (traditionally a managerial prerogative). Labour and management accommodated this new technology with a joint control system where a union and management representative both sit in the control room at nearly identical terminals, directing the process in an interactive and cooperative fashion.

Robert McIntosh's article "'Grotesque Faces and Figures": Child Labourers and Coal Mining Technology in Victorian Nova Scotia,' *Scientia Canadensis* 12:2 (Autumn-Winter 1988), 97-112, is the single article in this journal in the past decade which connects the two specialties. It describes how steam technology allowed for the employment of a large number of boys underground which earlier technology had not. He points out that although technological change had everything to do with putting boys into the mines in the 1820s it was changing social attitudes that saw their removal a century later.

It is possible, indeed quite accurate, to see the development of the labour process literature in Canada to be a reflection of the various stages of appreciation of Braverman. At one extreme is Clement's 1981 *Hardrock Mining* -- a close application of Braverman's approach. By the late 1980s, with the publication of Radforth's *Bushworkers and Bosses* and Heron and Storey's *On the Job*, the focus had turned to a criticism of the 'simplistic' deskilling model and a search for a more sophisticated analysis. Still, these publications make it clear that Braverman's 1974 questions still set the agenda for the literature, even if his answers were rejected. As a result, they have had a tendency to concentrate more on the effect of technology once it arrives on the shop floor than on how and why the new technology appeared.

III

Three more-recent books in 'labour history' show a break with the fixation on the Braverman agenda and have challenged historians of technology, as well as of labour, with a whole new set of questions. They make new connections from technology through the workplace into family structures, gender identities, boardrooms, ethnicity and state policy, opening up vital aspects of the interaction between society and technology. Like other books that escape the conventional groove of scholarship it is inaccurate to describe the three books described below as being 'labour history' though they are surely that as well as other things, and their authors are well-known labour historians.

A measure of the quality and prominence of this new labour history is that one of the books, Joy Parr's, was selected by the Canadian Historical Association as the best book on Canadian history published in 1990. The other two won honourable mentions for this award in the two previous years. Space does not allow a complete critical review of these books so I have focused on the positive contributions each makes to the history of Canadian technology.

The time frames of all three books overlap in the latter part of the nineteenth century and the early part of the twentieth, an indication that the temporal focus of Canadian labour history is shifting to examine the second industrial revolution. These painstakingly detailed studies of the workplace and its many components, including technology, are a manifestation of an increasing recognition in labour history of the importance of 'context' in labour history. All three deftly merge a wide range of painstakingly gathered evidence, including oral history, and, variously, massive statistical data bases, financial statements, personnel files, trade journals and government documents in order to establish both the micro and macro contexts of their work.

Craig Heron's book, *Working in Steel: The Early Years in Canada, 1883-1935* is a melding of labour history, the history of technology and business history. One of the book's four chapters is devoted to the machinery of steel making and it is the centre around which the chapters on business organization and labour pivot.

Heron provides an overview of the pre-1883 methods of making iron, then proceeds to chronicle the major technological innovations in the iron and steel industry in Canada through to the depression. Throughout the book his broad goal is to examine the effects of the 'second industrial revolution' on Canadian workers. He argues that the steel industry provides a good proxy for understanding the effect on other workers in the new mass production industries.

He provides detailed descriptions of the machinery used to make steel and how it changed in the fifty years under study. He pays particular attention to the introduction of science-based steel making and the changes this meant for the skilled steel-workers. Surprisingly, he concludes that the steel companies found that even with their labs and university-educated scientists, they had to rely on the eye of the experienced labourers. Frequently, the scientists and managers were sent down to the factory floor to do a labouring apprenticeship before they were permitted full authority (70). In locating the impetus for technological change he records the introduction of American methods via American managers who were hired by the Canadian financier/promoters to develop the industry (87-91).

Heron challenges the Braverman deskilling thesis, arguing that while some skilled jobs disappeared, many more unskilled jobs were eliminated and numer-

ous semi-skilled machine tending jobs created. He describes an era in which workers found pride in their role as machine operators (63).

This book is a well-argued reminder that technology should always be located in the context of the capitalist economy that calls it forth: business cycles, labour supply, ideological fashions, all shape the rate of technological change and the response it evokes form managers and workers. Heron's book is unique in illustrating the effect of the second industrial revolution on Canadian workers in the crucial mass production industries and as such will be particularly valuable resource for courses on the history of Canadian technology.

Turning to Eric Sager's book *Seafaring Labour*, it is as though he took Thucydides declaration that 'seafaring is an art like any other...' to heart, with David Alexander's words, that sailors might be 'working men who got wet.'[20] His focus is on the work of the ordinary seaman in the British North American fishing and freighting fleets during the transition from wood and sail to iron and steam. Since, as he points out, the sailors' workplace was itself a machine (designed to constrain social relations as well as be functional), the changing nature of seafaring labour is in large part the study of changing technology. All but three of his nine chapters concentrate explicitly on this sea-borne technology.

Sager's own skilled hand is revealed in his combination of a mass of statistical evidence garnered from the Atlantic Canada Shipping Project, a SSHRCC sponsored team-endeavour (of which he was a part), with the oral tradition and written reminiscences of the sailors he studies. The book is illustrated by detailed drawings of the ships and their riggings, reproduced from the *Oxford Companion to Ships and the Sea*.

The highlight is Sager's description of a sailor's work and the tools he worked with. He also explores in detail the costs associated with alternative technologies, why owners opted for some over others, as well as the implications for labour. Chapter seven is an examination, in this vein, of the shift from ships to barques in the late nineteenth century.

Sager rejects Braverman's thesis, concluding that 'there was no conscious effort by shipowners to "deskill" workers in order to reduce the dependence of capital on labour. The transition to iron, steel and steam, followed by the transition to diesel power and other forms of propulsion, resulted from an on-going search for a complex of advantages, including seaworthiness, greater longevity, in-

20 Thucydides, 142 cited in Marx, **Capital**, I, 366. Alexander cited in Sager, 3.

creased average carrying capacity, and lower costs of purchase, maintenance, and operation' (259).

An important part of the 'complex of advantages' Sager describes was an attempt to reduce, not labour skill, but labour costs. Skilled and unskilled alike were displaced by this pressure. In the Canadian fleet the initial response was to reduce the size of crews on existing ships and to require men to do more work, faster. New labour saving technologies changed the way that sails were deployed and reefed. These measures pointed to an increasing reliance on the skill of fewer men. Eventually the ships themselves were built of new materials, propelled in new ways and old skills were displaced by new ones, including those needed to run the new labour saving machinery (261). In contrast to other workplaces, Sager concludes that the industrial revolution actually made the ship a safer workplace than it had been earlier (256).

Sager's book should be required reading for anyone interested in 19th or 20th century shipping technology and for those interested in the relationships between skill and technology, and technology and social organization.

Of the three author's, Parr has placed technology farthest from the centre of her narrative but in some respects it has the most to offer historians of technology. Only two of her ten chapters focus directly on the technology of textile production and furniture making respectively, while in the rest of the chapters technology remains part of the backdrop. More important, for historians of technology, is the attention that is paid to the introduction of scientific management in Canadian factories and, particularly, Parr's questions and answers about the interaction of technology and gender.

Parr's *The Gender of Breadwinners: Women, Men and Change in Two Industrial Towns, 1880-1950* compares two Ontario communities, Paris and Hanover, with different industrial bases. In Paris, the main employer was Penmans textile mills which employed a large percentage of women, while in Hanover, a town of similar size, the main employer, Knechtels' furniture factory, employed almost exclusively men. The book examines how the two industries became gendered and the implications this had for the people of the two towns over a 70-year period. She challenges existing interpretations of work, gender and class and shows the degree to which these categories were constructed differently in her two communities.

One of the strengths of the book is the skilful use of a wide variety of sources. Parr extensively uses business records, trade journals, local newspapers, municipal rolls and interviews with former employees, weaving them together, comparing one source against another. Another of the features that make this book remarkable is that Parr is able to connect her two detailed micro-level studies directly to the large political questions of the day (national tariffs, labour militancy,

business cycles) as well as to major social questions around the construction of gender, power, and class.

It is instructive to see how the technology of knitting and the very architecture of the Penman factory were built to convey messages of respectability: it was respectable for young women to work at a respectable firm like Penmans. The result of this striving to make the built environment convey the image of respectability and hospitality to women was 'a spacious and stately building, quite unlike the popular ideal of the factory; four stories high, and with lofty, well proportioned apartments...a model of architectural neatness and beauty' (36).

Parr's discussion of technology focuses on the conflict over its 'gender': who would operate it, men or women. She examines knitting technology on both sides of the Atlantic, finding that some machines which were considered to require male operatives in British industry, were considered the domain of females in Paris, Ontario. She also charts the changing 'gender' of the machines over time, as the workplace responded to changing labour markets and relative gender power. For those interested in hardware, there are also evaluations of competing English and American textile machinery.

The discussion of the rationale behind technical change in woodworking is explored in more depth than in textiles (129-131). The gender implications of furniture making machinery is examined in detail, particularly on how the dangerous machinery rendered the job masculine (Chapter 8). Chapter seven is of particular interest for its discussion of the reasons behind the wood-working firm's introduction of scientific management. The management of the firm had passed on to the founder's son who was 'book-learned', not a master craftsman as his father had been. The father had managed the shop through his personal relationship with the workers and his own status as the best among them. The son turned to the trade journals and found that 'modern' firms were applying 'Scientific Management' and so he hired an American engineering firm to come to Hanover and install the system.

Parr reports that the men felt confused at first, and later betrayed, by the change in their relations with their employer. Unlike many of their contemporaries they successfully resisted the Taylorist bargain of higher wages for higher productivity and sloppier craftsmanship. Drawing on their identity as 'skilled' and as 'male' they resisted this 'emasculation' and eventually defeated the new system in favour of a modification of the old.

Parr's book provides a clear example of how technology is gendered, how gender shapes workplace organization and of how production technology is designed with a particular workforce in mind. Like the other two books reviewed in this

section it connects precise micro-studies to macro-questions of major importance.

All three books, with Radforth's *Bushworkers and Bosses* and Heron and Storey's *On the Job* could be of useful in a course on the history of Canadian technology. Indeed it is hard to imagine a discussion on the social impact of technology that did not include one or more of them. Discussion of the second industrial revolution, the gender impact of technology, scientific management and the design of technology could all be enhanced by this literature.

IV

The authors of the books described above have not set out to write the history of technology, but they have added enormously to this sub-discipline. These new studies have conclusively illustrated the interconnectedness of technology with other elements of the socially constructed world, from tariff structures to masculine pride and feminine respectability. They illustrate how labour and labourers have shaped the design of technology. Together they demonstrate that new levels of sophistication have arrived in the field of Canadian labour history and the necessity for historians of technology to take a closer look at what their colleagues have been up to.

Labour process continues to represent one of the key interpretations of social impact of technology. But it is not the labour process of old. The ideological dogmatism that was part of the 1970s and early 1980s has largely disappeared. The literature is much more tentative, more searching and open to connection with the history of technology and other specialized fields. In moving away from its own previous specialization the new work is being judged by its ability to draw on related disciplines. The literature has avoided the false paradox of whether history is dominated by structure or agency by examining how agency at the micro-level interacts with the structures at the macro-level. Given the attention to the human impact of technology it is not surprising that this new literature continues to pay close attention to the social implications of technological change, particularly its differentiated gender ramifications.

What are the prospects for rapprochement between the history of technology and labour history? There is a recognition that something ought to be done on both sides of the divide. Philip Scranton is the most prominent of those trying to make a bridge. He has argued the case to historians of technology in a special issue on *Labour and Technology* and to labour historians in *International Labor*

and Working Class History.[21] Arguing from the perspective of theory, Jacques Perrin made the inseparability of technology and workplace organization the subject of his 1990 article in *History and Technology*.[22]

Both subdisciplines have much to gain from a better understanding of the other. One of the theoretical benefits that might ensue is terminological. The present definitions of technology in the respective subdisciplines still carry heavy ideological burdens that could and should be lightened. The recent work in labour history shows that the unlading has begun. These works suggest that for historians of technology the question of 'technological progress' will have to be shifted to a question of 'progress for whom'? Another advantage that might ensue is that 'context' can be enriched on both sides. Better still, a rapprochement may mean that production systems can be treated as single systems, rather than having their social and technical components examined separately as is presently common.

The recent work in labour history suggests that it is conceptually impossible to separate technology from workplace organization; and the gender, culture, and attitudes of labour from technology. This new literature shows that the bridges between labour history and the history of technology do exist, and that they could bear a lot more traffic.

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21 'None-Too-Porous-Boundaries: Labor History and the History of Technology,' **Technology and Culture** 29:4 (October 1988), 722-43; 'The Workplace, Technology, and Theory in American Labor History,' **International Labor and Working-Class History** 35 (Spring 1989), 3-22.

22 'The Inseparability of Technology and Work Organization,' **History and Technology** 7 (1990), 1-13.