

Mechanomorphosis: Science, Management, and “Human Machinery” in Industrial Canada, 1900-45

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IN 1929, ANTONIO GRAMSCI remarked that the “American phenomenon” represented the “biggest collective effort to date to create, with unprecedented speed, and with a consciousness of purpose unmatched in history, a new type of worker and of man.” The Italian Communist theorist was reflecting on the global impact of rationalized production and scientific management techniques. Their driving purpose was to inculcate “automatic and mechanical attitudes” which would destroy the “old psycho-physical nexus” of skilled labour, eliminate the need for the worker’s “intelligence, initiative and fantasy,” and thereby reduce productive operations “exclusively to the mechanical, physical aspect.” For all that he recognized its epoch-making qualities, Gramsci historicized rationalization of production as yet another phase, if a particularly “marked and vigorous” one, in the “uninterrupted, often painful and bloody process” of subjugating human instincts [“animality”] to “new, more complex and rigid norms and habits of order, exactitude and precision.” Modern industry demanded nothing less than this “new type” of human machinery.¹

Gramsci’s observations about “the American phenomenon,” with its necessarily-entwined effects on the labour process and sociocultural evolution, are pertinent to Canadian developments during the interwar years. The ideas of Frederick Winslow Taylor and Henry Ford, its chief engineers, were not contained by either national boundaries or factory walls. Their ideological force spilled into theories about body and mind, about relations both intimate and public, that would manifest

¹A. Gramsci, “Americanism and Fordism,” “Animality and Industrialism,” “Rationalization of Production and Work,” in Q. Hoare, G.N. Smith, eds., *Selections from the Prison Notebooks of Antonio Gramsci* (New York 1971), 298-302.

in regulatory state policy. Health and efficiency were consistently equated in a variety of interlocking discourses: the reformist platforms of voluntarist associations and state agencies, parliamentary debates, medical commentaries, sociological surveys, and media analyses of such related "social problems" as public health, working conditions, "industrial hygiene," recreation and reproduction. As both a biological and social product, the human body was simultaneously subject and object of these discussions, resource and project, defined in terms of its productivity and political instrumentality. Scientific regimens in home, school and factory would see to the successful formulation of the "new type" as the ideal member of a social complex committed to the disciplined body and mind, the "rationality," productivity and "citizenship" that were all encapsulated in "national efficiency."² A society enthralled by the machine ethic adopted industrial metaphors to valorize ideas and practices that calculated social progress as a measure of economic productivity, thus the nation's standing in the modern world order.

The Historical Body: Industrial Capitalism and Machine Metaphors

However little the human body has changed over time, its conceptualization, and its corresponding representations, are not unitary and fixed. Different priorities of production and reproduction have left their mark even on the body's seemingly-immutable physical boundaries.³ Notions about how bodily potential should be materialized — how human perfection should be "embodied" — have fluctuated correspondingly. The most material of things, the ultimate boundary between self and world, the body has historically been invaded and transformed by subjective definitions that accord with particular sociocultural values and aspirations.⁴

The 19th century's emergent social sciences borrowed the language of medicine to pathologize the urban industrial environment, lending scientific authority to developing dominant-class ideas about inspection and regulation of an unruly population. At the same time, critics recognized that industrialization accelerated the natural physical deterioration of human bodies, especially those of its workers. Friedrich Engels detailed the ways in which every occupation and industry inscribed its productive demands on the worker's body in specific typologies of pain, illness, and death. For Karl Marx, the crippling of body and mind were aspects of labour's alienation. The worker became "an appendage of the machine," as the machine became the worker's foremost competitor: "the inevitable result for the worker is overwork and premature death."⁵ As labour was commodified under

²A. Rabinbach, *The Human Motor* (New York 1990), 4.

³C. Shilling, *The Body and Social Theory* (London 1993), 3-4; 100.

⁴B. Turner, *Regulating Bodies* (London 1992), 103.

⁵F. Engels, *The Condition of the Working Class in England* (London 1969), 126-40; K. Marx, *Capital*, I (Moscow, n.d.), 435, and ch. 10, 15, 25, 27. Edwin Chadwick's *Report on the Sanitary Conditions of the Labouring Population of Great Britain* (1842) fostered international interest in the relationship between environment and health. British social

industrial capitalism, so too was the physical body that produced labour power, and so consequently was health itself.

Fearing mass degeneration and "devolution" as the inevitable outcome of a corrosive industrial environment, sociobiological theorists personified "the nation's health" in anxious discourses about social anomie. Those who recognized the connections between class and health advocated "social medicine," envisaged as radical state intervention for the public good.⁶ They relocated pathology from individual bodies to the social body itself, dispersing medical power more widely than ever before. The rise of "social medicine," however, met an ironic test in the concomitant rise of "scientific medicine." Premised on individual "case histories," scientific medicine obscured the social contexts of health. Medicine fixed on the body as object of examination and intervention, negating any concept of the patient as an embodied subjectivity.⁷

By the end of the 19th century, western medicine favoured a mechanistic conception of the body that emphasized the objective, organic basis of illness. The medical profession also espoused a behavioural explanation of the evident class differentials in health. Within this model, individual lifestyle choices (classified as personal failings) were the true source of ill health. Prescribed changes in individual behaviour, consequently, made the most efficacious approach to the body. The "social" and the "scientific" approaches to medicine were reconciled in some measure by public education crusades. Supported by minimalist legislation, these ameliorative campaigns used interventionary agencies to encourage, regulate, and monitor individual responsibility for collective health and welfare.⁸ Among the new relationships of the modern order was an ever-closer one between medicine and the state, the nexus of which was the regulation of reproduction as the source of healthy, reliable, efficient and productive bodies.⁹

scientists Booth and Rowntree also made explicit correlation of poverty, disease and deviance in the working class; see A. Synnott, *The Body Social: Symbolism, Self and Society* (London 1993), 251-6.

⁶D. Porter and R. Porter, "What Was Social Medicine?" *Journal of Historical Sociology*, 1 (1988), 102; also Turner, *Regulating Bodies*, 130-4.

⁷S. Ritchie, "A Body of Texts: The Fiction of Humanization in Medical Discourse," in K. Young, ed., *Bodylore* (Knoxville 1993), 204-5; Turner, *Regulating Bodies*, 24.

⁸C. Gersuny, *Work Hazards and Industrial Conflict* (Rhode Island 1981), 5; also D. Rosner and G. Markowitz, "Workers' Health and Safety: Some Historical Notes," in Rosner, Markowitz, eds., *Dying For Work: Workers' Safety and Health in 20th Century America* (Bloomington 1987), ix. On women and children, see D. Chunn, *From Punishment to Doing Good* (Toronto 1992), 45-7; W. Mitchinson, "Early Women's Organizations and Social Reform," in A. Moscovitch, J. Albert, eds., *The Benevolent State* (Toronto 1987), 77-92.

⁹B. Turner, *Medical Power and Social Knowledge* (London 1987), 195-6, 217. On production/reproduction, see C. Brown, "Mothers, Fathers and Children: From Public to Private Patriarchy," in L. Sargent, ed., *The Unhappy Marriage of Marxism and Feminism* (London 1986), 243. Brown's ideas are developed and historically applied to Canada in J. Ursel, *Private Lives, Public Policy* (Toronto 1992).

Within this context of shifting material, ideological, and scientific developments, the body as central metaphor of the political and social order was significantly modified through a process of inversion. The contemporary industrial system, shared in varying degrees by all western nations, became the central metaphor of the body.¹⁰ Just as social science borrowed from medicine to convey its images of social malaise, medicine increasingly appropriated an industrial vocabulary to conceptualize bodily health. Depicted variously as a machine, a motor, a factory in itself, the human body absorbed industrial symbolism. Industrialization dramatically reconfigured such earlier mechanistic versions as the "animal-machine" of seventeenth-century Cartesian discourse and LaMettrie's preliminary "man-machine" theories from the mid-18th century.¹¹ The steam engine, and its successor, the electrically-powered motor, not only transformed the nature of production, but also endowed science and medicine with new paradigms for understanding body and mind. As lines blurred between science, technology and medicine, they jointly augured a machine-focused modern age. Disease, the natural deterioration of the human body, mental health, even mortality, appeared amenable to scientific regimens of bodily regulation and control.

The symbolic basis of evolving constructions about the body was thus a refined and advanced machine, the "latest" machine of modern industry. But Enlightenment notions about the machine as the ultimate weapon against untamed nature remained ideologically powerful in Victorian circles celebrating a "progress" whose motive force was technology. In 1881, *The Scientific Canadian* equated "machinery and civilization" in its editorial premise that "the scientific wealth of all the past" was the "mechanic's capital."¹² Science and industry spun a vision of

¹⁰Turner, *Regulating Bodies*, 55, 89, summarizes the materiality/subjectivity arguments about the body. J. Butler, *Bodies That Matter* (New York 1994), 17, considers "how power relations work in the very formation of "sex" and its "materiality" through discourses about the body. See also J. LeGoff, "Head or Heart? The Political Use of Body Metaphors in the Middle Ages;" L. de Heusch, "The Sacrificial Body of the King;" L. Marin, "The Body-of-Power and Incarnation at Port Royal and in Pascal, or of the Figurability of the Political Absolute," all in M. Feher, R. Naddaff, N. Tazi, eds., *Fragments Toward a History of the Human Body*, 3, (New York 1989); also M. Poovey, *Making a Social Body: British Cultural Formation, 1830-64* (Chicago 1982); T. Laqueur, *Making Sex: Body and Gender from the Greeks to Freud* (Cambridge, MA 1990).

¹¹R. Descartes, *Discourse on Method and the Meditations* (1637) (Harmondsworth 1968), 53-4; 74-6; 104, 163. For further discussion of this shift from the Cartesian view, see A. Synnott, *The Body Social*, 22-5; Rabinbach, *The Human Motor*, 1-2. A. Vartanian, "Man-Machine from the Greeks to the Computer," in P. Weiner, ed., *Dictionary of the History of Ideas*, 3 (New York 1973), 134-6, discusses Descartes and La Mettrie's *Histoire naturelle de l'ame* [1745]. A comprehensive and provocative historical account of the evolution of "man-machine" ideas is found in B. Mazlish, *The Fourth Discontinuity: The Co-Evolution of Humans and Machines* (New Haven 1993).

¹²Editorial, "Machinery and Civilization," *The Scientific Canadian*, (April 1881), 175.

"advancing civilization" that evoked what is recognizably "the technological sublime," a machine aesthetic that made technology awe-inspiring and beneficent. It was the key to a mechanistic *Eden* to vindicate the Prometheus who paid its price with his own body. In Promethean fashion, however, there was little thought given to the possibility that the technological mastery of nature might reasonably extend to the human animal; that it might depersonalize and eventually dislocate the worker; that the mechanization of life might amount to its dehumanization; that humanity might come to serve the machine. A resounding triumphalism about science and technology made the machine the ultimate evolutionary project for the body, the ideal embodiment of the modern imaginary.¹³ Theoretically dissolving traditional boundaries between the mechanical and the organic, between artifice and nature, the human machine was not only more modern — more "evolved" — than the ordinary human, it was transcendent.

The man-machine concept thus re-emerged with force in the late 19th century, deriving impetus from concurrent research in the human sciences and advances in technology and industry. As European experimental scientists furthered understanding of the physiology of sensation and perception, the laws that governed mechanical systems were seen to be applicable to those that governed bodily systems.¹⁴ By establishing continuities between humans and animals, thereby providing biological explanations for instincts and needs, Darwinian biology also motivated new directions in psychology and sociology that emphasized "mastery" and progress as successful manipulations of an unstable environment.¹⁵

Representations of the body, and of bodily health, respond to the shifting requirements of particular modes of production. As agriculture and industry were transformed by the application of steam power, manual labourers came to be identified uniquely as "hands." Their human value equated with their exclusive position in the production process, they were effectively disembodied in favour of their most "valued" body parts. By the turn of the 20th century, the changes taking place in western industrial nations prompted an adaptive shift in the socioeconomic

¹³On the "technological sublime," see M.R. Smith, "Technological Determinism in American Culture," 17-24, in M.R. Smith, L. Marx, eds., *Does Technology Drive History?* (Cambridge, MA 1993); D. Nye, *American Technological Sublime* (Cambridge, MA 1994). See also the classic L. Marx, *The Machine in the Garden* (Oxford 1964); and C. Tichi, *Shifting Gears: Technology, Literature, Culture in Modernist America* (Chapel Hill 1987). A less-satisfying, but also intriguing, deconstruction of the concept is found in M. Seltzer, *Bodies and Machines* (New York 1992). The seminal texts on modernism include T.J. Lears, *No Place of Grace: Antimodernism and the Transformation of American Culture* (Chicago 1983); M. Berman, *All That is Solid Melts Into Air: The Experience of Modernity* (London 1983); see also the essays in M. Nava, A. O'Shea, eds. *Modern Times* (London 1996), and, for Canada, I. McKay, *The Quest of the Folk* (Montréal 1994).

¹⁴Vartanian, "Man-Machine," 143.

¹⁵Tichi, *Shifting Gears*, 34-6, 41-4; Mazlish, *Fourth Discontinuity*, especially ch. 5 and ch.

delineation of human bodies, and in scientific theories about how they worked and how they could be put to work. Developments in the “psychophysics” of industrial labour turned the attention of scientists and social scientists to the physiological and mental impact of new modes of production. The “science of work” investigated and redefined the relationship between machine and human being to allow for the “calibration” of workers — the “mechanical” fine-tuning of their bodies — to fit them to machinery.¹⁶ The corresponding definition of health also shifted from emphasis on physical endurance, which could be secured by simple replacement of “outworn” workers, to optimum labour efficiency, which had to be actively promoted and instilled in all workers and potential workers, through a process of “general apprenticeship,” of “psychophysical adaptation to specific conditions.”¹⁷

The increasing pervasiveness of machine motifs in contemporary medical discourses testifies to these trends. Most renowned of all Canadian physicians, author of a landmark medical textbook, and a prolific commentator on diverse issues outside the purely clinical, Sir William Osler’s enthusiastic adoption of machine symbolism suggests the ways in which science itself is a sociocultural construct. In his presidential address to the Classical Association at Oxford in 1919, Osler defined science as “the embodiment of a mechanical force.” The physician’s purpose, his subject and object, was the physical “machinery” of the human body, “this complicated mechanism,” this mass of “batteries, commutators, multipliers, switches, and wires innumerable.” Science gave medical professionals charge over “the machine in order, the machine in disorder”; it was their entire “business...to put it to rights.”¹⁸ The mind was also “a working machine,” its “thought-engines” requiring “the adaptation in it of habit” to permit the “deliberate training” of the body “to perform complicated actions with unerring accuracy,” in almost “automatic” fashion. Osler employed the chief symbol of modern machinery, the automobile, to explain both physical and emotional malaise as due to the body’s owner having “neglect[ed] his machine, driving it too hard, stoking the engines too much, or not cleaning out the ashes and clinkers.” The personal “outlook,” in this mechanical scenario, was “largely a question of a clean machine — of physical morality in the wide sense of the term.” He was dismayed by the “sad wreckage” of young people caught up in the hectic pace of a modern lifestyle, compelling that

¹⁶Vartanian, “Man-Machine,” 144; Rabinbach, *Human Motor*, esp. ch. 1; R. Brain, “The Extramural Laboratory Limited: German *Arbeitswissenschaft* versus Max Weber,” paper presented to the British-North American Joint Meeting, Canadian Society for the History and Philosophy of Science/History of Science Society/British Society for the History of Science, University of Toronto, 26 July 1992.

¹⁷Gramsci, “Feminism and Masculinism,” in *Selections*, 296.

¹⁸W. Osler, “The Old Humanities and the New Science” [1919], 15-17; “A Way of Life,” Address to Yale University Students [1913], 238; “The Student Life,” Valedictory Address, McGill University [1905], 177; in G.L. Keynes, ed., *A Way of Life and Selected Writings of Sir William Osler* [12 July 1849 - 29 December 1919] (New York 1958).

"the human machine [be] driven day and night, as no sensible fellow would use his motor."¹⁹ In remarkable imitation, but from the patient's perspective, satirist Stephen Leacock depicted the modern doctor/patient relationship as analogous to that of automobile and mechanic. The modern doctor saw "not a man at all, but a complicated machine contraption, probably running very badly, wheezing in the pipes and clogged in the carburetor. Naturally he wants to get at it just as a garage man longs to tear a motor to pieces."²⁰

In Canada as elsewhere, the transition to monopoly capitalism and the onslaught of a "second industrial revolution" altered the labour process, further eroding labour skill and autonomy with the expansion of mechanized assembly-line production. The formal apprenticeship that ensured the craftsman's mastery over his tools all but disappeared. Modern industry demanded an intensification of labour that made bodily efficiency paramount. Repetition of motion and fragmentation of the labour process required only attention to the immediate physical function of "doing work," of keeping up to the machine that set the pace. Technical knowledge of the machine, thus the worker's mastery over it, was no longer necessary to production, transposing the traditional relationship between worker and instrument of work. The industrial ethic, fundamentally a machine ethic, became the ethic of modern life.²¹

Constructing the body as human machinery stripped labour of its specific class dimension, removing health from that context. Machinery has no sociocultural identity or allegiance, no social organization or hierarchy, no "self" beyond the functional. Science and medicine did not so much "animate" the machine, as they subjected the body to an intent "mechanomorphosis." Disregarding the human relations that constitute the social body, they defined social "value" or "contribution" as the individual worker's capacity to transform bodily energy into material output. As relations between humans were de-emphasized, those of human and machine became ever more intimate. The worker was subsumed by the machine to

¹⁹Osler, "The Student Life," 177; "Way of Life," 238-46; in Keynes, ed., *A Way of Life*.

²⁰S. Leacock, "Medicine As It Was," in S.B. Leacock, *Afternoons in Utopia* (London 1932), 87; see also the hilarious piece "The Doctor and the Contraption," 91-6, in which the "Contraption" is the patient as viewed by the scientific modern doctor.

²¹As Marx contended, "instruments of labour not only supply a standard of the degree of development which human labour has attained, but they are also indicators of the social conditions under which that labour is carried on;" Marx, *Capital*, I, 342-3; see also the classic critiques of technology in L. Mumford, *Technics and Civilization* (New York 1963; originally 1934) and *The Myth of the Machine 1, Technics and Human Development* (New York 1966), 189-200, and J. Ellul, *The Technological Society* (New York 1964), 6, 14-21. Canadian critics of technocracy are led by Harold Innis; see, for example, "Industrialism and Cultural Values," [1950] in D. Drache, ed., H.A. Innis, *Staples, Markets and Cultural Change: Selected Essays* (Montréal 1995); M. McLuhan, especially *The Mechanical Bride: Folklore of Industrial Man* (New York 1951) and the many provocative publications of A. Kroger, starting with *Technology and the Canadian Mind* (Montréal 1984).

become part of its inner workings. Body and machine were [or ought to be] interchangeable component parts of the larger system of industrial capitalist society. Machine-awe took on the tone of religious fervour, a certain cult worship surrounding the essence of modernity — although, as a few critical voices suggested, there was an insistent dark side that bespoke the machine's dehumanizing properties and capacity to enslave. Some prophesied that, with "armies of toilers reduced to physical machines," mounting social unrest was inevitable. For all the ambivalence, however, the machine's promoters far outnumbered its detractors among the socially-influential.²²

While modern industry meant "progress," it was undeniably undermining the health of the current generation of workers and the potential of future workers, hence national productivity. In their attempts to offset the effects of labour inefficiency, employers had to avoid adding to overall costs. One of the easiest means of state investment in national productivity and efficiency, heartily supported by capital, was the replacement of Canadian workers by a fresh source enticed from other nations. Organized labour interpreted this approach as a denial of responsibility: "when modern capitalism devitalizes the physical bodies of its own national workers, it seeks foreign immigration to fill the gaps." Workers protested the importation of substitute "foreign" bodies at the same time that racist and imperialist theories construed immigration as another means of increasing the numbers of "the unfit." Classified in medical categories, though more subjective and moralistic than "scientific," those deemed bodily, mentally and morally unfit were believed to reproduce their unfitness at escalating cost to the social body.²³

Employers could not, with impunity, continue to exploit workers to the point where damaged health perpetuated and even exacerbated inefficiency; applying the metaphor himself, Gramsci described the labour force collectively as "a machine which cannot, without considerable loss, be taken to pieces too often and renewed

²²Dr. H. Schneider, "Two Kinds of Work," *Industrial Canada* (August 1912), 59, presents this negative view, very rare for the pages of this periodical; for the more typical, positive side, see Dr. J. Klein, "Factory Efficiency and Unemployment," *Industrial Canada* (November 1928), 46-8. On the labour side, one of innumerable commentaries about the destructive effect of mechanization on craft skills is C. McKay, "The Machine Age and the Fisheries," originally published in *Canadian Fisherman* (October 1926), reprinted in I. McKay, ed., *For a Working-Class Culture in Canada* (St. John's 1996), 245-6.

²³For anti-immigration labour views, see Editorial, *Industrial Banner*, 20 April 1920; *ibid.*, "Health Methods Will Save Canadians" (29 August 1931). For similar medical views, see Dr. J. Halpenny, "One Phase of the Foreign Invasion of Canada," *Canadian Journal of Mental Hygiene*, 1, 3 (1919), 224-6; J. Crosbie, RN, "The Foreign Problem as Related to Public Health," *Canadian Nurse*, 26, 3 (1920), 136-7. See also A. McLaren, *Our Own Master Race* (Toronto 1990), 46-67, on social reform and medical concerns about immigration and racial degeneration. On business support of immigration, see J. T. Sturrett, "The March of the Immigrant," *Industrial Canada* (September 1912), 208-9; D. Avery, *Dangerous Foreigners* (Toronto 1979).

with single new parts."²⁴ Moreover, even substitution through immigration was inefficient in view of the goal of using fewer but more productive workers and maintaining a stable, trained labour force. Employers would attain higher profits and long-term economic objectives by introducing mass production technology and scientific management to the workplace. The state would impress principles of management and efficiency upon the nation's homes by means of "health teaching" and regulatory legislation. The combined effect was intended to "mould" appropriate behaviour ["character training" or "management"] by habituating mind and body to the modern ideals that now connoted citizenship. Common socioeconomic benefit inspired the argument that "the highest standard of living will be reached when, in the greatest interest, each one should understand his own machinery and will apply the best rules of running that machinery."²⁵ The necessity of coordinating and integrating the population for production made the body the key distinguishing element between strong and weak, rich and poor, useful and wasteful. New or redesigned institutions — prisons, asylums, clinics, factories, schools — would contain and train recalcitrant bodies. The regulated process of socialization saw the state expand its purview to "private" institutions such as the family. The health and productivity of the population were now commonly referred to as "national efficiency."²⁶

From an economic standpoint, preventive medicine in the form of mass education and medical supervision was ranked alongside "such great agencies of waste elimination as forest conservation, chemical research on the utilization of waste products, engineering projects to improve mechanical efficiency, modern accounting, and scientific management." More interventionary than curative medicine, prevention required state involvement for the purposes of public education and regulation. Yet health education was not a simple matter of top-down regulation. Organized labour contended that workers held "an especial interest" in public education on disease prevention, because "to no part of the community" was health so materially important as to workers and their families.²⁷ In the face of unwavering professional and state commitment to a marketplace model of health care delivery, prevention through education about the body and regulatory public health legisla-

²⁴Gramsci, "Animality and Industrialism," 303.

²⁵University of Waterloo Archives, Elizabeth Smith Shortt collection, Box 47, File 1854, typescript, undated speech by Shortt, "Hygiene for Women."

²⁶M. Foucault, *Discipline and Punish* (Harmondsworth 1980), 171-2; B. Turner, *The Body and Society* (London 1984), 160-1; also Turner, *Regulating Bodies*, 6; 192-3. For further discussion of the federal and provincial departments' role in public health promotion and coordination, see C.R. Comacchio, *Nations Are Built of Babies: Saving Ontario's Mothers and Children* (Kingston 1993), especially ch. 2.

²⁷Editorial, "Health and Hygiene," *Canadian Trade Unionist*, 28 September 1927.

tion appeared the most viable approach. The public health department became "the first line of defence of the people."²⁸

Entirely congruent with views of bodies as "human machinery" were the theories of scientific management devised by the American engineer, Frederick Winslow Taylor. Taylor's *Principles of Scientific Management*, the epistolary manual of modern industry, was translated into the language of every industrial nation by 1913. *Industrial Canada*, official organ of the Canadian Manufacturing Association, enthusiastically published excerpts over three consecutive issues in spring of that year. Also in 1913, Henry Ford started the first of his revolutionary moving assembly lines that exemplified, by his own specifications, "power, accuracy, economy, system, continuity, speed and repetition." For many, the regimes of Taylor and Ford suggested far more than increased industrial output, important as that was: they were the basis for a model society, the modern technocratic utopia.²⁹ Against the background of industrial consolidation and technological innovation, the early 20th century witnessed an all-out campaign to professionalize management and systematize production.

The express purpose of Taylorist techniques was to transfer control over production from skilled workers to managers, the management will reflected in planning sheets, instruction cards, and supervisory and disciplinary factory systems. Taylor devised his system partly to block the practice that he called "soldiering" —the workers' deliberate pacing of their work, whether for reasons of personal health, inclination, or resistance to management incursions. Workers were to function like the machinery that was literally in their hands. What remained of an autonomous skilled workforce was consistently undermined by employers who used mechanization and scientific management not just to maximize profit and their

²⁸H.M. Cassidy, "The Economic Value of Public Health," *Canadian Public Health Journal*, 23, 2 (1932), 52. Other contemporary arguments supporting the socioeconomic benefits of prevention are E.M. Chapman, "The Soundest Kind of Prevention," *Maclean's*, 1 August 1921; J. Miller, "Preventive Pathology," *Queen's Quarterly* (October 1922); H.E. Spencer, "For a Healthy Canada," *Chatelaine* (August 1930); Dr. J.H. McDermot, "The Control of Disease," *Queen's Quarterly* (January 1930); also Editorial, "Public Health and Social Welfare," *Canadian Public Health Journal*, 23, 10 (1932), 493. To this end, the Canadian Public Health Association was formed in 1910; the Canadian Social Hygiene Council [later Health League of Canada] was established in 1922.

²⁹F.W. Taylor, "Principles of Scientific Management," *Industrial Canada* (March 1913), 1105-7; *ibid.*, "What is Scientific Management" (April 1913), 1224-6; *ibid.*, "How Scientific Management Works" (May 1913), 1349-51. Ford is quoted from the *Encyclopaedia Britannica* (1926) in Carroll, *The Machine in America*, 239. See also Henry Ford, with S. Crowther, *My Life and Work* (1922; republished New York 1973). There was much interest, in the Soviet Union's early days, in the possibilities of applying Taylorist techniques under Socialist relations of production; see Gramsci, "Americanism and Fordism," 277-8.

own power, but because of an ideological commitment to the productive superiority of actual machinery over idiosyncratic human machinery.³⁰

Taylorist and Fordist ideas were readily integrated with other regulatory notions concerning the human body and, ironically, "human nature." "By efficiency," proclaimed one expert, "we mean an understanding working knowledge of human nature and how to put it to the best use."³¹ While conceding that low wages contributed to ill health and economic dependence, doctors argued that "inefficiency of labour" was itself responsible for low wages. This circular reasoning made labour inefficiency both the source and the outcome of mass physical deterioration. Ill health was due to poor choices, ignorance, incorrect behaviour — in short, to personal deficiency now construed as "inefficiency," and a "problem" of national scope and importance.³² Workers, and their families of future workers, became embodied units of production, subject to scientific analysis, management, and eventually, engineered "improvement," just as were all regular machines.

The mass unemployment occasioned by the Great Depression made the issues of mechanization and rationalization all the more pressing. Was this another of the serial crises of capitalism, or did it represent the permanent displacement of workers by machinery, the remaining jobs going to a select and exploited few? Maritime labour activist Colin McKay declared that modern industry had failed "lamentably to live up to its own cult of efficiency," with profits in the rationalized industries increasing at a far greater rate than wages, thus accentuating "the evils of the business cycle."³³ Most industrialists disputed "the claim that machinery causes unemployment." One proclaimed that the Depression was "due directly to the fact that a lot of people have been fighting the machine and its benevolent reaction by crippling production in a dozen ways, trying to get more by producing less."³⁴ The

³⁰D. Noble, *Forces of Production* (New York 1984), 34-6. On skilled workers and shop-floor practices in Canada, the classics remain B.D. Palmer, *A Culture in Conflict* (Kingston 1979) and G.S. Kcaley, *Toronto Workers Respond to Industrial Capitalism* (Toronto 1980). It is important to note that some important sectors, such as mining and lumbering, were not amenable to the application of scientific management; see B.D. Palmer, *Working Class Experience*, 2nd ed. (Toronto 1992), 229-30.

³¹Dr. W.A. Evans, "Human Efficiency," *CPHJ* 4, 3 (1913), 138; K. Derry, "Morale, National and Industrial," *Canadian Congress Journal* 12, 3 (1933), 23; N.S. Rankin, "100 Percent Efficient," *CCJ*, 3, 12 (1924), 8.

³²University of Waterloo Archives, Elizabeth Smith Shortt collection, Box 46, File 1813, Dr. E. Smith-Shortt, "Everyman's Child," undated manuscript.

³³C. McKay, "The World's Dilemma," *Canadian Unionist* (July 1930), 21-2, reprinted in McKay, *For a Working-Class Culture in Canada*, 321-6.

³⁴W.R. Yendall, President, Richards-Wilcox Canadian Company, Executive Council, Canadian Manufacturers Association, "Machinery and Unemployment," *Industrial Canada* (July 1939), 91-4. The League of Nations passed a convention on the hours of work in 1921 at its Washington conference, establishing the 48-hour week as a maximum; in Canada nearly a decade later, the Washington Convention had yet to be ratified. See T.E. Moore, "The New

elimination of a strata of the working class was simply part of an evolutionary process called "progress"; history had proven the futility of resistance.

This sense of futility before the "on-rushing thunder of machinery" was captured in contemporary popular culture. A 1932 *Canadian Forum* short story, aptly titled "Juggernaut," described how an automobile assembly line "winds through the plant...its nondescript crew shackled by want no less securely than the slaves of galley days." When a "foreign" worker snaps back at a foreman who orders him to "get on with the job," the ensuing bloody fist fight "is all over in perhaps two minutes and the line goes on." A worker's battered body crashing to the factory floor could not halt the juggernaut. The human/machine relationship was also depicted evocatively in Charlie Chaplin's film *Modern Times* [1936], where the worker is literally drawn into the unrelenting wheels of production. Although the hopeful masses standing in silent vigil outside the gates kept the employed and their machines operating in willed synchrony, workers did not yield entirely to the machine's mastery. If the unemployment crisis was not conducive to organized labour resistance, the 1930s nonetheless saw the spread of a more broadly-based, inclusive — and potentially-radical — industrial unionism, signifying labour's response to the continuing encroachments of mass production and automation.³⁵

Modern industry's disciplinary requirements were addressed in prescriptions for body management delivered through state campaigns of mass education regarding such private, personal, bodily concerns as diet, exercise, leisure, sleep, and sexuality.³⁶ In turn, constructs about the body became significant referents for state policy. From the First World War years, Canada's urban areas witnessed the steady growth of municipal public health networks, featuring supervisory clinics, visiting nurse services, school inspection, and mass inoculation campaigns. In "unorganized" areas of sparse settlement, such as existed in Northern Ontario, Northern

Morality," *The Canadian Unionist* (July 1929), 14-15. Moore was president of the Canadian Congress of Labour, and the journal was the CCL's official organ. See also Editorial, "The 48-Hour Week," *Canadian Unionist* (July 1929), 19, and the commentary by F. Wheatley, Vice-President, CCL, President, Mineworkers Union of Canada, "The Six-Hour Day," *Canadian Unionist* (July 1929), 41.

³⁵C. McKay, "Industrial Unionism: the Workers' Answer to Mechanization," *Canadian Unionist* (September 1937), 95-6; B. Gluckman, "Juggernaut," *Canadian Forum* (October 1932), 49. On the rise of industrial unionism and the CIO, see Palmer, *Working Class Experience*, 250-7. See the discussion of Chaplin's film in C. Pursell, *The Machine in America: A Social History of Technology* (Baltimore 1995), 256; also K. Lucic, *Charles Sheeler and the Cult of the Machine* (Cambridge 1991) 9, 21.

³⁶See, for example, the series of "Blue Books" published by the federal government between the First and Second World Wars, with such titles as *How to Take Care of the Mother* and *How to Take Care of the Father and the Family*, by Dr. Helen MacMurchy, first Chief of the Child Welfare Division of the health department (1920). For further discussion of prescriptive health literature, see Comacchio, *Nations Are Built of Babies*.

Quebec, and many parts of the western prairies, provincial governments sent out travelling nurses and mobile clinics. They would educate the masses in modern health techniques and cast a trained eye over endemic health problems such as tuberculosis and maternal and infant mortality. The state would use them, and a torrent of free published information, to extend "the medical gaze" without extending actual health care services, and certainly without attacking the material basis of ill health.³⁷

*The Machinery of Women's Bodies: Social Reproduction,
Scientific Management, and Scientific Motherhood*

Where women were concerned, the lexicon was no less "mechanical," but the emphasis was indisputably placed on their femininity. If women's bodies were also machines, they were not only inadequate machines because of their humanity, they were even more so because of their womanliness. Medical discourses on feminine physiology in the early 20th century carried over much of the preoccupation with "nerves," and especially the delicacy of the female nervous system, that characterized Victorian ideas about the nature of women's bodies.³⁸ Put simply, their "mechanism" was much less reliable than that of men. They were much more finely "wired," and therefore prone to all manner of "breakdowns." As workers, women were less efficient than men in regards to motor power, muscular force, and stamina. The earlier and more severe impact of fatigue on the woman worker was at once an argument for regulation of work hours and an argument against the employment of women. The 1908 Royal Commission on the working conditions of female telephone operators found that "the breaking point of the operator's health is not far from the breaking point of efficient work."³⁹ Doctors and social critics — generally men — contended that "natural law" prohibited women from attaining "eminence" in industrial life, "and nature will not be gainsaid." Thus, the "fundamental fact" determining women's place in industry was "that nearly every woman

³⁷Dr. P.H. Bryce, "The Scope of a Federal Department of Health," 3; Dr. A. Meyer, "The Right to Marry: What Can a Democratic Civilization Do About Heredity and Child Welfare?" *Canadian Journal of Mental Hygiene*, 1, 2 (1919), 145; Dr. H. MacMurphy, "The Parent's Plea," *ibid.*, 1, 3 (1919), 211; see also MacMurphy's reports for the Ontario government, "The Feeble-Minded in Ontario," in Legislature of Ontario, *Sessional Papers* (1907-15), annually; and MacMurphy, *Sterilization? Birth Control?* (Toronto 1934). All of these use blatant class and race arguments in explaining perceived social degeneration, and support state/medical regulation as the solution.

³⁸On 19th century medical attitudes toward women, see W. Mitchinson, *The Nature of Their Bodies* (Toronto 1992); also the essays in M. Jacobus, E. Fox Keller, S. Shuttleworth, eds., *Body/Politics: Women and the Discourses of Science* (New York 1990), and L. Jordanova, *Sexual Visions: Images of Gender in Science and Medicine Between the 18th and 20th Centuries* (Madison, WI 1989).

³⁹J. Martin, "The Married Woman in Industry," *Canadian Public Health Journal*, 43, 3 (1919), 380.

is a potential mother." A man could be "terribly overworked" with little ill effect on his "power for paternity," but any woman who stood all day before "an unwearying machine" could not produce healthy offspring. Only "confusion and inefficiency" would result if men and women were employed together without due attention to the gendered differences in the working capacity of their bodies. A McMaster University political economist used census statistics to prove that women's wages were low because their efficiency was low, "a commentary upon the demand for equal wages for equal work," since women's work was "very seldom as efficient as a man's work."⁴⁰

The prevalent industrial imagery offered few literary devices to celebrate women's contributions to production. Within a very masculine symbol system, the machine, motor, and factory were "hard," technical, rational, calculated, powerful, effective, efficient and productive. Fabricated from cold metal and the advanced scientific expertise of men, to precise specifications, modern industry's keywords were antithetical to persistent representations of women as soft, delicate, "natural," emotional, nurturing, and above all, maternal. "Masculine" science, after all, was after the conquest of "feminine" nature. Yet — like machines and nature too — women were necessarily subordinate to men within the ideal social order that they projected, as well as the one that existed. These inherent contradictions suggest why, despite the resolutely-masculinist figures of speech, actual machines were most commonly personified in the feminine. Like nature, the machine was a "she," threatening, but conquerable by force of masculine reason and muscle. Only male workers could "man" the machines effectively. If their intellectual participation in the production process was diminished, their superior muscular and nervous efficiency was emphasized by the new relationship between human and machine.⁴¹

Whatever the representation, the reality of the times was substantially at odds with the patriarchal ideal. Women were also increasingly "components" of this modern industrial order. Their participation in factory production and other work outside the home was undeniably growing. At least on the rhetorical level, their social value was recognized "more than ever before," with specific reference to

⁴⁰J. Martin, "The Four Ages of Woman: How Far is Industrial Subjugation of the Sex Involved in Certain Phases of Feminism," *Canadian Public Health Journal*, 43, 4 (1919), 186-8; H. Michell, "A Study of the Efficiency of Canadian Labour," *Industrial Canada* (June 1928), 183. Probably the most explicit example of contemporary reasoning along these lines is by American engineer Richard Turner Dana, originally published in 1927, *The Human Machine in Industry* (Easton, PA 1980), in which he declares humans deficient because they possess non-machine propensities such as "emotions" and "fatigue." Dana devotes an entire chapter to "Relative Inefficiency of Men and Women;" see especially his conclusions, 215-17.

⁴¹On women as "the material of science," see M. Jacobus, E. Fox Keller, and S. Shuttleworth, "Introduction," in Jacobus, Fox Keller, Shuttleworth, eds., *Body/Politics: Women and the Discourses of Science*, 2-6. See also the discussion of Fritz Lang's 1927 film *Metropolis*, whose central character, Maria, is a female robot, in Jordanova, *Sexual Visions*.

their responsibility for reproducing productive bodies and socializing them into "citizenship." Their crucial reproductive role meant that women could not be left out of considerations of ideal modernity, but neither could they embody an equivalence to men. And so, as the forces of production and reproduction were ideologically calibrated, women's bodies were also fitted to this new and improved industrial system, if in decidedly feminine ways. The formation of "a new feminine personality" became a central purpose of the new civil order.⁴²

The intersection of theories of production and reproduction in the late 19th/early 20th centuries demonstrates the period's driving apprehension about degeneration. Social critics of the time understood that reproduction encompasses more than the biological. Comprising the socialization, physical maintenance, and emotional nurture of family members, it is the basis of the dialectical interchange between families and society. In a 1929 debate in the House of Commons, J.S. Woodsworth discussed the relationship between production, reproduction, and the state, in terms of "the debt that industry owes to the family...which provides the labour that is needed in industry."⁴³ Women have historically carried the primary responsibility for the domestic labour that ensures the maintenance and renewal of the nonworking, as well as the active labour force.⁴⁴ Yet modern industry, for all its wonders, was indisputably attacking the patriarchal basis of society: "the innumerable machines of industry ... have brought women from the home and field into factories, and limited their maternal powers and instincts."⁴⁵ The new methods of work would be sustained by strengthened families, further to the regulation and stability of traditional gender and sexual relations.⁴⁶

Women and men both own productive bodies; but the nature of that production was defined in gender-specific ways that replicated the gendered division of labour and life in the material world. While class anxiety is intrinsic to contemporary fears, nowhere do discourses about social anomie intersect more obviously than over the bodies of women. The representations of women underpinning scientific ideas, combined with the material outcome of those ideas, categorized the "new woman"

⁴²Gramsci, "Feminism and Masculinism," 295-6.

⁴³Canada, House of Commons *Debates*, 13 February 1929, 88-9.

⁴⁴On women's productive/reproductive work, see L. Tilly and J. Scott, *Women, Work and Family* (New York 1989), 14-45; S. Rose, "Proto-industry, Women's Work and the Household Economy in the Transition to Industrial Capitalism," *Journal of Family History*, 13, 2 (1991), 183; M. Luxton, *More Than a Labour of Love* (Toronto 1980), 17. See also the essays in B. Fox, ed., *Hidden in the Household: Domestic Labour Under Capitalism* (Toronto 1980), especially E. Blumenfeld and S. Mann, "Domestic Labour and the Reproduction of Labour Power," 271-301, and W. Seccombe, "The Expanded Reproduction Cycle of Labour Power," 225; P. Armstrong and H. Armstrong, *Theorizing Women's Work* (Toronto 1990), 67-97.

⁴⁵Dr. P.H. Bryce, "The Scope of a Federal Department of Health," 3-4; also G.I.H. Lloyd, "The Relation of Preventable Sickness to Poverty," *CPHJ*, 6, 5 (1915), 244.

⁴⁶Gramsci, "Animality and Industrialism," 300.

principally as a new mother who produced and reproduced under the direction of the men of science.⁴⁷ In discussing the ground-breaking provincial mothers' allowances, for example, the National Council of Women of Canada contended that "the fundamental important aim" of state provision for dependent women and children "should be first the prevention of such conditions by prolonging the lives and increasing the working efficiency of men."⁴⁸ If men could produce efficiently, women could reproduce efficiently.

The postwar idealization of traditional gender and familial roles — paradoxically within the setting of a much-exaggerated modernity — prepared a receptive audience for such constructions of feminine roles. As Canadian doctors and public health activists promoted scientific motherhood, there was a renewed glorification of the home and the woman's place in it, all the more curious because tradition was held in such contempt in this newly-modern world. Nor was there any disavowal of maternalist ideology in working-class circles: labour women called upon women's "mighty power for the uplift of womanhood, the family and the home."⁴⁹ Modern medicine found much popular support for its assertions that "it is the man's place to build and subsidize the home; the woman's place to rear the young in it."⁵⁰

What was modern about this domestic ideal, so clearly premised on a traditional gendered division of labour, was the place accorded to medicine and the state. Together, they conceptualized mothers as thoroughly modern creations of the new industrial order.⁵¹ Multiple ironies are at play in these representations of modern mothers. Women were at once defective machinery (because they were not men) and superior machinery (because of their unique reproductive capacity). Their womanhood placed them in special need of "management," yet specially-equipped for the "management" of household and family. Women as mothers and potential

⁴⁷S. Shuttleworth, "Female Circulation: Medical Discourse and Popular Advertising in the Mid-Victorian Era," in Jacobus, *Body/Politics*, 54-5; Turner, *The Body and Society*, 6; Foucault, *History of Sexuality*, 1 (Harmondsworth 1981), 139; M. Feher, "Introduction," in Feher, Naddaff, Tazi, eds., *Fragments for a History of the Human Body*, 11.

⁴⁸University of Waterloo Archives, Elizabeth Smith Shortt collection, Box 46, File 1814, Letter of Shortt to Dr. Peter Bryce, Chief Medical Officer, Department of Immigration, Ottawa, November 1914. In addition to being a medical doctor, Shortt was also a leader of the NCWC and a founding member of the Mothers' Allowance Commission in Ontario.

⁴⁹R. Torrington, "Presidential Address," *NCWC Yearbook* (1917), 16; similar views are expressed in Editorial, "A Splendid Move," *Industrial Banner*, 7 May 1920; also Editorial, "The Value of Motherhood," *Industrial Banner*, 26 March 1920; also "To Women Readers of the *Banner*: Your Cooperation is Requested in the Formation of a Great Women's Federation in the Cause of Motherhood, Childhood and the Home," *Industrial Banner*, 21 May 1920. The outcome was the United Women's Educational Association.

⁵⁰Dr. B. Atlee, "The Menace of Maternity," *Canadian Home Journal* (May 1932), 8.

⁵¹C.E. Hamilton, "The Scientific Management of Household Work and Wages," *Canadian Public Health Journal*, 4, 1 (1913), 30-1. See V. Strong-Boag, *The New Day Recalled* (Markham 1988), 148-52.

mothers were both source and solution of the problem of national health. Training, organization and efficiency, relayed by scientific experts, would meet the perceived threat of degeneration through maternal fitness. At bottom, maternal fitness was "the true measure of a nation's place, a true measure of its survival," all contingent upon the bodily energy, the labour "power," that transformed material into product, that ensured the nation's economic vitality.⁵²

Contemporary understandings of the relationship between citizen and state thus politicized the body in a manner that placed specific gendered value on bodies. The feminine responsibilities of household production and reproduction meant that women's bodies had to be defined in terms of their potential: for their own potential to give birth, and for the future potential of the children that they bore. Industrial metaphors were used to describe sex and reproduction, transforming reproductive relations, biological and social, into what can be described as a "sad mimicry of production."⁵³ Maternity, "a hazardous occupation," demanded a scientific approach and medical regulation because of the very real possibility of a "break-down," itself a mechanical term. Doctors would furnish the "intelligent oversight" necessary to protect women from "the dangers incident to industrialization" that had adversely affected their reproductive efficiency.⁵⁴ Just as all efforts were being made to increase the productivity of workers, similar initiatives would be directed at "the workers in our greatest, most vital and most profoundly important productive industry." After all, asked one enthusiast in a popular magazine, "if a man builds a motor car he consults with engineers, studies, examines patents and others' suggestions. Isn't the moulding of human life of more importance than a motor car?" The mother who was willing to embrace the experts' training and supervision would emerge superior as "a steam engine is to a stage coach." Scientific motherhood would achieve "perfect health and perfect training" in model young Canadians, inspiring "new hope for the generations to come."⁵⁵

⁵²Dr. W.W. Chipman, "Some Conclusions After a Symposium in Obstetrics," *Canadian Medical Association Journal*, 14, 8 (1924), 705.

⁵³Dr. T. Oliver, "Some Pressing Problems," 136, equates the entry of women into industry with the declining birthrate and national degeneration. Turner discusses "the body as potentiality" in *Regulating Bodies*, 16; see also E. Martin, *The Woman in the Body* (Boston 1992), 54-67; J. Mitchell, *Woman's Estate* (New York 1971), 108.

⁵⁴Dr. W.P. Tew, "Antenatal Hygiene," *Social Welfare*, 4, 10 (1922), 215; A. Morceau, RN, "Minor Abnormalities," *The Canadian Nurse*, 26, 2 (1930), 141-2; Dr. W.W. Chipman, "Some Thoughts After a Symposium on Obstetrics," *Canadian Medical Association Journal*, 14, 8 (1924), 380; Dr. A. Brown, "Certain Features of Child Welfare Work Not Sufficiently Emphasized," *Canadian Public Health Journal*, 14, 9 (1923), 243.

⁵⁵Dr. Woods Hutchinson, "The Modern Mother," *Maclean's*, 15 July 1920, 69; also Dr. W.W. Chipman, "Preparing Women for the Greatest of Professions," *Maclean's*, 15 October 1921; F. Webb, "Troubles and Triumphs," *Canadian Magazine* (July 1932). This was the first of a regular column on childrearing in the popular magazine; also E.S. Chesser, "Perfect Babies," *Canadian Congress Journal*, 3, 12 (1924), 59.

The "efficiency problem" and the "crisis in productivity" were thus conflated with the broad issue of national health, itself profoundly an issue of reproduction. Just as the household economy was the province of women, a new economy of the body would address the social costs of reproduction. If women could be re-formed as scientific mothers through the regulation of a reconstituted "modern" family, the appropriate bodies, with the appropriately-developed character, would transform the problematic issue of social reproduction into a controllable "science."⁵⁶ For, even more so than mother, the paediatrician and family physician were "the most important teachers," and the nation's welfare would depend on "the skill of these workers in properly starting the human machine."⁵⁷

There was much borrowing of ideas and methods from the productive setting for attempted transferral to the home. The home was "the first factory of the nation," the setting "where bodies grow and characters receive their first moulding."⁵⁸ The model proposed for the home was the masculine model of the workplace, the man's world that attempted to shut out women. An almost-uniquely masculine endeavour, management was the core concept informing the experts' childrearing programmes.⁵⁹ Scientific motherhood was infused with the industrial spirit, with its unrelenting demands for repetition, scheduling, regimentation, systematization, discipline, and productivity. The "kitchen timepiece" became "the most important tool" of modern childrearing, analogous to the stop-watch and punch-clock that regulated modern production.⁶⁰

Early 20th-century psychology also sustained the concept of the human body as a factory needing management, a machine requiring "conditioning." The American Behaviourist school, led by John B. Watson, was highly influential in emergent child studies circles during the 1920s. With its focus on objective, external observation of the mind as the key to behaviour — much as a machine's behaviour can only be externally perceived and explained — behaviourist psychology supported mechanistic theories about human character development. Watson saw the individual as a body, the body as a machine, and the machine as a car: "Let us try to think

⁵⁶J. Donzelot, *Policing the Family* (New York 1979), 12-13; 409; Turner, *Regulating Bodies*, 125. See also D. Wayne, "The Function of Social Welfare in a Capitalist Economy," in Dickinson, Russell, eds., *Family, Economy and State*, 55; Brown, "Mothers, Fathers and Children," 244.

⁵⁷Editorial, "Practical Hygiene," *Canadian Practitioner*, 46, 7 (July 1921), 232.

⁵⁸V. Tench, "The Home: The First Factory of the Nation," Radio Talk, Canadian Social Hygiene Council, published in *Canadian Public Health Journal*, 16, 11, (November 1925), 525-6.

⁵⁹Hamilton, "The Scientific Management of Household Work and Wages," 30-1; see also V. Strong-Boag, *The Parliament of Women* (Ottawa 1976), 187, on the National Council of Women of Canada's support of scientific management in the household.

⁶⁰W. Blatz, H. Bott, *Parents and the Preschool Child* (Toronto 1928), vii. All medical advisers were strict on the subject of scheduled feeding, bathing, sleeping and playing. Some even scheduled in "crying time."

of man as an assembled organic machine ready to run."⁶¹ Every human could be "conditioned" to respond properly and efficiently to external directives, particularly if the conditioning process began in infancy, when the "raw material" of the human factory was obviously at its most malleable. Effective maternal management would quickly transform the child into a "little machine," the ubiquitous symbol of the period's childrearing texts, signifying the supreme and penultimate mutation of the human body.⁶² Largely excluded from management, women became managers of the human factory manifested in the family. While their actual role deviated little from tradition, its public, professional, and state acknowledgement exalted maternalism as more than domestic duty: this was duty to the nation. The success of the "scientific programme" for regenerating the social body depended greatly on the efficacy of medical regulation of families, and of mothers in particular. And this regulation could not be successful without support by the state, its new health departments and associated welfare agencies.

From Ideal to Policy: Science, the State, and the Efficiency Problem

The medicalization of social problems — or their outright construction by the rising experts in science and medicine — created activist roles for doctors and state agencies in private lives and private relations, legitimizing rights to the body as public property. The Great War catalyzed many of the nation's reformist campaigns, and facilitated state and public acceptance of medical management of the population through the interventionist platforms of various reform organizations, voluntarist agencies, and the newly-established federal health department [1919]. By directing attention to the population as a biological resource, the exigencies of war also made "the nation's health" more a public concern than ever. Outcome depended as much on industrial production as on actual combat in the field in this first modern technological war. Apprehension was aroused by the slaughter of thousands of combatants "of a class drawn from what must be considered the most valuable, so far as productivity is concerned, of the population."⁶³ This class was also the most vulnerable to ill health and preventable disease. One of the "good results" of the war, doctors declared, when "manpower was so very vital," was to awaken employers to the importance of their workers' "health and effectiveness."

⁶¹J.B. Watson, *Behaviourism* (New York 1925), 269, 4; Vartanian, "Man-Machine," 144.

⁶²Dr. A. Brown, *The Normal Child: Its Care and Feeding* (Toronto 1923); Dr. F.F. Tisdall, *The Home Care of the Infant and Child* (New York 1931), and various government publications of the period, (ie. Ontario Department of Health, *The Baby*, multiple editions, 1920-40) all employ this "little machine" metaphor to depict the ideal child. The concept was prevalent in international child welfare circles: see D. Beekman, *The Mechanical Baby* (London 1979), and B. Ehrenreich, D. English, *For Her Own Good: 150 Years of the Experts' Advice to Women* (New York 1978).

⁶³Dr. A.C. Jost, "The Conservation of Child Life," *Canadian Public Health Journal*, 11, 11 (1920), 503.

Because loss of time through sickness was a major cause of "waste in industry," it was evident that, in health matters, "the interests of the wage earner and the wage payer are identical." Most important, the country's industrial future depended upon the families of workers: "if they are eventually to justify their place in the world, they must be saved from ill health, ignorance and vice."⁶⁴ Yet, when the Trades and Labour Congress implored Dr. Charles Hodgetts, public health activist and chair of the health branch of the federal Commission of Conservation, to launch "an exhaustive investigation" into work-related diseases in the interests of recommending protective legislation, Hodgetts argued that the government had to focus its initiatives on the war effort.⁶⁵

The enlistment crisis of the early war years magnified medical concerns. Public uproar over the numbers of young men rejected for active service took on the contours of a moral panic, the statistics flown before alarmed Canadians as the warning flag of national degeneration. Under the Military Service Act, 83,355 applicants were accepted, while 181,000 — 68 per cent of the total — were rejected as unfit for active service. As General Sir Arthur Currie pointed out, even among those accepted, "something like 100,000 men went overseas who were physically unfit for service and cost the country some \$150,000,000." A young and sparsely-populated nation, Canada also lost at least 60,000 of the "finest of her developing citizens, finest physically and finest in the spirit of selfless idealism from which national greatness springs."⁶⁶ Similar worries in Britain and in the United States intensified anxiety about the imminent collapse of western civilization. The exigencies of war brought production and reproduction to the point of crisis "as never before," a phrase that reverberates through such urgent discourses about the nation's health.

The necessity for Canadian industrial competitiveness also spurred the establishment of the Honorary Advisory Council for Scientific and Industrial Research, intended to strengthen the "important relation" among science, industry, and national welfare. Imitating British wartime efforts with an eye to gauging the equally-vital relationship between industrial efficiency and workers' health, the Council devised an Associate Committee on Industrial Fatigue in 1919. Composed largely of physiologists, it would play an advisory and investigative role much like

⁶⁴Dr. O.A. Cannon, "Health Opportunities in Industry," *Canadian Public Health Journal*, 21, 1 (1930), 2-3; Dr. A. Brown, "Infant and Child Welfare Work," *Canadian Public Health Journal*, 9, 4 (1918), 149; also A.W. Coone, "The Child as an Asset," *Social Welfare*, 1, 2 (1918), 38.

⁶⁵"President's Report," Trades and Labour Congress, *Report of the Proceedings of the 31st Annual Convention* (1 June 1915), 49-50.

⁶⁶C.S. Walters, "The Duty of the City to the Child," *Canadian Public Health Journal*, 6, 11 (1915), 540; also "Social Hygiene," *Social Welfare*, 7, 3 (1924), 48. Currie is cited in H.E. Spencer, "For a Healthy Canada," *Chatelaine* (August 1930), 10; Things Editorial, *Social Welfare*, 2, 1 (1919), 3.

that of its parent body. Its mandate was expressly "to make the knowledge and experience of Medical Science, as it bears on industrial health and efficiency, available for all industry." It would assist employers to increase production by reducing lost time, labour turnover, preventable illness, and "unnecessary hardships of working conditions." Offices were to be established in "all the chief industrial centres." Only one ever opened, at the University of Toronto, home of its chair, Dr. J.J.R. Macleod of the Department of Physiology.⁶⁷

Regulating human machinery necessitated scientific research and experimentation as much as did the invention and improvement of actual machines. In the immediate post-World War I years, scientists and medical researchers worked on the elimination of fatigue, regarded as the final defect of human machinery, the one last boundary to all-out efficiency and supreme productivity, to true machine status. No longer the inevitable, normal outcome of physical and mental labour, fatigue, too, was pathologized. More than a source of ill health and inefficiency, fatigue represented deviation from the mechanical ideal proclaimed normative for all rightful citizens of the modern industrial order. Illness and inefficiency exemplified the body's stubborn resistance to progress, namely, to the industrial-capitalist imperatives of increased productivity and profit.⁶⁸ Thus the bodily inefficiency of the working class, clearly signified by the term "industrial fatigue," became another of the social body's sundry degenerative ailments, impeding progress at the very least and foreshadowing devolution at the worst.

The fatigue issue was initially adopted by reformers combatting exploitative working conditions. But it was quickly grasped by "Taylorites" aiming to enhance output through a scientifically-ordained exploitation that pushed bodies past the limits of physical endurance.⁶⁹ In North America, the 1920s marked the heyday of

⁶⁷Honorary Advisory Council for Scientific and Industrial Research, *Report of the Administrative Chairman* (1917-18), 13. In 1918 Professor J.C. Fields of the University of Toronto published his personal commentary on this relationship in Fields, *Science and Industry* (Ottawa 1918), Bulletin no. 5, 1. See also R.M. Hutton, Committee Secretary, "Industrial Hygiene in Canadian Factories," *Industrial Canada* (June 1920), 80-3. In addition to Macleod, the Committee was composed of A.B. Macallum, administrative chair of the Honorary Advisory Council and a University of Toronto physiologist; various members of the physiology and psychology departments of various Canadian universities, and, as was typical of such government committees in the period, one representative each from labour [Trades and Labour Congress], women's, social work, and manufacturers' organizations. See Dominion of Canada, Honorary Advisory Council for Scientific and Industrial Research, *Survey of General Conditions of Industrial Hygiene in Toronto* (Ottawa, 1921), 3.

⁶⁸Rabinbach, *Human Motor*, 2-6; also Dana, *Human Machine in Industry*, 9.

⁶⁹The first American work on the subject of fatigue was Josephine Goldmark's *Fatigue and Efficiency: A Study in Industry* [1912]. A Progressive activist, Goldmark's purpose in summarizing and popularizing contemporary physiological findings was purely reformist: the book's central argument, that daily output was subject to physiological laws, was intended to uphold the laws regulating hours for women workers; see R. Gillespie, "Industrial

Taylorist management, behaviourist psychology, and industrial fatigue research, all three premised on "conditioning" or regulation of the human machine, body and mind. The decade opened to the social strains of postwar readjustment and industrial unrest, typified in Canada by intensive labour organization and strike activity. If war made government and industry keen to upgrade productivity, labour's postwar propensity to organize and resist made the issue of worker management all the more critical. Where "fatigue" originally referred simply to the physiological changes leading to muscular inefficiency, its meaning now expanded to allow for the scientific delineation of optimum hours and conditions of work.⁷⁰

The Committee's efforts to organize research into industrial fatigue were furthered by the development of physiology, or "physiological hygiene" in the medical parlance of the day, at the University of Toronto.⁷¹ By 1919 the Toronto School of Hygiene was offering undergraduate and graduate instruction in "industrial hygiene," the umbrella term that encompassed an infinite variety of work-related health difficulties to be addressed for efficiency's sake. Particularly notable in the immediate postwar years were the fatigue studies conducted there by Charles Best, about to be acknowledged as part of the team that invented insulin. Best wanted to make physiological hygiene a vital aspect of preventive medicine, in the interests of maintaining the body's organs at "their maximum efficiency" while also maximizing the body's adaptations to its environment. Among other projects, he conducted electrical timing experiments on athletes to measure both their peak muscular efficiency and the impact of fatigue on their performance. In keeping with the time-motion objectives of scientific management theorists and all the productivity-conscious of the nation, the most important conclusion of such studies was that, "as a subject [became] better-trained for any particular exercise, superfluous movements [were] eliminated." The human result, as fervently hoped and much-expounded, was that "the subject certainly works more efficiently." Best, too, employed machine analogies to explain the process: "the muscle has been compared to a battery. Both are so constituted that they can discharge very rapidly a great deal of energy — in violent muscular contractions or in starting a car — and this expenditure can be made good slowly during rest after exertion, or during the time

Fatigue and the Discipline of Physiology," in G.L. Geison, ed., *Physiology in the American Context* (Bethesda 1987), 241-2.

⁷⁰"Industrial Fatigue," *Canadian Medical Association Journal*, 15 (1925), 737; Gillespie, "Industrial Fatigue," 255-7.

⁷¹A.B. Macallum, a Committee member as well as the larger Council's chairman, had a full-time teaching and research position in physiology at Toronto as early as 1887. By 1909, in addition to Macallum, the University had two other professorships held by men trained in physiology in England and the United States, John Beresford Leathes, and Thomas Gregor Brodie. By the end of the Great War, the university had become a creditable centre for physiological research. See S. McRae, "A.B. Macallum and Physiology at the University of Toronto," in Geison, ed., *Physiology in the American Context*, 97-8.

the car's engine is running." He surmised that human beings are about 25 per cent efficient. Consequently, more information about the process of training, the factors producing fatigue, and the recovery process, "could greatly increase our bodily efficiency, to good performance in sport or on the job."⁷² By the 1920s industrial fatigue had become the leading area in applied physiology, as researchers in western nations set their sights to studying the physiological impact of labour, its conditions and hours. A "social problem of national significance" had urged scientific experts out of their clinical role and into the mainstream of social and political influence, transforming the factory into their laboratory, making science the link between industry and humanity.

The idea of fatigue had a broad impact on physiology, on medicine more widely, and on psychology. It was a concept so amorphous and encompassing that it could protect the fluid boundaries between the "moral" and the scientific to good effect. Scientific experts aspiring to social power could then deliver moral judgements as objective knowledge. From the beginnings of research into bodily efficiency, moralistic notions connecting fatigue to physical laziness, mental lassitude, and the absence of self-discipline — all integral to the middle-class moral core — were the subtext of scientific discussions.

Because "the mental and moral dimensions" made human machinery unique, physiological and psychological alignment were crucial to bodily efficiency. Alcohol, for example, was seen to "lessen the muscular power of the individual," and to "paralyse" the nervous mechanism, spurring a related moral/physical indolence, and eventually stopping the machine altogether.⁷³ Modern science would uncover the objective laws to make bodies function in regular, predictable, mechanistic fashion. Subjective feelings — such as the individual's "natural" response to the labour of his or her own body, or the compulsive need for emotional solace offered by alcohol and other "deviant" drugs and activities — were objectified. They became social and medical problems requiring public regulation. It is no coincidence that Prohibition and successively more precise statutes defining "normal"

⁷²C. H. Best and Ruth C. Partridge, "Observations on Olympic Athletes," in *Selected Papers of Charles H. Best* (Toronto 1963); originally published in Royal Society of Canada, *Proceedings* (1929); also "Physiological Experiments on Athletes," in *Studies from the Connaught Laboratories*, 3 (1926-8) (Toronto 1929), 236-9; C.H. Best, "An Address on Aspects of Physiological Hygiene," given before the Section of Public Health, Canadian Medical Association, Toronto, June 1927; published in *Studies from the Connaught Laboratories*, 3, 249-53.

⁷³Dr. C. Miller, "The Public Health Aspects of Alcoholism," *Canadian Public Health Journal*, 7, 1 (January 1916), 6; also "Ages At Which Different Diseases Stop the Human Machinery," *Canadian Journal of Medicine and Surgery*, 12 (1902), 192. There were even attempts to understand labour organization with respect to the "character types" of workers; see Dr. E.E. Southard, "Trade Unionism and Temperament," *Canadian Journal of Mental Hygiene*, 3, 2 (1921); Dana, *Human Machine in Industry*, 89, also discusses "emotional control" and worker morality.

sexual relations marked the 1920s. Such "puritanical initiatives," Gramsci argued, served the purpose of preserving, outside of work, "a certain psycho-physical equilibrium which prevents the physiological collapse of the worker, exhausted by the new method of production."⁷⁴

The short-lived Committee on Industrial Fatigue conducted a "Survey of the General Conditions of Industrial Hygiene in Toronto." Published in 1921, the survey is remarkable largely for its narrowness of scope and impressionistic findings, which belie both the scientific purpose and social scientific methodology it was supposed to represent. Investigation was conducted by personal visits to 76 Toronto plants; the investigator was "entirely dependent on the courtesy of the managements concerned," none of which are specified. The personal statements of managers were "supplemented where possible by a general and necessarily cursory inspection of the premises."⁷⁵

The surveyors discovered that little effort was being extended to industrial hygiene. There was a disheartening lack of management recognition of "its full importance as a factor in commercial prosperity." The few existing corporate welfare schemes were aimed at "keeping the man on the job" and preventing discontent rather than "as a means of maintaining health and efficiency." Managers appeared unwilling to believe that the "good working conditions" essential to good labour relations were "not vague and indefinite," but could be "accurately determined by science, through knowledge of the laws which govern the human body." They balked about improved working conditions because they questioned the degree of their own responsibility respecting the health of their workers. Of what use were any such employer efforts "if the same factors are bad in the home and their effects intensified by absence of personal hygiene?"⁷⁶

It was also evident that health considerations had not "played a prominent part in determining the hours of labour," most firms still demanding a 48-hour, 6-day work week. For organized labour, the debate over hours was taking on an urgency not experienced since the movement for late 19th-century factory legislation. Now, mechanization of production increased output while shortening the time required for quotas to be met. The resulting fatigue, trade unionists contended, "lessened vigour and vitality." "Speeding-up" made workers susceptible to a vast catalogue of physical, mental and moral ills, including "predisposition to disease, industrial accidents, lessened moral resistance, drinking, dope addiction, premature death, infantile mortality, industrial strife, demoralization of family life, loss of interest in church and community, and removal of all ambition and desire for self-improvement." The hazy definition of fatigue actually gave workers a useful scientific

⁷⁴Gramsci, "Rationalization of Production and Work," 302-3; he also noted the "inspection services" created by Ford and others to patrol the "morality" of their workers' private lives.

⁷⁵Survey, 4.

⁷⁶Survey, 4-5.

concept to employ in their own right, to protect and promote their own interests against those of machines and management. For workers, the question was whether the industrial system needed a "new morality" that would permit "man to become master of the machine," thereby giving to workers "that leisure and comfort which...should accrue to us" through a shorter work week.⁷⁷

Workers' attempts to revise and modernize the work ethic to their own benefit were counterbalanced by stronger social forces. From the side of capital, supported in this instance by medicine, shorter-hours legislation added to the costs of production while encouraging "results which do not make for improvement of the morals of the working classes...events have shown how readily the working men and women of this country succumb to the influence of leisure."⁷⁸ A great many "inefficient" workers were physically-defective or diseased at the moment of hiring, and "weak material to start upon only means a subsequent breakdown and replacement."⁷⁹ Not surprisingly, the fatigue investigators found managers generally agreed that there was "no question" of fatigue being caused by too long hours or too strenuous work. The majority of workers were simply not working up to capacity, "and owing to the high wages prevailing, were able to take time off at will." The few available absentee records indicated "a very high proportion of absence for minor disabilities," including, as was somehow surmised, "a considerable amount of absence for personal reasons."

Managers also contended that "unsettled postwar conditions" accounted for the "abnormally high" absenteeism [estimated to be 5 to 10 per cent per day]. But was the alleged "general slackness" the result of high wages, "out of all proportion to the cost of living," which made erratic worker attendance financially possible, as employers charged? Or did the high rate of absence actually point to overwork and ill health in the labour force? That workers were overpaid and could take time off at whim and at will is neither supported by the survey's own findings, nor by other official statistical studies of wages and prices during the 1920s. The latter indicate a contrary picture: nearly half the Canadian labour force could not provide

⁷⁷The Ontario government's "survey of industrial welfare" in the province, conducted in 1929, reported that of 276 firms employing 167,634 workers, over 73 per cent worked a 48 hour week, the remaining quarter working more than that. See J.J. Holmes, "The Social Consequences of the Long Working Day," *Canadian Unionist* (February 1930), 115; N. Spencer, "The Six Hour Day," *Canadian Unionist* (March 1938), 261. No new statutory holidays were created in Canada between 1896 and 1945; see D.G. Wetherell, I. Kmet, *Useful Pleasures: The Shaping of Leisure in Alberta* (Regina 1990), 7-9, 39. The best recent discussion of the work/leisure debate is G. Cross, *Time and Money: The Making of Consumer Culture* (London 1993).

⁷⁸Dr. T. Oliver, "Some Pressing Problems of Modern Times," *Canadian Public Health Journal*, 39, 9 (September 1914), 140.

⁷⁹A. Mitchell, Director, Canadian Chamber of Commerce, "The Scope of Medical Services in Industry," *Canadian Public Health Journal*, 30, 11 (November 1939), 521.

for the necessities of life in a period of overall prosperity.⁸⁰ Broader trends in the postwar history of labour and class relations hint at reasonable explanations for high absenteeism [if we take management estimates at face value]. Even doctors occasionally recognized the validity of labour complaints. The *Canadian Practitioner* editorialized that, in a large proportion of the strikes taking place during 1919, the watershed year of labour unrest, "the working hours have been excessive, and, as a consequence the endurance of the workers has been overtaxed without proportionate increase in the output." The editors cited the studies on fatigue performed by the War Committee in Great Britain to support this correlation.⁸¹ Despite the survey's express purpose and the nature of current physiological theories, the idea of adjusting hours of work to the physical capacity of workers did not arise, or at least was not acknowledged by either management or the scientific team itself.

There is no indication of the explanations provided by workers for their absenteeism, much less of the predominance of particular reasons. Nor do we learn anything about the nature of the workforce itself, its age and gender composition. We can make a few reasonable speculations, however, given the context that we do know. Most young workers entered the factories at the legal age of school-leaving, which was 14 years at that time. Due to the toll taken by war on those of military age, the workforce contained a disproportionate number of very young workers, workers over 40, and perhaps health-impaired returned veterans. These groups were more inclined to register bodily the impact of difficult working conditions. It is also likely that war widows with children, or mothers with war-incapacitated husbands, were not only taking up factory labour — consequently a double workload with its related health repercussions — but also had familial considerations that increased their absenteeism.

It is possible that absenteeism was a method of coping with job-related stress, resorted to at the onslaught of various bodily symptoms, especially in plants where the intensive assembly-line system was in effect. The investigators' own testimony regarding the impact of this mode of production on both workers and their product suggests its pressured and enervating effects:

Where a number of employees are stationed along the carrier [power-driven assembly line], each with a separate piece of work to perform, the rate of speed is determined largely by the slowest worker. These workers are usually employed at piecework rates, so that any one

⁸⁰"Changes in the Cost of Living in Canada from 1913 to 1937," *Labour Gazette* (June 1937), 819-21; also Public Archives of Ontario, ACC. 16383, Ontario Welfare Council papers, T.R. Robinson, "Report on Industrial Relations," Social Service Council of Ontario, *Annual Meeting and Conference*, Hamilton (May 1920), 72-3. See also T. Copp, *The Anatomy of Poverty* (Toronto 1974), 93-100; M. Piva, *The Condition of the Working Class in Toronto* (Ottawa 1979), 113-23.

⁸¹Editorial, "Labour and Strikes," *Canadian Practitioner*, 44 (1919), 238.

individual retarding speed unduly finds himself in difficulty with other employees...an opportunity to measure the extent of spoiled work, due to what appeared to be excessive speed, is presented here.⁸²

The investigators also noted the high level of noise and vibration, but adopted the employers' view that "the workers get accustomed to these," whatever the physical manifestations entailed. Later studies demonstrated that such worker accommodation/adaptation to pressure and noise did have measurable, cumulative, negative effects on health. A 1939 study, for example, revealed that only 28 of 75 machinists tested had normal hearing. By that year, the Director of the Ontario health department's Industrial Hygiene Division could point to a Toronto factory survey suggesting that rapidly-repetitive fixed-pace operations increased sickness, "more probably associated with their fixed pace than with their speed," the most important *controlling factor being "the extent to which the machine dominates the process."*⁸³ The issue is not their lack of knowledge, in 1921, about these important correlates of workplace health, but the seeming willingness of scientists to accept unquestioningly these self-serving managerial impressions.

Finally, there is the intriguing possibility that, in some small measure, worker absenteeism was a form of resistance, an individual "strike" against long hours, pressured and monotonous mechanized labour, management tyranny, and wages that did not allow the 1920s to roar for many Canadian workers. During the interwar decades, labour unrest and the rise of leftist political movements were met with fervid business commitment to mechanization, scientific management, and all-out technocracy. If workers were increasingly regarded as the human machinery of production, withdrawal of their bodies from the process was a form of industrial sabotage analogous to the deliberate removal of a cog, wheel, wire, or other component part.⁸⁴

⁸²*Survey*, 11. Holmes, "Social Effects," 116, also comments on the speed, noise and repetition of motion as deleterious to health.

⁸³Dr. J.G. Cunningham, Director, Division of Industrial Hygiene, Ontario Department of Health, "Maintenance of Health Among Industrial Workers," *Industrial Canada* (March 1941), 58-60; also D.A. Laird, PhD, SciD, Director, Psychological Laboratory, Colgate University, "Effect of Physical Factors on Efficiency," *Industrial Canada* (September 1939), 46-8. A recent survey conducted jointly by the Canadian Auto Workers and MacMaster University "paints a grim picture of life on the line" at 9 Canadian auto plants operated by the Big Three auto makers. General Motors was ranked worst, with Chrysler and Ford in second and third place respectively. It was found that "the torrid pace of production" on auto assembly lines was causing increased stress, physical risks, pain, and alcohol abuse. 77 per cent of workers at GM found the work "too fast," 48 percent finding it too heavy. See S. Bourette, "Torrid Production Pace Hurting Workers: CAW," *Globe and Mail*, 4 June 1996. GM disputes the findings.

⁸⁴The investigators admitted that systematic records of absenteeism for these plants "were too few to permit of any significant data being collected"; *Survey*, 14. On the emergence of the technocratic movement in the United States, see Pursell, *The Machine in America*, 252-5.

The Toronto survey is most revealing of contemporary ideas and ideals in what it does *not* consider, in the interpretations and speculations that its participants did not make. We are left with the sense that management impressions about "abnormal absenteeism" had more to do with labour/capital antagonism in a particularly antagonistic historical moment than with the unprecedented rise in the workers' standard of living, whatever the scientific tone and rhetoric of "systematic" investigation. The tug-of-war over the "living wage" and better working conditions underpinned the managers' assessment of absenteeism, and their judgement that workers were overpaid and lazy.

In the end, management perceptions about the problem of industrial hygiene led the investigators to "two very fundamental questions": first, that of the influence of a "living wage" in attenuating unhealthful home conditions, and second "the degree of the employer's responsibility for setting the standard of requirements for healthy living." These were indeed fundamental questions about the class basis of ill health, the environmental basis of "bodily inefficiency," and the responsibilities of capital and state in these areas. Engagement with such questions could have shaken intractable medical theories about the causal relationship between class patterns of personal hygiene allegedly based in ignorance, and the state of health of the individual/social body. Significantly, their discussion was deemed "beyond the scope of the present report."

Similar to other public health causes of the early 20th century, research into the specific problem soon uncovered a wide range of interrelated factors concerning the subjects' conditions of work and life. The connections between health and class could not be entirely ignored as they consistently came back to the fore. The Committee found that all the symptoms comprising industrial fatigue, and its related outcome in lowered productivity, were "associated very intimately with the health and diet of the worker and hygienic conditions or otherwise of his environment, not only during his working hours, but also his life outside the factory or workshop."⁸⁵ Because a wider scope seemed absolutely necessary, the Committee reconstituted itself to examine "industrial hygiene" as a means to understanding the contributory lifestyle factors that resulted in poor health and inefficiency. As industrial hygiene became an accepted part of the public health department's mandate, and a new area of specialization for medical researchers and practitioners, the Committee appeared poised to take on a vital leadership role in this area.⁸⁶

⁸⁵Honorary Council for Scientific and Industrial Research of Canada, *Report of the Administrative Chairman*, (1920-1), 21.

⁸⁶Editorial, "Industrial Hygiene," *Canadian Practitioner and Review*, 45, 9 (September 1920), 365-6. The front-running Ontario Department of Health, considered a modern prototype of health departments for the nation, inaugurated a division of industrial hygiene in 1914; the division had become a department by 1920. Editorial, "Hygiene of Recreation," *Canadian Practitioner*, 49, 6 (June 1924), 308, discusses the growing interest in industrial hygiene in Canada.

Internecine competition marked an end to this initiative. The new Dominion Department of Health, eager to establish its hegemony as the foremost health agency of the state, objected to the Committee's preliminary forays into industrial hygiene. The Council formally ceded responsibility for research in this field to the Dominion department in 1924.⁸⁷ No separate federal division of industrial hygiene was created, however, until 1938. The new division's objective was then defined in terms largely advisory and supportive: it would collect and disseminate information, as well as provide consultant and research services to provincial departments or industries on specific problems, and supply expert personnel to assist provincial departments in conducting preliminary fact-finding surveys.⁸⁸

With the demise of the Committee on Industrial Fatigue, promotion of industrial hygiene was carried out largely through provincial health departments, and by quasi-official and voluntarist committees associated with such groups as the Canadian Medical Association and its provincial affiliates, the Canadian Public Health Association, the Dominion Council of Health, and the Health League of Canada. The provincial divisions of industrial hygiene turned their attention almost exclusively to occupational disease and accident prevention, as did the medical associations.⁸⁹ The most important result was a combined medical/state lobby that resulted in some provincial legislative amendments to require the reporting of occupational diseases, the procedure to be followed in their medical control, and the mechanical control of dust, fumes, and specified toxic chemicals.⁹⁰ The health organizations showed an interest in the larger picture of workers' health that at least acknowledged its material basis. But groups such as the Public Health Association and the Health League were committed exclusively to health education. They produced literature, short films, "radio talks," and travelling displays for local fairs and exhibitions that invariably included posters and other pictorial representations

⁸⁷G. Feldberg, "The Origins of Organized Canadian Medical Research: The National Research Council's Associate Committee on Tuberculosis Research, 1924-1938" in R. Jarrell, Y. Gingras, eds., *Building Canadian Science: The Role of the National Research Council* (Ottawa 1992), 53-70.

⁸⁸Dr. F.S. Parney, "Division of Industrial Hygiene," *Canadian Public Health Journal*, 23, 4 (April 1939), 149.

⁸⁹The Ontario Medical Association's Committee on Industrial Diseases found "as many as 650 different types of industrial disease arising directly from the wage earner's exposure to substances used or produced in the course of his work." "Report," *Canadian Practitioner*, 49, 2 (February 1924), 58-9. See also "Industrial Disease," *Canadian Medical Association Journal*, 16 (1926), 304; Dr. J.G. Cunningham, Director, Division of Industrial Hygiene, Ontario, "Industrial Hygiene in Ontario," *CPHJ*, 30, 11 (November 1939), 524-5.

⁹⁰Dr. C.D. Selby, Medical Consultant, General Motors Corporation, Detroit, Michigan, "Medical Engineering in Industry," address before the Industrial Accident Prevention Association of Ontario, *Industrial Canada* (May 1937), 47-51. For a comprehensive historical analysis of legislation in this area to World War One, see E. Tucker, *Administering Danger in the Workplace* (Toronto 1990).

of "the human factory" and the "fuel" required to keep it in production. They also enlisted local groups such as the YM/YWCA to carry the message and the literature directly to factories. Above all, these associations stressed medical supervision in the factories, ideally through a physician specializing in industrial hygiene, but at least through part-time employment of a public health nurse who would always advise physician consultation. It was argued that "a systematic scheme of industrial hygiene" carried out in factories was "merely a logical continuation of the school medical inspection system."⁹¹

As with related public health campaigns, industrial hygiene — unarguably a question of class-based health problems and the inaccessibility of affordable health care — was addressed primarily through exhortations about the need for expert supervision and regulation of the specific bodies of industrial workers, for the long-term benefit of the social body. The bigger and more troublesome questions surrounding the implications of work for health and life were left alone. What counted above all were the implications of health for work, as is witnessed in the renewed attention given to the issue of bodily inefficiency, or fatigue, with the outbreak of the Second World War. Dr. Kingsley Kay, speaking on "industrial hygiene in wartime" before the Dominion Council of Health in 1940, implored that "no more practical time could be found for demonstrating the importance of the health factor in contributing toward a more efficient industrial production." The point was to avoid "inefficiency due to labour turnover and absence, deficiency and defectiveness of outputs," with industrial accidents and ill health notably last in the list of goals.⁹² The Health League of Canada [formerly the Social Hygiene Council] reported ominously that, in a single month of 1942, "the time stolen by illness among Canadian wage earners could have built 377 cruiser tanks or 370 medium bombers. In the present crisis ... continuance of such time-production losses is suicidal." Fatigue was playing "a sinister part" in the absentee problem, its nefarious aspects reinforced by illustrations of slumped workers, with Hitler caricatures grinning hideously in the background of stilled machinery. Advertisers of consumer

⁹¹National Archives of Canada (NAC), RG 29, v. 617, file 454-10-9, Annual Meeting, *Report*, Canadian Public Health Association, Halifax (June 1938), 2-5; Dr. F.S. Parney, Chief, Division of Industrial Hygiene, Department of Pensions and National Health, "The Division of Industrial Hygiene," *Canadian Public Health Journal*, 23, 4 (April 1939), 149. See also the special issue on industrial hygiene, *Canadian Public Health Journal*, 30, 11 (November 1939), especially A. Mitchell, "The Scope of the Medical Services in Industry," 521; "Chronic Disease in the Industrial Population," 540; Dr. F.G. Pedley, "The Industrial Poisons Problem," 530; Dr. H.M. Harrison, "The Practice of Preventive Medicine by a General Practitioner Among Employees in a Small Factory," 541-4.

⁹²NAC, National Health and Welfare, RG 29, v. 617, file 454-10-10, Dr. K. Kay, "Industrial Hygiene in Wartime," typescript, paper presented to the Dominion Council of Health (May 1940), 4. See also "The Health of the Industrial War Worker," *The Canadian Doctor* (November 1940), 21-2, recommending that male war workers not put in more than 65-67 hours per week, women no more than 55.

products picked up on the theme, promoting, as one example, Pepsi-Cola as a proven antidote.⁹³ Making the rounds again were medical arguments heard in the previous war-to-end-all-wars, that "a proper understanding of physiological principles" was the core of an effective industrial hygiene programme, and that output could increase materially if only industry recognized "that the work of each must conform to the laws of physiology."⁹⁴ The primary duty of the industrial doctor was "to fit the worker to the job and to keep him at work...to correlate the human body and the machine."⁹⁵ Not coincidentally, after the lull occasioned by the Depression years, worker militancy was very much on the upswing in North America during the early 1940s — at the same time that production for the war effort became the all-out objective of government and its experts in technology and science, and automation the essential means of achieving it.⁹⁶

Born of 19th-century developments in technology and the social and human sciences, the machine ethic of modern industrial capitalism did much to "mechanize" bodies and the society that they inhabited. Scientific attempts to understand and "manipulate" the human body, through physiological experiments, industrial fatigue studies, and scientific management theories, aimed at completing the body project by developing the ideal "new type" for the modern age: the machine-like human. In purely physical terms, the results were disappointing. However "scientific" the theory and studied its application, the synchronization of motion in human labour fell short of replicating machine motion. Even repetitive movements are intrinsically variable and idiosyncratic, and not completely controllable by physiological effort, however strongly-willed and enforced. Bodies could not be designed, produced, "Taylored," or truly reconfigured to mechanical specifications. As sensate creatures, human beings make deficient machines. As deficient machines, they remain workers whose "efficiency" is subject to factors that no science can unfailingly predict and contain. The same is true of the "production"

⁹³M.C. Duncan, "Correct Posture, Good Health: How Posture Affects Your Health and Efficiency," *Health* (Spring 1943), 11.

⁹⁴Dr. J.A. Baudoin, Director, School of Applied Social Hygiene, University of Montreal, "Industrial Hygiene from the Public Health Aspect," *Canadian Journal of Public Health*, 30, 11 (November 1939), 519.

⁹⁵F.R. Griffin, "Doctors in Industry," *Health* (Autumn 1942), 12. This was the organ of the Health League of Canada, formerly the Social Hygiene Council. See also W.H. Cruickshank, "Fatigue: Saboteur of Production," *Health* (Summer 1942), 6; "What Causes Fatigue," *Health* (Winter 1942-3), 23; M.C. Duncan, "Correct Posture, Good Health: How Posture Affects Your Health and Efficiency," 11; W. Sawyer, "Health for Workers" (Summer 1943), 12; also R.B. Morley, Manager, Industrial Accident Prevention Associations, "War Time Safety Problems in Canadian Industry," *Industrial Canada* (September 1940), 52.

⁹⁶Noble, *Forces of Production*, details the concerted attempts by state, capital, and scientists to automate production in the United States in the face of worker resistance during World War II.

⁹⁷Gramsci, "Animality and Industrialism," 300.

and "management" of children: neither mothers nor infants were the automatons that they needed to be in order to adhere to the rigid prescriptions that theoretically ensured the reproduction and socialization of perfect little machines. Mustering a guarded faith in the ultimate triumph of humanity over machinery, Gramsci concluded his 1929 consideration of "the American phenomenon" with the contention that "there is an inherent conflict between the "verbal" ideology which recognizes the new necessities and the real "animal" practice which prevents physical bodies from effectively acquiring the new attitudes."⁹⁷

Despite the material limitations of the immediate project, the early 20th-century diffusion of the machine ethic, sustained by the authority of science, medicine and state, has had lasting sociocultural impact. Modern medicine has contributed, in ways both overt and insidious, to the production and reproduction of the healthy social body. The medicalization of 20th-century life is concomitant to its rationalization, encouraging and reinforcing, in Foucault's terminology, a "biopolitics" of regulation and supervision as a joint project of medicine and the state. The corollary to increasing state regulation is the legitimization of certain classes and interest groups, to whom is relegated both the definition of the normative [actually derived more from ideal than from "objective" knowledge], and consequently the deviant; and the nature and distribution of health and welfare services in accordance. The expansion of the bureaucratic state in early 20th-century western democracies placed the medical profession in a unique mediatory position between the social and the scientific. The state has become increasingly important in the regulation of human bodies and human relationships through medical legislation, including mandatory blood tests and physical examinations for immigration and marriage, compulsory immunization, sanctions against abortion and birth control, enforced quarantine, and myriad public health laws.⁹⁸ Class, gender, and modernist concepts correlating progress, science and technology have granted doctors an impressive social and political power which has gone remarkably unchallenged during the 20th century.

Science, technology, and their related ideologies, necessarily build on an historical foundation of previous experiments and discoveries. Sociocultural adaptations are not motivated solely by advances in these areas, however, but equally by human choices with respect to which "new and improved" offerings should be

⁹⁸V. Navarro, "The Political Economy of Medical Care," in Navarro, ed., *Health and Medical Care in the United States*, 104-6; D. Naylor, *Private Practice, Public Payment* (Kingston 1986), 15. For contemporary examples discussing state intervention in these areas, see Editorial, "Free Mothers of a Free Race," *Canadian Public Health Journal*, 4, 1 (1919), 40-1; Dr. W.B. Hendry, "Maternal Mortality," *Canadian Medical Association Journal*, 13, 4 (1923), 253-4; Dr. B. Atlee, "The Menace of Maternity," *Canadian Home Journal* (May 1932), 8.

embraced in light of the available knowledge about their human repercussions.⁹⁹ If they were unable to transform humans into machinery in the early 20th century, the continued fascination of scientists, manufacturers, and managers with the “man-machine” concept foretold the next step: outright replacement of physical bodies by machines that could emulate humans without the “mechanical” disadvantages pertinent to them. “Labour,” as physical work and as social class, could thereby be eliminated. By the middle of the 20th century, experiments in robotics, cybernetics, and artificial reproduction would attempt to create a world so prosperous and productive that no thought need be given to human rights before technocratic power and corporate profit. In fact, ideally, nothing in this post-industrial, post-modern utopia ever need be touched by human hands — including human bodies.

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⁹⁹Sec R. Heilbroner, “Do Machines Make History?” in Smith, Marx, eds., *Does Technology Drive History?*; Noble, *Forces of Production*, especially 57-9.

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