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Science and the Labour Process

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Science and the Labour Process

Richard Price

Maxine Berg, *Technology and Toil* (London: CSE Books 1979).
CSE Microelectronics Group, *Microelectronics: Capitalist Technology and the Working Class* (London: CSE Books 1980).

Les Levidow and Bob Young, eds., *Science, Technology and the Labour Process* (London: CSE Books 1981).

Mike Hales, *Living Thinkwork: Where Do Labour Processes Come From?* (London: CSE Books 1980).

THERE IS A VERY IMPORTANT BOOK waiting to be written on the historical relationship between science and the labour process. It is widely recognized that the current revolution in microtechnology possesses serious implications for the structure of the labour market and the nature of white-collar work, but exactly where this latest stage of labour process development may be situated historically and how and why it is different from other periods of labour process reorganization are not yet the subject of any serious investigation. With the exception of Maxine Berg's *Technology and Toil* (a collection of documents), the books listed above are almost totally concerned with the relationship between high technology, science, and the degradation of white-collar work. And in many respects they portray a picture depressingly familiar to the historian of capital-labour relations of the creeping proletarianization of skills, of the subdivision and speed-up of clerical work, and of the use of machinery — in this case the pervasive programmes of the computer — to secure a "real subordination" of labour. What is new in all this is the decisive extension of this process from the blue-suited sons of toil to the mental labour (broadly defined) of the white-collar professional and clerical workers. Indeed, from an historical viewpoint there is a supreme irony in the fact that the very process that created security and separateness for the white-collar class is now the same

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process that is battering down its protections and pretensions; it was the original attempt by Taylorism to integrate scientific organization into blue-collar work that created the original need for managerial mental workers.

One of the curious, yet centrally important, reflections that these books suggest is the slowness with which science has entered the labour process. Ever since the industrial revolution the potential of science in the service of capital has been clearly recognized. Yet the extent to which that promise was fulfilled was peculiarly variegated between countries and incomplete within industry. It was no accident that Andrew Ure was both an industrial chemist and an early theorizer of the way machinery could subordinate the unruly hand workers. But the two sides of his talents were never fully meshed, and this was symptomatic of the strange myopia with which British industrial capital viewed the scientific world. We need only recall the bitter fate of Charles Babbage whose prescriptions for fusing the discipline of science with industry were ignored but who saw from the beginning an intimate connection between his diabolical calculating machine and the regularity of habits which every industrialist sought to instill in his workforce. Science remained distant from the labour process: every manufacturer, recommended factory owner James Montgomery in 1836, must know all the details of the factory, but innovation — the prerequisite of the scientific approach — was discouraged for fear that it disrupt the delicate balance between order and anarchy that was the nature of factory organization.[1] Indeed, it seems likely that no real distinction was made between scientific knowledge and technical know-how; combining dyes in a calico print shop obviously possessed a chemistry which people like Ure might lecture on or write books about, but this bore little relationship to the actual process by which that knowledge was used or modified. Britain, of course, was an extreme case in the way that industrial science was hardly distinguished from learning by doing. In Germany, things were very different; the 30 or so technical universities in 1872 contrasted sharply with the sixteen students reading chemistry at Cambridge. And the results were to show in the rapid development, for example, of the new coal-based chemical industry in Germany whilst Britain still meandered along using the old-fashioned alkali-salt processes for her dye-stuffs. Just as Napoleon had marched to Moscow in Yorkshire woollens, so the British Expeditionary Force sang its way to the Western Front in German khaki dyes.

War, of course, was the most powerful integrator of science and industry, decisively shifting the emphasis from pure to applied research which, as Edward Yoxen argues in his essay in *Science, Technology and the Labour Process*, is directed by large research foundations in the interest of capitalist priorities.[2] But already by World War I, a second stage in the relationship between science and the labour process had been opened with the Taylorist application of scientific principles (through pseudo-scientific methods) to the organization of work. This stage had two important characteristics — both in need of historical investigation. In the first place, the distance between science and industry was narrowed by the deliberate substitution of research and development for technological tinkering. Taylor's own experiments with high-speed cutting steel illustrate this. Second, there was a consequent emphasis on the clear separation between manual and mental labour with the effort to subordinate completely the actual doing of the work to a rationalized control determined by calculations and decisions exter-

[1] Berg, *Technology and Toil*, 58-62.

[2] Yoxen, "Life as Productive Force: Capitalising the Science and Technology of Molecular Biology."

nal to the workplace. In the engineers' economy of Taylorist fantasy, there lay a clear distinction between science and performance which had not been extant before and the responsibility for the determination of how to perform lay in the mental world of the white-collar class from scientists through managers to clerks. The central theme of most of the books listed above shows how it is precisely this group that is now undergoing its own Taylorist transformation as the microelectronic revolution enters not only into industry but also into the white-collar world of low-level office work and the highly sophisticated work of mathematicians. The development of software programmes for stress analysis of air frame structures, for example, means that the mental labour of mathematicians is potentially as replaceable by computer as is hand-held spot welding by robotics.[3]

The sources of this third stage of the relationship between science and the labour process are, of course, varied and are not to be found in the internal dynamics of the labour process alone. But the material of these books suggests two particular features of the labour process that are common to other periods of change. In the first place, one result of the Taylorist separation of mental and manual labour was to allow white-collar groups to secure autonomy through their possession of knowledge. Pre-conceptualizing was the essence of this Taylorist division, but if it removed discretion from the craft worker, it shifted it into the head of the mental "craft" of the intellectual worker.[4] Thus, just as artisans in early industrial society remained only "formally" subordinate so now this formal subordination was replicated amongst the mental labourers. Indeed, securing the real subordination of the craft worker could only be achieved by allowing white-collar workers an autonomy denied to the skilled artisan; the condition of blue-collar subordination by science was the development, over time, of white-collar "craft control." Naturally, for reasons too complex even to mention here, the political consequences of this white-collar control were vastly different than they were amongst the traditional working class. But it is unsurprising that as control has been undermined by microtechnology, so a certain (but by no means universal) radicalization of white-collar workers has occurred. The computerization of bank operations in Britain, for example, stimulated a growth of unionization as bank workers lost their putative middle-class status and has led to the consideration of such blue-collar problems as how to control redundancies.[5]

Perhaps the best example of the growth of a craft control amongst the white-collar sector is that of the computer programmers whose key role as conceptualizers and depositories of the mysteries of the craft during the early stages of the computer revolution rested upon their specific knowledge of how most effectively to manipulate the technical forces of production — how to make the hardware do what was required of it. At this stage, which lasted until the mid-1960s, each programme was specific to its task and hardware component and, significantly, programmers replicated "craft" behaviour in their general lack of respect for higher management — although this was reflected far more in job mobility and individualized freedom than it was in the collective solidarity typical of traditional crafts. How far the impetus for the removal of this kind of discretionary power derived from the problems of managerial control is unclear; it was certainly an issue managers were concerned with in the 1960s, but the development of universal software languages like COBOL was

[3] Mike Cooley, "The Taylorisation of Intellectual Work," in Levidow and Young, 47.

[4] Hales, *Living Thinkwork*.

[5] CSE, *Microelectronics*, 108.

first undertaken in response to military needs.[6] It was this that effectively fractured the craft division of labour in programming, removing the need for programmers to know anything about the hardware applications of their work and routinizing much of the production of software into mere keyboard operations. Like all de-skilling processes, this one has been far from unilinear or unambiguous in its results: the craft has been fragmented by an increasing division of labour into unskilled data base workers and an aristocracy of systems analysts whose design and production of large software projects still constitutes a high-cost, low productivity bottleneck.[7] Nevertheless, this represents a further division of mental and manual labour in white-collar work between those who perform routine tasks in a style and at a speed determined by the technology and those who conceptualize the process.

This division may be seen most particularly in the application of the chip revolution to office and clerical work which is now undergoing a Taylorization reminiscent of that of blue-collar work early in the century. Clerical work has always been labour intensive; as service industries come to constitute the largest sector of capitalist economics, the productivity bottleneck of clerical labour assumes increasingly serious proportions — and this provides the second labour process imperative to apply the new technology. Theoretically, the copy typist, for example, should be able to produce 1750 lines per day; in fact, the average output amounts to 250. Much of this is due to the diversity of job responsibilities — from buying the boss' socks to photo-copying — and to the fact that the typewriter will only go as fast as the operator makes it. The "paternal" and patriarchal basis of discipline in the office is hardly an adequate instrument of productivity depending as it does on flattery, coaxing and persuasion. The application of computer technology promises to introduce a more rationalized division of labour and time and move clerical work towards a continuous flow production basis with a recomposed hierarchy of skills which will endow top secretaries with supervisory and administrative responsibilities. In many places this has already occurred; isolated from others in a cubicle, receiving instructions over headphones, transfixed to a Visual Display Terminal, the modern secretary resembles the line worker in all save her white blouse. One consequence has been the appearance of industrial illnesses in the office; leg cramps, eye strain, back and neck pains suggest the shortening of clerical work life; the bottle of aspirin traditionally kept in the desk is no longer for the boss.[8] As is not uncommon in periods of technological change, the secretarial labour market has continued to expand and the computer has not implied a shrinking of clerical employment; ironically, its main effects in the office may be to create redundancy amongst managerial staff. But where the new technology has been applied to traditional industrial jobs, as in printing, its labour saving potential is only too evident.

A similar, though more painful, shake out of labour is now occuring in the auto industry where robotization and computer-controlled automation are now part of a thorough reorganization of the labour process. In this case, the choice of techniques (anticipated and known about for 30 years) was stimulated by the combined efforts of tightened product markets and the labour militancy of the late 1960s and early 1970s. The clearest example of this process is the introduction of the Digitron assembly line by Fiat at Turin which involves the complete computer-

[6] Joan Greenbaum, *In the Name of Efficiency* (Philadelphia 1979); Mike Duncan, "Microelectronics: Five areas of Subordination," in Levidow and Young, 188-9.

[7] CSE, *Microelectronics*, 31-40.

[8] *Washington Post*, 8 November 1982, 15-17.

ization of the assembly of body and engine units and allows management to monitor more completely production flow from an external source. These kinds of changes were begun in the 1960s and were accompanied by a judicious composite of labour policies which allowed a final showdown with labour to be avoided until 1980. In the meantime, however, these changes emphasized again how microtechnology was Taylorizing white-collar work as command responsibility was displaced from the foremen and middle managers into the computer machines. Work stations linked to a central computer which monitored all stages of the work process removed the traditional function of foremen as coordinators of production and communicators of information. But the response of these white-collar groups is by no means as predictable as that of traditional craftsmen. At Fiat, for example, a fragile unity between middle management and line workers that had developed during the 1970s crumbled in October 1980 when the former helped to break the strike as part of a bargain with management which involved greater loyalty from foremen in return for increased security.[9]

As these books amply demonstrate, the key feature of microelectronics is the scope that it offers for the removal of discretion and conceptualization of work into the highly specialized and technical categories of scientific workers. Historically, the theme itself is not new, although the scale and areas of its intrusion may be. It is as well to remember that the self-acting machinery of the early industrial revolution contained the same implications which Taylorism sought to realize through bureaucratic organization. And we should also beware of viewing this as anymore thoroughgoing a revolution than previous efforts to infuse production with science. Not only has it reproduced similar patterns in the division of labour as in the past, it has also ensured the expansion of archaic forms of production to complement the advanced sectors. Thus, within the computer industry itself the high-cost intellectual labour that still characterizes much software production is paralleled by the intensive production of the silicon chips in low-cost areas of the third world. Numerical control in engineering may be used to permit the introduction of mass production into machine tool manufacture but in Norway and Sweden some efforts have been made to gain control over the introduction and utilization of the new technology, and in Italy high technology engineering has flourished in a reconstituted domestic industry organized and run by artisans.[10] Within the same company, the world wide division of labour is often reproduced. The notorious photoprocessing firm of Grunwick, for example, possessed highly computerized chemical and accounting departments which permitted the rapid turnover essential to its competitive success. But the seasonal nature of the work discouraged an equivalent investment in computer technology for the sorting and billing of the mail-order film and in these sections low-paid Asian women worked under Dickensian sweat shop conditions.[11]

It is observed several times in these books that microtechnology contains the potential for a structure of work that is less centralized and more democratic: the technology itself does not dictate new kinds of de-humanization. How it is used is a matter of social choice and in this respect, too, we may expect to see the struggles of the past to be reflected in those of the present and the future.

[9] Marco Revelli, "Defeat at Fiat," *Capital and Class*, 16 (Spring 1982).

[10] Charles Sabel, *Work and Politics. The Division of Labor in Industry* (Cambridge, Mass. 1982), 220-30; CSE, *Microelectronics*, 52-6.

[11] Les Levidow, "Grunwick: The Social Contract Meets the 20th Century Sweatshop," in Levidow and Young, 139-46.