

Chapter 3

Marxisms

Marx's Machines

It is too late in the day to become intensely vexed as to what Marx 'really said' about technology. For Marx was, like all of us, a multiple. He wrote variously about technology, making statements that cannot all be reconciled one with another--or at least, can be reconciled in very different, sometimes radically opposed, ways. In the historical development of Marxism this heterogeneity of utterances has yielded a volume of interpretation which now weighs considerably on the brain of the living, and whose influence powerfully refracts every re-reading of their source.

This chapter begins, therefore, with a scan of the many representations of the machine in Marx's texts. It then moves on to see what other Marxists have made of and from these representations as they respond to the 'information revolution.' Three positions are examined: scientific socialism, which sees technoscience as a central agent in a dialectical drama culminating in the inevitable defeat of capital; neo-Luddism, which focuses on technology as instruments of capitalist domination; and post-Fordism, which often looks to the possibility of a technologically mediated reconciliation between labour and capital. While this is by no means a complete inventory of Marxist, or Marxist-derived, thought on technological change, it does muster the major analyses with which I want to take issue. For, I argue, scientific socialists, neo-Luddites and post-Fordists all, though in very different ways, fall short of an adequate response to the challenge of the information revolutionaries.

As we have already seen, there is a certain Marx very close in spirit to the information revolutionaries--the Marx of "The handmill gives you society with the feudal lord; the steam-mill with the industrial capitalist."¹ This technologically determinist Marx is not a negligible figure.² His hand has been seen at work in the celebrated account in the Preface to the Contribution to a Critique of Political Economy of how "in the social production of their life men enter into definite relations that are independent of their will, relations of production which correspond to a definite stage of development of their material productive forces."³ At a certain stage in their development, Marx says, "the material productive forces of society come into conflict with the existing relations of production" and "from forms of development of the productive forces these relations turn into their fetters"--thereby initiating social revolution.⁴

What precisely constitutes the forces of production and what the relations of production, and the precise nature of the interaction between the two, are amongst the most controversial questions in Marxist theory.⁵ But what is certain is that a view which sees the forces of production as technological, and only the relations of production as social, with the former having primacy over the latter seems to have taken root very close to Marx himself, in the work of his friend Frederick Engels, who wrote that with the advancement of modern machinery "the productive forces themselves press forward with increasing power towards . . . their deliverance from their character as capital."⁶ From there extends a line of Marxist thought, along whom are posted figures such as Nikolai Bukharin, J.D. Bernal and G.A. Cohen, which understands technological development as an autonomous force, a motor of history, whose ever expanding productive powers smash relentlessly

through anachronistic forms of property ownership in a trajectory heading straight to the triumph of socialism.⁷

However, there are other passages in Marx that modify and indeed contradict this mechanistic view of history. For example, the major treatments of factory machinery in Capital tells a story in which capitalism, as it deepens its control of the workplace and society transforms methods of production. Marx describes this process in terms of successive degrees of "subsumption."⁸ In "formal subsumption"--roughly the early stages of the industrial revolution--capital simply imposes the form of wage labour on pre-existing modes of artisanal production. But in the subsequent phase, "real subsumption," it undertakes a wholesale reorganisation of work. Science is systematically applied to industry; technological innovation becomes perpetual; exploitation focuses on a "relative" intensification of productivity rather than an "absolute" extension of hours.⁹

Central to this process of subsumption is the replacement of manual methods of work by machinofacture. And the impetus for this development is, Marx says, the factory master's drive to enhance command over his labour force by deskilling craft workers and enlarging the reserve army of the unemployed. Such a narrative precisely reverses the technologically determinist account. For it is social relations--capital's requirement for total control over the valorisation process--that shapes machines, not vice versa. From the reading of such passages flows a different line of analysis whose exponents run from Georg Lukacs through to Harry Braverman and David Noble, who insist that machinery is only a moment in forces of production whose constitution is itself a matter of social power.¹⁰

However, even if it could be agreed that Marx posits a complex interaction between 'social' and 'technological' factors--indeed, complex to the point where the two categories are understood as so inseparably bound up as to make him one of the first theorists of what today are termed 'socio-technical systems'--there would still be space for disagreement in his writing on machines. Many readers have been impressed by his nightmare portrayal of nineteenth century factory masters' use of technology. Throughout his work, Marx again and again tells us how machinery confronts the worker in production as the power of capital incarnate--or at least metallized. The steam engine serves as an "instrument of torture" in the hands of the factory owner. In a necrotic tyranny, the "dead labour" of automatic machinery becomes a "mechanical monster" with "demonic power" that "dominates, and pumps dry, living labour power," converting the worker into a "living appendage."¹¹ Or, as Marx put it in a speech to the Chartists in 1856,

At the same pace that mankind masters nature, man seems to become enslaved to other men . . . All our invention and progress seem to result in endowing material forces with intellectual life, and stultifying human life into a material force.¹²

From this, and many other passages can be distilled a technophobic, dystopian, neo-Luddite Marx, a Marx who rages against the machine.

Yet the production of such a Marx depends on a considerable effort of edition and selection. For there are other moments where Marx speaks not just of the infernal effects of machines, but also of their emancipatory promise. For example, in one passage of Capital he discusses how "modern industry" continually transforms itself "by means of machinery,

chemical processes and other methods" and in doing so "incessantly throws masses of capital and of workers from one branch of production to another," in a way that "necessitates variation of labour, fluidity of functions, and mobility of workers in all directions."¹³ Under capital, Marx says, this incessant technological change is an appallingly destructive, immiserating force, which "does away with all repose, all fixity and all security as far as the worker's life situation is concerned."¹⁴ However, he argues, such relentless innovation also has a potentially positive side. By annihilating the narrow specialisations that previously characterised craft production it makes possible "the recognition of variation of labour and hence of the fitness of the worker for the maximum number of different kinds of labour."¹⁵

Modern industry thus opens the vision of an alternative--communist--social order in which the "monstrosity" of technological unemployment is replaced by the "possibility of varying labour."¹⁶ The "partially developed individual, who is merely the bearer of one specialised social function" will give way to "the totally developed individual, for whom the different social functions are different modes of activity he takes up in turn."¹⁷ Citing a French worker who claimed that constantly changing trades in California made him feel "less of a mollusc and more of a man," Marx recommends the development of technical, agricultural and vocational schools, in which "the children of the workers receive a certain amount of instruction in technology."¹⁸ From such moments can be constructed another Marx, an enthusiast for the progressive possibilities of human-machine interaction.¹⁹

Although much of Marx's writing on machines concerns factory automation, a broadly similar ambivalence informs his observations about the other great technological innovations of his age--those in the sphere of communication and transport.²⁰ For Marx, the

telegraph, the steamship and the railway were the inseparable concomitants to the development of factory production, instruments for the creation of the world market necessary to supply the raw materials and absorb the goods produced by industrial machinery, an extension of capital's ceaseless revolutionising of the means of production. They were the manifestations of a relentless dynamic which "chases the bourgeoisie over the whole surface of the globe" compelling it to "nestle everywhere, settle everywhere, establish connections everywhere."²¹

As such, the new channels of travel and communication were tendrils for the extension of a system of domination. In a passage which strikingly anticipates the conditions of contemporary globalisation Marx writes of how:

Every development in the means of new productive forces is at the same time a weapon against the workers. All improvements in the means of communication, for example facilitate the competition of workers in different localities and turns local competition into national.²²

Elsewhere, Marx analyses the new means of communication as essential component in the "autonomisation of the world market," elevating monetary exchanges into an force whose impersonal and relentless processes appear to stand over and against any possibility of human intervention or transformation.²³ These observations--especially when linked to Marx's remarks on ideology and commodity fetishism--have provided planks for a Marxist political economy focused almost entirely on the dominative effects of capitalist media and information industries.

Yet at the same time, and even more emphatically than in the case of industrial machinery, Marx also saw liberatory possibilities in the nineteenth century communications revolution. The telegraph, fast mails, and travel broke down parochialism, localism and narrow national interests. As such, they were potential catalysts for proletarian internationalism. Indeed, The Communist Manifesto's famous exhortation to the "workers of the world" is prefaced by a series of enthusiastic observations on how this "ever expanding union of workers" is "helped on by the improved means of communication that are created by modern industry and that place the workers of different localities in contact with one another."²⁴ This is one vital aspect of a process by which "the bourgeoisie "forges the weapons that bring death to itself" and also calls into existence "the men who are to wield these weapons--the modern working class-the proletarians."²⁵

In his own life, Marx was eager to take advantage of such possibilities. According to James Billington, Marx and Engels on one occasion planned to penetrate the international wire agencies in Brussels, through a leftist press agency, in order to distribute their messages more widely!²⁶As Peter Waterman notes, this may not be quite enough to make Marx a 'hacker' avant la lettre! Nevertheless, the enthusiasm for the revolutionary possibilities of mass communication so evident in his texts has resonated with theorists from Bertholt Brecht and Walter Benjamin to Hans Magnus Enzensburger onwards.²⁷

These synoptic observations only skim the surface of Marx's machine-writings. But they are perhaps enough to establish that throughout these texts there runs an electric tension, an alternating current that oscillates between rival possibilities. At one pole, technology is an instrument of capitalist domination, a means for the intensification of exploitation and the enchainment of the world in commodity exchange. On the other, it is the

basis for the freedom from want and the social intercourse that are prerequisites for a communist society. How much emphasis is given to each pole, and by what logic or narrative they are connected, is, however a matter of huge contention. Later, like all the other interpreters, I will select my own favoured points of reference, the passages where, for me, Marx's antinomies about the machine fuse at white heat into brilliant insight. But for the moment, we will see what others have made of Marx's ambiguous machines.

Scientific Socialism

I use the term 'scientific socialism' to designate that form of Marxism --also variously referred to as 'objectivist,' 'classical' or 'neo-orthodox' Marxism--which, taking its direction from Marx and Engel's observations about the contradictions between forces and relations of production, sees history driven by scientifically predictable laws of motion toward a socialist destination.²⁸ Perhaps the most sophisticated recent example of this school of thought is to be found in the work of Ernest Mandel, the eminent theoretician of the Fourth International.

Mandel's magnum opus, Late Capitalism, was first published in 1968 and translated into English in 1975. It represents a magisterial attempt to reinsert many of the societal phenomena which were at that time being claimed by post-industrial theorists to mark the definitive supersession of Marxism--cybernetics and other new technologies, the increasing importance of planning and education, and the increasingly 'knowledge based' nature of economic development--within the framework of historical materialism. For Mandel's fundamental claim is that the societies of contemporary Europe and North America, far from having transcended the features of capitalism described by Marx, in fact exhibited them in a singularly pure form.²⁹

Mandel argues that there have been three fundamental moments in capitalism, each one marking a dialectical expansion over the previous stage: market capitalism, monopoly capitalism, and our own phase, "late capitalism." He links the appearance of these stages to Kondratieff's famous theory of "long waves"--successive, rhythmic episodes of economic growth and stagnation which supposedly dominate the last two centuries of Western history. In each wave, surges in technological innovation are precipitated by temporary increases in the rate of profit after a protracted period of under-investment. Corresponding to the three phases of capitalism are three "general revolutions in technology"-- steam driven machinery of the 1840s, electric and combustion motors of the 1890s, and, from the 1940s on, the "third technological revolution" of nuclear power and computerisation.

The central feature of this latest phase is the increasing level of automation, and, in particular, the replacement of industrial workers by cybernetic systems and continuous flow processes based on automatic control. This brings with it a series of interrelated developments, which reverberate through the capitalist economy. These include a shift of living labour from the actual treatment of raw materials to preparatory or supervisory functions; new developments in organised research and university education; a speed up in production and a consequent pressure for more effective inventory control, market research and demand management; and increasingly large, and increasingly quickly obsolete, investments in large technological systems. These developments in turn generate a compulsion to introduce exact planning of production not only within each enterprise but also within the economy as a whole--leading to more state intervention. All of these changes, however, relate back to the overwhelming imperative of capitalism, the maintenance of the rate of profit.³⁰

This analysis brings Mandel into direct confrontation with the first expressions of post-industrial theory. Categorically rejecting any idea that the new economic centrality of science and technological knowledge mark some unprecedented historical epoch, Mandel argues that "Late capitalism, far from representing a 'post-industrial society,' . . . appears as the period in which all branches of the economy are fully industrialised for the first time."³¹ Specifically citing Bell's work as an example of prevalent theories of "technological rationalism," he declares that "Belief in the omnipotence of technology is the specific form of bourgeois ideology in late capitalism":

This ideology proclaims the ability of the existing social order gradually to eliminate all chances of crises, to find a 'technical' solution to all its contradictions, to integrate rebellious social classes and to avoid political explosions.³²

However, Mandel says, the idea that new technologies allow capitalism to transcend its perennial antagonisms and crises is spurious; on the contrary, such innovations only bring closer its inevitable collapse.

Although Mandel enumerates a wide array of factors, all of which he sees interacting to generate breakdown, the centrepiece of his argument is a traditional mainstay of 'objectivist' Marxism: the falling rate of profit, consequent on the rising organic composition of capital. To understand this argument a brief technical exposition is necessary.³³

The Marxist theory of value holds that the source of surplus value is the exploitation of living labour. Capitalist production can be represented in value by the

formula $C+V+S$. C is "constant capital"--the part whose value is not increased in production but merely preserved by it--buildings, raw materials, and, especially, machines. V is "variable" capital, the part used by the capitalist to buy labour power, so termed because it is the only part of capital which lets the capitalist increase the value of his/her capital. S is the "surplus value" --the portion of the newly created value appropriated by the capitalist. The rate of profit is the ratio between surplus value and total capital= $S/(C+V)$. The ratio between constant capital and variable capital, C/V , is the 'organic composition of capital.'

The fundamental tendency of the capitalist system is to increase the ratio of constant capital (machines and raw materials) to variable capital (wages). For Mandel--and most other objectivist Marxists--the principal impetus in this direction comes from the "whip of competition" amongst capitals, which compels entrepreneurs to constantly automate in order to raise productivity.³⁴ But if the organic composition of capital, C/V increases, other things being equal, the profit rate $S/(C+V)$ will decline. The more completely mechanisation expels workers from production, the more the rate, and eventually the mass, of surplus value diminishes. This decline in profitability causes faltering investment, catalyses class conflict and drives irrevocably toward revolutionary crisis. Capital's profit-driven compulsion to expand the forces of production thus becomes the instrument of its self-destruction.

This formally elegant argument is a topic of immense controversy, even amongst Marxists. In his original account of the 'falling rate of profit,' Marx identified certain countertendencies--intensified exploitation of labour; cheapening of the elements of constant capital (i.e. increased efficiency in the manufacture of machines, new sources of

raw materials); the opening up of industries with low organic composition; increases in foreign trade; speed up in the turnover in capital--all of which might alter the inevitability of the falling rate of profit.³⁵ But in neo-orthodox accounts these tend to be seen as subsidiary factors.³⁶ Certainly Mandel believes that "the fall in the average rate of profit is inescapable."³⁷

Cybernetics, by bringing in sight the 'workerless factory' drives this process to a climax, placing on the horizon what Mandel terms "the absolute inner limit of the capitalist mode of production"--the point where fully automated production no longer allows the creation of surplus value.³⁸

The absolute limit . . . lies in the fact that the mass of surplus value itself necessarily diminishes as a result of the elimination of living labour from the production process in the course of the final stage of mechanisation.

Capitalism is incompatible with fully automated production in the whole of industry and agriculture, because this no longer allows for the creation of surplus value or valorisation of capital.³⁹

To secure this prediction Mandel makes certain theoretical assumptions which rule out capital discovering way of lowering the average organic composition by moving outside its traditional factory base. The development of the service sector is discounted on the grounds that most work in this area, because it does not change the "bodily form" of a commodity, is "unproductive."⁴⁰ A shift of labour power to spheres of research and design is similarly rejected because such a transformation "would imply a radical suppression of the social division between manual and intellectual labour" which would "undermine the

entire hierarchical structure of factory."⁴¹ Having blocked off these boltholes, Mandel can be confident that the third technological revolution seals the fate of capital.

Mandel does not see capitalism straightforwardly automating itself into oblivion. Rather, he believes that declining profits will ultimately cause it to check automation. But the closure of this route to expansion will lead to crisis-ridden stagnation and intensified conflict over the allocation of surplus. In fact, capitalism is caught in the historical trap foreseen by Marx, where its achievement in expanding the forces of production unleash conflicts that explode the social relations its continuance requires. While Mandel qualifies the finality of his verdict, admitting of reprieves and postponements, the teleology is inscribed in his masterwork's title--Late Capitalism.

In many ways, Mandel's work is a brilliant answer to Bell and the post-industrialists. By showing how so many of the allegedly new features of contemporary society cited by these theorists relate to the very old logic of accumulation, he effectively refutes the claim that the logic of capital has been replaced by some unprecedented and benign informational principle. Moreover, at the time of its publication Mandel's prediction of renewed economic crisis showed remarkable prescience compared with the post-industrialists rosy forecasts of unimpeded economic growth.

What is striking, however, is the subterranean affinity between Mandel and his post-industrial opponents. To a remarkable degree such "automatic Marxism" mirrors the assumptions of the very theories it opposes.⁴² There is disagreement about the prospects for scientific-technological innovation yielding capital a smooth, evolutionary future. But there is a common view of the forces of production--seen primarily as machines--as central instruments of inevitable social transformations. In Late Capitalism the dance of machines

and capitalists moves like clockwork towards a foreordained conclusion which uncannily echoes the linearity of post-industrial doctrine.

Unlike more vulgar scientific socialists, Mandel is not a technological determinist who reduces revolution to a consequence of autonomous scientific progress. On the contrary, he dialectically relates capital's mechanical self-destruction to its competitive drive for innovation. But he is a social determinist for whom technology relentlessly executes a predecided verdict. The distance between this position and the "bourgeois" faith in the "omnipotence of technology" is not as great as he would like to imagine. As interpreted by Mandel, the doctrine of the falling rate of profit in fact functions as a mirror image of the upward path of progress espoused by Bell and the post-industrialists, the one leading as surely to socialist victory as the other does to capitalist stability.⁴³

There are theoretical reasons even for those who share Mandel's premises to doubt his conclusions. As I have noted, Marx himself noted the existence of countertendencies to the 'falling rate of profit,' and many Marxists see its supposed inevitability as a special case obtaining only under specific conditions.⁴⁴ Capitalism's deployment of new technologies certainly drives living labour out of production (through automation), but it can also enhance the countertendencies against the falling rate of profit by increasing the rate of exploitation (through surveillance and monitoring), cheapening machine production (robots making robots), opening new areas of exploitation with a low organic composition (tertiarisation), speeding circulation (through advertising, marketing and innovation) and integrating the world market (telecommunications). Mandel rejects such possibilities with arguments whose intricacy verges on the quasi-theological. But such possibilities seem significant enough to cast doubt on his teleological certainty. This is not to ratify the post-

industrialists' dreams of unimpeded market expansion. But it is to see crisis as contingent on the outcome of series of social struggles over the scope, scale and velocity of commodification rather than guaranteed by capital's own internal logic.

What is remarkable about Mandel's account is the absence of any agency for such struggles. At the moment of crisis, of course, the working class is summoned to seize the revolutionary hour. But a striking feature in the pages of Late Capitalism is that this crucial protagonist, the ostensible raison d'être of the whole drama, is in fact largely invisible--far less closely analysed than capital and its machines. When, elsewhere, Mandel does discuss the modern proletariat, it is essentially to reaffirm the verity of Marx's description of the industrial worker, dismiss the significance of the "manipulations" of the mass media, and assert the guarantee of revolutionary commitment given by "the basic structural stability of the proletarian condition."⁴⁵ In such objectivist analysis there is little sense of labour as a living subject, animated by needs and desires; little sense that this subject might change, altering in complexity and capacity in ways at least as dynamic as that of the dead labour embodied in machines, or that capitalist development might itself be crucially shaped by its efforts to harness and contain the energies of this collective subject. Mandel's dialectic of productive forces and relations, in short, skips over class struggle. It is rhetorically prominent but analytically ancillary, the insurgencies of the labouring subject merely the predestined reflex of capitalism's auto-destruction.

Moreover, this covert affinity between the determinism of Marxist scientific socialism and bourgeoisie theories of technological development extends further to touch the very concept of socialism. For if socialism is seen as a by-product of the advance of science and technology, rather than as a result of people's rebellion and self-organisation,

the revolutionary task easily becomes defined as the speeding of technoscientific advance at all costs--including the suppression of any resistance or alternative offered by the very workers in whose name the revolution is undertaken. Where the consequences of this concept appeared in truly grotesque form was of course in the late Soviet regime--in which the objectivism of scientific Marxism combined with a logic of vanguardism, substitutionism and technocratic expertise in a fatal mix.

As a student of Trotsky, Mandel necessarily maintained a highly ambiguous position toward the Soviet Union. But his notion of a "third technological revolution" has a strong similarity to the notion of a "scientific technological revolution" or "STR" embraced by Soviet officials and academicians in the 1960s and 70s.⁴⁶ Such theories, which foresaw a new historical epoch inaugurated by cybernetic automation, essentially recapitulated bourgeoisie theories of post-industrialism, with the caveat that the beneficiary of the "STR" would be not capitalism, but socialism. In the Soviet bloc the planned realisation of the "STR" would be a vital lever for the achievement of a classless society, while in the West, the anarchy of the market would intensify contradictions, conflict and disintegration. But the essential terms of the analysis were little different from Bell's or Brezinski's--and the accompanying injunctions about the necessity of adjusting people's subjective attitude to the new objective realities were, if anything, even more chilling.

What links information society theory and scientific socialism is a shared, though differently inflected, determinism that subordinates the wishes of human subjects to the necessity of technoscientific advance. Each duplicates the other's linearity, scientism, and technocratic tendencies. As such, both are doctrines suitable for regimes in which the means of production have been sequestered from collective control, whether by a

corporate or a bureaucratic class. This is precisely why information revolutionaries have been able to borrow so much from scientific socialists, and vice versa.⁴⁷ The former were of course, more successful than the latter: the Soviet advocates of STR failed to make the innovations the Western information revolutionaries are, with at least temporary success, effecting. But what divides the promulgators of such doctrines is the sort of distinction that differentiates carnivorous dinosaurs into tyrannosaurs--bulky but deadly--and velociraptors--fast, agile, and even more lethal. With the demise of the Bolshevik experiment, all the teleological certainties of scientific socialism have been thrown up in the air. The one thing that is sure, however, is the irrelevance to future struggles of a Marxism convinced of predestined triumph, fixated with the industrial factory, and carrying internally the seeds of the very dominative logic against which it contends.

Technology As Domination

From the late 1960s--in the very period post-industrial theory emerged--attitudes amongst many European and North American Marxists toward technoscience moved in a direction notably different from that of scientific socialism. Confronting assembly lines, napalm manufacturers and nuclear power plants, growing numbers of theoreticians and activists rediscovered the dark, nightmarish aspects of Marx's writings on technology. Seen through the window of such writings, emergent technologies of automation and communication seemed more likely to strengthen capital than undermine it. The new forces of production appeared not as agencies automatically and autonomously bursting apart the old relations of production, but rather as themselves implacably shaped by those relations, designed and deployed at the behest of a ruling class to whose purposes they were almost entirely instrumental.

The groundwork for such an understanding had in fact previously been laid by the Frankfurt School. As is well known, the basic contention of the 'critical theory' developed by Max Horkheimer, Theodor Adorno, Herbert Marcuse is that technological rationality, once a powerful lever for humanity's liberation from want and superstition, has now itself become oppressive. In the "dialectic of the enlightenment," means have usurped ends, the domination of nature has become the domination of man (sic), and the forces of production have turned to forces of destruction.⁴⁸ Enabled by its technoscientific powers both to generate endless desires and also to fulfil them, capital exercises a control so comprehensive as to produce Marcuse's "one dimensional man"--a subject incapable of thinking, or even perceiving, beyond the limits of the system.⁴⁹

Although the best work of the Frankfurt School and their colleagues predated the enunciation of post-industrial theory, their critique of science and technology both anticipated the developments Bell and his colleagues so enthusiastically embraced, and coloured an entire line of post-war neo-Marxist response to computers and telecommunications. As the information revolution intensified in pace during the 1970s and 1980s, their analysis of technology-as-domination was extended by a variety of theorists, some following in the steps of Marcuse and his colleagues, others tracking back more directly to Marx. This project developed in two streams--one focussed on the labour process, the other exploring the mass media.

The seminal statement of the labour process stream is Harry Braverman's study of the "degradation of work"--- a direct reply to the post-industrial claims of progress toward a new and technologically improved era of labour relations.⁵⁰ Basing himself firmly in Marx's analysis of the labour process, Braverman argues that the 'scientific management'

initiated by Frederick Winslow Taylor at the turn of the twentieth century, with its separation of conception from execution, managerial monopolisation of knowledge and systematic destruction of skills, is a manifestation of the "great truth of capitalism," namely "that the worker must become the instrument of labour in the hands of the capitalist."⁵¹ However cosmetically disguised, this remains the dominant philosophy of twentieth century management.

The rise of 'white collar' work cited by Bell as evidence of an enlightened post-industrial society is for Braverman simply a symptom of the enlarging managerial apparatus of administration, supervision and planning. Similarly, the new "intellectual technology" of computers and communications which post-industrialists expected to usher in an era of skilled and satisfying mental work, for Braverman signals a precisely contrary tendency. Whether in the movement of a factory worker following the pace of a pre-programmed tool or the monitored keystrokes of an office secretary, the power of the new technologies to record, store and reproduce activities previously dependent on embodied consciousness yields only another extension of Taylorist authority. In the hands of scientific management, machinery is seized upon as "the prime means whereby production may be controlled not by the direct producer but by the owners and representatives of capital."⁵²

This critique of the computerised labour process has subsequently been developed in a number of studies.⁵³ Perhaps the most influential is David Noble's work on numerically controlled machine tools--technology central to the vision of the 'workerless factory'.⁵⁴ Noble argues that the drive to automate machining cannot be explained solely by the requirements of a purely technical efficiency but is marked by the managerial imperative to gain total control over the shop floor, and in particular to break the power of skilled,

unionised machinists. This is demonstrated by the suppression of technological options that would allow workers an element of control over the newly automated processes. Noble shows that even when this participation might have improved the operations of the system-- by allowing for revision of programmed instructions according to circumstances --the managerial desire to eliminate the human element prevailed. Indeed, the whole thrust of capital's use of information technology in the workplace is, Nobel argues, fundamentally anti-human, predicated on a model of "progress without people."⁵⁵

The other strand of the technology-as-domination school is that devoted to the media and communication. In an enormously important move beyond the factory focus so apparent in the work of classical Marxists such as Mandel, Adorno and Horkheimer had argued that the subordination of society to capital is largely the work of the "culture industry"--the entertainment and advertisement conglomerates which create artificial needs, distract dissent, and endlessly endorse the existing order.⁵⁶ Subsequently, broadly Marxian scholars such as Herbert Schiller, Vincent Mosco, Dallas Smythe and Nicholas Garnham have deepened this analysis with detailed research into the operations of the capitalist media.⁵⁷ In doing so, they have produced an analysis much more fine-grained than the Frankfurt School's, and sometimes considerably more nuanced in its recognition of possibilities for resistance.⁵⁸ Nonetheless, the overall emphasis of these writers falls heavily on capitalism's technological power, producing a picture of domination almost as sombre as that discovered on the shopfloor, but expanded over a vastly greater sphere.

Here the work of Schiller can be taken as exemplary.⁵⁹ Explicitly targeting theorists who claim we are witnessing the transcendence of capital in "an individualised, electronic global commune," he has consistently argued that what is occurring is rather a push toward

a "corporate-controlled information society."⁶⁰ Focussing on the US situation, Schiller shows how in all areas of information technology--hardware, software, and transmission networks--the flux of innovation follows a path of relentless commodification. The new satellites, fibre optics and computer networks are deployed to create a media explosion whose apparent pluralism is belied by the near total absorption of thousands of newspapers, magazines, radio stations, TV channels and cable systems into a few giant media combines.

From ownership flows ideological control. Implicitly following the classic Marxist logic by which economic base must determine ideational superstructure, Schiller insists that corporate domination of communications industries yields a prodigious power over the formation of popular consciousness. While information society theorists claim that a proliferation of technologies and channels democratises and diversifies opinion formation, Schiller argues that the giant media corporations generate, filter and refine the flows of imagery, news and entertainment to exclude anything that might subvert the interest of owners or advertisers and to systematically intensify the commodification of social relations.

"The consequence," says Schiller, echoing Marcuse, "is a national discourse that is increasingly one dimensional."⁶¹ Although he allows for contradictions produced by conflict within and amongst media industries or between such industries and other sectors of capital, the overwhelming weight of his analysis points to the "systematic envelopment of human consciousness by corporate speech."⁶² And since information technologies are seen as a central instrument in this envelopment, the assessment of them is comprehensively negative:

It is not a question of "either-or". . . good technology or bad technology use.

It is solely a matter of developing and using the new communication technology for holding on to the economic benefits derived from a world system of power. . . insistence on the potential and positive features of the current communication instrumentation is disingenuous at best.⁶³

"Mind management" in the cultural sphere becomes thus the corollary of deskilling and in the workplace.⁶⁴

These two streams of technology-as-domination analysis--one focussed on the labour process and the other on the media--are melded by Frank Webster and Kevin Robins in their relentlessly bleak account of "cybernetic capitalism."⁶⁵ This makes explicit the connection of Taylorism with media management. Taylorism, Webster and Robins point out, was in its original formulation not only a doctrine of shop floor control but also an overall social philosophy which pursued increasing productivity as "the key to future prosperity, harmony and progress."⁶⁶ The deployment of information technology represents the realisation of this second phase of "generalised or social Taylorism," extending capitalist control of knowledge and information beyond the factory to society as a whole.⁶⁷

Confronting this prospect, Webster and Robins articulate the deep foreboding characteristic of so much contemporary Marxian analysis of technology :

This . . . is what we foresee in the future: a society in which corporate capital, using the most advanced forms of I.T. that have been designed to suit its requirements and constantly talking about the imperatives and promises of a technological revolution, extends and consolidates its hold in

society, strengthening its control over employees (and shedding significant numbers) while intruding further into the everyday lives of consumers both groups of whom it observes, analyses and schemes about what changes might be to the company's advantage and perceived as inevitable--by those likely to suffer from restructuring--or desirable--by those able to pay the going rate. Behind, often in front, and almost always in collusion with this centralised corporate capital, is arraigned a disciplinary state, equipped with the latest surveillance technologies, able to contain dissent from those minorities unwilling to accede to the market's control or unable, through unemployment and/or poverty, to participate in its technologies of abundance.⁶⁸

The changes presented by information revolutionaries as liberatory thus signify something quite opposite--greater reach for the `visible hand' of managerial control, now exercised through an arsenal of devices for broadcasting, monitoring and surveillance to allow the observation and shaping of social subjects as both workers and customers.

Although scientific socialists, like Mandel, had always condemned the uses to which capital puts technology, this critique of the technology-as-domination cut much deeper. For scientific socialists, machines are neutral, although capital's deployment of them is objectionable. For technology-as-domination theorists, however, this apparent neutrality is a lie. Technologies embody social choices made by those with power over their construction. Political intentions are present not only at the level of use, but of

research and construction--not merely in what is done with machines, but in how they are designed, and, indeed, in whether potential innovations are realised at all or suppressed.

The thought that technology might, in its very core, incarnate the intentions of the capitalists who make them, while certainly present in Marx, was first enlarged on by the Frankfurt School theorists--who nevertheless clung, somewhat self-contradictorily to the hope that technological rationality might be rescued from capital's grasp. But in the subsequent development of this line of thought, the redemptive hope largely fades. In a flat contradiction of scientific socialism's technological optimism, machines are seen as buttressing rather than overturning established power. Noble says:

Technology . . . is not an irreducible first cause; its social effects follow from social causes that brought it into being; behind the technology that affects social relations lie the very same social relations. Little wonder, then, that the technology usually tends to reinforce rather than subvert those relations.⁶⁹

Increasingly technological development comes to be seen as so deeply tainted by drives toward domination and omnipotence as to constitute a social pathology--a madness to be resisted at all costs.⁷⁰

From such a position, it is natural that many technology-as-domination theorists look for inspiration to the machine wreckers of the first Industrial Revolution--the Luddites. For Noble, Webster and Robins the pejorative use of this epithet by information revolutionaries slanders the real nature of a movement which represented a coherent protest against destructive industrialisation advanced under the banner of technological necessity. And, just as in the first industrial revolution capital accumulated itself through

popular immiseration, so the computerised 'second industrial revolution' will expand corporate wealth and control by massive dislocation, deskilling, and unemployment. What is required to confront this prospect is a revival of the resistant spirit of General Ludd--a neo-Luddism for the information age.⁷¹

Thus for Noble "the essence of technology question today" is that "there is a war on, but only one side is armed."⁷² Notions of technological transcendence peddled by information society theorists are no more than legitimations for the corporate assault on workers. Given capital's control of research and innovation, the immediate possibility of shaping and humanising the approaching wave of technological change is minimal. Rather, leftist energies should be directed toward an immediate effort at halting, or at least drastically slowing, its diffusion. Pointing to the actual incidence of sabotage amongst people replaced by computers, Noble declares that "if workers have begun to smash the physical machinery of domination <then> responsible intellectuals must begin to deliberately smash the mental machinery of domination."⁷³

Of all the positions examined in this chapter, this neo-Luddite stance seems to me the most insightful. It is the one that most fully confronts the ambition of the information society project, not as a foreordained ascent of civilisation, but as a strategy of societal power. This theoretical perspective is backed with concrete studies of the shaping of new technologies to capitalist ends, both in the workplace and beyond it. And the consequent call for resistance has an integrity lacking in the obeisances paid by scientific socialists and social democrats alike to capitalist 'progress.'

However, such analysis also has serious and ultimately self-defeating limitations. At root this is because the technology-as-domination school overestimate capital's capacity

to command living labour with dead labour. It restores the human subject whom objective Marxism banishes, but it introduces this subject primarily as victim. In this respect, the reproach often levelled against Braverman's labour process analysis--that it sees workers only as the passive objects of capitalist designs, and ignores the consequences of their counter-strategies and resistances--is justified. So too are the criticisms made of media analysts who acknowledge audiences only as the cultural dupes of advertisers. On both fronts, capitalism's intentions and its capacities are too easily equated--a conflation which Stewart Ewen has rightly criticised for its belief in "the self-generating potency of . . . technology and domination."⁷⁴

The more persuasively such analysis demonstrates the complete instrumentality of technoscience to capital, the harder it becomes to credibly posit opposition or alternative. This of course is precisely where the Frankfurt School encountered a fatal self-contradiction. For if technological dominance was in fact as total as Adorno or Horkheimer suggested, it became difficult to explain even the basis for their own critical viewpoint, let alone how it could possibly mobilise political action. Critical theory relentlessly painted itself into a corner, where hope could only be sustained at the price of heroic inconsistency. This dilemma is repeated by many later theorists, in whose portrait of techno-capitalism revolutionary possibility gives way to dystopian nightmares of indoctrination, surveillance and robotisation. The result is a radical pessimism that, while certainly puncturing the euphoria of information society theory, also concedes its hegemony over the future.

The problem is only partially addressed by the neo-Luddite theorists. In reviving the figure of the machine-smasher their analyses vigorously reassert the active capacity of

capital's subjects--but only in a reactive mode. Such defensiveness can end in the romanticisation of forms of labour which are either already manifestly dehumanising, or, alternatively, which represent islands of relative privilege (the tendency of labour process analysts to focus on the predicament of highly skilled male workers is a case in point.) Further, it can take little account of the possibility--particularly apparent in the field of media and communication technologies--that capital's labouring subjects may find real use-values, perhaps even subversive ones, for the new technologies.

Ultimately, this position suffers the deficiencies of all oppositional theories that conceive struggle only as resistance, and not as counter-initiative. Most neo-Luddite authors in fact admit the need to eventually develop perspectives not just of resistance, but of reappropriation.⁷⁵ But the theoretical optic they have so powerfully developed cannot really register such possibilities. For if capital does possess such entire, unilateral powers to implant its logic into technologies as neo-Luddites assert, then efforts to recapture these systems or turn them to alternative use are foredoomed.

It should be noted that although such critiques often begin with a rediscovery of Marx, they frequently end with a repudiation of him. For the more strongly Marx's writings on technology as domination are emphasised, the greater the inclination to dismiss or regret his equally undeniable assertions about its liberatory potentials. Although Marx was clearly sympathetic to the Luddites, he was also critical of them --remarking that

. . . it took time and experience before the workers learnt to distinguish between machinery and its employment by capital, and transfer their attacks from the material instruments of production to the form of society which utilises these instruments.⁷⁶

For many neo-Luddites, such comments only show how deeply Marxism was mortgaged to bourgeois ideas of progress, and its inadequacy to the current crisis. However, in their justified attacks on scientific socialism neo-Luddites have in fact discarded something critical in Marx's vision--his understanding of technological development as a contradictory process yielding countervailing possibilities for contending agencies. To affirm and extend this latter strand, we need theory which, without reverting to the automatism of scientific socialism, can find in technological knowledge empowerment not just for capital, but for those who fight against it.

Post-Fordism: New Times?

The discovery of such a perspective has, however, been complicated by the emergence of yet another line of Marxian analysis, one moving in an almost diametrically opposite direction from neo-Luddism. If this line also leads eventually to a departure from Marxism, it takes its exit by an opposite door: one marked not by despair at the oppressive power of capital's new technologies but by enchantment with their liberatory potentials. And if this tendency marks a return to a 'positive' Marxian attitude towards technology, it is one very different from the revolutionary teleology of scientific socialism. For what it looks forward to is not the inevitable victory of socialism, but the technological reconciliation of workers with capital.

Much of this analysis has marched under the banner of 'post-Fordism.' This is a phrase that has entered a diversity of theoretical positions. Not all analysis that uses the term shares the spirit of compromise that I discuss here: for example, the work of David Harvey and several of the radical geographers who have followed in his footsteps is very

different in tone.⁷⁷ My remarks here should therefore not be taken as a total rejection of the concept. Indeed, later in this work I sometimes use 'post-Fordism' as a convenient label to designate recent changes in the way capitalism operates. Nevertheless, here I want to focus on the way in which a certain version of 'post-Fordism' has become widely associated with a perspective that brings neo-Marxian analysis surprisingly close to that of liberal academics, management consultants, and, indeed, to the positions of the information society theorists.

To understand this process, it is necessary to look at one of the roots of the post-Fordist idea, in the work of the French 'Regulation School' of political economy. In what seemed in origin a classic Marxian project, theorists such as Michel Aglietta and Alain Lipietz set out to investigate the conditions governing the surprisingly successful and ongoing reproduction of contemporary capitalist society. Capitalism, they proposed, is neither an historically invariant formation, nor one teleologically destined to collapse. Rather, it repeatedly overcomes internal contradictions by generating successive "regimes of accumulation"--intermeshed orderings of wage relations, consumption norms, and state intervention which synchronise the overall social prerequisites for the extraction and realisation of surplus-value.⁷⁸ Consolidation of such a regime depends on the successful development of a "mode of regulation" based on "the institutional forms, procedures and habits which either coerce or persuade private agents to conform to its schema,"⁷⁹ and also, in some later versions of the theory, on its integration of a viable "industrial paradigm," or technological system of production.⁸⁰

The principal application of this theoretical perspective has been to develop the category of 'Fordism.' Fordism of course takes its name from the integration of a Taylorist

division of labour with intense mechanisation pioneered in the auto-plant assembly lines of Henry Ford. Inspired by Antonio Gramsci's fragmentary but suggestive essay "Americanism and Fordism," Regulation School theorists expanded the meaning of the term to designate the regime of accumulation characteristic of industrial capitalism during the middle period of the twentieth century.⁸¹ Fordism in this sense was a comprehensive system of social organisation, coordinating factory-based assembly-line production, mass markets consuming standardised manufactured goods, and Keynesian stabilisation of the business cycle. Under Fordism, capital enjoyed its post-World War II "Golden Age."

But in the late 1960s and early 1970s, the Regulation School argues, Fordism encountered a serious crisis. Their accounts of its causes vary in the writings of various theorists--ranging through a saturation of mass markets, shopfloor disaffection, the fiscal costs of the welfare state, and changing conditions of global competition. Often these factors are combined in an impeccably overdetermined account. But in any event, Regulation School theorists agree that, starting about twenty five years ago, capital's most successful regime of accumulation began to falter; sliding profit rates inaugurated a period of continuing flux and uncertainty, disintegration and restructuring in the global economy that continues to this day.

If Fordism is breaking up, the obvious issue is: what will succeed it? This is the question theories of a 'post-' or 'neo-' Fordist regime attempt to answer. While accounts of the emergent regime vary in detail, it is generally agreed that it will centrally involve the introduction of new technologies--a change in "industrial paradigm." Aglietta himself speculated that a "neo-Fordist" regime would replace the "mechanical principle" of the assembly line with computerised systems based on the "informational principle."⁸²His

view of such developments was far from rosy: while their arrival unleashed "the most shameless propaganda about the liberation of man in work," they actually meant intensified workplace deskilling and, at the level of society as a whole "a strong totalitarian tendency."⁸³ Some theorists drawing on his work retain this sceptical orientation. But others have elaborated the idea of post-Fordism far more optimistically.

Here the Regulation School's Marxism intersects in a remarkable way with non-, indeed anti-Marxist, perspectives. One of the most important of these is the work of Michael Piore and Charles Sabel on the "second industrial divide."⁸⁴ Piore and Sabel, far from being Marxists, are, if anything, Proudhonist in their orientation--fascinated by the prospects of escaping the alienation of modern capitalism by return to small-scale, cooperative, artisanal production.⁸⁵ For these theorists, the disintegration of Fordism amounts to a moment equivalent in importance to the first industrial revolution. On the other side of this divide lie bright prospects. Information technologies possess a reprogrammability that gives them a plasticity unknown to dedicated industrial machinery. This, Piore and Sabel argue, will allow the restoration to the workplace of the judgement, learning and variety lost to Taylorism.

New computerised systems of "flexible specialisation" can both respond to the disaggregation of standardised Fordist mass consumption into more fluid, niched and customised markets and at the same time supersede the deadening routine of Fordist mass production.⁸⁶ The monotony of the industrial assembly line will give way to versatile high-tech craft work that requires the willing engagement of the operator's knowledge and attention and places a premium on cooperation between management and worker. The result Piore and Sabel claim, will be to dissolve the alienation and antagonism of the

capitalist workplace and lay the basis for a new, artisanal, computerised post-Fordist "yeoman democracy."⁸⁷

By the mid 1980s, the production of such optimistic post-Fordist prophecies had become a veritable academic industry. The concept of a new regime of accumulation was variously married with theories of flexible specialisation, Japanese management or Swedish humanised workplaces to generate a series of predictive models of labour/capital cooperation in the new epoch.⁸⁸ With their promise of a new era pivotally shaped by computers and telecommunications, these versions of post-Fordism triggered memories amongst both critics and supporters of post-industrialism and information society theory. Indeed, for its proponents on the left, one of the attractions of the concept was undoubtedly that it represented a rejoinder to such theories. It seemed to offer a way of talking about computers that did not pretend capitalism had ceased to exist, yet did not box itself into the relentless pessimism of theories of technology-as-domination.⁸⁹ Yet in doing so, it often replicated the most problematic aspects of post-industrial theory. For, as Pelaez and Holloway point out in their scathing attack on theories of post-Fordism, in many of these accounts the complexity of Aglietta's original analysis of the crisis of Fordism is simplified into a blunt technological determinism whereby it is the sheer force of new technologies that produces the new era.⁹⁰

A more sophisticated version of the argument--strongly advanced by Lipietz, a founder and foremost populariser of Regulation School theory--is that the crisis of Fordism opens the way to a variety of alternative accumulation regimes. Some of these would be better for workers than others. One could have either neo-Fordist regimes--in which informatics duplicate and intensify traditional patterns of exploitation--or truly post-Fordist

systems, which take advantage of the new technological opportunities for reskilling and responsibility. For Lipietz, the pursuit of this latter path, the search for a "a way out of the crisis" based on "responsible involvement," in which workers gain higher security, higher pay, and/or shorter hours in return for their cooperation in post-Taylorist high technology systems represents "the dream of a new deal for the 21st century."⁹¹

However, many critics have suggested that such dreams of a high-tech "new deal" rest on a very uncritical acceptance of management propaganda about new production systems. Post-Fordist analysis, they charge, de-emphasises the way "flexible specialisation" segments the workforce between a 'core' of permanent skilled workers and a 'periphery' of casualised and temporary employees.⁹² It also often glosses over how, even within this 'core,' the new post-Taylorist work organisation, with its 'autonomous work teams,' peer policing, and internalised competition have been developed as an attack on trades union strength.⁹³ Moreover, its customary contrasts between dirty assembly lines and clean computers ignores the reality of stress, repetitive strain injuries, eye strain, and electronic sweatshops.

To this I would add that many theorists of post-Fordism are remarkably silent about the way automation and global communication have been deployed to swell the reserve army of the unemployed, in a way that ferociously undercuts the strength of movements struggling for improved conditions of work and life. Even where these negative features of restructuring are recognised in 'post-Fordist' analysis, as they are in some of Lipietz's work, they are seen as contingent options, undesirable alternatives within an array of social options. What is not confronted is the possibility identified by neo-Luddite analysts, namely that these destructive outcomes might not be subsidiary to capital's logic, but rather

central to it --that post-Fordist restructuring might be a project predicated on discipline through austerity as a prerequisite for future profit. In this view, the weakening of resistance, on the shopfloor and in society at large, is a central purpose in the corporate deployment of new technologies, and the chances of negotiating a "new deal" around their use are thus probably illusory.

This tendency to downplay the darker side of capitalist restructuring is even more apparent when post-Fordism has entered discussions on media and popular culture. Just as in the the labour process debate the post-Fordist cachet often marked a shift away from pessimism about the degradation of work toward post-Taylorist optimism, so in the field of culture it has been associated with a rejection of sombre theories of mind-management in favour of an effervescent enthusiasm for `popular culture.' A salient example is the concept of `New Times' proposed in the British journal Marxism Today by a cluster of authors including Stuart Hall, Dick Hebdige, Robin Murray and John Urry.⁹⁴ In the New Times analysis the switch from standardised mass consumption to flexible specialisation is seen as bringing with it an intensified attention to advertising, design, fashion, media and market information. This generates a postmodern ambience of sliding signifiers, simulacra and spectacle, a culture whose volatility and recombancy both reflects and contributes to the fluidity of post-Fordist production systems.⁹⁵

However, in marked contrast to theorists such as Schiller, New Times analysts do not view this explosion of media and imagery with suspicion or alarm. Rather, the new scope of consumer choice--including the proliferation of media channels--and the energetic experimentation of post-Fordist commercial culture, with its gender-bending advertisements, socially conscious products, global eclecticism and self conscious

embrace of feminism and multiculturalism, are seen as opening an exciting space replete with possibilities for the forms of life championed in various identity politics. Hall speaks of the disintegration of Fordism catalyzing a "revolution of the subject," and creating an "expansion in the positionalities and identities available to ordinary people."⁹⁶ Exhorting the left to adapt to the pluralising, decentralising and variegating aspect of the new cultural regime he cites Marx's famous lines about the dynamic effects of "the constant revolutionising of production" in which "all fixed, fast frozen relationships . . . are swept away . . . All that is solid melts away."

In the eyes of critics such as A. Sivanandan, however, what has melted away in the enthusiasm for post-Fordism is the solidity of Marxist commitments.⁹⁷ Even more moderate critics voiced concerns that the "designer socialism" of Hall and his colleagues expressed the limited perspectives of a fraction of left intelligentsia favoured by the growth of new cultural industries, and that their enthusiasm for "new times" was achieved only at the expense of forgetting about "old enemies."⁹⁸ And indeed, the New Times celebrations of post-Fordism's cultural vivacity seem remarkably indifferent to the appearance in Thatcherite Britain of new exclusions and stratification at least as pernicious as the massified divisions of Fordism. Eloquent about the improved choices post-Fordism brings to consumers, it was very silent on the street-level bricolage left for those destituted by the degradation of the welfare state. When this is taken together with an evident distaste for the militancies of miners' strikes or anti-poll tax riots, a politics hovering vaguely on the left of a Labour Party marching rapidly to the right, and a theoretical rapprochement with specifically 'post-Marxist' theorists, it is difficult not to think that the New Times analysis made the title of Marxism Today into a very postmodern irony.

Distaste for such positions has led many Marxists to entirely reject the categories of Fordism and post-Fordist as a mystification of capital's perennial, and ugly, features. This may be to throw the baby out with the bathwater. The argument that capital entered a phase of drastic restructuring in the early 1970s is a compelling one. In recognising this shift, theorists who use the category of post-Fordism have often been more alert to important changes in work, culture, and politics than their more orthodox Marxist critics. They could even be said to have rediscovered a sense of the dynamic, tumultuous and experimental nature of capitalist development that was salient in Marx's own writings, but is often forgotten by those who insist that capital is always 'the same old thing.'⁹⁹

However, to agree with the post-Fordists that capitalism is undergoing a period of rapid change is not to assent to their analysis of the cause, course or consequence of this transformation. As Julie Graham has pointed out, embedded within the theoretical apparatus of the Regulation School is a deep tendency to downplay the conflict at the heart of capitalist society.¹⁰⁰ For their analysis takes as its focus and "point of entry" the requirements for capital's successful organisation of society, not the contestation of its rule.¹⁰¹ Its research agenda is built around capitalist growth, not class struggle. Once such study is divorced from scientific socialists' teleology of inevitable breakdown, it tacitly enters onto the same ground as non- or anti-Marxist theories of economic development, so that "Marxism becomes another theory of capitalist growth, focusing primarily on those social processes that promote capital accumulation and excluding those that do not."¹⁰² The result, as Graham notes, is a vision that is premised on the "vitality and uncontested hegemony" of capital's reproduction, but "obscures the weaknesses and instabilities of that

process (and) hides the failures and unevenness that make non-capitalist alternatives an existing and future option."¹⁰³

This emphasis on the historical adaptability of capital, taken in conjunction the general demoralisation of the left in the 1980s, has led to a very rapid acceptance that what will emerge from the crisis of Fordism can only be another capitalist regime of accumulation. The assumption that restructuring will succeed--an inverse reflection of scientific socialism's faith in inevitable collapse--leads, by gradual but inexorable stages, to a circumscription of left action. Even in the work of Lipietz, shrewdest and most persuasive of post-Fordist reformists, it is impossible not to be struck by how emphatically socialism is ruled off the agenda for the foreseeable future, how complete is the acceptance of the hegemony of the market, or how large the concessions to the corporate agenda for the reorganisation of work. The only issue becomes what sort of capitalist regime will emerge, and how good a "deal" workers and social movements can cut within it.

This effects what Les Levidow has termed a "foreclosure of the future."¹⁰⁴ By implicitly accepting the success of capital's restructuring it directs attention away from forms of action which might challenge that completion. It shuts the door on strategies where workers' knowledge of new production systems yield, not partnership with management, but new ways to challenge managerial command, and new ways in which emergent media networks are made to circulate struggles rather than commodities. In doing so, it represses radical potentialities in favour of reformist hopes.¹⁰⁵ This is done in the name of realism. But given the enormous offensive capacity the new technologies allow global business, the expectation that capital will negotiate any reformist compromise unless faced with a serious challenge to its overall control of society is itself utterly utopian. For Lipietz, the

task is "to find a way out of the crisis." But the Marxist project has never been to help capitalism find a way out of crisis. It has been to find a way of capitalism. This is precisely the possibility that much post-Fordist writing abdicates.

Condition Terminal?

In this chapter we have seen how various schools of Marxism have responded in radically contrasting ways to the 'information revolution.' This diversity of response arises from the complexity of Marx's own writings on technology. The amplification and extension of different aspects of these texts has given rise to very different perspectives on the relation of machines to social change. Scientific socialism has conceived of a teleological interaction of forces and relations of production, leading to the eventual collapse of capital; technology-as-domination theorists, on the other hand, see machinery as consolidating and deepening capitalist power; and post-Fordists have often found in new technologies the promise of a humanisation of work which would transcend the traditional patterns of exploitation.

All these accounts suffer major defects as a reply to the anti-Marxist challenge of the information revolutionaries. In a way that uncannily mirrors the logic of their opponents, scientific socialism effectively liquidates human agency, and substitutes for it an inexorable, and ultimately sinister, technological automatism. Technology-as-domination theorists restore to view the question of the subjectivity constituted by a machine saturated society-- but can conceive of it only as a process of victimised exploitation, to which the best response is a reactive, heroic, but probably hopeless neo-Luddism. Many post-Fordist accounts, on the other hand have embraced so much of the information revolutionaries own euphoria about the new subject of technology as to

essentially abdicate the negative moment of critique and subscribe to capital's own logic of technological development.

Indeed, all three perspectives lead, although by different routes, to potential disintegrations of or exits from Marxism: scientific socialism shattered by the confounding of teleological optimism marked by the events of 1989; neo-Luddism descending into a dystopian, radical pessimism; and several versions of post-Fordism converging with a post-Marxist politics that claims to go 'beyond' issues of capital and class. Surveying these dead-ends, it would appear that the information age has put Marxism into a terminal condition.

Notes

¹ Karl Marx, The Poverty of Philosophy (New York: International Publishers, 1971) 109.

² For a valuable discussion, see Donald.McKenzie, "Marx and the Machine," Technology and Culture 25.3 (1984): 473-502.

³ Karl Marx, Preface to the Contribution to a Critique of Political Economy (London: International Publishers, 1971) 20-21.

⁴ Marx, Preface 21.

⁵ On this debate see Laurence Harris, "Forces and Relations of Production," Dictionary of Marxist Thought, ed. Tom Bottomore, Laurence Harris, V.G. Kiernan, Ralph Miliband (Cambridge: Harvard University Press, 1983) 178-180.

⁶ Frederick Engels, Socialism: Utopian and Scientific (Peking: Foreign Languages Press, 1975) 88.

⁷ Nikolai Bukharin, Historical Materialism: A System of Sociology (New York International Publishers, 1925);. J.D. Bernal, The Social Function of Science (Cambridge: MIT Press, 1939); Gerald Cohen, Karl Marx's Theory of History: A Defence (Oxford: Clarendon, 1978).

⁸ Karl Marx, Capital: A Critique of Political Economy vol. 1 (New York: Vintage Books, 1977) 1026-1040

⁹ Marx, Capital vol. 1 1037.

¹⁰ Georg Lukacs, "Technology and Social Relations," New Left Review 39 (1966) 27-34; Harry Braverman, Labour and Monopoly Capital: The Degradation of Work in the

Twentieth Century (New York: Monthly Review, 1974); David Noble, Forces of Production (New York: Knopf, 1984).

¹¹ Marx, Capital vol 1 590-614.

¹² Marx, "Speech at the Anniversary of the People's Paper" (Apr. 14, 1856), Karl Marx: Selected Works, ed. V. Adoratsky and C.P. Dutt, vol. 1 (London, 1942), 428, cited in Simon Schaffer, "Babbage's Intelligence: Calculating Engines and the Factory System." Critical Inquiry 21 (1994): 206.

¹³ Marx, Capital vol. 1 618.

¹⁴ Marx, Capital vol. 1 618.

¹⁵ Marx, Capital vol. 1 618. "Ne sutor ultra crepidam' ('let the cobbler stick to his last', a phrase which was the absolute summit of handicraft wisdom, became sheer nonsense from the moment the watchmaker Watt invented the steam-engine, the barber Arkwright the throstle and the jeweller Fulton the steamship."

¹⁶ Marx, Capital vol. 1 618.

¹⁷ Marx, Capital vol. 1 618.

¹⁸ Marx, Capital vol. 1 618.

¹⁹ For such an account see Paul S. Adler "Marx, Machines, and Skill," Technology and Culture 3.4 (1990): 780-812.

²⁰ An excellent collection of Marx's writings in this sphere is Yves de la Haye, Marx and Engels on the Means of Communication: The Movement of Commodities, People, Information and Capital. (NY: International General, 1979). See also Armand Mattelart

and Seth Siegelau, eds., Communication and Class Struggle: 1. Capitalism and Imperialism (New York: International General, 1979).

²¹ Karl Marx and Frederick Engels, The Communist Manifesto (New York: Washington Square, 1969) n.p.

²² Karl Marx, Wage Labour and Capital: Value, Price and Profit (New York: International Publishers, 1976), cited De La Haye 52.

²³ Marx, Grundrisse, cited De La Haye 10-103.

²⁴ Marx and Engels, The Communist Manifesto n.p.

²⁵ Marx and Engels, The Communist Manifesto.n.p.

²⁶ James Billington, Fire In the Minds of Men: Origins of the Revolutionary Faith (New York: Basic, 1980) 309.

²⁷ Peter Waterman, "International Labour Communication by Computer: The Fifth International?" Working Paper Series 129, (The Hague: Institute of Social Studies, 1992) 9.

²⁸ On these definitions see James O'Connor, The Meaning of Crisis (Oxford: Blackwell, 1987) 49-108.

²⁹ Ernest Mandel, Late Capitalism (London: New Left Review).

³⁰ Mandel, Late Capitalism 195-197.

³¹ Mandel, Late Capitalism 191.

³² Mandel, Late Capitalism 501.

³³ The following summary draws on Mandel's own account in his An Introduction to Marxist Economic Theory (New York: Pathfinder, 1969).

³⁴ Mandel, Late Capitalism 111.

³⁵ Karl Marx, Capital: A Critique of Political Economy. vol. 3 (New York: Vintage Books, 1981), 339-349. For the immensely complex debate on this topic see Michael A. Lebowitz, "Marx's falling Rate of Profit: A Dialectical View," Canadian Journal of Economics 9.2 (1976): 233-254; Harry Cleaver, "Karl Marx: Economist or Revolutionary?" Marx, Schumpeter and Keynes: A Centenary Celebration of Dissent, ed. Suzanne W. Helburn and David F (New York: M.E. Sharpe, 1986) 121-148, and O'Connor.

³⁶ O'Connor 76.

³⁷ Mandel, Introduction 50.

³⁸ Mandel, Late Capitalism 207.

³⁹ Mandel, Late Capitalism 110.

⁴⁰ Mandel, Late Capitalism 405-407.

⁴¹ Mandel, Late Capitalism 208.

⁴² The phrase is from Russell Jacoby, "Towards a Critique of Automatic Marxism: The Politics of Philosophy From Lukacs to the Frankfurt School" Telos 10 (1971): 119-146, and "The Politics of Crisis Theory: Toward a Critique of Automatic Marxism II," Telos 23 (1975): 3-52.

⁴³ This resemblance is tellingly revealed by the facility with which Mandel's theories, stripped of political implication, have been reabsorbed by post-industrial long-wave theorists, with their visions of ineffable economic cycles pulsing tidally across the centuries. 'Long wave theorists' such as Christopher. Freeman and Carletta Perez Technology, Policy and Economic Performance (London: Frances Pinter, 1987)) and Hall,

Peter Hall and Paschal Preston, The Carrier Wave: New Information Technology and the Geography of Innovation, 1846-2003 (London: Unwin Hyman, 1988) base their work on Kondratieff's theory of inexorable--albeit mysterious--economic cycles linked to clusters of technological innovation and situate the emergence of computers and communications as part of the new "techno-economic" paradigm marking the onset of "fifth Kondratieff." or "carrier wave" about to unfold at the turn of the century (Hall and Preston 1988) While this construction moderates claims of the scope of epochal change made by postindustrialists--situating the microchip and fibre optic cable within a sequence of technological revolutions whose predecessors include steam, steel processing, electricity --it retains the idea of momentous technological change overtaking the contemporary world with inhuman irresistibility.

⁴⁴ See note 35 above.

⁴⁵ Ernest Mandel and George Novak, The Revolutionary Potential of the Working Class (New York: Pathfinder, 1974) 6.

⁴⁶ For discussion of the "STR" see Frederic J. Fleron Jr., ed., Technology and Communist Culture: The Socio-Cultural Impact of Technology Under Socialism (New York: Praeger, 1977); Krishan Kumar, "Futurology: The View From Eastern Europe," Futures 4.1 (1972); and Dallas Smythe Dependency Road: Communications, Capitalism, Consciousness and Canada (Norwood: Ablex, 1981).

⁴⁷ See, for example, Bell's comments on Trotsky's concepts of economic planning in "The Social Framework of the Information Society," The Computer Age: A Twenty Year View., ed. Michael L. Dertouzous and Joel Moses (Cambridge: MIT Press, 1979). Bell in part

derives his model of "technocracy" from Soviet practice, and scientific socialists model the "scientific technological revolution" from American futurists.

⁴⁸ Theodor Adorno and Max Horkheimer, Dialectic of Enlightenment (New York: Herder and Herder, 1972: orig 1947).

⁴⁹ Herbert Marcuse, One Dimensional Man (London: Routledge Kegan Paul, 1964).

⁵⁰ Harry Braverman, Labour and Monopoly Capital: The Degradation of Work in the Twentieth Century (New York: Monthly Review, 1974).

⁵¹ Braverman, Labour and Monopoly Capital 114.

⁵² Braverman, Labour and Monopoly Capital 193.

⁵³ See the essays in Andrew Zimbalist, ed., Case Studies in the Labor Process (New York: Monthly Review, 1979).

⁵⁴ David Noble, Forces of Production (New York: Knopf, 1984).

⁵⁵ David Noble, Progress Without People: New Technology, Unemployment, and the Message of Resistance (Toronto: Between The Lines, 1995).

⁵⁶ Adorno and Horkheimer, Dialectic of the Enlightenment n.p.

⁵⁷ Representative works include Vincent Mosco, Pushbutton Fantasies: Critical Perspectives on Videotex and Information Technology (Norwood: Ablex, 1982) and The Pay-Per Society: Computers and Communication in the Information Age: Essays in Critical Theory and Public Policy (Toronto: Garamond, 1989); Nicholas Garnham, Capitalism and Communication: Global Culture and the Economics of Information (London: Sage, 1990); Dallas Smythe Dependency Road: Communications, Capitalism, Consciousness and Canada (Norwood: Ablex, 1981). For works by Schiller see the following note.

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- ⁵⁸ See in particular Mosco's recent The Political Economy of Communication (London: Sage, 1996).
- ⁵⁹ Schiller's work includes The Mind Managers (Boston: Beacon, 1973); Communication and Cultural Domination (New York: International Arts and Sciences Press, 1976); Who Knows: Information in the Age of the Fortune 500 (Norwood: Ablex, 1981); Information in the Crisis Economy (Norwood: Ablex, 1986); Culture, Inc: The Corporate Takeover of Public Expression (Oxford: Oxford University Press, 1989).
- ⁶⁰ Schiller, Who Knows xi-xiii.
- ⁶¹ Schiller, Culture, Inc 165.
- ⁶² Schiller, Culture, Inc 45.
- ⁶³ Schiller, Information in the Crisis Economy 22.
- ⁶⁴ Schiller, The Mind Managers.n.p.
- ⁶⁵ Kevin Robins and Frank Webster, "Cybernetic Capitalism: Information Technology, Everyday Life," The Political Economy of Information, ed. Vincent Mosco and Janet Wasko (Madison: University of Wisconsin, 1988) 44-75.
- ⁶⁶ Frank Webster and Kevin Robins, Information Technology: A Luddite Analysis (Norwood: Ablex, 1986) 311.
- ⁶⁷ Webster & Robins, Information Technology: A Luddite Analysis 329.
- ⁶⁸ Webster & Robins, Information Technology: A Luddite Analysis 347.
- ⁶⁹ David Noble, "Social Choice in Machine Design: The Case of Automatically Controlled Machine Tools," Case Studies in the Labor Process , ed. Andrew Zimbalist (New York: Monthly Review, 1979) 19.

⁷⁰ For statements on the pathological nature of capitalist technology, see Schiller, Information in the Crisis Economy, 25; Kevin Robins and Frank Webster, "Athens Without Slaves . . . Or Slaves Without Athens? The Neurosis of Technology." Science as Culture 3 (1988): 7-53; and Noble, Forces of Production.

⁷¹ For classic statements of this position see Kevin Robins and Frank Webster, "Luddism: New Technology and the Critique of Political Economy," Science, Technology and the Labour Process, vol. 2, ed. Les Levidow and B. Young (Atlantic Highlands: Humanities, 1983) 9-48, and the series of articles by David Noble, "Present Tense Technology," Democracy, 1983, "Part 1," Spring: 8-24; "Part 2," Summer 70-82; "Part 3," Fall 71-93. These articles are reprinted in Progress Without People. Although Schiller does not adopt the Luddite label, in Who Knows, 149, he concurs with Noble's call to halt the rapid diffusion of IT, urging "a maximum effort directed at slowing down, and postponing wherever possible, the rush to computerisation."

⁷² Noble, "Present Tense Technology: Part 1" 8.

⁷³ Noble, "Present Tense Technology: Part 3" 87.

⁷⁴ Stuart Ewen, rev. of The Mind Managers, by Herbert Schiller, Telos 17 (1973): 186.

⁷⁵ See the articles mentioned in note 69.

⁷⁶ Marx, Capital vol. 1 554-555.

⁷⁷ David Harvey, The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change. (Oxford: Blackwell, 1989). For an interesting anthology containing several of the more 'radical' strains of post-Fordist analysis, see Post-Fordism: A Reader, ed. Ash Amin (Blackwell: Oxford, 1994).

⁷⁸ Two foundational works of Regulation School analysis are Michel Aglietta, A Theory of Capitalist Regulation (London: New Left Books, 1979), and Alain Lipietz, Mirages and Miracles: The Crisis of Global Fordism (London: Verso, 1987).

⁷⁹ Lipietz, Mirages and Miracles 32-33.

⁸⁰ Alain Lipietz and D. Leborgne, "New Technologies, New Modes of Regulation: Some Spatial Implications," Environment and Planning D: Society and Space 6 (1988): 41.

⁸¹ Antonio Gramsci, Selections From the Prison Notebooks, ed. Q. Hoare and G. Nowell-Smith (London: Lawrence and Wishart, 1973) 217-316.

⁸² Aglietta 123-124.

⁸³ Aglietta 124, 385.

⁸⁴ Michael J. Piore and Charles Sabel, The Second Industrial Divide: Possibilities for Prosperity (New York: Basic, 1984).

⁸⁵ They discuss workplaces based on "flexible specialisation" as places where "Proudhon might have taken Marx to show him where cooperation and competition meet." Piore and Sabel 287.

⁸⁶ Piore and Sabel 258-280.

⁸⁷ Piore and Sabel 305.

⁸⁸ Representative works include Martin Kenney and Richard Florida, "Beyond Mass Production: Production and the Labor Process in Japan," Politics and Society.16.1 (1988) 121-158; John Mathews, Age of Democracy: The Politics of Post-Fordism (Melbourne: Oxford University Press, 1989), and Tools of Change: New Technology and the Democratisation of Work (Sydney: Pluto, 1989); Robin Murray, "Fordism and Post-

Fordism," New Times, ed. Stuart Hall and Martin Jacques (London: Lawrence & Wishart, 1989) 38-54. Although it does not use the 'post-Fordist' terminology, the work of Larry Hirschorn is very similar in themes, and in its trajectory away from Marxism. See his "New Productive Forces and the Contradictions of Contemporary Capitalism: A Post-Industrial Perspective," Theory and Society 7 (1979); "The Post-Industrial Labor Process," New Political Science 2.3 (1981): 11-32; Beyond Mechanisation: Work and Technology in a Post-Industrial Age (Cambridge: MIT, 1984).

⁸⁹ On this point see Chris Smith, "From the 1960s Automation to Flexible Specialisation: A Deja Vu of Technological Panaceas," Farewell to Flexibility, ed. A. Pollert (Oxford: Blackwell, 1991) and Stephen Wood, "The Transformation of Work?" The Transformation of Work?: Skill, Flexibility and the Labour Process, ed. Stephen Wood (London: Unwin Hyman, 1989) 1-43.

⁹⁰ Eloina Pelaez and John Holloway, "Learning to Bow: Post-Fordism and Technological Determinism," Science as Culture 8 (1990): 15-27.

⁹¹ Leborgne and Lipietz 263, 272.

⁹² Les Levidow, "Foreclosing the Future," Science and Society 8 (1990): 59-79.

⁹³ Mike Parker and Jane Slaughter, "Management By Stress," Science and Society 8 (1990): 27-58.

⁹⁴ Many of these articles are collected in Stuart Hall and Martin Jacques, eds., New Times (London: Lawrence & Wishart, 1989).

⁹⁵ See Dick Hebdige, "After the Masses," Hall and Jacques, 76-93.

⁹⁶ Stuart Hall, "The Meaning of New Times," Hall and Jacques, 121, 129.

⁹⁷ A. Sivanandan, 'All that melts into air is solid: the hokum of New Times', Race and Class 31.3 (1989) 1-23.

⁹⁸ See Michael Rustin, "The Trouble with 'New Times,'" Hall and Jacques, 303-320, and John Clarke, New Times and Old Enemies: Essays on Cultural Studies and America (London: Harper Collins, 1991).

⁹⁹ See Nick Witherford and Richard Gruneau, "Between the Politics of Production and the Politics of the Sign: Post-Marxism, Postmodernism, and New Times," Current Perspectives in Social Theory 13 (1993) 69-92.

¹⁰⁰ Julie Graham, "Fordism/Post-Fordism, Marxism-Post-Marxism." Rethinking Marxism 4.1 (1991).39-58.

¹⁰¹ Graham 48.

¹⁰² Graham 48.

¹⁰³ Graham 49.

¹⁰⁴ Levidow, "Foreclosing the Future."

¹⁰⁵ This tendency appears even where supporters of the Regulation School believe they are arguing most strongly for the 'radicalism' of their outlook. Thus Mark Ellam, "Puzzling Out the Post-Fordist Debate: Technology, Markets and Institutions," Post-Fordism: A Reader, ed. Ash Amin (Blackwell: Oxford, 1994) 66, contrasts the Regulation School with "neo-Schumpeterian" and "neo-Smithian" approaches, and approves it because it "sees the new rulebook of capitalist life as only partially written with room for many more coauthors." In support of this, he asserts the insight that "In fact, strategic resistance against new technology and the market may well be essential if a new period of stable capitalist growth

is to be secured." (original emphasis). This strikes us as the apogee of functionalist recuperation: "strategic resistance" is defined by its role in consolidating accumulation.