OUTLINES OF A CRITIQUE OF TECHNOLOGY

Edited by **Phil Slater**
Introduction by **Monika Reinfelder**
Essays by **Raniero Panzieri, Norbert Kapferer, Hans-Deiter Bahr**

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Preface

This book aims to outline the task of a critique of technology. It consists of a relatively small number of articles, which, far from exhausting the subject, simply attempt to outline what is at stake. The articles were originally published in either Italian (Panzieri) or German (Kapferer and Bahr), and have been specially translated for the present volume. The articles are written from different perspectives and with different emphases; no attempt has been made to edit out repetitions or divergences, although each article has been provided with a brief introduction by way of contextualization. An overall introduction reconstructs the orthodox tradition with which the critique of technology must first break, as well as drawing together the positive achievements to be consolidated; this seemed preferable to reprinting material that has been readily accessible for some time now. The present volume consists, therefore, of material previously unavailable in English.

The Editor

Introduction: Breaking the Spell of Technicism

Monika Reinfelder

> *Nothing so corrupted the German labour movement as the belief that it was swimming with the current, a current it located in the dynamic of technological development.*
> **Walter Benjamin**

Since his death in 1883, arguments over Marx's 'message' have been characterized by fundamental splits rather than consensus. This makes all the more impressive the fact that on the question of technology, consensus has reigned for close on a century, if only by default. Not that the word 'technology' is absent from Marxist arguments: on the contrary, it figures heavily whenever it is a question of stating 'basic principles', and is always in the forefront of debates on the transition to socialism. However, technology itself is rarely considered to pose a problem for Marxist theory; rather, technology is technology, and that is that! In such fields as politics, economics, and law, such a perspective would be regarded as heresy: here, as almost all currents of

Marxism would concede, what is called for is a *critique*. But the idea of subjecting *technology* to the same treatment appears so ludicrous that it need only be mentioned at all in the form of a violent repudiation of those who dare to take the idea seriously to begin with.

In an attempt to open up the prospect of a critique of technology, it is useful to recall what Marx meant by *A Critique of Political Economy* (the indicative subtitle of *Capital*): namely, to lay bare the categorial framework of political economy (value, equality, free exchange, revenues, etc.) as a *bourgeois ideology*. Whereas political economy explained capitalist society in terms of categories that supposedly expressed transhistorical 'natural laws', Marx's *critique* identifies those categories (starting with 'value') as the mystified expression of a *specific*, namely *capitalist mode of production*:

> The value-form of the product of labour is the most abstract, but also the most universal form of the bourgeois mode of production; by that fact it stamps the bourgeois mode of production as a particular kind of social production of a historical and transitory character. If then we make the mistake of treating it as the eternal form of social production, we necessarily overlook the specificity of the value-form, and consequently of the commodity-form together with its further developments, the money form, the capital form, etc.[1]

This 'mistake' is not simply rooted in some 'conspiracy' to perpetuate bourgeois ideology, but is systematically reproduced by the objective appearance of capitalist production in as far as the latter is not subjected to a

1 K. Marx, *Capital*, I, Harmondsworth 1976, p.174.

systematic critique. Marx's *Capital* is therefore not merely a repudiation of the bourgeoisie's overt spokesmen, but also, and primarily, an ideological struggle for the consciousness of the proletariat: "in so far as such a critique represents a class, it can only represent the class whose historical task is the overthrow of the capitalist mode of production".[2]

None of this is particularly new, of course: indeed, the historical materialist nature of the critique of political economy is emphasized even by those Marxists whose subsequent theory and practice reveal a total oblivion to its fundamental significance. But when it comes to the question of technology, even 'basic principles' usually regress to a pre-critical level: just as political economy exhausted itself with the insight that the content of the value-form is labour, so Marxism exhausts itself with the view that the content of technology is 'scientific rationality'. Thus, one can say of Marxism's perspective on technology what Marx said of political economy's perspective on value: namely, that "it has never once asked the question why this content has assumed that particular form."[3] Thereby, the dominant Marxist understanding of technology remains at the level of immediate appearances, and the prospect of a critique is foreclosed.

In the absence of a critique, Marxism produces its own brand of bourgeois ideology under the grand title of the 'dialectic of history'. According to this evolutionist scheme, class societies 'develop' the means of production in the narrow interest of extracting maximum surplus labour from the immediate producers, but, so the account continues, this interest, far from *determining* the means of production, is (in a manner reminiscent of Hegel's 'Cunning of Reason') actually the unwitting carrier of

2 Ibid, p.98.
3 Ibid, p.174.

the latter's *transcendent goal*, which is the perfection of man's technical mastery of nature. This obviously involves *social* relations of production, but these are by way of 'attendant circumstances', mapped onto the autonomous technical processes that constitute the 'inner essence' of actual historical development. As a result, Marxist 'theorization' of the objective body of the immediate process of *capitalist* production is usually, and quite logically, restricted to a faith that the body in question already constitutes the potential base of *socialism*. In this way a historical materialist, critical perpective takes second place to the overriding teleology of 'technique', and it is for this reason that the *critique* of technology presupposes breaking the spell of an ideology that can justifiably be labelled *technicism*.

The Foundations of Technicism: Engels and Kautsky

Despite his many positive contributions to Marxism and to Marx's own work,[4] it was Engels (1820-95) who first formulated the technicist version of the Marxian legacy. Paradoxically, it was the well-intentioned concern to argue that Marx's thought was not just 'economic' which led Engels astray: rather than arguing in the (admittedly daunting) direction that the natural sciences should, via a critique of their theoretical status, be incorporated *into* historical materialism, Engels took the opposite direction and *reduced* historical materialism to the status of an 'application' of a broader metaphysical system which, not unreasonably, has become known as 'dialectical materialism'.

'Dialectical materialism' begins, analagous to the

4 In fact, it was Engels who first conceived of the revolutionary analysis of capitalism as a *Critique of Political Economy*; see K. Marx and F. Engels, *Collected Works*, III, London 1975, pp.418ff.

Leviathan of Thomas Hobbes (1588-1679), not with specific societies, nor with society in general, nor even with man in general, but with 'the most general laws' of *all* motion, laws which must be "valid just as much for motion in nature and human history as for the motion of thought".[5] According to this theory, *matter*, which is primary, moves by contradictions, and this movement is 'reflected' in the movement of *mind*, which is secondary. Within this metaphysical system, the technological ensemble appears in the indeterminate form of an objective application of man's "rapidly growing knowledge of the laws of nature"; thus, "in the most advanced industrial countries we have subdued the forces of nature and pressed them into the service of mankind." In this perspective, socialism appears as the relatively simple task of centralized, conscious *planning* of production, a task which is becoming "daily more indispensable", but also "with every day more possible".[6] All in all, *technological* development is manifested *in* specific modes of production, but, far from carrying the marks of the latter in its objective structure, it actually *determines* and ultimately *transcends* them. Such is the essence of technicism as bequeathed to Marxism by Engels.

However, even during Engels' life, but more so after his death, the role of 'executor' of Marx's theoretical legacy fell to Karl Kautsky (1854-1938). Far more explicitly and consistently than Engels, Kautsky 'extended' the 'materialist view of history' to the point where the 'history of humanity' became merely a 'special case of the history of living beings' in general; this 'special case' certainly had its 'specific laws', but it could

5 F. Engels, *Dialectics of Nature*, London 1954, p.267; this is an explicit summary of the metaphysics propounded in Engels' more popular work, *Anti-Dühring*.

6 *Dialectics of Nature*, p.34f.

ultimately be grasped only in conjunction with the 'general laws of animate nature'.[7] Quite logically, Kautsky explains technological change not in terms of specific social relations of production, but in terms of 'human practice' in general:

> The extension of our knowledge of nature enables us to advance technologically and to improve our human activity in terms of the production of life. Every advance in this activity brings new facts of nature to light, and thereby the possibility of further advances in our knowledge of nature, which means the possibility and necessity of readjusting our thoughts to the facts.[8]

'Nature', 'economy', and 'technology' are in constant 'interaction', to be sure, but the nature of this 'interaction' is understood on the basis of a 'materialist', not an 'economic' view of history.[9] In particular, warns Kautsky, let no Marxist be so 'crude' as to believe that class contradictions might be objectively contained *within technology itself*.[10] Henceforth, technology is placed beyond all possible critique, and technicism becomes a self-validating exercise.

The Russian Connection: Soviet Marxism

Kautsky, and the Social Democrats generally, did not, of course, go unchallenged in their claim to be the apostles of Marx: Bolshevism was to a large extent constructed as an explicit repudiation of this claim. But whereas the

7 K. Kautsky, *Die Materialistische Geschichtsaufassung*, Berlin 1927, II, p.630; no translation available.
8 Ibid, I, p. 872f.
9 Ibid, I, p.866.
10 Ibid, I, pp.727 and 873f.

split was quite radical on questions of party organization, parliamentary democracy, state power and international war, the *technicist* dimension of social democratic thought not only went unquestioned, but was explicitly affirmed and, if anything, deepened. The pivotal figure here was the 'Russian Kautsky', Georgi Plekhanov (1856-1918). As in the case of his German counterpart, Plekhanov's consternation at the misunderstanding of Marxian thought as 'economic determinism' was so great that he hastily conceded an absolute autonomy to (amongst other things) natural science, where "a genius discovers laws the operation of which does not, of course, depend upon social relations."[11] The same holds, quite logically, for the means of production, which, though developed in and through specific social relations of production, have logical and historical priority over the latter; thus, the reader is subjected to the simplistic generalization that "on the basis of a particular state of the productive forces there come into existence certain relations of production."[12]

It was from Plekhanov that Lenin (1870-1924) learned his Marxism, and although the pupil never hesitated to denounce his teacher's 'tactical opportunism', Lenin was anxious and emphatic that this should not be allowed to blur the fact that in the sphere of *philosophy*, Plekhanov was "the only Marxist in the international Social-Democratic movement to criticize the incredible platitudes of the revisionists from the standpoint of consistent dialectical materialism".[13] That Lenin thereby affirmed Social Democracy's *technicism* is clear enough from his restatement of 'consistent dialectical materialism' in *Materialism and Empirio-Criticism*.[14] But, not surpri-

11 G. Plekhanov, *The Development of the Monist View of History*, Moscow 1972, p.192.
12 Ibid, p.157.
13 V. I. Lenin, *Collected Works*, Moscow 1960-1970, XV, p.33f.
14 Lenin, *CW*, XIV; see, for example, p.190.

singly, though more importantly, this technicism is in the forefront of Lenin's conception of the transition to socialism. From the beginning, the struggle to build the new party was based on a 'Marxism' understood as 'the ideology of the proletariat trained by capitalism'; to fully exploit this 'training', the Bolshevik must "distinguish between the factory as a means of exploitation (discipline based on a fear of starvation) and the factory as a means of organisation (discipline based on collective work united by the conditions of a technically highly developed form of production)". Having drawn this distinction, Lenin proceeds to commend its political significance: "the discipline and organisation which come so hard to the bourgeois intellectual are very easily acquired by the proletariat just because of this factory 'schooling'."[15]

However, this was not Lenin's last word on the subject: once the Bolsheviks were installed in power as the state organizers of work, Lenin began to express doubts about the rigour of the proletariat's former 'training'; he bemoaned the fact that "obedience, and unquestioning obedience at that, during work . . . is far, very far from being guaranteed as yet."[16] However, Lenin took comfort in the fact that the 'dialectic of history' had produced a more effective 'training' in the form of Taylorism,[17] to which he adopted his usual 'dialectical' attitude:

> The Taylor system, . . . like all capitalist progress,

15 Lenin, *CW*, VII, p.389.
16 Lenin, *CW*, XXVII, p.316.
17 On his own admission, Frederick Winslow Taylor (1856–1915) was a management agent who fought to wrest all understanding of, and thus all control over production from the workers, as a prelude to increase in ouput; for details, see H. Braverman, *Labor and Monopoly Capital*, New York and London 1974, pp.85ff. Braverman's own significance for a critique of technicism is discussed below.

> is a combination of the refined brutality of bourgeois exploitation and a number of the greatest scientific achievements in the field of analysing mechanical motions during work, the elimination of superfluous and awkward motions, the elaboration of correct methods of work, the introduction of the best system of accounting and control, etc. . . . We must organize in Russia the study and teaching of the Taylor system and systematically try it out and adapt it to our own ends.[18]

This is no mere expedient dictated by the precarious military position of the new Soviet state, but a general theoretical and practial imperative in the Leninist conception of the transition to socialism. Crude materialism, reflection theory and the 'dialectic of history' fuse logically into a technicist model which turns from a Social Democratic dream into the state workhouse of the USSR.

Lenin himself did not live to consolidate this dream, which was the work of Stalin (1879-1953). Along the way, the latter also produced a codification of *Dialectical and Historical Materialism* that is disarmingly simple: first, one needs to understand *dialectical* materialism in the manner of Engels; then, one applies dialectical materialism to the study of society in the form of *historical* materialism, which, true to the universal nature of dialectics, reveals that "the productive forces are not only the most mobile and revolutionary element in production, but are also the determining element in the development of production".[19] Applied to contemporary capitalism, this world-view demonstrates that "capitalist relations of production have ceased to correspond to the state of productive forces of society and

18 Lenin, *CW*, XXVII, p.259.
19 *The Essential Stalin*, London 1973, p.322.

have come into irreconcilable contradiction with them"; revolutionaries thus learn that their 'mission' is "to replace the existing capitalist ownership of the means of production by socialist ownership".[20] Once again, 'dialectics' performs the feat of purging technology of any objective class structure and restricting the transformation of production to a simple question of property rights.

Stalin, as is well known, did not have an easy job in his attempt to formulate and embody the 'true' spirit of Marxism-Leninism. On the contrary, he was assailed and pilloried by Trotsky (1879-1940) on a vast series of problems ranging from 'socialism in one country' to the struggle against fascism. But precisely because of this mutual animosity, the technicist continuum in Social Democratic and Bolshevik theory and practice is revealed all the more strikingly when one realizes that even in his attack on Stalin's break-neck, terroristic industrialization programme, Trotsky never once entertained the thought that this programme might in fact be in perfect harmony with the objective structure of machine technology, electrical power, and Taylorism. As if sensing that he was on the threshold of heresy, Trotsky affirmed his own orthodoxy by stating that "Marxism sets out from the development of technique as the fundamental spring of progress, and constructs the communist programme upon the dynamic of the productive forces."[21] And as if to prove that these were not empty words, Trotsky elsewhere extended Lenin's 'dialectical' appraisal of Taylorism to Henry Ford's work in constructing the first conveyor-belt production line: revolutionaries, according to Trotsky, should aim *not* to *smash* Fordism, but to "separate Fordism from Ford and

20 Ibid, p.326.
21 L. Trotsky, *The Revolution Betrayed*, New York 1974, p.45.

to socialize and purge it". This, we are told, is what 'socialism' does.[22]

We are thus dealing with a time-honoured tradition that takes in the otherwise un-unitable: Engels, Kautsky, Plekhanov, Lenin, and, as a mere footnote, Stalin and Trotsky. The list could be expanded *ad infinitum* (and *ad nauseam*); but to underscore the fundamental *reformism* of this tradition, one should perhaps close with Harold Wilson's vision of 'forging socialism in the white heat of the scientific-technological revolution',[23] and his Euro-Communist counterpart, Santiago Carillo, whose own brand of reformism quite legitimately establishes its 'orthodox' credentials by emphasizing that "what can really be inferred from the development of the forces of production is that modern society is ripe for socialism."[24]

A Pseudo-Critique of Technicism: Mao, Althusser and Bettelheim

As we shall see presently, this powerful technicist tradition has not gone totally unchallenged in the history of Marxism. However, before proceeding to assemble the rare, but invaluable elements for a genuine critique, it is imperative to deal with a recent theoretical current which, while claiming to constitute such a critique, in fact merely scratches the surface and, worse still, ultimately accomodates itself *within* the technicist tradition. A critical assessment of this current will,

22 L. Trotsky, *Problems of Everyday Life*, New York 1977, p.243.

23 This famous slogan summed up a central theme of Wilson's speeches from the Labour Party Conference of 1963 to the General Election of the following year; see, for example, H. Wilson, *Purpose in Politics: Selected Speeches*, London 1964, pp.14ff.

24 S. Carrillo, *'Eurocommunism' and the State*, London 1977, p.23.

though largely negative, serve the positive purpose of forestalling any premature restriction in the terms of reference of a genuine critique of technicism.

The pseudo-critique in question finds its most up-to-date expression in the work of the French Maoist-cum-Althusserian, Charles Bettelheim. The main object of his attack is a 'simplification' of Marxism which is traceable to the European labour movement of the 1880s, but which took its most terrible toll within the Third (Communist) International, particularly from the late 1920s. The 'simplification' in question involves presenting the development of the productive forces as the 'driving force of history'. This thesis of the 'primacy' of the productive forces "prevents one from using rigorously the concepts of historical materialism, and leads to incorrect political formulations". Historical materialism, by contrast, teaches first, that "*the driving force of history is the class struggle*", and second, more specifically, that socialist social relations can arise only *through* class struggle.[25]

Unfortunately, the significance of Bettelheim's 'non-simplified' Marxism turns out to be less dramatic than one might have expected. In fact, Bettelheim goes on to rehabilitate the very thesis he claimed to repudiate: "in general—that is, as long as the prevailing production relations do not hinder their development—it is the productive forces that play the principal and decisive role." The only 'qualification' to this bare-faced technicism is that the class struggle takes over as the 'principal and decisive' factor whenever the productive forces "can no longer develop within the limitations of the prevailing production relations".[26] In fact, this is no qualification of

25 C. Bettelheim, *Class Struggles in the USSR, First Period: 1917-1923*, Hassocks 1977, p.23f.

26 Ibid, p.474.

technicism at all, since this intervention of revolutionary class struggle in the 'principal and decisive role' is *determined* by the 'development' of the productive forces themselves.

Anyone expecting to learn how Bettelheim's 'non-simplified' Marxism enables one to use the concepts of historical materialism 'rigorously', so as to construct 'correct' political formulations, is in for an equal disappointment. All we gather is that Marxists should ascribe the 'major' role in the construction of socialism not to the accumulation of new means of production and technical knowledge, but to the 'initiative of the working people'.[27] Beyond this well-meaning generality, Bettelheim says less than nothing; the idea that there is no teleological development of the productive forces to begin with, let alone that specific class relations might be *objectively* contained within specific means of production, is not even contemplated.

This theoretical block is quite consistent with Bettelheim's acknowledged debt to the French philosopher, Louis Althusser. In the latter's work, one finds the same dual-pronged attack: namely, on "the exaltation of the development of the Productive Forces" and "*the elimination of the relations of production and of the class struggle*".[28] But in Althusser's case, the innocuous nature of this 'critique' of technicism is quite explicit and theoretically grounded (albeit in terminology bordering on hieroglyphics): Marx's 'total theoretical revolution' is presented as a theory of the "different specific *levels* of *human practice* (economic practice, political practice, ideological practice, scientific practice) in their characteristic articulations, based on the specific articulations of the unity of human society".[29]

27 Ibid, p.34.
28 L. Althusser, *Essays in Self-Criticism*, London 1976, p.88.
29 L. Althusser, *For Marx*, London 1969, p.229.

Desite endless talk of being 'determined in the last instance' by what Althusser calls the 'economy', these 'levels' enjoy an 'autonomy' which the epithet 'relative' can do nothing to challenge: indeed, any real attempt to show how the economy of capitalist society *determines the technological ensemble* would immediately call forth cries of 'economism' from Althusser.[30]

But if Bettelheim acknowledges a debt to Althusser, both men repeatedly acknowledge an overriding debt to Mao Tse-Tung (1893–1976), whose work must therefore be briefly considered. The first thing which must be stated is that Mao is the author of several famous articles propounding a technicist perspective pure and simple; for example, *On Contradiction* begins with the 'basic law of materialist dialectic', namely, the 'law of contradiction in things', and goes on to explain that when Marx 'applied' this law to the study of capitalist society, "he discovered that the basic contradiction of this society is the contradiction between the social character of production and the private character of ownership."[31] Dialectics even affirms that "in the contradiction between the productive forces and the relations of production, the productive forces are the principal aspect."[32] Admittedly, Mao contradicts himself (perhaps to prove the universality of the 'basic law of materialist dialectics') by stating, elsewhere in the same article, that "in capitalist society the two forces in contradiction, the proletariat and the bourgeoisie, form the principal contradiction".[33] But throughout this equivocation, one

30 Wisely, however, he chooses silence in the case of Cornelius Castoriadis, who anticipated Althusser's (and Bettelheim's) stress on class struggle by more than a decade, but who took this so seriously that he embarked on a critique of technology itself; Castoriadis' work is discussed below.

31 Mao, *Four Essays on Philosophy*, Peking 1968, p.48.

32 Ibid, p.58.

33 Ibid, p.51.

thing remains quite clear: Mao regards the productive forces as *transcendent* of specific social relations of production. And what is more, Mao is obliged to do so by his metaphysics.

However, to forestall the accusation of basing one's own account of Mao on an article written before the Communist seizure of power, the Great Leap Forward, or the Cultural Revolution, let us turn to a later, but equally hallowed work, namely, *Where do Correct Ideas Come From?* This article paraphrases a famous, and provocative statement by Marx to the effect that "it is man's social being that determines his thinking"; but in Mao's hands, this is 'substantiated' by a puerile restatement of the crude materialism and reflection theory that render Marx's thesis meaningless. In the same manner, having tantalized the reader with the thesis that 'correct ideas' come from social practice and from it alone, Mao becomes more precise: "they come from three kinds of social practice, the struggle for production, the class struggle and scientific experiment."[34] The division is along clear Kautskyan lines: Kautsky's warning on the dangers of 'crudity' seems not to have fallen on deaf ears.

However, rather than pursue an epistemological argument, it will be more rewarding to conclude with the collection of articles entitled *A Critique of Soviet Economics*, which is the basis for even more ambitious claims on behalf of Mao's status as an anti-technicist theoretician of the first order.[35] Here, it is true, Mao does criticise his idol, Stalin, for wanting "nothing but technology, nothing but cadre: no politics, no masses".[36] But on the question of technology, Mao still works with

34 Ibid, p.134.

35 See, for example, Derek Sayer's review-article in *Capital and Class*, No.8; this appraisal is elaborated at length in P. Corrigan et al., *For Mao*, London 1979.

36 Mao, *A Critique of Soviet Economics*, New York and London 1977, p.129.

evolutionist categories like 'backward' and 'advanced', rather than dealing with specific relations of production: and his insertion of 'politics' and 'the masses' boils down to the hazy notion that mechanization and automation must not be 'made too much of'. Instead, Mao councils a 'sense of proportion',[37] the moralizing substitute for a critique of technology.

Critical Sparks: Luxemburg, Korsch and Gramsci

Turning now to those thinkers and doers who have managed, in varying degrees and forms, to extricate themselves from technicism, one can usefully start with Rosa Luxemburg (1871-1919). Her unique contribution to Marxism lies in the fact that while repudiating both the overtly reformist as well as the sham-orthodox currents of the workers' party, she simultaneously took issue with the technicist basis of Lenin's related broadside. Her rejection of the notion, common to both Kautsky and Lenin, of socialist consciousness being 'introduced into the proletarian class struggle from without',[38] took the form of a spontaneist prospect in which "the proletarian army is recruited and becomes aware of its objectives in the course of the struggle itself." Indeed, these very *objectives* appear as the product of that struggle, such that there can be no pristine 'class consciousness from without': all that can be distilled are the *general principles of the struggle itself*.[39]

These general principles can say little or nothing of a positive nature about socialist reconstruction, but they can and do deal mercilessly with residual capitalist

37 Ibid, p.91.
38 See Lenin, *CW*, V, p.383f, where Kautsky's formulation is quoted at length and described as "profoundly true and important".
39 *Rosa Luxemburg Speaks*, New York 1970, p.118.

values within the socialist movement. For example, Luxemburg pillories Lenin's hymn to factory discipline as evidence of his mechanistic conception of socialist organization; for her part, she explicitly rejects the idea of a technocentric continuum in the transition to socialism (at that time still referred to as 'social democracy'):

> The self-discipline of the social democracy is not merely the replacement of the authority of the bourgeois rulers with the authority of a socialist central committee. The working class will acquire the sense of the new discipline, the freely assumed self-discipline of social democracy, not as a result of the discipline imposed on it by the capitalist state, but by extirpating, to the last root, its old habits of obedience and servility.[40]

In the wake of the Bolsheviks' actual seizure of power thirteen years later, Luxemburg's revolutionary imperative became, if anything, even more passionate.[41]

"One's attitude to Rosa still strikes me as the best test of revolutionaries",[42] was the opinion of Karl Korsch (1886-1961), whose break in the 1920s with the technicism common to both Social Democracy and Bolshevism grew out of a rejection of the crude materialism and reflection theory that form its metaphysical base. Whereas, ever since Engels, historical materialism had been reduced to an 'application' (one among many) of an overall metaphysical system, Korsch took the opposite direction: "the correct materialist conception of history . . . is incompatible with separate

40 Ibid, p.119f.
41 Ibid, p.390.
42 K. Korsch to P. Mattick, 1 January 1939, *Jahrbuch Arbeiterbewegung*, II, Frankfurt 1974, p.199.

branches of knowledge that are isolated and autonomous."[43] More specifically, Marx's critique of political economy "never ceases to be a critique of the *whole* of bourgeois society and so of *all* its forms of consciousness".[44] The failure of 'social democracy' to grasp this scarcely needed stating, but the Bolsheviks' parallel course needed to be exposed in full, with direct reference to its reformist consequences:

> The 'new materialism' of Lenin is the great instrument which is now used by the Communist parties in the attempt to separate an important section of the bourgeoisie from the traditional religion and idealistic philosophies upheld by the upper and hitherto ruling strata of the bourgeois class, and to win them over to that system of state capitalistic planning of industry which for the workers means just another form of slavery and exploitation.[45]

In this way, Luxemburg's rejection of Lenin's 'factory discipline' is theoretically grounded in a repudiation of its technicist base, and Korsch thereby implicitly indicts a time-honoured tradition stretching back to Engels.

If Korsch's immunity to a pre-critical and (quite logically) technicist metaphysics of matter was in some sense due to his appreciation of Classical German Idealism, something similar happened in Italy in the case of Antonio Gramsci (1891–1937). While much of the *Prison Notebooks* is concerned to *criticize* the

43 K. Korsch, *Marxism and Philosophy*, London 1970, p.54.
44 Ibid, p.75.
45 K. Korsch, "Lenin's Philosophy", printed as an appendix (and wrongly attributed to P. Mattick) in A. Pannekoek, *Lenin as Philosopher*, London 1975, p.119. Pannekoek's anti-technicism is summed up and even deepened by Korsch, and thus does not merit separate discussion here.

indigenous idealist tradition, particularly for its abstraction from class struggle, Gramsci felt that this tradition was perhaps closer to the critical spirit of historical materialism (dubbed the 'philosophy of praxis') than was the technicist materialism popularized, for example, by Nikolai Bukharin in the early 1920s.[46] Gramsci asked:

> Might not the idealistic conception according to which nature is none other than the economic category be reduced, once cleansed of its speculative superstructures, into the terms of the philosophy of praxis and demonstrated to be historically linked to and a development of that philosophy? In reality the philosophy of praxis does not study a machine in order to know about and to establish the atomic structure of its materials or the physical, chemical and mechanical properties of its natural components . . . but only only in so far as it is a moment of the material forces of production, is an object of property of particular social forces, and expresses a social relation which in turn corresponds to a particular historical period.[47]

This not only brings technicism into question, but even implies a critique of the *objective structure of technology.*

Historical Materialism, Commodity-Fetishism and the critique of Technicism: Lukács

In anticipation of any misguided euphoria, however, it must be stated that Gramsci, Korsch and Luxemburg

46 N. Bukharin, *Historical Materialism*, New York 1965; for the author's hyper-technicism, see pp.120ff and 242ff.

47 *Selections from the Prison Notebooks of Antonio Gramsci*, London 1976, p.466.

were complex, even contradictory thinkers, whose break with orthodoxy was far from definitive: numerous passages in their works reveal a residual technicism in one form or another. But, more importantly, even in their *anti*-technicist moments, their theoretical frame of reference offers little in the way of constructing a *critique of technology* in the spirit of Marx's critique of political economy. This is particularly true of Gramsci, whose enthusiastic 'revolution against Karl Marx's *Capital*'[48] was not merely a repudiation of social democracy's evolutionist determinism, but also testified to a life-long disregard of Marx's analysis of capitalist production as value-in-process.

By way of total contrast, Georg Lukács (1885–1971) undertook a theoretical revolution on the *basis* of Marx's *Capital*. Lukács, too, is a complex figure, who went through many phases, and who actually produced one of the most cynical defences of Soviet Marxist technicism ever to appear.[49] But in the early 1920s, when serious theoretical work on revolutionary communism did not yet mean expulsion from the Communist Party, he proved himself a very gifted revolutionary thinker. Indicatively, Lukács' many achievements included an attack on technicism, as well as some serious progress in the direction of a critique of technology.

As a first introduction to this dimension of his work, one should consult Lukács' attack on the technicism personified by Bukharin (an attack, incidentally, that is far superior to Gramsci's). Lukács' general point is that "this attempt to find the underlying determinants of society and its development in a principle other than that of the social relations between men in the process of

48 A. Gramsci, *Selections from Political Writings (1910–1920)*, London 1977, p.34.

49 G. Lukács, *Die Zerstörung der Vernunft*, Berlin 1955; no translation available.

production . . . leads to fetishism." In particular, "it is altogether incorrect and unmarxist to separate technique from the other ideological forms and to propose for it a self-sufficiency from the economic structure of society."[50] Giving Bukharin a lesson in history which could long since have been learned from *Capital*, Lukács points out that the *social* preconditions of modern machinofacture predate the latter's *technical* realization, which can only be theorized as "the consummation of modern capitalism, not its initial cause".[51]

The implications of this perspective are drawn out in Lukács' classic work, *History and Class Consciousness*. His fundamental principle is that Marx's theory of commodity-fetishism can be made to "yield a model of all the objective forms of bourgeois society together with all the subjective forms corresponding to them".[52] Lukács applies this not merely to the subjective form of *technicism*, but to the *factory system* itself:

> Time sheds its qualitative, variable, flowing nature; it freezes into an exactly delimited, quantifiable continuum, filled with quantifiable 'things' . . . In this environment where time is transformed into abstract, exactly measurable, physical space, an environment at once the cause and effect of the scientifically and mechanically fragmented and specialised production of the object of labour, the subjects of labour must likewise be mathematically dissected . . . Mechanisation makes of them isolated abstract atoms whose work . . . becomes mediated

50 G. Lukács, "Technology and Social Relations", *New Left Review*, No. 39, p.29f.
51 Ibid, p.31.
52 G. Lukács, *History and Class Consciousness*, London 1971, p.83; for Marx's discussion of commodity-fetishism, see *Capital*, I, p.164f.

> to an increasing extent exclusively by the abstract laws of the mechanism which imprisons them.[53]

The factory could not possibly achieve this, Lukács adds, "were it not for the fact that it contains in concentrated form the whole structure of capitalist society". This strikingly and provocatively reveals the profound difference between parroting isolated Marxian aphorisms on the 'dialectic of history' and actually basing oneself on the *analysis* contained in *Capital*.[54]

Revisionist Ambivalence: Marcuse, Gorz and Braverman

With Lukács' kowtow to Soviet Marxism in the mid-1920s, the critique of technicism became increasingly divorced, at least temporarily, from the organized labour movement. This is illustrated by Korsch's increasing isolation after his break with Moscow, but it is even more marked in the case of Herbert Marcuse (1898–1979), who, though never actively involved in working-class politics, was nonetheless destined to keep alive something of Lukács' critical spirit. Common to the whole 'Frankfurt School' was a Lukácsian repudiation of crude materialism, reflection theory and technocracy;[55] but it was Marcuse who, again following Lukács'

53 *History and Class Consciousness*, p.90—modified.

54 Regrettably, the Belgian Trotskyist Ernest Mandel uses the occasion of his Introduction to the otherwise impeccable edition of Volume One of *Capital* in the Pelican Marx Library to reduce the 'contradictory' nature of the machine to a simplistic 'contradiction between use-value and exchange-value' (p.37); the fig-leaf for this technicism is provided, as so often, by empty talk of 'Marx the dialectician'.

55 The 'Frankfurt School' position on this score is presented at its most elaborate in A. Schmidt, *The Concept of Nature in Marx*, London 1971.

lead, extended this as early as 1941 to an attack on Taylorism as a "streamlined autocracy" in which the laws of physical science and technological reason fused inextricably with the capitalist profit-motive.[56]

In the early 1960s, Marcuse developed this into his famous thesis of one-dimensionality, within which the attack on technological rationality was absolutely central:

> Not only the application of technology but technology itself is domination (of nature and men)—methodical, scientific, calculated, calculating control. Specific purposes and interests of domination are not foisted upon technology 'subsequently' and from the outside; they enter the very construction of the technical apparatus.[57]

As part of what he called the Great Refusal, Marcuse searched for signs of a working-class struggle against this technological monolith, and in the wake of 1968 he enthusiastically spoke of "a collapse of work discipline, slowdown, spread of disobedience to rules and regulations, wildcat strikes, boycotts, sabotage".[58] And just to make quite explicit his rejection of Social Democratic and Bolshevik technicism both as a metaphysical system and as a political strategy, his last work identified elements of a revolutionary consciousness in "the struggle against the entire capitalist and state-socialist organization of work (the assembly line, Taylor system, hierarchy)".[59]

But despite this welcome break with the theory and

56 H. Marcuse, "Some Social Implications of Modern Technology", *The Essential Frankfurt School Reader*, Oxford 1978.
57 H. Marcuse, *Negations*, London 1968, p.223f.
58 H. Marcuse, *An Essay on Liberation*, London 1969, p.83.
59 H. Marcuse, *The Aesthetic Dimension*, London 1979, p.28.

practice of technicism, Marcuse's revisionism cannot be passed over in silence.[60] While not going as far as to repudiate Marx's analysis of value-in-process, Marcuse equally shies away from adopting the latter as his frame of reference. Instead, as in the case of his 'Frankfurt School' colleagues,[61] the full weight of the incipient critique is supposed to be borne by the elusive category of 'domination'. As a result, Marcuse's critical contribution is restricted to a number of stimulating, but diffusely scattered, semi-aphoristic insights, which, in the absence of a theoretical framework to sustain them, are precarious in the extreme.

The same applies to the more substantial contributions of André Gorz. On the one hand, he argues that "organization, production technology, division of labour form the matrix that invariably reproduces through inertia hierarchical work relations, the capitalist relations of production." As regards the latter, he emphasizes, quite correctly, that "the goal of capitalist production can only be the growth of capital itself";[62] but Gorz traces this to an undifferentiated extortion of surplus *labour*;[63] oblivious to the fact that for Marx (Gorz's avowed teacher) capitalism is specifically characterized by the fact that surplus labour is extracted in the *value-form*. Thus, instead of viewing the immediate process of production in Marxian terms as the unity of labour process and valorization process,[64] Gorz, like Marcuse, abandons value-theory in favour of

60 This is the flaw in Phil Slater's *Herbert Marcuse and the Analysis of the Labour Process*, mimeo 1977, which does, however, serve the useful purpose of assembling Marcuse's most radical observations on technology, for which the present author is indebted.

61 See, for example, M. Horkheimer and T. W. Adorno, *Dialectic of Enlightenment*, London 1973.

62 A. Gorz (ed.), *The Division of Labour*, Hassocks 1976, p.viii.

63 Ibid, p.174.

64 *Capital*, I, pp.283ff.

a unity of 'technique of production' and 'technique of dominating those who are producing'.[65] This revisionism explains a number of things: first, the ease with which Gorz slips back into a technicist perspective of science and technology being 'incorporated' from outside, explicitly granting them a 'degree of irreducible autonomy'; second, Gorz's uncritical celebration of the Chinese Cultural Revolution and its panacea of *collective* 'initiative'; and third, his explicit identification with Bettelheim.[66]

The same ambivalence is found in Harry Braverman's widely read *Labor and Monopoly Capital*. On the one hand, Braverman stresses that only with the development of machinery is capitalism's goal of the domination of dead labour over living labour established *as a physical fact*.[67] On the other hand, theories which view machine technology as 'negative' in its *objective structure* are, in Braverman's estimation, "constructed on every level to exonerate capitalism".[68] In this situation, there is no alternative (certainly no 'Marxist' alternative) but to return to a simple use/abuse model, garnished with some anthropological generalities: "it is not the productive strength of machinery that weakens the human race, but the manner in which it is employed in capitalist social relations."[69] If the ambivalence evident in Gorz is here resolved in favour of the technicist dimension, the revisionism behind it is all the more explicit: abandoning Marx's surplus-*value* in favour of a generalized 'surplus', Braverman glibly outlines the 'major' thesis that "monopoly capitalism tends to generate a greater economic surplus than it can absorb".[70] Thereby, he

65 *The Division of Labour*, p.viii.
66 Ibid, pp.165, 170, and 185, respectively.
67 *Labor and Monopoly Capital*, p.228.
68 Ibid, p.229.
69 Ibid, p.228f.
70 Ibid, p.285. Laying his revisionist cards on the table, Braverman

blithely ditches value-theory, the basis upon which Marx structured *Capital*, and, as we have seen, Lukács' point of departure for a repudiation of technicism and a critique of technology.

The Revolutionary 'Anti-Marx': Castoriadis

While Marcuse, Gorz and Braverman reveal an ambivalence ultimately rooted in their revisionism, they do nonetheless acknowledge that their anti-technicist moments are somehow indebted to Marx. This stands in total contrast to the Greek-cum-French ex-Trotskyist, Cornelius Castoriadis, who argues that one can only develop an anti-technicist, revolutionary theory and practice on condition that one breaks with Marx altogether. To this end, Castoriadis does not (as with Bettelheim or Althusser) simply attack the idea of productive forces being history's 'dynamic element'; rather, he challenges the whole notion of 'productive forces' to begin with. Writing in 1962, but drawing together ideas he had been developing since the 1950s, Castoriadis writes:

> It is one thing to recognise the fundamental importance of Marx's insights on the connections that exist between production and other aspects of the life of a society . . . But it is another thing to reduce production, work, and human activities mediated by instruments and objects to the level of 'productive forces' i.e. in the end to the level of technology. And it would be just as wrong to grant to technology an evolution which 'in the last instance' would be autonomous.[71]

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adds: "I recommend to the reader the excellent exposition in Baran and Sweezy, *Monopoly Capital*."

71 P. Cardan (pseudonym of Cornelius Castoriadis), *History and Revolution*, London 1971, p.7.

In reality, Castoriadis argues, 'technological evolution', far from being an autonomous, homogeneous, teleological continuum, is determined "by the development of the proletariat and by the class struggle waged in the womb of capitalism".[72]

In total contrast to Bettelheim's account, the class struggle does not simply 'intervene' in the transition from one mode of production to another, but actually determines the development *within* the mode of production. Thus, if there is any sense at all in speaking of a 'contradiction' between productive forces and relations of production, it is *not* in the sense of a *transcendence* of capitalism:

> In the last 25 years the productive forces have undergone a development far in excess of anything previously imaginable . . . but it has not altered or challenged the capitalist nature of the relations of production. What seemed to Marx and the marxists to be a 'contradiction' which would lead to the explosion of the system has been 'solved' from within the system itself.[73]

As a result, the revolutionary assault on capitalism, far from 'taking over' an existing technological ensemble, must take the form of an *assault on* that ensemble, along with its very canons of scientific and technological 'rationality', canons to which Marx himself, by and large, remained enslaved.[74]

While Castoriadis thus repudiates what the technicists uphold, he nonetheless stands on common ground with

72 Ibid, p.8.
73 Ibid, p.5.
74 This is elaborated at its fullest and most provocative in C. Castoriadis, *Les carrefours du labyrinthe*, Paris 1978, pp.221ff; a translation is planned by Harvester.

them as regards the content and location of Marx's 'message'. While mocking the vulgarizers for ignoring the corner-stone of Marx's theory, namely, *Capital*, Castoriadis himself shows a marked tendency to rely on the "1859 Preface" so popular with them.[75] When he does turn to *Capital*, it is to copy out passages reaffirming the 'dialectic of history' rather than to study Marx's *analysis* of "Machinery and Large-Scale Industry"; this failure too Castoriadis shares with the 'orthodoxy' he so despises. And, last but not least, Castoriadis seems oblivious to the fact that his proposed critique of technology was pioneered long ago by Lukács on the very *basis* of *Capital*, in particular its analysis of the value-form.

This negative state of affairs can nonetheless serve as a convenient conclusion to our Introduction, which has itself pursued a predominantly negative, even iconoclastic goal. We started with the tentative prospect of a critique of technology, and saw how this presupposed breaking the spell of a dominant technicism that encompassed even ostensibly critical thinkers like Bettelheim. We then saw how a number of activists, most notably Lukács, did start to break the chains of technicism, but we also recognized that their achievements were either left in a rudimentary state or else, as with Lukács, consciously cut short by subservience to Moscow. Next, we assembled a number of critical insights from thinkers who have achieved prominence in the tumultuous period since the mid-1960s, but here we

75 K. Marx, Preface to *A Contribution to the Critique of Political Economy*, Moscow 1970. We can safely dispense with quotations since they abound in the technicist tradition traced above; we shall simply observe that the frequency of quotation from this Preface is usually in inverse proportion to the seriousness accorded to the *Contribution* as a whole.

were forced to note an unmistakable ambivalence and prevarication attributable in no small measure to an either latent or blatant revisionism. And finally, we were faced with the figure of Castoriadis, whose critique of technicism was as merciless as his verdict on Marx. However, given the simplistic account of Marx offered by Castoriadis (and by the 'orthodoxy' he pillories so effectively), we can conclude our Introduction with the clear awareness that though we may have broken the spell of technicism, the task of elaborating the significance of Marx's critique of political economy for a critique of technology is still before us. It is to this task that the following articles address themselves.

Introduction to Panzieri

It is well known that, for Marx, capitalism revolutionizes both "the groupings into which society is divided" and "the technical processes of labour". What is less well known is that Marx theorizes the unity of these two moments (social groupings and technical processes) as constituting "*a specifically capitalist mode of production*" (our emphasis). Taken in isolation from the technical processes of labour, the social groupings (i.e. wage-labourers and capitalists) constitute what Marx calls a *formal* subsumption of labour under capital; but on the basis of this formal subsumption there is erected a set of "methods, means and conditions" of production which Marx terms the *real* subsumption of labour under capital.[1] This is elaborated at length in Marx's recently published *Results of the Immediate Process of Production* (the so-called 'lost chapter' of *Capital*);[2] but the same perspective is abundantly clear in *Capital* itself, as was demonstrated nearly twenty years ago in the article by Raniero Panzieri printed below.

Born in Italy in 1921, Panzieri's adult life (tragically cut short by his sudden and unexpected death in 1964, at the age of forty-three) was that of a theoretical and practical Marxist militant.[3] His formal affiliation was to

1 K. Marx, *Capital*, I, Harmondsworth 1976, p.645.
2 Ibid, pp.941ff.
3 In the absence of any secondary literature in English, I am indebted for much of the following information to John

the Socialist Party (PSI), of which he became a Central Committee member and Spokesman on Cultural Affairs in the 1950s. However, Panzieri broke with the strategy, common to the PSI, PCI (Communist Party) and left-wing Trade Unions, of a corporate alliance aimed at 'developing' Italy through a 'planned' consolidation at national level of the 'rationality' that capitalism established at plant level.[4] To ground his rejection of this strategy theoretically, Panzieri turned in earnest to Marx. On the one hand, Panzieri made his own contribution to extending the Italian corpus of Marxian texts, himself translating Volume Two of *Capital* (which proved central to his understanding of capitalism); on the other hand, he supplemented the primary texts with a series of theoretical elaborations, at first in the PSI journal *Mondo Operaio*, and subsequently, when these articles created a tension with the PSI leadership that obliged him to leave Rome for Turin, in the epoch-making *Quaderni Rossi*, of which Panzieri was co-founder and chief editor.

Panzieri's most articulate, but far from definitive exposition of his attempt to grasp the laws of motion of capitalist society was published in *Quaderni Rossi* in 1964, the year of his death. Focusing on the labour movement's favourite categories, namely, 'anarchy' and 'planning', Panzieri's concern to undercut the dominant reformist version produced a dual thesis: first, at the

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Merrington, whose long-awaited edition of Italian Marxist texts (*Money and Proletarians*, to be published by Allison & Busby of London) will fill a serious gap in this regard. I am also indebted to Ed Emery of Red Notes, whose *Working Class Autonomy and the Crisis* (London 1979) assembles relevant documents of the theoretical and practical development from Panzieri's death to the present.

4 This strategy is propounded at length in *The Italian Road to Socialism : An Interview by Eric Hobsbawn with Giorgio Napolitano of the Italian Communist Party*, London 1977.

social level, capital is not simply 'anarchy', but *social capital*;[5] as such, capital was capable of *planning*, and while this in no sense negated the *contradictory* laws of capitalist accumulation, it should be abundantly clear that there was nothing inherently 'transitional' about 'planning' in the abstract. The complementary proposition of Panzieri's argument was that, just as at the *social* level capitalist *planning* remains *capitalist* planning, so too does capitalist planning at *plant* level. To the dominant Marxist view of productive forces as the autonomous moving-force of history, Panzieri counterposed the view that "*the relations of production are within the productive forces*."[6] And to the equally prevalent idea of the inherent 'rationality' of technology, Panzieri counterposed the "capitalist objectivity of the productive mechanism with respect to the workers".[7]

Fortunately, the article in question has been available in English for some time now, so there is no need for further details. However, the reader may well find the discussion of technology too condensed; this is because Panzieri had already, in the very first issue of *Quaderni Rossi* (1961), devoted an entire article to this question: it is this article which is printed below. Its significance in the present context is threefold: first, it establishes the basis on which machinery is theorized in *Capital*; second, it contrasts the latter with the orthodox Marxist perspective that Panzieri labels 'objectivism' (his term for 'technicism'); and third, it specifies the political dimension to the problem in terms of class consciousness, strategy and revolutionary transition.

5 See K. Marx, *Capital*, II, Harmondsworth 1978, pp.425ff, and III, Moscow 1971, passim but especially pp. 435ff. The significance of all this was later specified systematically in M. Tronti, "Social Capital", *Telos*, No. 17.

6 R. Panzieri, "Surplus value and planning", *The Labour Process & Class Strategies*, London 1976, p.12.

7 Ibid, p.9.

In the two decades since the article first appeared, Panzieri's pioneering work has been developed considerably, largely by others due to his early death. First in line came Mario Tronti, whose involvement with *Quaderni Rossi* led to the single most important book of the revolutionary Italian left of the 1960s, *Workers and Capital*.[8] Following Panzieri's view of the "capitalist objectivity of the productive mechanism with respect to the workers", Tronti argued that a revolutionary class consciousness presupposed "The Strategy Of the Refusal".[9] Since the factory was the place where living labour *reproduced* its subservience to dead labour, this "Refusal" crystallized in the "Struggle Against Labor",[10] according to which, "suppression of labor by the working class and the violent destruction of capital are one and the same."[11]

This apocalyptic vision was fundamental to the development of the Italian class struggle in the 1960s and 1970s,[12] even if Tronti himself beat a hasty retreat to the PCI that he had earlier abandoned. The Panzierian legacy was now taken over by the group called *Potere Operaio* (Workers' Power), which in 1973 dissolved itself into the diffuse 'area' of *Autonomia Operaia* (Workers' Autonomy). Instead of aiming to take over what was in fact an *adequate form of capital* both inside and outside the factory, the revolutionary movement now defined itself as a struggle *against* the 'capitalist objectivity' of 'civil society and the state' as a whole. The title of Toni Negri's *Capitalist Domination & Working Class*

8 M. Tronti, *Operai e capitale*, Turin 1966. An English edition of this text should be a political priority.
9 This chapter of Tronti's book is translated in *Working Class Autonomy and the Crisis*, pp. 7ff.
10 This chapter of Tronti's book is translated in *Radical America*, Vol. VI, No. 3, pp.22ff.
11 Ibid, p.25.
12 See *Working Class Autonomy and the Crisis*, pp.167ff.

Sabotage[13] effectively sums up the entire movement. If the 'Autonomists' thereby threatened the whole basis of the traditional labour movement's complicity in supporting the tottering Italian state, the latter was not slow to recognize this threat: since 7 April 1979, Negri and other 'Autonomists', including almost the entire Political Science Faculty of Padua University, have been in prison on charges ranging from 'subversive association' to 'armed insurrection'.[14]

By this stage, the "capitalist objectivity of the productive mechanism with respect to the workers", a formulation that presupposed a tremendous theoretical effort on Panzieri's part, had become axiomatic in 'autonomous' theory and practice. Furthermore, the prevarication that was still occasionally evident in Panzieri had been totally extinguished. But at a time when the theory and practice of the Italian class struggle are beginning to make some impact in the Anglo-Saxon world,[15] and, among other things, clearing the ground for a revolutionary critique of technology, a translation of Panzieri's seminal document is particularly opportune.

The Editor

13 Ibid, pp.93ff.
14 For details of the defence campaign, see ibid, pp.139ff.
15 See ibid, as well as the American journal *Zerowork*.

The Capitalist Use of Machinery: Marx Versus the 'Objectivists'

Raniero Panzieri

It is well known that, according to Marx, simple cooperation appears historically at the beginning of the capitalist mode of production's process of development. But this *simple shape* of cooperation is merely one *particular form* of the cooperation that is the *fundamental form* of capitalist production.[1] "The capitalist form presupposes from the outset the free wage-labourer who sells his labour-power to capital."[2] But the worker, as owner and seller of his labour-power, enters into relation with capital only as an *individual*; cooperation, the mutual relationship between workers,

> . . .only begins with the labour process, but by then they have ceased to belong to themselves. On entering the labour process they are incorporated into capital. As co-operators, as members of a working organism, they merely form a particular mode of existence of capital. Hence the productive power developed by the worker socially is the productive power of capital. The socially productive power of labour develops as a free gift to capital whenever the workers are placed under certain conditions, and it is capital which places them under these conditions. Because this power costs capital

1 K. Marx, *Capital*, I, Harmondsworth 1976, p. 454.
2 Ibid, p. 452.

> nothing, while on the other hand it is not developed by the worker until his labour itself belongs to capital, it appears as a power which capital possesses by its nature—a productive power inherent in capital.[3]

The capitalist productive process develops through its various historical phases as a process of development of the division of labour, and the basic site of this process is the factory:

> It is a result of the division of labour in manufacture that the worker is brought face to face with the intellectual potentialities of the material process of production as the property of another and as a power which rules over him. This process of separation starts in simple co-operation, where the capitalist represents to the individual workers the unity and the will of the whole body of social labour. It is developed in manufacture, which mutilates the worker, turning him into a fragment of himself. It is completed in large-scale industry, which makes science a potentiality for production which is distinct from labour and presses it into the service of capital.[4]

The development of technology takes place wholly within this capitalistic process. Although labour is parcellized, manufacture is still based on handicraft skill, and "since the mechanism of manufacture as a whole possesses no objective framework which would be independent of the workers themselves, capital is constantly compelled to wrestle with the insubordination of

3 Ibid, p. 451.
4 Ibid, p. 482.

the workers." Manufacture thus has a "narrow technical basis" which comes "into contradiction with requirements of production" which it has *itself created*.[5]

The introduction of machinery on a vast scale marks the transition from manufacture to large-scale industry. This transition means that "on the one hand, the technical reason for the lifelong attachment of the worker to a partial function is swept away", and "on the other hand, the barriers placed in the way of the domination of capital by this same regulating principle now also fall."[6] The technology incorporated in the capitalist system at once *destroys* the old system of division of labour and *consolidates* it *systematically*, "in a more hideous form", as a means of exploiting labour-power:

> The lifelong speciality of handling the same tool now becomes the lifelong speciality of serving the same machine . . . In this way, not only are the expenses necessary for his reproduction considerably lessened, but at the same time his helpless dependence upon the factory as a whole, and therefore upon the capitalist, is rendered complete.[7]

Technological progress itself thus appears as a mode of existence of capital, as *its* development:

> Even the lightening of the labour becomes an instrument of torture, since the machine does not free the worker from the work, but rather deprives the work itself of all content. Every kind of capitalist production, in so far as it is not only a labour process but also capital's process of valorization,

5 Ibid, p. 489f.
6 Ibid, p. 491.
7 Ibid, p. 547.

> has this in common, that it is not the worker who employs the conditions of his work, but rather the reverse, the conditions of work employ the worker. However, it is only with the coming of machinery that this inversion first aquires a technical and palpable reality. Owing to its conversion into an automaton, the instrument of labour confronts the worker during the labour process in the shape of capital, dead labour, which dominates and soaks up living labour-power.[8]

The automatic factory *potentially* establishes the domination of the associated producers over the labour process. But in the capitalist use of machinery, in the modern factory, "the automaton itself is the subject, and the workers are merely conscious organs, co-ordinated with the unconscious organs of the automaton, and together with the latter subordinated to the central moving force."[9]

It can thus be concluded, among other things: first, that the capitalist use of machinery is *not*, so to speak, a mere distortion of, or deviation from, some 'objective' development that is in itself rational, but that capital has *determined* technological development; second, that "the science, the gigantic natural forces, and the mass of social labour" are "embodied in the system of machinery, which, together with those three forces, constitutes the power of the 'master'."[10] Hence, vis-à-vis the 'voided' individual worker, technological development presents itself as a development of capitalism: *as capital*, and "because it is capital, the automatic mechanism is endowed, in the person of the capitalist, with consciousness and a will."[11] In the master's mind, "the machinery

8 Ibid, p. 548.
9 Ibid, p. 544f.
10 Ibid, p. 549.
11 Ibid, p. 526f.

and his monopoly of it are inseparably united."[12] The process of industrialization, as it achieves more and more advanced levels of techr ological progress, coincides with a continual growth of the capitalist's *authority*. As the means of production, counterposed to the worker, grow in volume, the necessity grows for the capitalist to exercise an absolute control. The capitalist's *plan* is the ideal shape in which "the interconnection between their various labours" confronts the wage-labourers, while it presents itself "in practice, as his authority, as the powerful will of a being outside them."[13] Hence, the development of capitalist planning is something closely related to that of the capitalist use of machines. To the development of cooperation, of the social labour process, there corresponds—under capitalist management—the development of the plan as *despotism*. In the factory, capital to an ever-increasing extent asserts its power "like a private legislator". Its despotism is its planning, a "capitalist caricature of the social regulation of the labour process".[14]

Technical and Organizational Transformations of Capitalism and Objectivist Interpretations Thereof

Marx's analysis of the division of labour, in the system of large-scale industry under capitalist management, offers a valid methodology for refuting the various 'objectivist' ideologies which are once again flourishing on the terrain of technological progress (especially in connection with the phase of automation). The *capitalist* development of technology, as it passes through the various stages of rationalization, involves more and

12 Ibid, p. 549.
13 Ibid, p. 450.
14 Ibid, p. 549f.

more sophisticated forms of integration, etc.—a continual growth of capitalist control. The basic factor in this process is the continual growth of constant capital with respect to variable capital. In contemporary capitalism, as is well known, capitalist planning expands enormously with the transition to monopolistic and oligopolistic forms, which involve the progressive extension of planning from the factory to the market, to the external social sphere.

There exists no 'objective', occult factor, inherent in the characteristics of technological development or planning in the capitalist society of today, which can guarantee the 'automatic' transformation or 'necessary' overthrow of existing relations. The new 'technical bases' progressively attained in production provide capitalism with new possibilities for the *consolidation* of its power. This does not mean, of course, that the possibilities for overthrowing the system do not increase at the same time. But these possibilities coincide with the wholly subversive character which working-class 'insubordination' tends to assume in face of the increasingly independent 'objective framework' of the capitalist mechanism.

Obviously, therefore, the most interesting aspects of the 'objectivist', 'economistic' ideologies have to do with the problems of technological development and factory organization. We are, of course, not referring here to late-capitalist (*neocapitalistiche*) ideologies, but to positions expressed within the working-class movement and its theoretical problematic. In opposition to the old ideological crystallizations in trade-union action, the process of renewal of the class trade union in recent years has above all been based on a recognition of the 'new realities' of contemporary capitalism. But the attention that has correctly been paid to the modifications accompanying the present technological and

economic phase is—in a whole series of positions and studies—distorted into a representation of those modifications in a 'pure', idealized form, stripped of all concrete connection with the general and determining (power) elements of capitalist organization.[15] Rationalization, with its extreme parcellization of labour, its 'voiding' of the worker's labour, is seen as a passing phase—a 'painful' but necessary transition to the stage which 'puts parcellized labours together again in a unitary sense'. It is ambiguously recognized that the declining use of living labour in production and the corresponding growth of constant capital are pushing in the direction of an uninterrupted continuity of the cycle, while "the bonds of internal and external interdependence increase: just as within a productive unit the individual job and the individual worker can only be seen as part of an organically integrated whole, so too on the outside each individual productive unit and its behaviour have stronger bonds of interdependence with the whole economic order."[16]

15 It is useful, in our view, to cite the initial documents of the trade-union 'turn', since it is on the basis of these that the debate continues to develop: *I lavoratori e il progresso tecnico* (Proceedings of the Conference on "Technical and Organizational Changes and Modifications of the Work Relationship in Italian Factories", held at the Antonio Gramsci Institute in Rome in June and July of 1956), and S. Leonardi, *Progresso tecnico e rapporti di lavoro*, Turin 1957. We take as our basic reference the work by Leonardi, which amplifies and develops the paper he presented to the Gramsci Institute Conference. For the most recent developments of the discussion, see the papers and contributions at the recent Congress on "Technological Progress and Italian Society", referred to below. See too Dino De Palma's survey in the present issue of *Quaderni Rossi*. In these notes, we are omitting any reference to the vast literature on the themes in question (whether late-capitalist or Marxist in inspiration) and intend to allude only to the debate in progress in our trade-union movement.

16 *Progresso tecnico e rapporti di lavoro*, p. 93; see also ibid, pp. 35, 46, and 55ff.

New characteristic features assumed by capitalist organization are thus mistaken for stages of development of an objective 'rationality'. Hence, for instance, the positive, 'rational' function of Methods-Time Measurement is stressed, in that "by studying times, the technician is obliged to study methods"![17] Again, it is quite forgotten that—in the great modern firm "with planned production achieved through continuous flow"—"the non-correspondence of a worker or group of workers with what is asked of them on the basis of the forecasts made in the firm's production plan"[18] has enormous disruptive potential. What is instead dwelt upon is the necessity ('rational', of course) of "the so-called 'moral' relationship between entrepreneurs and workers, which is both precondition and aim of so-called 'human relationships', precisely because only on this basis can collaboration be established". Thus, "integrated production must be matched by an integration of the worker within the firm, and this integration must be voluntary, since no constriction or discipline can obtain of men the surrender of their freedom, for example, to produce a little less one day and a little more another day", etc., etc.[19] Thus, "the reason why this ['human relationships'—R.P.] movement may peter out is that the valid part of its ideas can be absorbed"—though, of course, the unions must intervene "to destroy harmful forms of 'company-ism' closely bound up with such 'human relations' "![20] Thus, the *substance* of the integration processes is accepted: they are seen as having an intrinsic necessity that flows inevitably from the character of 'modern'

17 Ibid, p. 48.
18 Ibid, p. 50. "The mere lateness or absence of a single worker, or even just a drop in his production, can be reflected through an entire line of machines", etc. (Ibid, pp. 50ff).
19 Ibid, p. 50f.
20 Ibid, p. 52.

production. One is merely reminded that certain 'distortions' which capitalist use injects into these procedures must be corrected. Even the 'functional' organization of production is viewed in this framework merely in its technologically 'sublimated' form, as an actual leap beyond the hierarchization characteristic of the preceding phases of mechanization. It is not even suspected that capitalism might use the new 'technical bases' offered by the passage from the preceding stages to that of high mechanization (and to automation) in order to perpetuate and consolidate the *authoritarian* structure of factory organization: indeed, the entire process of industrialization is represented as being dominated by the 'technological' fatality which leads to the liberation of man from the 'limitations imposed on him by the environment and by his physical capabilities'. 'Administrative rationalization' and the enormous growth of 'outward organizational' functions are alike viewed in a 'technical' or 'pure' form. The relationship between these developments and the processes and contradictions of contemporary capitalism (its quest for ever more complex means to accomplish and impose *its* planning), or the concrete historical reality in which the working-class movement finds itself living and fighting (the daily 'capitalist use' of machinery and organization)—these are ignored in favour of a technologico-idyllic image.

An 'objective' view of the new technological-organizational forms gives rise to particularly serious distortions of the nature of employment in the modern factory. There is a tendency to perceive a disappearance of parcellized functions and establishment of new tasks of a unitary character, allegedly involving responsibility, decision-making and a multiplicity of technical skills.[21] The development of techniques and functions connected

21 Ibid, p. 55f.

with management is isolated from the concrete social context in which it occurs, i.e. from the growing centralization of capitalist power, and hence viewed as the basis for new categories of workers (technicians, 'productive intellectuals') who will 'naturally'—as a direct reflection of their new professional qualities—bring a solution to contradictions "between the characteristics and requirements of the productive forces and the relations of production".[22] The clash between productive forces and relations of production here appears as a technical 'non-correspondence': for example, "in choosing the best combination of specific factors of production (something which can now be achieved with ever more objectively valid methods)", the 'new-type' workers are often "constrained to set aside the objectively most valid solutions, in order to respect limits imposed by personal interests".[23] And it is certain, from this point of view, that "the hammer and sickle . . . can only be a symbol of human labour today from an ideal point of view"![24]

All this, of course, has a direct impact on how the working-class struggle is conceived, on the way in which the actual protagonists of this struggle see it. The reality of today's struggles shows the various 'levels' of workers created by the present organization of the large factory tending to converge on *self-mangement* demands. This, it goes without saying, is a process which takes place on the basis of objective factors, represented precisely by the various ways in which workers are 'situated' in the productive process, the various types of relation to

22 Ibid, p.82f. On the 'total alienation' of the 'productive intellectuals', however, see Pino Tagliazucchi's observations, really perceptive and to the point, in "Aspetti della condizione impiegatizia nell'industria moderna", *Sindacato Moderno*, February-March 1961, pp. 53ff.

23 *Progresso tecnico e rapporti di lavoro*, p. 81f.

24 Ibid, p. 67.

production and organization, etc., etc. But the specific element of the process of 'unitary recomposition' cannot be grasped if the connection between the 'technological' and politico-organizational (power) elements in the capitalist productive process is either missed or else denied. The *class* level expresses itself not as progress, but as rupture; not as 'revelation' of the occult rationality inherent in the modern productive process, but as the construction of a radically new rationality counterposed to the rationality practised by capitalism. What characterizes the processes whereby workers in large factories (like those studied in this issue of *Quaderni Rossi*) acquire class consciousness today is "not just the primary demand for expansion of the personality in work, but a structurally motivated demand to wield political and economic power in the firm and through it in society".[25] Hence, the aforementioned factors that 'objectively' characterize the various strata of workers in the productive process certainly do have some significance in forming a 'collective' awareness, on the workers' part, of what the factors of production imply politically. But these factors relate to the formation of a unitary, disruptive force tending to invest every aspect of the capitalist factory's present-day technological-organizational-proprietorial reality.

Integration and Equilibrium of the System

It is obvious that simply to ratify rationalization processes (taken as the totality of productive techniques evolved within the framework of capitalism) is to forget that it is precisely capitalist 'despotism' which takes the form of technological rationality. In capitalist usage,

25 R. Alquati, "Documenti sulla lotta di classe alla Fiat", *Quaderni Rossi*, No. 1.

not just machines, but also 'methods', organizational techniques, etc., are incorporated into capital and confront the workers as capital: as an extraneous 'rationality'. Capitalist 'planning' presupposes the planning of living labour, and the more it strives to present itself as a closed and perfectly rational system of rules, the more it is abstract and partial, ready to be utilized solely in a hierarchical type of organization. Not 'rationality', but *control*, not technical programming, but a plan for power of the associated producers, can ensure an adequate relation to the global techno-economic processes.

In fact, in the framework of a 'technical', pseudo-scientific study of the new problems and contradictions which arise in the present-day capitalist firm, it is possible to find ever more 'advanced' solutions to the new instabilities without touching the substance of alienation, indeed while guaranteeing maintenance of the system's stability. In fact, the sociological and organizational ideologies of contemporary capitalism reveal various phases—from Taylorism to Fordism and finally to the development of techniques of integration, human engineering, human relations, regulation of communications, etc.[26]—precisely in a more and more complex and sophisticated attempt to adapt the planning of living labour to the stages progressively attained, through the continuous growth of constant capital, by the requirements of productive planning.[27] In this context, it is evident that techniques of 'information'—

26 See N. Mitrani, "Ambiguité de la technocratie", *Cahiers Internationaux de Sociologie*, Vol. XXX, p. 111.

27 Franco Momigliano has correctly pointed out that "the modern factory does not just exclude the workers more and more from any conscious participation in the actual process of drawing up a rational production plan, in the global productive process; it also requires the workers, subordinated to the new rationality, to personify simultaneously the 'anti-rational' moment, that corresponds to the old empirical philosophy of 'muddling

designed to neutralize the working-class protest that arises immediately from the 'total' character which the processes of alienation assume in the large rationalized factory—tend to take on greater and greater importance. Naturally, concrete analysis finds itself confronted by situations that may be profoundly different one from another, from this point of view, depending upon a considerable quantity of specific factors (disparities in technological development, differing subjective approaches in capitalist management, etc., etc.). But the point we want to emphasize here is that in the use of 'informational' techniques, as a manipulation of working-class attitudes, capitalism has incalculably vast margins for 'concession' (or, rather, 'stabilization'). It is impossible to define the limit beyond which 'information' concerning the overall productive processes ceases to be a factor of stabilization for the power of capital. What is certain is that information techniques tend, in the more complex situation of the contemporary capitalist enterprise, to restore that 'charm' (satisfaction) of work of which the *Communist Manifesto* already spoke.[28]

The extension of information techniques and their field of application, like the extension of the sphere of technical decisions,[29] fits perfectly into the capitalist 'caricature' of a social regulation of production. It is,

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through'. In this way, working-class resistance itself—paradoxically—is rationally exploited." (F. Momigliano, "Il sindacato nella fabbrica moderna", *Passato e Presente*, No. 15, p. 20f.)

28 "Owing to the extensive use of machinery and to the division of labour, the work of the proletarians has lost all individual character, and, consequently, all charm for the workman. He becomes an appendage of the machine." (K. Marx and F. Engels, "Manifesto of the Communist Party", K. Marx, *The Revolutions of 1848*, Harmondsworth 1973, p. 74.)

29 On the ways in which a more rational capitalist administration requires 'democratic' participation by the workers, see the very important book by S. Melman, *Decision-Making and Productivity*, Oxford 1958.

therefore, necessary to stress that 'productive awareness' does not bring about an overthrow of the system; that participation of the workers in capitalism's 'functional plan', in itself, is a factor of integration—of alienation, so to speak—at the furthest margins of the system. But what is true is that this development of late capitalism's 'stabilizing factors' represents a condition which, so far as working-class action is concerned, makes the total overthrow of the capitalist order immediately necessary. The working-class struggle thus presents itself as the necessity of global opposition to the capitalist plan, where the fundamental factor is awareness—let us call it dialectical awareness—of the unity of the 'technical' and 'despotic' moments in the present organization of production. The relationship of revolutionary action to technological 'rationality' is to 'comprehend' it, but not in order to acknowledge and exalt it, rather in order to subject it to a new use: to the socialist use of machines.[30]

Wages and Political Enslavement

With the modern organization of production, 'in theory' the possibilities for the working class to control and direct production increase, but 'in practice'—through

30 The most recent developments of economic and technical research in the Soviet Union present an ambiguous character: the call for autonomy of research does undoubtedly represent a break with the cruder, Stalinist-type voluntarism in planning; however, the development of 'rational' processes, independently of the social control of production, seems rather to represent (to what extent already today, and to what extent as a future possibility?) the precondition and basis for new developments of the old processes of bureaucratization. But it is important not to lose sight of the distinctive feature of Soviet planning compared with the capitalist plan: the authoritative, despotic element of productive organization *arises* within capitalist relations, *survives* in planned economies of a bureaucratic type. The

the ever more rigid centralization of power decisions—alienation is intensified. Consequently, the working-class struggle, *any* working class struggle, tends to propose a *political* rupture of the system. And the agent of this rupture is not the conflict between the 'rational' demands implicit in the new techniques and the capitalist utilization of them, but the opposition of a working-class collectivity which calls for productive processes to be subordinated to social forces. There is no continuity to be asserted, across the revolutionary leap, in the order of techno-economic development: working-class action calls into question the very foundations of the system, and all its repercussions and aspects, at every level.

Obviously, technological progress is deeply engrained in the capitalist process: Engels spoke of "discoveries and inventions which supersede each other at an ever-increasing rate", and of a "productivity of human labour which rises day by day to an extent previously unheard of".[31] But while Engels deduced from this process "the

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bureaucracies, in their relation to the working class, cannot appeal solely to objective rationality; they have to appeal to the working class itself. The demise of the basic element, the element of ownership, deprives the bureaucratic organization of its own basis, so to speak. Hence, in the USSR and the People's Democracies, the contradictions manifest themselves differently, and despotism presents a precarious rather than an organic character. This does not, of course, mean that its manifestations may not assume forms just as crude as those of capitalist society; see Rodolfo Morandi's seminal observations in "Analisi dell'economia regolata" (1942) and "Criteri organizzativi dell'economia collettiva" (1944), rptd in *Lotta di Popolo*, Turin 1958. The exclusion of the ownership element, and the simple study of the authoritarian-bureaucratic element or of technical alienation (or both), are, as everyone knows, at the centre of a by now boundless neo-capitalist and neo-reformist ideological literature; one of our *Quaderni Rossi* will be devoted to the analysis of these ideologies.

31 See F. Engels, Introduction to Marx's "Wage Labour and Capital", K. Marx and F. Engels, *Selected Works In One Volume*, London 1970, p. 70.

division of society into a small, excessively rich class and a large, propertyless class of wage-workers", Marx foresaw an increase not just of the nominal but also of the real wage: "if the income of the worker increases with the rapid growth of capital, the social gulf that separates the worker from the capitalist increases at the same time, and the power of capital over labour, the dependence of labour on capital, likewise increases at the same rate." Hence, the more the growth of capital is rapid, the more the *material* situation of the working-class improves. And the more the wage is linked to the growth of capital, the more direct becomes labour's dependence upon capital.

> The more rapidly the working class increases the power that is hostile to it, the wealth that does not belong to it and that rules over it, the more favourable will be the conditions under which it is allowed to labour anew at increasing bourgeois wealth, at enlarging the power of capital, content with forging for itself the golden chains by which the bourgeoisie drags it in its train.[32]

Moreover, Engels himself was to acknowledge (in his *Critique of the Erfurt Programme)* that "the system of wage labour is consequently a system of slavery, increasing in severity commensurately with the development of the social productive forces of labour, *irrespective of whether the worker is then better or worse paid*" [our emphasis—R.P.].[33] Lenin stressed this aspect

32 K. Marx, "Wage Labour and Capital", ibid, p.87.

33 [The Engels text referred to is "A Critique of the Draft Social-Democratic Programme of 1891", to be found in K. Marx and F. Engels, *Selected Works in Three Volumes*, III, Moscow 1977, pp. 429ff. However, the passage Panzieri quotes is not in fact by Engels, but is taken from Marx's "Critique of the Gotha Programme"; see K. Marx, *The First International and After*, Harmondsworth 1974, p. 352.—*Trans.*]

of Marxism: "Marx's theory, which recognised that the more rapid the growth of wealth, the fuller the development of the productive forces of labour and its socialization, and *the better the position of the worker,* or as much better as it can be under the present system of social economy, took over this view of accumulation from the classical economists."[34]

The progressive widening of the *social gulf* between workers and capitalists was also expressed by Marx in the form of the—declining—*relative wage*. But it is obvious that this concept implies the element of political consciousness, precisely the awareness that to the improvement of material conditions, the growth of nominal and real wages, there corresponds an intensification of *political dependence*. The so-called inevitability of the transition to socialism is not on the plane of the material conflict; rather—precisely upon the basis of the *economic* development of capitalism—it is related to the 'intolerability' of the social rift and can manifest itself only as the acquisition of political consciousness. But for this very reason, working-class overthrow of the system is a negation of the entire organization in which capitalist development is expressed—and first and foremost of technology insofar as it is linked to productivity.

The rupture, the superseding of the wage/productivity mechanism, thus cannot be posed as a 'general' demand for increased wage levels. It is obvious that action tending to supersede wage inequalities constitutes an *aspect* of the superseding of that relationship; of itself, it does not in any way guarantee a rupture of the system, but merely 'chains of brighter gold' for the entire working class. Only by attacking the alienation processes at their roots, and isolating the growing *political dependence* upon capital, is it possible to give shape to a

34 V. I. Lenin, "A Characterisation of Economic Romanticism", *Collected Works*, II, Moscow 1963, p. 148.

truly general class action.[35] In other words, the subversive strength of the working class, its revolutionary capacity, appears (potentially) strongest precisely at capitalism's 'development points', where the crushing preponderance of constant capital over living labour, together with the rationality embodied in the former, immediately faces the working class with the question of its political enslavement. Moreover, the growing dependence of the overall 'external' social processes upon the capitalist plan, as this first manifests itself at the enterprise level, is so to speak in the elementary logic of capitalist development. It is well known that Marx more than once emphasized such an ever-widening proliferation of the roots of capitalist power: ultimately, the division of labour in the factory tends to coincide with the *social* division of labour—which, of course, should not be viewed in a crudely economistic manner.

Consumption and Free Time

'Objectivism' accepts capitalist 'rationality' at enterprise level and downplays the struggle within structures and development points; but it tends to stress the value of action in the external sphere of wages and consumption. The consequences of this (with the quest for a 'dialectic' at a higher level, within the framework of the system, between capital and labour) are an over-rating of action at the state level, a distinction/separation between the trade-union and political movements, etc., etc. Thus, even in the most serious and 'up-to-date' discussion (which in Italy today takes place above all within the ambit of the class trade unions), one ends up finding a simple confirmation, in more critical and modern forms,

35 See the current debate in *Politica ed Economia*, with articles by Garavini, Tato, Napoleoni, etc.

of the old 'democratic' conceptions of the working-class struggle. All the toil of research, all the adapting of trade-union action to the modes of development of capitalism, risk debouching into a mere ratification of old positions, enriched by a new content, but in a mystified form. In this way, "the autonomous action of the broad masses comes to be defined only in the wake of decisions by the bosses, never in advance of them."[36]

While the processes intrinsic to capitalist accumulation become ever more globally determinant both 'internally' and 'externally' (at the level of the firm and at the level of society in general), the various positions which are springing up anew from the Keynesian matrix (even within the working-class movement) represent genuine ideologies, a reflection of late-capitalist developments. Marx's warning is still—indeed more than ever—valid against them: "the sphere of circulation

36 R. Spesso, "Il potere contrattuale dei lavoratori e la 'razionalizzazione' del monopolio", *Politica ed Economia*, November 1960, p. 10. The positions expressed by Momigliano merit special consideration; he correctly recalls that consideration of the "instruments for organization and rationalization of the modern world" must constitute, for the trade union, a precondition "for discovering the conditions for an effective competition and a hegemonic capacity of the working class". ("Il sindacato nella fabbrica moderna", pp. 20ff.) And on several occasions he has insisted on the need for the working class, by this means, to reconquer a true and compete autonomy vis-à-vis capital. But it is hard to understand how he can reconcile these theses and demands with his ratification of the 'specific institutional terrain' of the trade union, which leads him to refuse to recognize that trade-union action itself has the character of an increasing disruptive tension with respect to the system: see F. Momigliano, "Struttura delle retribuzioni e funzioni del Sindacato", *Problemi del Socialismo*, June 1961, p. 633; see too, by the same Momigliano, "Una tematica sindacale moderna", *Passato e Presente*, No. 13, and his report to the Congress on "Technological Progress and Italian Society" (Milan, June 1960), on the theme of "Workers and Trade Unions Face to Face with Transformations of the Productive Process in Italian Industry".

or commodity exchange, within whose boundaries the sale and purchase of labour-power goes on, is in fact a very Eden of the innate rights of man."[37] Not for nothing is 'healthy' consumption, which the working class should propose, counterposed to the consumption 'imposed' by capitalism; and not for nothing is a general increase of wages, i.e. the ratification of capitalist slavery, presented as an 'appeal' from the worker as a 'human being', who (within the system!) calls for the recognition and assertion of his 'dignity'.[38] Even the invocation of 'essential needs' (culture, health) as against the spectrum of consumption imposed by capitalism (or late capitalism) makes no sense, as Spesso has correctly pointed out, without a refusal of capitalist rationalization and a working-class demand for control and self-management in the sphere of production.[39]

It is significant that 'revisionist' positions should refer to, and distort, Marx's conception of free time, its relation to the working day, and its place in the perspective of a

37 *Capital*, I, p. 280.

38 See A. Tato, "Ordinare la struttura della retribuzione secondo la logica e i fini del sindacato", *Politica ed Economia*, February-March 1961, pp. 11ff. The growing immediate social incidence of the sphere of production is, of course, stressed in all Marxist research. Like other authors, Paul Sweezy gave a demonstration of this that is still in many ways valid today: see P. Sweezy, *The Theory of Capitalist Development*, 1942, rptd New York 1968, in particular pp. 239ff and 270ff. Sweezy recalls (p. 249) the following passage from Rosa Luxemburg's *Reform or Revolution*: " 'Social control' . . . far from being . . . a reduction of capitalist ownership . . . is, on the contrary, a protection of such ownership. Or, expressed from the economic viewpoint, it is not a threat to capitalist exploitation, but simply the regulation of this exploitation." (*Rosa Luxemburg Speaks*, New York 1970, p. 53.) For the English laws on the limitation of working hours, see *Capital*, I, pp. 389ff.

39 "To wish for . . . increased cultural consumption has no sense if one cannot consider it feasible for the individual to utilize this culture precisely in his creative activity, in other words *par excellence* in the labour process . . . An individual's consumption

communist society. There is a tendency, in other words, on the basis of an 'economistic' interpretation, to identify communist freedom in Marx's thought with the expansion of free time, on the basis of more and more 'objective', rationalized planning of the production processes.[40] In fact, for Marx, free time for the free mental and social activity of individuals by no means simply coincides with the reduction of the 'working day'. It presupposes a radical transformation of the conditions of human labour, the abolition of wage labour and the "social regulation of the labour process". In other words, it presupposes the total overthrow of the capitalist relationship between despotism and rationality, for the formation of a society administered by free producers, in which—with the abolition of production for the sake of production—planned development, the plan itself, rationality and technology would be subjected to the permanent control of social forces, and work would thus (and only thus) be capable of becoming man's 'vital need'. Overcoming the division of labour, as a goal of the social process and the class struggle, does not mean a leap into 'the realm of free time', but the achievement of a dominance of social forces over the sphere of production.

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is itself wholly conditioned by his position in productive activity . . . His 'essential needs' (culture, health) arise, become defined, are asserted in the refusal of 'work rules', in the acquisition of a *working-class* consciousness of the meaning and role of work." ("Il potere contrattuale del lavoratori e la 'razionalizzazione' del monopolio", p. 9f.) The representation of alienation under late capitalism as alienation of the consumer is at once one of the most ridiculous and one of the most widespread of present-day ideologies.

40 See P. Cardan, *The meaning of socialism*, Solidarity Pamphlet No. 6; it should, however, be made clear that Cardan alludes to this kind of interpretation in order to express a revolutionary point in polemical opposition to Marxism. [Paul Cardan is the pseudonym of Cornelius Castoriadis, whose work is discussed at some length in the general Introduction to the present volume.—*Ed.*]

The 'complete development' of man and of his physical and intellectual capabilities (which so many 'humanist' critics of 'industrial society' like to invoke) appears as a mystification if it is represented as an 'enjoyment of free time', as an abstract 'versatility', etc., independently of man's relation to the process of production and the worker's reappropriation of the product and of the content of work in a society of free associated producers.[41]

Workers' Control in a Revolutionary Perspective

The 'new' working-class demands which characterize trade-union struggles (studied in the present issue of *Quaderni Rossi*) do not directly furnish a revolutionary political content, nor do they imply an automatic development in that direction. Nevertheless, their significance cannot be limited, either, to their value as an 'adaptation' to modern technological and organizational processes in the modern factory—precondition for a 'systematization' of work relations in general at a

41 The representation of communist society as a society of 'abundance' of goods (even if not purely material ones) and of 'free time' is widespread in Soviet ideology, and is obviously the result of denying any effective social regulation of the labour process. 'Technological' illusions intervene today to sustain such ideology; for example, in R. Strumilin (*On the Road to Communism*, Moscow 1959), 'directing functions in the processes of production' are identified with 'technical' control, with the 'higher intellectual content' of work made possible by the "development of technology with its miraculous automatic mechanisms and electronic machines that 'think' ". Thus, automation will make it possible to achieve a really 'affluent' society of consumers of 'free time'; see above, note 30! As an example of typical deformation of Marx's texts on this point, see G. Friedmann, *Industrial Society*, New York 1955, where the worker's reappropriation of the product and of the content of work itself is identified with 'psychic-physiological control of work'!

higher level. They contain *development pointers* relating to the working-class struggle as a whole and to its political value. Such pointers, however, do not simply spring from noting or adding together such demands, however different and more 'advanced' they may seem compared with traditional objectives. Contracts governing the tempo and rhythm of work, the work-force, the relationship between wages and productivity, etc. will obviously tend to oppose capital within the accumulation mechanism itself and at the level of its 'stabilizing factors'. The fact that such contracts are extended *pari passu* with the struggle of working-class nuclei in the strongest and most highly developed firms is a confirmation of their vanguard, subversive nature. The attempt to utilize them for the purposes of a general struggle that is purely concerned with wages is only illusorily to seek a new and vaster unity of class action. On this path, what would be achieved in practice would be precisely what the aim allegedly is to avoid, i.e. a retreat to situations of enclosure within the firm, an inevitable consequence of neglecting the potential elements of political struggle. The tendential line that can be identified objectively as a valid hypothesis/guide lies in the strengthening and expansion of self-management demands. Since self-management demands are not posed merely as demands for 'cognitive' participation, but affect the concrete relationship rationalization/hierarchy/power, they do not remain closed within the ambit of the firm. Instead, they are precisely directed against the 'despotism' which capital projects and exercises over society as a whole, at all levels, and they are expressed as the need for a total overthrow of the system, by means of a global *prise de conscience* and a general struggle of the working class as such.

We consider that, practically and immediately, this

line can be expressed in the demand for workers' control. However, some clarifications are necessary here. The slogan of workers' control may be judged today to be ambiguous, assimilable to a 'centrist' approach that attenuates the revolutionary demands thrown up in struggle, or conciliates them with the traditional national-parliamentary-democratic line. And it is true that there do exist hints of a utilization of the slogan in this sense. For instance, the reference to workers' control is voluntaristic and ambiguous when what is meant by it is the continuation or revival of the theory and practice of the *Consigli di Gestione* (Management Councils).[42] In the *Consigli di Gestione* movement, an authentic demand for workers' control was subordinated, to the point of annihilation, to the 'collaborationist' element linked with the ideologies of national reconstruction, and to an approach that instrumentalized the real movement for the purposes of an institutional-electoral plan. The same ambiguity can be discerned when a workers' control line is proposed as an 'acceptable' alternative, as a 'corrective' to the 'extremism' of a perspective of full workers' self-management. Now, it is obvious that a non-mystified formulation of workers' control makes sense only in relation to an objective of revolutionary rupture and a perspective of socialist self-management. In this framework, workers' control expresses the need to bridge the chasm which exists

42 [The *Consigli di Gestione* were established to run factories during the last months of the War, as the Resistance spread especially in northern Italy. Recognized by all the anti-fascist parties in the Decree of 25 April 1945, they were for the most part clearly organs of class collaboration, and were seen as such by the main working-class parties. The movement reached its high point when a national congress was held in November 1947, and was briefly swayed to the left by a turn on the part of the Communist Party. After this, it went into sharp decline.—*Trans.*]

today between even the most advanced working-class demands at the trade-union level and the strategic perspective. It thus represents, or rather can repesent, in a non-mystified version, a political line that is a direct alternative to those currently being put forward by the working-class parties.

Obviously, the line of workers' control is proposed here as a factor which can accelerate the time-scale of the overall class struggle, a political instrument for the achievement of a 'shortened' time-scale for revolutionary fractures. Far from it being possible to present it as a 'surrogate' for the conquest of political power, workers' control would thus constitute a phase of *maximum* pressure on capitalist power (as a threat explicitly directed at the roots of the system). Hence, workers' control must be seen as a preparation for situations of 'dual power', in connection with a total political conquest of power. There is no point in insisting on the reasons for putting forward workers' control here and now as a general political proposal. What is really important is that a polemic against slogans should not serve as an alibi for evading the general political problems imposed by the workers' struggles; and that concretely one should strive to reconstruct, on the basis of these struggles, a new political perspective that guarantees against a 'trade-unionistic' degeneration of working-class activity and its reabsorption into capitalist development.

Translated by Quintin Hoare

Introduction to Kapferer

If "it is not the consciousness of men that determines their existence, but their social existence that determines their consciousness",[1] then a crucial aspect of the critique of technology is the ability to identify the historical materialist origin, logic and dynamic of techno-scientific thought and practice. This task has been taken up by Alfred Sohn-Rethel, whose recently published *Intellectual and Manual Labour* is the result of nearly half a century's hard work.[2] Born in Germany in 1899, Sohn-Rethel dedicated his life, though with frequent interruptions, to the theoretical task of demonstrating the logical and socio-historical affinity between the commodity-form analysed by Marx and the thought-forms analysed by Kant in his *Critique of Pure Reason*.

Immanuel Kant (1724-1804) argued that while our knowledge *begins with* experience, it does not follow that all our knowledge *arises solely out of* experience. Rather, our minds are so structured that we experience the world through the 'forms' of space and time, and

1 K. Marx, *A Contribution to the Critique of Political Economy*, Moscow 1970, p. 21.

2 A. Sohn-Rethel, *Intellectual and Manual Labour*, London 1978. For a basic intellectual biography-cum-bibliography, see M. Reinfelder and P. Slater, "Intellectual and Manual Labour: An Introduction to Alfred Sohn-Rethel", *Capital and Class*, No. 6.

then work up the raw material of this experience into scientific knowledge of nature via the 'categories' of quantity, quality, relation and modality.[3] From Sohn-Rethel's historical materialist perspective, Kant is correct to argue that the mind imposes a formal structure on the objectively given world (insofar as the latter is transformed into the world as we know it), but wrong to locate this formal structure in the human species as such: if men's social existence determines their consciousness (a maxim frequently repeated by Sohn-Rethel), then *specific social relations of production* must involve *specific forms and categories of thought.*

In the absence of a demonstration of this principle, Marxism is marred by a 'schism of thought': "on the one hand, all phenomena contained in the world of consciousness, whether past, present or future, are understood historically as time-bound . . . On the other hand, questions of logic, mathematics and science are seen as ruled by timeless standards."[4] This is no mere philosophical quirk, but a fundamental problem for the very conception of revolutionary politics: "if . . . science and technology elude historical-materialist understanding, mankind might go, not the way of socialism, but that of technocracy."[5] It is within this context, therefore, that Sohn-Rethel poses the question: "Is modern technology class-neutral?"[6]

Unfortunately, although producing a string of expositions, each highlighting one specific aspect of his overall theory, Sohn-Rethel has not produced a monograph on the particular question of technology, and it is for this reason, initially, that his ideas on the subject are conveyed below in the form of a commentary by Norbert

3 See I. Kant, *Critique of Pure Reason*, London 1933, pp. 65ff.
4 *Intellectual and Manual Labour*, p. 2.
5 Ibid, p. 3.
6 Ibid, p. 1.

Kapferer. Born in Germany in 1948, Kapferer studied Political Science, Sociology and Philosophy at Berlin's Free University from 1971 to 1977. Since 1978, he has worked as a Teaching and Research Assistant in the latter's Institute for Philosophy and Social Sciences, where his interest in a critique of epistemology, science and technology has crystallized around Marx's critique of political economy. He has published several studies on the subject in German, and is at present working on the critical significance of the 'irrationalist' critique of science and technology (Georg Simmel, Martin Heidegger, Michel Foucault, etc.).

The present article was originally delivered as a paper to the symposium held in Bremen in February 1977 on the theme of "Commodity-Form and Thought-Form", a symposium devoted to the work of Sohn-Rethel. Kapferer's paper was published in 1978 as part of the transactions of the symposium as a whole, and it is from the latter that the following translation has been made. Its relevance in the present context is fourfold: first, it gives a short, but lucid exposition of Sohn-Rethel's basic theory; second, it reveals the affirmative attitude adopted by Sohn-Rethel towards modern flow production; third, it demonstrates that, far from being an aberration, this affirmation is implicit in Sohn-Rethel's initial formulation of his 'critique'; and fourth, it attempts to redress the balance by arguing that modern technology is not simply 'used', but *inherently structured* for "the real subsumption of labour under capital".[7]

By way of a postscript, it is only fair to point out that in the face of Kapferer's critique, Sohn-Rethel conceded he was "wrong to believe that one could transform the conveyor-belt societation of labour dominated by capital

7 See K. Marx, *Capital*, I, Harmondsworth 1976, pp. 645 and 1023ff.

into a societation freed from this domination and controlled at the social level by the producers themselves".[8] However, Sohn-Rethel's rider that this only applies to his pre-1975 writings must cast doubts on the depth of his recantation, since, as late as 1978, he is tempted to the view that plant economy à la Taylor "might harbour potentialities which could assume a vital significance if society were no longer subservient to capitalism".[9] And more importantly, Sohn-Rethel's 'dialectical' evaluation of Taylorism is unmistakable in the subtitle given to the entire third part of *Intellectual and Manual Labour*: namely, "The Dual Economics of Advanced Capitalism".[10]

But in any case, Sohn-Rethel resolutely refuses to concede that his prevarication on this score is the result of a fundamental flaw in his overall perspective; rather, he adamantly reasserts that "it is not the logic of capital that produces the technology of its instruments of production . . . The 'logic' of capital covers capital's relation to labour and labour-power, but does not extend to nature and the forces of nature. Failure to make this distinction has the far-reaching consequence of a machine-wrecking orgy of unimaginable proportions."[11] Obviously, the very words "machine-wrecking" are intended to strike such terror into the heart of the reader that they shall function as a taboo on such a line of

8 A. Sohn-Rethel, "Von der 'Apotheose des Taylorismus' zu seiner kritischen Liquidierung", H. Dombrowski et al. (eds), *Symposium Warenform-Denkform*, Frankfurt 1978, p. 66.

9 *Intellectual and Manual Labour*, p. 165.

10 Ibid, pp. 137ff. As a result of this intransigence, Sohn-Rethel has recently been subjected to a similar line of critique on the specific question of the 'scientificity' of flow production: see P. Taylor, "Labour Time, Work Measurement and the Commensuration of Labour", *Capital and Class*, No. 9.

11 A. Sohn-Rethel, *Anti-kritische Bemerkungen zu Kapferer und Anderen*, mimeo 1977, p. 9.

enquiry to begin with. Since, however, the critique of technology pursued by the present volume is precisely concerned with *breaking taboos*, Kapferer's article is reprinted below in the interest of inquiring as to the precise *political interest* served by that taboo.

The Editor

Commodity, Science and Technology: a Critique of Sohn-Rethel

Norbert Kapferer

Sohn-Rethel's works[1] have drawn attention to the need for a critique of natural science and its cognitive form, not only to uproot what he calls a 'timeless theory of truth', but because, in the absence of an insight into the nature of modern technology and its theoretical base (natural science), the construction of a socialist society is ruled out; in this regard, Sohn-Rethel also points a finger at the socialist countries, "where allegiance to technocracy is sworn in the name of 'dialectical materialism' "(1972 p.17). If the cognitive principles of natural science can be deciphered as the necessary false consciousness of a socio-historical formation based on a division into classes and dependent for its development on the social division of head and hand, then, according to Sohn-Rethel, an important theoretical step would have been taken in the direction of abolishing these divisions. Now, where does this critical epistemological point stand in relation to modern natural-scientific

1 A. Sohn-Rethel, *Warenform und Denkform*, Frankfurt 1971; *Geistige und körperliche Arbeit*, 2nd edn Frankfurt 1972; "Technische Intelligenz zwischen Kapitalismus und Sozialismus", R. Vahrenkamp (ed.), *Technologie und Kapital*, Frankfurt 1973. [Only the second title has appeared in English, but since this is not so much a translation as a new edition, Kapferer's references have been kept to the German original, against which they have been checked and corrected as necessary.—*Trans.*]

technology? Put another way, what consequences does Sohn-Rethel draw with regard to the intended transcendence of capitalist forms of production and societation (*Vergesellschaftung*)? The following remarks are restricted to a short sketch and critique of Sohn-Rethel's line of argument from his 'critique' of natural-scientific thought-forms to the glorification of Taylorism.

Sohn-Rethel's aim is a 'critical liquidation of apriorism' (1971 p.27), i.e. of a mode of cognition that first crystallized in ancient Greek philosophy and that reigns supreme in modern European science:

> What needs explaining is the theoretical phenomenon of the 'pure understanding', together with its objective validity for the perceptive reality of the things from which it abstracts. The objectivity of the pure understanding's conceptualisation is the epistemological crux of the mathematical sciences, and the standard against which to measure our proposed historical materialist solution of the problem. (1972 p.108)

The genesis of this mode of cognition, dating from Greek philosophy, must be specified in a historical materialist manner, so as to put an end to the process by which thought employs a set of apriori categories for which it can give no account whatever:

> Its possible sources are totally obscure, unless one shares traditional epistemology's faith in man's original and innate 'faculty of understanding'. This, at least in its modern European form, is precisely the phenomenon to which Kant's questions were addressed: How is pure mathematics possible? How is pure science of nature possible? How are synthetic judgments a priori possible? (1972 p.36)

For Kant, the categories and their respective forms of possible judgement (including mathematics) are 'pure' concepts of the 'synthetic unity of apperception', the latter combining the two sources of knowledge ('sensibility' and 'understanding') in a manner that is both *prior* to, and the *basis* of, all possible experience. This synthesis enables the natural manifold of things to be subsumed under categorial concepts; only thus can things become objects of experience to begin with. Consciousness, which, as *cogito* ('I think'), experiences the world of objects, is *present* in all empirical subjects, but not *exhausted* by them; otherwise, strictly scientific judgements would be impossible. Consciousness must therefore be 'pure' *cogito*, 'pure understanding', disregarding the 'empirical ego'. To Kant, this was a phenomenon beyond explanation: the categories of the 'pure synthesis' must be present in the human mind prior to all experience, since without them experience was not possible to begin with.[2]

Sohn-Rethel agrees with Kant to the extent of denying that these categories were extracted inductively (as empiricism presumed) in some cognitive struggle with nature; how could they be so extracted, when they have no *basis* in nature? For Sohn-Rethel, they come from a different practice, a historical one: they were the result of a commodity-producing society, whose cohesion was effected via exchange. The 'social synthesis' mediated through exchange relates to the above-mentioned 'pure synthesis' in that "the socially necessary thought-structures of an epoch stand in the most intimate formal relationship to the forms of that epoch's social synthesis." (1972 p.20) In all commodity-producing societies, it is money which constitutes the bearer of the 'social

2 See in particular the sections on the discovery and deduction of the pure concepts of the understanding: I. Kant, *Critique of Pure Reason*, London 1933, pp. 104ff.

synthesis', and in this capacity it requires formal features characterized by a high level of abstraction. These features are, according to Sohn-Rethel, the organizing principles of the cognitive functions of pure thought, functions that "constitute the conceptual basis of both ancient philosophy and modern natural science, and to which, for the sake of simplicity, we can give the label (current since Kant) of 'apriori categories' " (1972 p.21).

Now, what Sohn-Rethel criticizes in epistemology is that it views these abstractions solely as an activity of thought, and that it is consequently unable to establish how these thought-forms come about. Materialist thought, by contrast, inquires, according to Sohn-Rethel, into thought's determination by being. Abstractions exist *in* thought, but do not arise *out* of thought. In Sohn-Rethel's estimation, the thought-forms requisite to a 'pure contemplation of nature' arise out of an *act* that mediates the cohesion of society; this is the act of exchange. Inherent to commodity exchange is a force of abstraction that Sohn-Rethel terms the 'exchange-abstraction': exchange is an empirical event, but the 'non-use' of the commodity during exchange gives the latter a 'non-empirical', and thus abstract dimension. Sohn-Rethel terms this the 'homogeneity of abstraction' in commodity exchange and epistemology. (1972 p.49)

How, then, does this so-called 'real abstraction' penetrate consciousness? Answer: "thought is not struck by the exchange-abstraction directly, but only when confronted with its finished results, i.e. only after things have run their course." (1972 p.54) The exchange-abstraction is thus obliged to *manifest*, or rather *objectify*, itself before it can reach consciousness:

> The minted coin is the value-form become visible, for here we have a nature-given material formally

> stamped as being ordained not for use, but solely for exchanging and bearing values . . . The elements of the exchange-abstraction are reflected . . . in the consciousness of the possessors of money as pure concepts because they are pure form-abstractions (though rooted in social being). The popular and much abused talk of a 'reflection' of being in consciousness here loses its merely metaphorical significance and expresses the matter quite literally: namely, a formal identity, demonstrable a priori, of social being and consciousness. (1972 pp.95 and 99)

Sohn-Rethel depicts ancient Greece as the place where the social synthesis is first mediated via the process of exchanging products as commodities. The developed money-economy enabled the 'real abstraction' to become the dominant element of the thought-form, thus justifying us in "tracing the essential conceptual characteristics of Greek philosophy and mathematics, as well as the resultant sharp division of intellectual and manual labour, to this, its specific point of origin" (1972 p.142). These pure thought-forms arising from the exchange-nexus of the rulers are what Sohn-Rethel terms "pseudo-autonomous, alienated forms of consciousness founded on exploitation" (1971 p.13). Thus, "in the sphere of theoretical knowledge, the real world is standing squarely on its head, and real praxis necessarily confronts people as if from beyond the world itself." (1971 p.24)

Even in this condensed account, Sohn-Rethel's attempt to derive the genesis of both the pure understanding (synthetic unity of apperception) and the categories from the 'exchange-abstraction' certainly gives grounds for sufficient objections. It seems to me untenable, for example, to portray the ancient Greek

communities as synthesized through commodity exchange and dominated by exchange-value. Far more plausible would seem to be Marx's conclusion that 'value' was marginal to these communities, particularly in view of the fact that money itself only congealed in the interstices of society, rather than arising out of circulation proper.[3] As for actually deriving pure thought-forms from the commodity-form, Sohn-Rethel's attempt to deduce the abstract concept of motion in physics from the 'motion of commodities', or to deduce mathematical forms from the quantitative mental operations involved in the exchange act, strike one as downright helpless. Even a genetic conceptualization of the pure understanding's categories in terms of a reflection (in consciousness) of the exchange-abstraction congealed as money (i.e. a conceptualization along the lines of 'abstract thing compels abstract thought') remains a prisoner of the logic of the very reflection-theory and empiricism that Sohn-Rethel seemed to have overcome by recourse to Kant. Furthermore, Sohn-Rethel's insistence on a reflection-schema of coined money and abstract thought is incompatible with the

3 See K. Marx, *Grundrisse*, Harmondsworth 1973, p. 223. In contrast to Sohn-Rethel, Marx's analysis of the value-form concluded that even the exchange of equivalents presupposes a particular form of abstraction, namely an abstraction from the empirical individuality of commodities to a non-empirical general equality. In my estimation, Marx's account of the nature of this abstraction is much closer to the 'value abstaction' discussed here. Furthermore, once freed from the methodological concentration on *actions*, Sohn-Rethel's concept of 'real abstraction' regains in relevance with regard to Marx's conceptual designation of money as a "sensuously supra-sensuous thing" (*sinnlich übersinnliches Ding*). [K. Marx, *Das Kapital*, I (*MEW*, XXIII), Berlin 1972, p. 85. Inexplicably, this paradoxical formulation is suppressed in both current translations of *Capital*; see, however, the word-for-word translation in *Value: Studies by Karl Marx*, London 1976, p. 34.—*Ed.*]

indisputable fact that thought-forms characterized by an abstraction à la value-form were already developed in communities where money relations did not yet exist.

These, and a host of further objections which cannot be dealt with here, do not diminish Sohn-Rethel's fundamental achievement of displaying the affinity between, on the one hand, the categories of the transcendental subject (the pure thought-forms of European philosophy and especially natural science), and, on the other hand, the categories of value.[4] But the interesting question is what significance Sohn-Rethel attaches to his theory in terms of an assessment of natural science and technology. He started with the intention of demonstrating that the categorial forms of pure thought originated in a society based on class divisions, where knowledge of nature took the form of pure mental activity, managed by the ruling class independently of manual production and thus derived from sources other than those of manual labour. Insofar as this pure activity of thought abstracts from praxis, its truth is tested not practically, but logically; such is the origin of the timeless concept of truth. (1972 pp.36ff) The conceptual forms of exact natural scientific thought do not, therefore, originate at their point of application (which is the production process), but arise from the sphere of circulation. (1972 p.105) What are the consequences as regards the epistemological critique of natural-scientific thought? Sohn-Rethel's assessment is

4 In this connection, see Adorno's estimation of Sohn-Rethel's achievement: "not only is the pure ego mediated through the being of the empirical ego (the unmistakably pellucid model of the first version of the deduction of the pure concepts of the understanding); the transcendental principle itself, the supposed 'priority' of philosophy over being, is mediated though actual being too. Alfred Sohn-Rethel was the first to point out that hidden in this principle, in the general and necessary activity of mind, lies labour of an irreducibly social nature." (T. W. Adorno, *Negative Dialectics*, London 1973, p.177—modified.)

that "theoretical knowledge, i.e. knowledge based on intellectual labour, has a class nature, although this does not prejudice its objective validity, i.e. a validity unsullied by its class connections." (1972 p.109)

But what is the basis of this 'objective validity' of pure thought-forms? Sohn-Rethel continues:

> The contribution of the intellectual labourer is directly social labour. In proportion as it partakes of truth, the scientist's research is valid for all, and done on behalf of society as a whole. The unity of his thought, and the unity of the society mediated through the traffic of commodities, are one and the same. (1972 p.113)

But if the unity of this thought is created by the value-abstraction, one could well conclude from the foregoing that since the concept of 'objective validity' is based on Sohn-Rethel's very object of critique (namely, the 'pure understanding', that Kantian transcendental subject that subsumes the manifold of things under concepts knowing of no socio-historical limitation), then 'objective validity' is itself a fetishistic concept. But Sohn-Rethel disagrees: the abstract intellect produces *objectively valid* knowledge, albeit with false consciousness. (1972 p.120) For Sohn-Rethel, the sole flaw in pure abstract thought is its 'false consciousness', i.e. its 'conceptual blindness' to its own social existence and historical genesis. (1972 p.117) This 'abstract intellect' can only achieve 'correct consciousness' in a classless society, which means that the synthesis of society through *exchange* must be replaced by a synthesis through *production*, i.e. where intellectual and manual labour are united. (1972 p.123)

Sohn-Rethel elaborates as follows: the reunification of intellectual and manual labour already begins to

develop—at least potentially—within capitalist society, whose specific form of societation creates the preconditions for a 'modern society of production'. To be in a position to depict the 'dialectic' of this societation-process historically, Sohn-Rethel is obliged to postulate a 'formal independence' of *economic* development (formation of capital) and *technological* development (technique as a productive force). Since both follow their own separate course of development, they are destined, in contradistinction to Marx's perspective, to be followed up and depicted in systematic independence.

The historical point of departure is the social transformation arising out of the reactivation of money-economy and the resultant development of merchant and interest-bearing capital. The new economic conditions had a corrosive impact on the old organization of labour: the incumbent expansion of production could neither be achieved by *means* of, nor be measured by the *standards* of the personal unity of head and hand. (1972 p.149) In the 'economic' course of development, there appeared in the person of the capitalist a subject who assumed the role of producer, without, however, actually exercising a productive function himself. (1972 p.153) The capitalist's 'necessary false consciousness' consists in regarding the production process as self-activating. Thus, this consciousness arises not from the given production *technique*, but from the changed *relations* of production: "it is therefore not science, but 'ideology' . . . when, in the Sevententh Century, the cosmos and its parts . . . are conceived in terms of self-activating mechanisms." (1972 p.154)

This ideology, arising from the 'economic' course of development, and expressed in the philosophies of Descartes, Hobbes, and Gassendi, stands in marked contrast to the Galilean-Newtonian 'scientific' mode of

throught arising from the 'technological' course of development:

> Quantifying science arises through the process by which the personal unity of head and hand, unable to meet the demands upon the individual artisans, yields to a new relationship of intellectual and manual performance, as the necessary pre-condition for creating and mastering productive forces of social dimensions. (1972 p.158)

Thus, for Sohn-Rethel, it is simply a question of increased demand demonstrating the limitations inherent in labour founded on the personal unity of head and hand. This form of labour could only put across *practical* knowledge, either through demonstration or through everyday speech; by such means, "physical events cannot be separated into intellectual and manual labour. The only symbolic language that frees itself from human activity and the latter's actual performance (manual and otherwise) is mathematics." (1972 p.160f)

Mathematics enables a division of head and hand in relation to events within production. The possibility of pure intellectual labour in this sphere was given as soon as it was possible to construct physical events in terms of mathematizable concepts:

> The foundations of modern quantifying natural science were laid with the successful formulation of observable events in the conceptual forms of 'abstract nature' (forms of social abstraction from society), together with a corresponding understanding of the methodological significance of such formulations for nature in the concrete . . . The amazing feat had been performed of determining events in nature on the basis of sources other than

> handicraft's practical means of experience. (1972 p.162)

The knowledge of nature so acquired fulfils a social need "in the service of the real subsumption of labour under capital" (1972 p.163). Thereby, Sohn-Rethel includes the mathematical sciences among the preconditions of the capitalist mode of production, by virtue of the fact that these sciences permit a sharp division between intellectual and manual labour in the production process. It was precisely this division which, according to Sohn-Rethel, made possible on a social scale what was beyond the powers of the personal unity of head and hand. (1972 p.166)

However, it was not until the Nineteenth Century, with the emergence of large-scale electro-chemical technology, that the production technique became truly scientific, for it was only at this point that the degree of societation of labour began to approach that of scientific thought. This societation creates something qualitatively new: according to Sohn-Rethel's theory, "the possibility now makes itself felt of reuniting intellectual and manual activity at the level of society as a whole." (1972 p.171) Sohn-Rethel identifies this possibility in the 'unwitting' formation of a 'new economics', whose dominant law is the necessary synchronization of production's numerous detail operations, which have usually been dissected into the smallest particles possible. (1972 p.179)

What is paradoxical in this regard is that while arising from the labour process itself, this new economics is supposedly the diametrical opposite of the market economics of the capitalist mode of production. (1972 p.180) Taylor developed a 'rational' organization of the production process by means of a methodical quantification of different human labours on the basis of pure

time-measurements. Yet, the immediate aim of this dissection of labour was simply the maximum exploitation of human labour. In total disregard of man, the production process was subjected to so-called 'Time and Motion Study', the aim of which was to create a uniform measure (or 'commensuration') of man and machine:

> It is precisely this uniform measure of human function and machine function in the production process that defines itself (spontaneously, so to speak) as the principle of labour's full societation . . . By virtue of a common operative measure with machine functions, manual labour in flow production achieves a degree of societation on a par, at least potentially, with scientific thought. (1972 p.203)

Up to now, the commensuration of labour was effected behind the backs of the commodity producers via the economics of the market. But Taylor's method makes it possible to measure and compare labour *consciously.* Hence, "this uniform measure contains the potential for a modern unity of intellectual and manual labour at the level of society as a whole." (1973 p.28)

However, collective labour is not yet truly social, since, restricted to individual firms, it only possesses reality at the level of 'plant economy', and not yet at the level of 'social economy' (1973 p.27). Sohn-Rethel believes that germinal forms of socialism can be discerned in this 'rational' form of labour organization:

> The essential characteristics of the system should not be confused with its slave-driving function under capitalism . . . It is this confusion which, more than anything else, has prevented us from recognising that what we are looking at, albeit disguised

> in extremely contradictory forms, is the key to labour's full societation, and thus the potential basis, or 'material substructure', of a socialist mode of production. (1972 p.197)

Beneath this disguise, the ongoing societation heightens the tension between labour process and valorization process. As its would-be resolution, this contradiction necessitates a specific institution: namely, modern industrial management.

In the first instance, to be sure, this management stands in the service of capital valorization, but, in this very service, it nonetheless pursues a different kind of economics, one rooted in the modern labour process and in contradiction to the economics of the market. (1973 pp.23ff) Sohn-Rethel asserts:

> By and large, the truth is that the norms of modern labour economics drive in the direction of increasing production capacity, or, in Marxian terms, of multiplying the sources of social wealth; by contrast, the postulates of market economics exercise a restrictive influence. (1972 p.181)

To a certain extent, management is the final hurdle (beside the political system) to be cleared before workers can take control of production:

> The alienation of labour's societation by 'functional management' can legitimately be designated as a usurpation . . . A usurpation can be reversed; the usurper can be eliminated; the direct producers can themselves take over the societation of their labour and become both its supports and its social subjects. In a word, the social relations of production can be fundamentally transformed on the basis of the given level of development of the material productive forces. (1972 p.200)

These elaborations document a peculiar shift in Sohn-Rethel's critique of natural science and its cognitive forms: his programmatic demand for a 'demystification of Reason' has turned into a fetishization of 'Reason'; his critique has turned into affirmation. Why? I believe this shift is already implicit in the initial formulation of the problem: Sohn-Rethel is not, as first appears to be the case, interested in a *critique* of 'pure understanding' (today's dominant thought-form), but, rather, in a 'materialist' *grounding* for a mode of thought that has hitherto understood itself in idealist terms. This is the sense of Sohn-Rethel's claim that since the mathematical science of nature proves to be of non-idealist origin, its validity can be conceded by historical materialism. (1972 p.163) Sohn-Rethel's social derivation of the categories serves solely to refute any claims to *transcendental* synthesis. (1973 p.80f)

If, then, Sohn-Rethel is concerned merely to demonstrate the validity of the pure thought-forms, his assertion of the affinity between commodity-form and thought-form is actually of no consequence; thereby, he even falls back to a pre-Lukácsian position. Lukács' critique characterizes modern rationalism, with its a priori forms of thought and knowledge, as a specifically bourgeois relation to nature:

> In the sense of a system uniformly aimed at that aspect of phenomena that can be grasped, created, and thus dominated, predicted and calculated by the understanding, 'rationalism' has existed in diverse epochs and in diverse forms. But there are fundamental distinctions to be made, depending on the *material* to which this rationalism is applied and on the *role* assigned to it in the overall system of human knowledge and objectives. The novel feature of modern rationalism is its increasingly

> insistent claim to have discovered the *principle* connecting up each and every phenomenon that confronts mankind, whether in nature or society.[5]

Lukács' critique was aimed at the coercive character of this thought vis-à-vis nature, a coercion expressed most clearly in mathematical science, which makes no attempt to comprehend reality as a whole. Lukács recognized that the attempt by mathematical science to expunge all a-rational content was directed not only against the object, but even against the subject itself: the cognizing subject was increasingly divorced from the human subject and transformed into something purely formal. By liquidating the a-rational, mystical forces of nature, the subjects erected a kind of 'second nature', which confronted them with a corresponding austerity.

While Lukács' specific concern was to reveal the 'reification of thought' in the cognitive ideal of natural science as an expression of the law of value, he in fact came much closer to a critique of apriori thought than Sohn-Rethel, who believes that by reuniting intellectual and manual labour one can cancel the apriori character of pure natural science 'practically'. Indicatively, Sohn-Rethel makes the following observation on Lukács:

> We share Georg Lukács' application of the Marxian concept of fetishism to logic and epistemology, but we differ from him in that the limits imposed on rational thought by reification and exploitation do not lead us to conclude that this thought is mere false consciousness. In our view, a society free of class exploitation will not eradicate logic or reification, even if they will be *transformed* in a

5 G. Lukács, *History and Class Consciousness*, London 1971, p. 113—modified.

> manner which cannot, in our estimation, be predicted. (1971 p.30f)

A few pages further on, however, one does learn how Sohn-Rethel envisages this transformation: cognitive logic will establish 'truth' or 'falsity' in a 'practical', rather than a 'purely logical' manner. But the paradoxical nature of such a demand is obvious: the practice of natural science presupposes this 'pure logic of cognition' as the condition of its very possibility. Without a 'pure science of nature', an empirical science of nature as formulated by Kant is impossible. The epistemological critique and transcendence of 'pure, apriori cognition' cannot be achieved through 'practical' activity: on the contrary, 'going practical' in no sense dissolves, but actually *perpetuates* the antinomies established in the critique of cognition. One might well use Lukács to point out to Sohn-Rethel that the question of 'pure thought' cannot be solved simply by transcending the contemplative attitude; rather, the essence of *praxis*, in contradistinction to the practice of natural science, consists in annulling the indifference of form to content.[6]

For Sohn-Rethel, by contrast, the experimental practice of natural science proves the 'objective validity' of the apriori form of cognition: the latter has proved itself in reality through the successes of natural science. All that remains to be criticized in apriori thought and cognition is their *philosophical* expression. This is also at the back of Sohn-Rethel's construction of an imaginary

6 See ibid, p. 125f. In passing, it should be pointed out that it was not only in later works like *Die Zerstörung der Vernunft* that Lukács came to opposite conclusions. Even in *History and Class Consciousness*, the critique of apriori thought takes a remarkable, downright metaphysical turn when the author comes to discuss the possibility of transcending reification. But that in no sense detracts from the far-reaching insights of his analysis of the 'antinomies of bourgeois thought'.

distinction between the 'ideological' Descartes and the 'scientific' Newton, a distinction which views the mechanical world-view of philosophy as 'false consciousness', but the mechanical view of nature as 'scientifically valid'.[7] At the surface level, one could no doubt focus on a whole range of theoretical points on which Newton and Descartes do indeed diverge; but on the present question of the objective validity of mathematical natural science, there is no fundamental disagreement beteween them. Mathematics has objective validity and is indispensable for exact science, such that without mathematics nature would remain a closed book: this is a maxim common to both Descartes and Hobbes, as well as to Galileo and Newton. Philosophy and natural science, (which can be separated out least of all in the Seventeenth and Eighteenth Century)[8] shared the goal of grasping nature as mathematically structured, or at least of thinking it in mathematical symbols. A strict distinction (à la Sohn-Rethel) of metaphysics and scientific physics thus gets into the embarrassing position of having to explain why it was that modern relativity theory rejected the concepts of 'absolute space and time' as formulated by the physicist Newton, while taking over the theory of 'relative space and time' from the metaphysician Leibnitz.[9]

7 The paradoxical state of affairs by which Marxism credits bourgeois thought *qua* natural science with a true cognition of nature, while elsewhere in bourgeois thought seeing only ideology, was first pointed out by Bloch; see E. Bloch, *Erbschaft dieser Zeit*, Frankfurt 1973, p. 291. [The work was originally published in 1935.—*Trans.*]

8 Ernst Cassirer points out that in the case of the Seventeenth Century one cannot distinguish strictly between metaphysics and mathematics, theology and physics: "when Newton's *Principia* appeared, it was greeted as the work not only of a great student of nature, but also of a great theologian and religious thinker." (E. Cassirer, *Philosophie und exakte Wissenschaft*, Frankfurt 1969, p. 161.)

9 Ibid, p. 160.

As already indicated, Sohn-Rethel undertakes his distinction on the basis of natural science's own criterion of success, namely, that science differs from ideology in that the former proves itself in practice. But in its constitutive attitude to nature, the experimental and empirical science to which Sohn-Rethel appeals does not differ in any fundamental sense from pure science: the arbitrary manipulation of nature-given materials in the experimental method corresponds to the reduction of the empirical manifold to the concepts of mathematics and physics. As a result, one can legitimately interpret the apparatus requisite to the experimental science as the *objectified* 'categorial thought-apparatus' with which the subject of knowledge confronts the object of nature. But nature 'as such' does not constitute the real object of empirical natural science; to become an object of cognition, nature must first be 'prepared' with a view to a *specific cognitive interest*. This 'preparation' is effected via a variety of methods, the purpose of which is to extract particular objects from their natural context and view them in isolation. Operational and 'valuable' regularities are established via an experimental procedure (e.g. the analysis and synthesis of materials) in which the construction is varied either until it corresponds to what was previously conjectured, or else until, under specific secondary conditions, a synthetic substance is created which was impossible under natural conditions.

Sohn-Rethel subscribes to natural science's own self-evaluation when he interprets its results as 'objectively valid' or even 'true' knowledge. The conception (taken over from Marx's *Theses on Feuerbach*) according to which the criterion of cognitive truth lies in *praxis*, cannot, however, in any sense be extended to the practice of the natural sciences. As early as Hegel, the critique of knowledge had modified natural science's claim to truth:

the *Phenomenology of Spirit*, claiming to comprehend the 'whole' and to recognize what is 'essential and true' therein alone, qualifies the quantitative and abstract mode of natural-scientific thought as an activity *external*, and thus doing *violence* to 'the true thing' (*die Sache selbst*).[10] A radicalization of this critique via Marx's critique of *political economy* would show how cognitive abstractions are translated into categories of social domination. The clearest illustration of natural scientific thought 'proving itself' (as a'real abstraction') under conditions of capitalist societation, is offered by the transcription of natural-scientific procedures into production technology, where 'pure scientific understanding' really comes into its own: the remote-control of nature (free from any interference by the human hand) as a self-activating process is the model of industrial production, as it is of the experimental method itself. Taylorism, for example, combines human material and technological constructions by strictly scientific procedures, namely, by dissecting man into detailed mechanical parts so as to fit him into the machine system.

The thesis, even propounded by Marxists, that natural-scientific technology is value-free and thus neutral, can only be sustained if one assumes the a-historical standpoint of this science. Thus, if the latter is viewed 'in itself' (outside the historical process in which it came to be, and in abstraction from the fact that its much acclaimed domination of nature was always mediated via the domination of man by man), then it is easy to overlook its class nature. The fact that the categories of natural science only unfurled their oppressive nature

10 G. W. F. Hegel, *Phenomenology of Spirit*, Oxford 1977, p. 25, and the Preface and Introduction generally; see also G. W. F. Hegel, *Philosophy of Nature*, Oxford 1970. However, the question of whether one can turn Hegel into chief witness for the prosecution of natural-scientific-technological rationality, is one that I should like to leave open in the present context.

under conditions of capitalist societation, does not negate their *inherently* manipulative and dictatorial character. It was not annexation by capital that first turned this science into an instrument of domination and valorization; science already possessed these characteristics—at least potentially—*prior* to its application by capital. And it is for this reason that one is more justified in designating this science as an anticipation of the logic of capitalist domination.

The key to such an interpretation is actually provided by Sohn-Rethel's 'materialist deduction of the categories', even if his own conclusions from it are different. On the one hand, he emphasizes that the scientific form of knowledge of nature, and the translation of this knowledge into technology, correspond to the needs of capital, i.e. he concedes that it was only on the basis of science that the *formal* subsumption of labour under capital could be transformed into *real* subsumption. But, at the same time, Sohn-Rethel believes that the capitalist 'utility' of science in this regard does not negate science's 'emancipatory' effects 'as such', for the simple reason that, according to Sohn-Rethel, capital does not affect science. (1972 p.107) But that is not all! The 'scientification' (*Verwissenschaftlichung*) of production is supposed, by virtue of reuniting intellectual and manual labour, to make possible a qualitatively new type of societation, 'formally' anticipating the economic base of a 'socialist mode of production'. But how can the 'scientific' form of the societation of labour possibly be indifferent to capitalist and 'socialist' *contents*? Surely indifference to form, and an open-ended purpose-structure—both ingredients of modern rationality—are proof of science's own 'value-form', a form that makes science adequate to capital's logic of valorization!

If, as Sohn-Rethel maintains, the capitalist societation of labour has already accomplished the decisive

preparatory work for socialization proper, then the 'liberation of labour' simply means workers taking production into their own hands and applying natural-scientific technology in a 'socialist' manner. But what the workers would really be taking into their hands is their own oppression. This technology is indeed subsumable under a variety of purposes, but (and this is what Sohn-Rethel fails to see) it is not an instrument for the liberation of labour. Again, the 'technical function' of machinery makes it indifferent to 'what' is produced with it, but the decisive fact is that, despite changes in this regard, the relationship of machinery to living labour remains the same: nothing changes as regards the specific manner in which living labour is incorporated into the dead, objectified labour of technology. It is precisely the reduction and adjustment of human capabilities (both mental and manual) to machine functions that Marx conceptualized as the *real subsumption of labour under capital*. Sohn-Rethel's celebrated reunification of intellectual and manual labour ('full societation') in the 'scientific' production process thus designates a developmental stage of capital in which the 'machinization (*Maschinisierung*) of intellectual labour' (to use an expression of Hans-Dieter Bahr) does indeed create a 'commensuration' of human and machine functions, a 'commensuration' that perfects and 'unifies' the mutilation of both mind and body.

The 'new economics' that Sohn-Rethel detects in the process of assimilating 'human and machine function' makes it possible—and this really is its novelty—to set about the total planning of man. But how can this 'new economics' be said—as in Sohn-Rethel's account—to stand in opposition to market economics? The first thing that must be said is that Sohn-Rethel clearly retains, in all essentials, the classical conception of economics, the basic criterion of which is the abstract measure of time. This is not really surprising, but in fact quite logical,

since, as we have seen, Sohn-Rethel accepts (as integral to economics) the abstract rationality of technology, a rationality identical to the economy of time in the abstract. The value-form of the means of production finds its perfectly adequate expression in 'value-form' *economics*: even in Sohn-Rethel's 'socialism', the social synthesis is still effected through value, with the minor difference that the law of value no longer operates behind the producers' backs, but is applied 'consciously'. But if the predominance of value and its abstract thought-structures are an expression of fundamental class divisions, what is so revolutionary about applying the law of value 'consciously'? The domination characteristic of 'value categories' does not disappear along with market economics; what really distinguishes capitalism from a society which, as in today's 'socialist countries', has passed (at least tendentially) beyond market economics to the 'conscious' application of the law of value, is that the latter can guarantee *continuity* in the labour that mutilates man, whereas the former cannot.

In essence, Sohn-Rethel's conclusion would seem to be that a socialist mode of production is obliged not to *abolish*, but to *consciously apply* value relations, and that the 'liberation of labour' will result from an even more consistent adaptation of man to machinery. That being the case, the difference between Sohn-Rethel and those who (to use his phrase) "swear allegiance to technocracy in the name of 'dialectical materialism' " is reduced to a minimum.

Translated by Phil Slater

Introduction to Bahr

Ultimately, the attempt to construct a critique of technology on the basis of Marx's critique of political economy must face up to the question of the relationship of technology to the value-form, "the most abstract, but also the most universal form of the bourgeois mode of production".[1] *Capital* offers sufficient indicators in this regard: in its initial, 'manufacturing' (handicraft-based) phase, capitalism's universal law of value ("the rule that the labour-time expended on a commodity should not exceed the amount socially necessary to produce it") asserts itself as "a technical law of the process of production itself",[2] but this 'technical law' is vitiated to the extent that "since handicraft skill is the foundation of manufacture . . . the mechanism of manufacture as a whole possesses no objective framework which would be independent of the workers themselves."[3] If "it is machines that abolish the role of the handicraftsman as the regulating principle of social production",[4] then the ground is prepared for theorizing machinery as the *purpose-built basis* of the *specifically capitalist* mode of production, i.e. of *value-in-process*. This is the task that Bahr sets for himself in the article below.

1 K. Marx, *Capital*, I, Harmondsworth 1976, p. 174.
2 Ibid, p. 465.
3 Ibid, p. 489.
4 Ibid, p. 491.

Hans-Dieter Bahr was born in Germany in 1939, and studied Philosophy and Literature in Berlin, Paris and Tübingen; it was from the latter university, under the supervision of Ernst Bloch, that Bahr gained his doctorate in 1968. From 1970 to 1974, he was Assistant Professor at the Political Institute of Berlin's Free University, and since 1975 he has been full Professor at the University of Bremen in the 'study area' known as 'Sciences of Society' (*Gesellschaftswissenschaften*), which, as will become apparent from the depth and range of his article, is not restricted to the narrow intellectual horizon of Anglo-Saxon 'Social Sciences'.

Bahr belongs to a generation of German intellectuals whose non-Soviet path to Marxism was paved in large measure by the so-called 'Frankfurt School'.[5] The latter's theory of technology found its most radical expression in the work of Herbert Marcuse, who argued that "specific purposes and interests of domination are not foisted upon technology 'subsequently' and from the outside; they enter the very construction of the technical apparatus."[6] Amid the mad rush, by all and sundry, to repudiate this thesis, the 'Frankfurt School' spawned its own 'Fifth Column' in the figure of Jürgen Habermas, whose 'clarification' ran as follows:[7] 'technological rationality' is *neutral* in the sphere of material production (where what he calls 'purposive-rational action' is appropriate), and only becomes 'dangerous' when extended beyond its legitimate bounds to the sphere of 'symbolic interaction' (where the ideal is 'communication free of domination'). Once extended to

5 See P. Slater, *Origin and Significance of the Frankfurt School*, London and Boston 1977, pp. 82f and 90f.

6 H. Marcuse, *Negations*, London 1968, p. 224; see also H. Marcuse, *One-Dimensional Man*, London 1964, passim. For more detailed discussion of Marcuse's critique of technology, see the general Introduction to the present volume.

7 J. Habermas, *Toward a Rational Society*, London 1971, pp. 81ff.

this sphere, 'technological rationality' produces 'systematically distorted communication', and it is *this* process (for which Marcuse's term 'one-dimensional' is well chosen) that, in Habermas' estimation, 'misled' Marcuse into an indictment of *technology itself.*

In a book entitled *Critique of 'Political Technology': A Debate with Herbert Marcuse and Jürgen Habermas*, Bahr entered the arena by not only *siding with*, but actually *radicalizing* the Marcusean perspective. Bahr's aim was "to comprehend technological rationality and its individual constructions in terms (*seemingly* paradoxical) of the non-political manner by which they establish themselves as political domination".[8] However, such a task is obliged to 'fly in the face of history' (*der Geschichte ins Gesicht schlagen*), and the book's real value is as a provocative (and with regard to Habermas, occasionally polemical) exploration of the terms of the problem, rather than as a systematic critique of technology as such. A more constructive perspective emerged in a paper to the "Technical Intelligentsia in Late Capitalism" symposium in Heidelberg in May 1971; this paper was reworked for publication two years later, and it is from this later version that the following translation has been made.

In the present context, Bahr's article serves two main purposes: first, to elaborate at length on the role of machinery in the *real subsumption of labour under capital*; and second, to identify the constitutive *form* behind this process as the *value-form*. It is hardly surprising, therefore, that this article should be the most difficult and demanding of the entire volume: apart from the (typically German) idiosyncrasy of using etymology as an indicator of meaning (e.g. 'uni-form-ity' literally signifying 'one-form-ness'), and the more

8 H-D. Bahr, *Kritik der 'Politischen Technologie'*, Frankfurt 1970, p. 7.

substantial problem of Bahr's predilection for Hegelian passages,[9] the real difficulty lies in the depth of meaning that Bahr affords to value theory. In this regard, there is no substitute for equal seriousness on the part of the reader.[10] Indeed, one of the merits of Bahr's article, particularly at the close of the present volume, is precisely to show that the critique of technology does not simply 'extend' value theory, but actually leads right into the *heart* of it.

The Editor

9 For a readily comprehensible introduction to Hegel, see W. Stace, *The Philosophy of Hegel: A Systematic Exposition*, New York 1955; this also includes an introduction to Kant (pp. 34ff) that can be highly recommended to those who find Kapferer's résumé in the previous article too condensed.

10 The basis for any sound understanding of value theory (which is *not* a 'specialist' question of 'economics') is a detailed study of *Capital*, in particular the first part, entitled "Commodities and Money". Useful light on the precise nature of what Marx is attempting here, is shed by the first two chapters of *Value: Studies by Karl Marx*, London 1976. As for secondary literature (which should be a *companion* to, not a *substitute* for the primary texts), the reader can usefully consult I. Rubin, *Essays on Marx's Theory of Value*, Detroit 1972, and D. Elson (ed.), *Value*, London 1979.

The Class Structure of Machinery: Notes on the Value Form

Hans-Dieter Bahr

The historical development of the *means* of labour (*Arbeitsmittel*) as the transformation through labour of nature-given forms into the socially purposive forms of the labour process is simultaneously the 'naturalization' of the social forms of instruments of use (*Gebrauchsmittel*). As a material thing, the means of labour not only mediate between *nature* and *subject* of labour, but also serve as the mediation, the 'means', among those who carry out labour. The fact that the tool can only serve the function of mediating the living relationship among workers if this living relationship is simultaneously severed is the reason why—in the form of private property—it can also 'mediate' a social relationship between workers and non-workers, or between different types of labour. If the means of labour, as means of production, come to mediate between the ruling and the subordinate class, they must acquire a dual social character in the course of their historical development: the means of labour are a means by which the ruling class can directly satisfy its wants, but they are also the 'purposive basis' for perpetuating the one-sided relation between worker and non-worker. As a means, therefore, the tool not only stands between nature, history and society, but also between different classes in society: it is not merely the *means*, but in fact the *purposive basis* for *one-sidedly* uniting the subject of

labour with the subject of appropriation. Hence, the genesis of the means of production, as this objective basis, is in fact the process of the mediation of two asymmetrical social subjects.

Bourgeois science perceives the fact that the ensemble of means of labour results from the objectification of these dialectical forms of the living relationships of labour merely as archaeology; this follows from its method of reasoning backwards from the result, the product, to the living social *formation*. For example, it concludes from certain snares and fishing hooks—in contrast to hunting projectiles such as spears—that a particular tribe was on the verge of stable settlement; specific types of stone-drills, requiring complex and painstaking manufacture, indicate more enduring forms of the division of labour. The once-existing *living* form of particular social relations and structures now resides in the tangible and symptomatic form of the ensemble of nature-given materials changed by the action of social labour. That archaeology does not turn its criteria around and apply them to its own material basis but confines itself to pre-/non-bourgeois social orders is part of its brief: there shall be no archaeology of the systems of *bourgeois* means of production.

The developmental forms of present-day means of production are more and more mediated through scientific labour. We can specify this relationship a little more precisely by noting the following: although it is well known that manual labour creates the means to transform nature-given forms into socially purposive forms, curiously little consideration is given to the fact that scientific labour differs from the former only in terms of the *form* of the means which it creates for the production of its knowledges. Even the critiques of the pure deductive sciences are in general less concerned to criticize the *possibility* of such scientific purity than to

question its actual *tenability* in practice. Historically, the beginning of the deductive sciences coincided with the empirical production of tools, models, drawings and symbols as the means for the supposedly pure, i.e. uncontradictory, expansion of knowledge; these means include rituals (as collective memory), along with language, writing and mechanical printing, and numerical and data processing.

Although experimental scientific equipment was a precondition for the technologization of production, it was—as Sohn-Rethel correctly points out—not the latter's active source. Neither the spinning-jenny and mechanical loom, nor the steam-engine arose in direct connection with either the discoveries or technical apparatus of theoretical physics. On the other hand, the pre-scientific structure of machinery—as it existed prior to the development of chemical techniques and the industrial application of electricity—represented a form of development which exhibited more than the 'personal unity of intellectual and manual labour' that Sohn-Rethel claims for handicraft implements. As means of labour, simple mechanisms already possessed a structure which machinery, as the purposive basis of the capitalist labour process, simply made more apparent: namely, the two poles of 'drive' (power) and 'tool' (mechanical construction), which are in turn *directly* mediated through the transmitting mechanism. Language has kept alive in its concepts what now only appears in material form: for *expenditure of labour power* as the moving force, read *drive*; for *skill and dexterity* as the purposive essence of the social transformation of nature wrought by mental and practical activity, read *tool*. And the *transmitting mechanism* could well be interpreted as the naturalized form of intercourse among the workers themselves; or, in historical terms, the ossified

form of intercourse could be interpreted as the mediation between the plebeian and peasant-handicraft form of labour, in which—in addition to the prevailing class antagonisms—there also lurked an incipient antithesis between the intellect and the increasing abstractness of the nascent proletariat's labour power. In this instance, the tool would correspond to the intellect, and the mere driving force to the proletariat, as labour power deprived of its skill, although the mediation of the two moments, inasmuch as it still lay with the handicraft workers themselves, was direct.

What this allusion is meant to indicate is that the instruments and the very basis of the scientific production of knowledge only became a condition for the development of the mechanism (via the stages of machinery and mechanization up to automation) because the social organization of living labour conditions had already assumed a 'rational', i.e. mathematical form which could therefore become the foundation for a systematic scientification (*Verwissenschaftlichung*) of the production processes.

This mediation between scientific and proletarian labour, anticipated in handicrafts, and later to assume its own independent and objective form in machinery, in turn points to a *third* factor underlying these two forms of activity, which despite a historically uneven mode of appearance constitutes from the outset the possible common factor: the *immanent value-form of the means of production*, as 'abstract natural form', or as abstract social purposiveness in the ossified form of nature-given material. The following descriptions are initially intended to sketch the development of the mechanical and technological 'means of labour' in terms of their surface appearance; this is a prerequisite for the deeper question of the development of inner form as (class-

determined) *structure* and external form as (instrumental) *shape*, and of their unity as *function*.

The Surface Appearance

The social nature of the relations of production, which, historically, only appeared in the first instance in the form of generalized exchangeability, becomes essential or real only in the living act of cooperation, where individual concrete labour is actually reduced to abstract average labour. "The law of valorization", writes Marx, "comes fully into its own for the individual producer only when he produces as a capitalist and employs a number of workers simultaneously, i.e. when from the outset he sets in motion *labour of a socially average character* [our emphasis—H-D. B.]."[1]

Cooperation, which according to Marx remains the basis of industrial production, consists initially of a purely quantitative aggregation of handicraft units in which the direct means of labour remain the property of the worker. The initial form of constant capital for increasing surplus labour appears as the method of attaining a merely external generalization within the existing division of labour in the workshop; however, this nevertheless takes on a qualitative dimension—such as increased scale of workshops, stores and internal means of communication. These means, or, better stated, these *bases*, as they exist in their actual shapes, must be seen as the material results of specific living relations of labour; they are in fact the basis for the possiblity of handicraft workers being able to work together in larger groups. Elements of feudal landowner and guild-master fuse—most noticeable in mining and mills—into a type

1 K. Marx, *Capital*, I, Harmondsworth 1976, p. 441.

of absolute bourgeois patriarchy over the journeymen.

In cooperation, the mechanical activity of the hand in working up and structuring materials increases merely quantitatively. By contrast, manufacture breaks down aggregate labour into detailed operations, which brings about a qualitative transformation in the relation of the worker to the object of labour: means of labour develop which increasingly reduce skill, i.e. manual dexterity and intellectual know-how, to the level of an abstract expenditure of force. This separation of the intellect of labour from the expenditure of labour power then becomes a necessary condition for the rise of the scientific-technological intelligentsia.

The *external* form of a merely *quantitative increase* in the number of workers finds its corresponding *inner* form in the deskilling of labour power as the precondition for collectively raising the abstract expenditure of force to a *higher power*. The 'body' of the collective worker precedes the appearance of machines for supplying motive power. The dissolution of the inner union of the labouring subjects and their skill alters the relation between the object of labour, which is to take on a new form, and the final result of the change wrought in the material, the product: the object is no longer a product in direct reference to the individual subject of labour, but only in relation to the individual capital. Even in quantitative cooperation, many objects of labour were simultaneously worked up alongside each other until the completion of an object of use in the hands of the master craftsman; but in manufacture, the object of labour passes through a series of stages (preparing, altering, shaping the material), which itself presupposes that the raw material can be dismembered and reconstituted, the final stage being a new assembly of the materials. However, the *transmission* of these partial operations (excluding chemical or electrical labour

processes) remains external and indifferent to the product being created; in other words, the product does not take on their form. Transmission consists of a non-mechanical form of transport for raw materials within the workshop, together with the communication of directions and instructions. In this context, speech is not so much aimed at passing on understanding, as 'semi-skilled' in fact means converting understanding into manual dexterity; rather, as long as the labour process is running smoothly, speech serves simply as a set of directions for ensuring that specific partial operations on the object of labour are always carried out in the same way, i.e. *uni-formly.* (Natural science later defined its own labour process in accordance with this model, i.e. as operational and experimental: the experiment should always yield the same result, under identical conditions, in order to produce a 'valid' conclusion or result on the object of research. Terminology itself here reveals the close affinity between natural-scientific labour and the increasingly abstract natural form as value-form.) Uniform motion, which already appeared in the demands made on time-measuring instruments or on static and dynamic mechanics (exemplified in construction work, or in the machinery of agrarian mills), is an expression of the fact that a nature-given material marked out as 'analytic' by the type of social labour, i.e. a material *divided* and *dismembered* by the division of labour, assumes a 'real' value-form contradicting not only its nature-given form but also its useful form. The reason is that the asserted (but never realized) formal equality of movements in the labour which produces commodities can be seen as the same type of *equi-valency* of form that in the value-relation appears as the equivalent form of value. This question is discussed more fully in the second section.

The qualitatively new form of societation which comes

into being with manufacture creates the living cooperative collective worker as an organically structured whole (an analytic synthesis) in which what had been a merely quantitive aggregation becomes a *qualitative social unity.* However, the form of societation tends simultaneously to bring about the negation of the direct collective worker in the workshop, primarily through the specialization of activities and the splitting-up of complex handicraft implements. The machine-tool is then the first transcendence of this acute specialization, namely by combining within itself a series of separate individual tools such that they no longer require the mediation of human labour. 'Combination' here means that collective labour, the living cooperation of a number of specialized workers, disappears as such, to be stored as the 'natural form' of a higher mechanical power. The objectification of specific social relations of labour corresponds to the de-objectification of living collaborative labour; this is expressed in the antithesis between the isolated specialized worker and the technological collective worker.

With the objectification of subjective labour conditions —which, as the machine-tool, forms the purposive basis for the industrial labour process—the worker is initially reduced to the function of pure motive force. The inversion of the relation between worker and tool (through which the body's simple physical power was transformed into the stationary mechanism driving the machine tool that actually shapes the material) leaves living labour with the cooperative organization of the internal transport of pieces of work. In this role, abstract labour power functions as the 'motor' force, as the living transmission, in addition to its function as a stationary motive force. In this usage, 'living' means that the object, the purposive condition, the means and the subject's purposes still constituted a simple, unspecialized unity

in relation to the labour process, from which it still appeared possible to determine and realize the very *aim* of labour by way of anticipation. Under the conditions of the class-based separation of labour power from the means of production, 'objectification' means that although there is a workshop-unity of purposive conditions (object and means of labour) and means to ends (the labour power to be valorized), the process is 'rational' (*rational*) only in the sense of 'mathematical' (*rationell*). In fact, there is a general social antagonism between the determination of the ends to which the labour is being put and the initial unity mentioned above, an antagonism which reacts back upon the form of development of the conditions of production. 'Living' cannot mean a secret desire to return to handicraft activities, since handicraft labour only permitted the vague utopia that it could give rise to a social subject *as* subject in conjunction with artistic labour.

The translation of the transmission and motive force of human beings in collaboration into 'natural' forms is the condition for the possibility of machinery; the rise of machinery was itself only possible because decisions as to the goal of labour (the production of the bourgeois class by capitalist means) remained totally external to the labour process itself as a mere functional condition, that is, as a 'sublated' (*aufgehoben*) means for the 'simple' satisfaction of needs: one social class had to be completely divorced from the final determination of ends before the social forms of labour could become more 'rational', i.e. 'subjectless', and consequently assume a purposive natural form as machinery. In this form, the direct social rationale of the labour process ceased to have a subject, and became irrational (although this lack of a subject is the necessary condition for the liberation of social reason from its blind natural shape). Machinery is precisely the clear proof (once the genesis

of its dual social form has been incorporated into the critique) that in the labour process bourgeois society exists without a real subject and consequently confronts nature as itself a simple 'force of nature'. This explains why the working class first had to become politically conscious, and therefore an ideal (*ideell*) subject, before the possibility of actualizing the social subject within the labour process could appear. At the same time, this 'ideality' of the proletariat's existence as a subject—incorrectly posited as *real* by Lukács in *History and Class Consciousness*—also constitutes from the outset a permanent tendency towards the de-revolutionizing of the working class, since its interest in production is not produced through the latter, but is obliged to become a political idea before it can produce its own material basis spontaneously. 'Revisionism' is therefore a significantly more serious problem than as registered in the various versions of the conspiracy theory.

On the other hand, the labour process based on machinery (where the worker retreats from activities which directly give form and shape to the material) itself assumes a more 'ideal' character: it, as it were, offers itself to the prospect of 'politicization' from within. Expressed in technological terms, living labour activity becomes confined to *assembly*, which is usually located at the end of a series of machine-worked partial operations. The worker is therefore confronted by the material in a *socially nature-given form*, whilst the directly nature-given form turns into an aesthetic object, becomes 'scenery'. The object—as a prospective commodity—is no longer wrested from the nature-given material, or at least so it appears to the individual consciousness; rather, elements of raw material that have already been pre-formed and pre-structured by a mystical subject and which thus appear as *objectively* social are constructed, assembled, fitted, inspected and

regulated. The transformation of work activity into the activity of assembly, transport and coordination was the condition for the invasion of the engineer into industrial labour. Prior to this, the engineers had proven themselves historically in the sphere of military science and practice, the field in which bourgeois society had anticipated the generalization of production through the 'rationalized' organization of destruction, and in particular, the unilateral appropriation of social wealth; as an economic subject collecting taxes militarily, the bourgeois state formation displays this 'one-sided' form of rationality. In contrast to the undifferentiated homogeneity of direct handicraft work on materials, the mechanical technology of construction allowed the *pre-planning* of coordination, transport and assembly operations. Consequently, using machinery as its purposive basis, the production process as a whole inevitably had to change the character of work activity (which had previously had a *directly determined* relation to nature) before the splitting of the production process into its ideal and real components could take place: i.e. operational and technological planning on the one hand, and individual realization through physical labour on the other. This change was achieved through practical analysis and simplification (deskilling). At the same time, planning became the inner-plant price-form-in-process, i.e. the ideal form of the measure of value, while its objectification in proletarian labour constituted the genesis of constant capital as machinery. Machinery is not therefore an application of theoretical mechanics to production; rather, it was the development of quantitative relations out of living cooperation which became the *a-priori* of machinery. Hence, it is the *form* of constant capital which constitutes the real mediation of natural science, its operational rationality and the degree of societation of labour in the production process; the

technical face of this mediation (the organic composition of capital) consists in the technologization of production.

Machinery sets free an intellect formerly bound to the feudal-handicraft labour process, an intellect which carries the possibility of forming a political collective worker out of the divided partial workers. In contrast to the work ethic of the guild, the political cooperation of wage-workers comes into external opposition to production as such, since the social ends of production confront the proletariat as an external force, i.e. as the ruling class. The levelling down of the specialized workers by means of production technology creates the condition for turning the wage-struggle into the potential *political* socialization of a working class in the process of organizing itself. On the other hand, the contradiction between the specialized worker and the technological intellect responsible for the direction, construction and transmission of the isolated detail operations, prevents the working class from recognizing its own *social* character in this intellect, which in fact

However, this process of mediation only becomes apparent when this relation of science and industrial labour begins to turn into its opposite, i.e. in the chemicalization of production, where the process changes from working up already existing materials to the creation of qualitatively new ones. At this point, the production of scientific knowledge and its instruments in laboratories and planning departments begins to function as the active moment in the generalization of production, a process in which 'scientification' is at the same time a kind of ideal societation; that is, the 'scientification' of production becomes a fundamental moment in the *power* of the actual *form* of societation, whose other moment consists of the external forms of realizing surplus value.

represents its *own* intellect, even if in the form of an unconsciously collective product alienated from the working class and acquiring independent shape in the form of planners, technicians and engineers. The proletariat therefore stands in outward opposition to its own intellect, which the capitalist process of production has created in formal independence. In part, it was this hostility which weakened and nullified the resistance of the working class to fascism. In addition, the absence of a practical-theoretical critique of the productive intellect blinkers the working class, binding it as a variable moment to the aggregate social capital; in this respect, the working class is merely an antagonistic, but nonetheless fixed component of bourgeois society. Its blindness towards its own, but alienated, intellect means that it contributes to the maintenance of the false totality of this society. And a 'liberation' which takes place behind the backs of the producers posits freedom as a mere ideal.

The uniformity of the partial operations, as the commodity-form-in-process within the workshop, also became the condition for flow production; this initially took the material shape of industrial standards for individual pieces of work. Subsequently, in many cases, the individual factory no longer needed to produce commodities as 'use values' for subjects; the individual parts of the product cease to possess any direct social use value, and are 'utilizable' only for the *possible* (but no longer *necessary*) assembly of individual objects into use values. This assembly is itself mediated through the capitalist market, and can therefore be thwarted by crisis: should difficulties arise in realizing the surplus value produced, these partial use values collapse into objects having no meaning. Such a contradiction encourages the formation of cartels: the standardized component part is the *appropriated* and objectified form

of the universal *exchangeability* of use values—not as price, but rather as the natural form of commodity capital. Bourgeois consciousness only comes face to face with this process in the repair trade, namely as the interchangeability of components which are useless in themselves but nevertheless still commodities.

With the standardization of component parts, even assembly loses the character of being a constructive activity. Complex forms of assembly-line, with intervening semi-automatic machine tools, 'construct' the object, mediating the individual operations of the production process. The need to set norms for the performance of the work-force itself dismembers the human body into abstract functions: the bodily organs—defined by the logic of modern medicine—themselves take on the abstract form of nature, the fully adequate substrate of the value form. Only now does the bodily organism actually become 'pure' value form in itself. The training of the organs for certain extremely specific functions renders the body as a whole clumsy: it loses its integral function as the creator of use value. In addition, an ever-increasing period of *formal* training and retraining becomes necessary, even for unskilled workers. The one-sided expenditure of force and skill by individual limbs and sense-organs destroys the functional unity of the individual's body: individuals cease to be an instrument of use to themselves even in work activity. At the same time, capital seeks to profit from this loss of bodily unity though 'leisure activities', medicine and sport.

With the objectification of assembly work, packing, delivery, storage and transport into machine-based mechanisms, the machinery described by Marx is reduced to a mere moment of technology, in which the industrial production-process itself assumes circulative forms, just as the circulation of commodity capital is

industrialized. Industrial and commercial capital fuse via the functional role played by finance capital. Nevertheless, the stage of mechanical technology remains overwhelmingly characterized by factory labour; the regional concentration of the means of production is still the basis of spontaneous forms of mass struggle, in which trade-union types of organization and political groupings can, at this relatively low level of development, still overlap to a great extent. However, mass communications based on technology take on increasing significance as means for artificially resolving the 'ideality' of the collective worker. This also marks the beginnings of bureaucratization: necessarily, but nonetheless incorrectly, the organized workers build up the cadre as a distinct form for their own implicitly revolutionary intellect, a form which often begins to blindly follow its particular inner contradiction of wishing to *conserve* the *revolutionary* movement without knowing how to constantly revolutionalize this work of conservation.

With the industrial application of electricity, traditional machinery begins to dissolve, or, rather, to encroach on the familial and even joint-stock spheres of capitalist private property. The state, as an abstract but underlying unity, gains in significance as a particular form of the aggregate national capital. The distribution of energy, that is, of the 'objective motor forces', undertaken by the state, takes on the role of providing the mutually exclusive individual capitals with their fundamental connection—a process which had already started with the nationalization of the communication, transport and education systems. With the transfer of power-generation away from most factories, machinery becomes 'supra-plant': machines which supply motive power grow into the independent power station. The previous network of canals, roads and railways is

expanded and extended through more 'ideal' means of communication, such as pipelines, cables and radio waves. In supra-plant terms, the individual factory is assigned the function formerly carried out by the machine tool: in contrast to the steam engine, the motor is an almost transmissionless moment in the drive of the machine tool. At the same time, the direction of the linguistic means of labour or of measurement and guidance systems in telecommunications also begins to turn into a technological form of the internal and external mediation of production, confronting the proletariat with its own intellect of earlier collaborative labour in a totally estranged form, and hindering spontaneous and mass forms of communication. A critique of trade unions and parties has yet to make this development really clear—a task of increasing importance since the first signs of the dissolution of the massified worker into work groups, gangs and teams can quite spontaneously lead to a renewed *guild* or *professional* type of organization rather than a *class* organization. Ritual allegiance to increasingly inadequate mass organizations of the working class leads on the one hand to merely 'representing the interests' of the commodity labour-power, and on the other to the further provincialization of the proletariat. This process is further encouraged by capitalist urban construction: with the rapid industrial urbanization of the countryside, the real social growth of towns, as it began at the end of the Nineteenth Century, can itself stagnate as mere 'sprawl'.

The development of high and low voltage engineering meant that principles of production (extension of surplus labour time through reduction in necessary) could also seize hold of the sphere of the reproduction of labour power. The technologization of domestic labour not only released the labour power of the woman, but above all

allowed the indirect extension of the working day, as the long time workers spend travelling is unpaid. In general, the wages of the worker no longer cover the reproduction costs of domestic labour power; should a member of the family become unfit for work, state welfare has to intervene. Unbelievable psychical misery is caused by the fact that capital has clearly destroyed the communication among members of a traditional small group (even if, as the family, this was a simple outgrowth of nature), and yet has artificially and formally kept this group together through the activities of state capital and the capital of the construction sector. The reverse side of the technological objectification of social powers is that living relationships, including even affective and sexual relationships, can only be conveyed and interpreted in mechanical terms.

High and low voltage technology offers the clearest proof of the problem which arises when production is generalized solely through these processes of objectification. Workers' councils in those places where workers also possess political power as a class can be both a first step in the reunification of consumption and production (work, need and interest consciously constituting society), as well as a form in which contradictions within the social division of labour beyond the individual factory level can spontaneously solidify into competition within the working class. This in turn necessarily produces a bureaucratic centralization which dictates an external cohesion to such self-managed units.

A counter-tendency to the process of division and sub-division in the sphere of mechanical technology can be found in the machine-tool and vehicle-building industries, although its principal field of operation is those branches which undertake the *chemical* processing of raw materials, or where chemical techniques are introduced into other branches of production. Whereas

the activity of forming and structuring materials first acquired objective structure via mechanization (in its broadest sense), only in a few rare instances could changes in the *inner* forms of raw materials be obtained through the mechanical expenditure of human force. As a consequence, those processes which change and *transform* materials underwent a much lower degree of decomposition into individual part-operations than those which *shaped* matter, and the tendency to relegate the mechanical aspect itself to a subordinate, intermediate moment of production arose here much earlier. Moreover, it developed less out of the nature of the tool than out of the necessity of isolating people from certain phases of chemical transformation. For this reason, the monopolization of capital found a favourable 'natural form' here, since in terms of the outlay on constant capital there was a high raw material intensity of production, i.e., a rapid turnover of circulating capital relative to the small amount of value transferred from the fixed capital. Since in many instances it was the scientific analysis of the inner characteristics of natural substances which first made new materials possible, the laboratory soon became an integral part of the chemical industry: scientification not only of the *means* of labour but of the *object* of labour itself was—to an even greater extent than in the electrical industry—an absolute priority. Many processes could *only* be carried out automatically. In the chemical industry, particular *moments* of mechanical technology became the characteristic basis. The 'drive mechanism' was necessary, partly for processing the material, but also as an inner moment in the actual process of chemical bonding; in contrast, transmission mechanisms and tool elements fused into one, as in the elements for lift, drive and bonding, and in parts such as pipes and storage systems through which materials flow. The characteristic abolition of the differences between *object* and *means* of

labour is already evident in the internal parts of the steam engine (for the flow of steam and gases), as indeed it is in all forms of equipment in which physical, chemical and biological processes are combined. The synthesis of object and means of labour finally reveals that the means of production are no longer a *means* for the workers, that they are no longer their 'instruments', but simply the autonomous purposive basis for *specific* forms of labour, in which the form of activity producing use values begins to diverge from the form creating value. The autonomization of the process of valorization, such that it produces its own structures of labour (which can only yield use value through the mediation of the market), expresses itself 'ideally' in the tendency towards the fusion of a nation's capitals into a quasi-state organization for administering the totality of social life. In this sense, the fascist 'folk community' (*Volksgemeinschaft*) was not only an ideology, but also a real integration of large sections of society into the slave-like organization of the conditions for valorization—an integration that in part was accomplished in total disregard of the actual class divisions.

The characteristic feature of techno-chemical production methods is not so much machinery itself, but the thoroughgoing union of machine and apparatus; the assembly process takes a back seat to the activity of measuring and regulating the continuous flow of a production linked by pipes, fed by storage reservoirs and united through the reactions which subject the material to chemical change alongside the mechanical forms which transport the commodity-object as it comes into being. In contrast to the historical forms of *changing* raw materials (e.g. smelting), in chemical production the various forms of motion and their transformations, together with the means, skill and object of labour, are fused in a manner which can no longer be seen as the

result of a spontaneous logic of cooperative work relationships (as is still the case with labour based on machinery): in this instance, the material form taken on by the intellect in the framework of production is no longer the alienated intellect of the proletariat—its ability to work and organize—but rather the outcome of deliberate scientification. The scientific intellect does not therefore have a merely alienated proletarian origin (such that it could be reclaimed) but is indifferent to working class consciousness from the outset. In contrast to the alienated proletarian intellect of engineers and mechanics, the intellect of the laboratory scientist is *haute-bourgeois* in origin, even if this difference itself tends to break down through the growing industrialization of scientific and technological work; in other words, the scientific division of labour is leading to dequalification of scientific work. Once numerical and data processing has passed through a corresponding development, giving rise to a fixed structure of partial operations in scientific activity, the qualifications of the scientist will almost totally lose their current form of the scientist's own quasi-handicraft private property. Research and discovery will be impossible without real control over private property in the 'means of thought'. The proletarianization of the scientific intelligentsia will then only be delayed through wage differentials and privileges.

The step from mechanization, via regulation, to automation could, for precisely this reason, contain the possibility of bringing the proletarian and scientific intellects together—not by the student or academic intelligentsia taking on an apparent proletarian character, but through a genuine critique of the politico-economic structures of scientific and technological forms of understanding. This involves not merely a critique of the ruling class, but also, in fact primarily, a critique of

'objective technical dictates', the universal social pressure for efficient performance exerted by capital in the frozen form of the perpetuation of its class-determined division of labour. The contradiction to the rapid change in the capitalist division of labour which simultaneously retains class-specific occupations (i.e. technical change in the division of labour but social fixing of the asymmetrical distribution of types of labour) appears in technical terms as the separation between the material and organizational aspect of production, and in social terms as the irrational drive for constant retraining—needed to maintain strict separation of the training of the mind from the occupational application of previously acquired, but now redundant skills. Class structures should therefore be sought not only in the form of the ruling agents of the bourgeoisie, but also in the technically veiled forms of labour and their corresponding training in an abstract, subjectless logic of production. This logic is the source of that attitude which rejects domination in subjective terms, but at the same time accepts it in the form of expertise and objective necessity, e.g. in technological and terminological constraints, in the abstract drive for productivity and in bureaucratic and administrative exigencies, but chiefly in the destruction of people's ability to communicate and address each other in libidinous and emotive ways. These objective class pressures secure the persistence of traditional forms of bourgeois life and are able, in turn, to outlive the actual capitalist mode of production without undermining the basic structure of bourgeois society, i.e. the value form. In order to be able to assess this society's essential nature, it is necessry to turn from the phenomenal aspect of the means, objects and conditions of the production processes to the *fundamental* structure re-produced therein: namely, the dual social

form of the commodity-objects, a form which reveals their class character.

Form as Identification

It is difficult to evaluate the developmental forms of machinery since these forms produce their own fetishism. For example, on the surface no *real distinction* can be made between *suitability* (*Zweckgemäßheit*) (which can be possessed by the characteristics of natural materials, although the actual use (*Zweck*) is a matter of complete indifference to them, only impinging upon them negatively, or, in Hegelian terms, as 'absolute susceptibility') and *purposiveness* (*Zweckmäßigkeit*). The notion of 'suitability' is meant to express the *indirect* relation of a thing to the purposes of society; 'purposive', by contrast, denotes a *direct* relation. Whereas nature remains an external moment to the aim for which it is appropriated, technology is always 'internal' to the aim, i.e. functionally appropriate: as a means, technology is accommodated and tailored to the ends. The purposive object may have 'natural material' as an underlying substrate; however, this figures in forms that must in general be regarded as 'technology', that is as a 'purely' social creation. If the 'material' or 'matter' expresses the form of nature in itself, then the 'content' expresses the form produced, characterized by and characterizing the material.[2]

Machinery is nature in *suitable* form, i.e. the natural materials offer their forms, as it were, so that 'nature-given form' can become form *for* something else, namely,

2 "Matter contains form locked up within it and is absolute susceptibility to form . . . *Matter must therefore be formed*, and form must materialize itself, must give itself in matter self-identity or subsistence." (G.W. F. Hegel, *Science of Logic*, London 1969, p. 451f.)

social requirements: sheer nature-given form dissolves and becomes the ground for social form. On the other hand, 'machinery' is *purposiveness*, created and produced by human beings, and to this extent its form is a purely social product since it cannot be found in nature. And yet, this form must simultaneously be available in nature since the social form of purposiveness must be expressed in a suitable natural material; otherwise, it would remain sheer want, unfulfilled human need. To this extent, an electrically driven lathe for cutting threads is a 'nature-given form' based on natural characteristics. However, this unity is not maintained: the cutter becomes worn during use, i.e. the nature-given form forcibly asserts itself against its purposive social form as soon as the machine, as purposive basis, itself 'produces' use-values. The cutter also becomes obsolescent, i.e. its social form can, under certain quite specific social relations of production, assert itself forcibly against the former unity of suitable and purposive form. In this case, the inner *structure*, as objective social form, shatters the external unity, which we shall term the technologically superseded *shape* of an indirect use-value. The machine, which in itself is contradictory, can only possess the unity of dual social form and nature-given form through its functioning and in the historical form of its development; and yet, the by-product of the latter is precisely the break-up of this unity.

The shortcoming of these observations is that a number of factors had to be introduced and posited externally; Marx himself bemoaned the lack of a rigorous history of technology, which—in contrast to the abstract materialism of the natural sciences—would have presented the genesis of the active relation between human beings and nature.[3] Such a history is still lacking,

3 *Capital*, I, p. 493f.

which explains why the real historical movement and the generation of relations of form cannot simultaneously provide us with the coining of their concepts. Marx was most sensitive to this gap on the question of the genesis of constant capital, where he was repeatedly obliged to assume certain *forms* of the instruments of use in the production process. Up to now, machinery as result, as purposive instrument of use for the production of objects of use, has always been abstractly counterposed (in critiques of technology) to machinery as constant capital for the simple utilization of labour power and the extension of surplus labour time. This has been so despite the fact that the two aspects develop in a real unity that arises and passes.

To forestall any conceptual confusion, we should note that as a 'means' (*Mittel*), namely means of labour, machinery is simply "a means for producing-surplus value";[4] machinery is *not* a 'means' in the sense of a use value for the creation of use values, since the 'mean term' or 'mediation' (*Vermittlung*) is precisely the labouring subject (which alone can organize and set 'means' in motion to attain ends) and not the machinery itself; the latter simply provides the purposive basis for this mediation. What exists as 'means' for capital is simply the purposive basic condition as far as the labour process is concerned. On the other hand, for capital, too, machinery figures as the purposive condition for extending the working day, and for the social labour process machinery is in turn a 'means' for creating use values. Yet, it is only for the subject who determines end-purposes that machinery is *truly* a means, namely, for the unilteral appropriation of objects of use; meanwhile, to the workers, machinery is simply the abstract basis for the realization of alien ends, in order to maintain their own existence.

4 Ibid, p. 492.

Hence, machinery is not only characterized by the dual character of nature-given and social form; its social form too has a dual character, which we term 'class structure'. As a social form, it first has the shape of a suitable means for appropriating surplus labour; to this extent, machinery is only machinery when in uninterrupted motion. On the other hand, it has the abstract shape, which only asserts itself indirectly through an inversion of the means-end relationship, of a purposive condition for producing use values whenever called upon to do so by social requirements. In this form, which asserts itself more deviously, machinery would be machinery only when *not* directly in motion, but merely available for use at any time. That distinguishing these two social forms of machinery is not mere hair-splitting is 'proven' in any crisis of overproduction, where each form works forcibly against the other.

The historical development of machinery has not only taken place within the contradiction between natural and social form; in addition, class society produces a dual, contradictory *social* form of machinery as value and as instrument of use. Under the conditions of commodity production, the inner structure of machinery as nature-given form develops simultaneously as both a form of use value and a form of value. The value-form must therefore be 'visible' as one of its moments. Thus, machinery 'at rest' does not express its character of availability on demand (as in the case of an empty road), but will always be the result either of its natural and historical wear, or the recoil effect of a crisis of overproduction. It is therefore precisely that side of machinery's social form that makes it a means for satisfying social needs which, under the conditions of the capitalist world market, serves to reflect possible economic crises.

One of the effects of the atrophy of Marx's critique of political economy into 'Marxist Economics' has been that insufficient attention is paid to the social form of use value qua means of labour. Not only—in Sohn-Rethel's appropriate formulation—has Marxism remained idealist vis-à-vis the natural sciences, but more so, and with more serious consequences, as regards the conceptual treatment of technology. This applies in particular to the means of production, which the political economist always views in the same light as that in which they were planned and designed by the engineer, i.e. purely instrumentally. However, a 'pure' instrument, i.e. an instrument unrelated to any specific purposes, would merely be an aesthetic object and not an instrument at all: it would be nothing more than abstract *functioning*, and this is precisely the *value-form-in-process*, frozen into a nature-given form. As far as the engineer is concerned, machinery, as a blue-print, wears out neither naturally nor socially; it appears neither as a means of production of surplus value, nor as the possible basis of a crisis of overproduction. The engineer considers only the most abstract form of its purposiveness: it must 'work'. But at the same time, the engineer is oblivious to the fact that this very conception corresponds exactly to the value-form of the intended machinery.

As we have already mentioned, there is no direct cause-effect relation between machinery as nature-given form, as instrument of use, and in the form of constant capital, since the change in form is effected by different subjects. The question is: what mediates these different, mutually contradictory forms, and where is the ground within which we can locate their determining characteristic? As Marx only gave a brief examination of this possibility of an inner connection of different characteristic forms, we intend to follow up and emphasize this connection. In *A Contribution to the*

Critique of Political Economy, where this question is more prominent, Marx writes: "use value as an aspect of the commodity coincides with the physical palpable existence of the commodity."[5] However, they can only 'coincide' in the result because they have first to be differentiated and then reunited in the process of labour. But even as a finished object, available for sale or exchange, the commodity requires a specific form of mediation between its use value (as the simple unity of nature-given form and purposive form) and its possible exchange value; Marx succinctly designated this form of mediation as the 'sensuous measures' of the commodity objects.

Measures (*Maße*) are quantitative relations (such as numbered items, spatial extension and weight) as social qualities of objects; viewed historically, they are for the most part elements of previously valid specific measures of value, 'particular equivalent forms' which were unable, for a variety of reasons, to evolve further into the general form of value. For example, scales in conjunction with the standardized poundal (*Kilopond*) as possible equivalent represent, as it were, an uncompleted development towards the money form (not all objects, as possible commodities, could be weighed). Nevertheless, the iron weight retained its social 'standardization' (its particular equivalent form) as a unit of measure, enabling relative value-magnitude to *appear* in a completely abstract form—namely, as the expression of a quantum of labour time—in the first place. Measures constitute the quantitatively distinguishable qualities of commodity objects as sheer amounts: number, length, area, space and weight. For the most part, these commodity measures are only 'relations' in themselves: the determinations of

5 K. Marx, *A Contribution to the Critique of Political Economy*, Moscow 1970, p. 27.

measurement rarely confront the commodities in reality. The sale of commodities means that they already ideally possess their particular measure as amounts, since price is the form of their equalization with those measures. The appearance of the magnitude of value as relative, quantitatively determined value-form expresses the fact that the magnitude of value appears in the particular relations of the commodities' measures: five bushels of wheat are worth two yards of cloth, i.e. a specified amount of specific volume units of wheat are made equal to a specified amount of specific area units of cloth. The commodity form thus accomplishes the paradox of equalizing relations of measurement which are utterly different socially: volume = area. Furthermore, it is only in such relations of measurement that the magnitude of value appears at all; they are its specific form.

Although the poundal itself only allows an abstract type of value-equality, tied to the nature-given form of the object (e.g. corn and wine, but not cattle and wheat, where the measure of weight is impracticable as a basis for equalization), the development of the value-form itself creates social forms of things that make possible the development of the price form of commodities. The value of a commodity always appears in the heterogeneous relation of two unit measures of specified amount; the equalization of different amounts therefore creates the form of the common element underlying this relation, a time-measured magnitude representing a quantum of labour. The form in question is the value-form. This also applies once commodities cease being exchanged and are bought and sold; one unit of measurement is hidden in the *price form* (the former measures in weight of gold as the 'standard of price'), the other unit of measurement is hidden in the expression of the amount of the commodity which has *received its*

price. This relation is expressed, somewhat unclearly, in Marx's notion of the 'natural form' which becomes the value-form of precisely that commodity whose natural form it is not. If 'natural form' is understood as the social unity of nature-given form and useful form, the concept is spot-on; however, if it is understood solely in terms of the nature-given aspect of the object of use (or commodity-object), the expresion is incorrect, since the value-form is reflected in the unity (expressed as amount and measure) of nature-given form and useful form. Only thus is it possible to appreciate the way in which the fetishism of the commodity is brought to completion: there is nothing mysterious in the fact that people 'reify', or objectify their living relations in the process of 'socializing' properties of nature. I shall therefore retain the distinction of nature-given form (*Naturform*) and useful form (*Gebrauchsform*), and employ the notion of 'natural form' (*Naturalform*) to express their negative unity. This is because the *determinate amounts* of commodities (i.e. amounts which could only be 'determined' by recourse to units of measurement in the first place) are relational forms that are as 'purely' social as is the form of the magnitude of value in its visible shape as the money form of commodities.

Initially, commodities are *produced* not as definite measures (which, like volume for example, usually originated in the sphere of consumption, the practical circumstances of the use of various objects), but rather as indeterminate *amounts* (*Mengen*). It is only the determination of value which requires already existing characteristics to become the quality of specific quantitative forms, i.e. to become measures. Weights, spatial areas, and numbers, which through unit measures become a *definite measure-magnitude*, first arise, as *intelligible forms of commodity objects*, in the value-*relation* itself; prior to this, even in production, the

'sensuous' measures are merely indeterminate amounts of products, i.e. simple magnitudes. Clearly, the nature-given forms remain the abstract, but not completely indeterminate phenomenal substrate of the commodity measures.

Commodities are produced in definite amounts, in the form of a quantitative determinacy which makes it possible to exchange and buy commodities as 'measured' amounts. In the *conscious* production of values characteristic of capitalism, these intelligible forms of the commodity ('intelligible' because these forms, like the price form, only exist through the 'understanding' of symbols, not through the sensuous perception of qualities) become forms of the commodity-object 'within' production. The operational planning of production expresses this through the fact that it no longer produces amounts in general, but, based on experience in the market, has to produce more or less precisely specified amounts; and since the division of labour means that the output of the factory no longer constitutes a complete use value but rather a fragment of a use value requiring the mediation of the market, these elements must assume measures which guarantee that they can be *repeatedly* assembled into a complete use value. The basis of these measures of the product lies in the 'sensuous' measures of the commodity. Hence, the *determination* of the amounts of commodities no longer takes place during exchange or sale, but is produced along with the commodity from the outset. These determinations enter into the plant-level development of new forms of use value: in the course of bourgeois society's development, use-values (produced as commodities) assume *different forms*, namely, inner value-forms. The object of use no longer corresponds merely to an appropriate relation between nature-given form and form *for* social need, i.e. purposive form; in

addition , the object of use must, as a commodity, take on a second social form to render the object 'purposive' for exchange, for circulation as commodity capital and for the value relation in general. The foundations of this commodity-purposiveness were the 'sensuous' measures, commodities as qualitative amounts. These measures are now basic to all technical and scientific research activities and theoretical constructions; certain areas—in particular, electrical and chemical technology—required the invention of new units of measurement, most of which referred back, in an analogous and comparative way, to older geometrical and mechanical measures.

The unification of such measures plays an important role in the further development of capitalist relations of production, as can be seen in Britain's current conversion to metric standards. These units of measurement are also the condition for the possibility of unitary industrial standards, which can be regarded as units of measurement attached to technically specific nature-given forms of commodities as inner value forms. Historically, this commodity-purposiveness became the basis for 'rationalization', not only in the creation of industrial standards but also in work-organization. The concept of rationalization reveals what lies at the core of bourgeois value-rationality: namely, as the logical, seemingly uncontradictory thought-form of valorization's pure functioning. Presumably, it was this characteristic form of technological rationality, sinking down from the value relation to the actual *production* of commodities, that first struck Sohn-Rethel, but which he could only interpret as a 'reflection' of the commodity form in consciousness.

To summarize: the nature-given material of the commodity object must assume a purposive form not

only for use but also for exchange. In turn, this latter form functions blindly as the condition for the possibility of more 'rational' forms, i.e. plays a part within production by co-determining the further development of adequate use-value forms for the products. The 'uniform motion' of machinery itself accommodated the creation of an 'inner value-form' of the commodity objects (as mutually *equal*), just as machine motion itself expresses the 'inner value-form' of the means of production as process. The equi-valency of the various commodities' amounts becomes their actual equality. The fact that these distinctions of form are no mere hair-splitting is shown in all those conflicts which arise between product planners and technicians on the one hand, and the factory's purchase and sales department on the other.

In my opinion, the dual social form necessarily assumed by the commodity provides us with a genetic explanation of abstract-categorial thought-forms that has more of a foundation in reality than Sohn-Rethel's arguments can have. The latter are ambiguous: on the one hand, thought-forms 'arise' from acts of exchange, a point which merely leaves us with an unanswered riddle; on the other hand, he interpolates an unspecified act of reflection between thought-form and commodity-form. Yet, the reflection of one form in another medium presupposes that very understanding which *com-pares* the real and reflected forms with one another in order to arrive at a judgement as to their formal identity. Certain forms of the social intellect are just as much *products* as *determining moments* of the universalization of value; they cannot be conceived either as merely 'presupposed' (as in Schelling) or as simply 'derived' (as in empiricism, to which Sohn-Rethel in the final analysis belongs). The amount of the commodity can only express itself as quantitatively determined value-relation if these

determinate amounts assume a peculiar additional nature-given form (either a very abstract form, like weight or extension, or a readily intelligible form, like number) and thereby become determinable relations of measurement, which are in turn the pre-conditions of the *appearance* of value; by becoming measures the amount of the commodity is abstract vis-à-vis the direct form of use value, but conditions the specific historical 'identification' of the directly natural use-form of commodities and their value-form. Without the activity of the understanding, the ideal form of the measure of value qua price-form could neither develop nor persist. A specific aspect of the understanding turns into a moment of the value-form and becomes one—but *only* one—of the constitutive pre-conditions of money, and hence of capital. Otherwise, one could never speak of the commodity's value-objectivity as 'sensuously supra-sensuous' (*sinnlich übersinnlich*).[6]

For the remainder, we shall further narrow down the problem to the commodity-objects in their capacity as material elements in the immediate production-process. Here, Marx specifies the results of the genetic form mentioned above: he formulates the dual social form in terms of the unity of means of production and 'means of valorization', i.e. constant capital encompassed within

6 [For this Marxian formulation, see footnote no. 3 to Norbert Kapferer's article in the present volume.—*Ed.*] As is well known, Marx demarcated 'social existence' from consciousness in terms of the material basis and what was derived from it. If one then conflates 'consciousness' and thought, a hostility to theory can develop which, although distancing itself from supposed 'idealisms', in fact constitutes the very basis for the latter's independent existence. Only the most minute part of the development and activity of social understanding is 'conscious', although it is this understanding as a whole which differentiates *social* from merely *natural* 'existence'. In turn, consciousness is the dependent term vis-à-vis the understanding; the former's relatively small role in social determination characterizes the specific blindness of reason in social development.

the concept of the means of production. We have already stated that this dual social form—structure and shape in the process of their mutual exclusion and identification as function—was the precondition for developing 'means of labour' which are no longer means for the worker but means for valorization, i.e. merely the purposive condition for the utilization of a social unit of labour power, or of labour power qua social. Machinery now possesses use-value form only in relation to society in the abstract (as capital); concretely, in relation to the individual worker, it only has the one-sidedly abstract social form of being 'value' in itself. It has the form of simple 'value', value *for* the production of things which somehow have utility. In the consciousness of the workers, 'value' becomes established as a scarcely differentiated contradictory unity of use value and abstract value. To say the machine has 'value' means that it has a significance, a validity, as a relation of labour and as a 'ware' (*Gut*). Although still unclear, proletarian consciousness reveals an understanding of the fundamental distinction between the two social forms of machinery—witness the history of machine-wrecking. However, it is for the *political* understanding of the proletariat to posit the specific meaning of each, so as, on the one hand, to be able to theoretically 'reconstruct' machinery in its role of a 'useful object' for the production of useful objects, and, on the other hand, to thereby be able to grasp machinery as capitalist private property for the extraction of surplus-value. Since machinery, and, even more so, apparatuses and technologies as nature-given forms, have in various occupations forfeited their elementary sensuousness, i.e. their character as means of labour, their meaning cannot be grasped through perception but only through an abstract political understanding qua critique of those relations.

The socially determined dual form existing as

machinery or as means of production in general causes certain structures of the class-based division of labour to become frozen, whereas others are revolutionized; in general, it mediates the unequal types of social labour and maintains them in such a way that 'plant rationality', the mathematical division of labour within the factory, constitutes the *irrationality* of the individual's labour. It is sheer chance whether an individual labours with no opportunity for communication, or whether there may still be a limited possibility for developing an interest in changes in working conditions and work tasks. In general, 'interest' as such is banished to the pure sphere of reproduction. The logic of the technological development of labour is employed against the direct needs of the proletariat as working individuals; this can be seen from any empirical study—for example, how automation is introduced in precisely those areas of production which are in fact the least stupefying. Only as a whole, in abstract totality, does reason blindly assert itself in the "increase of the constant constituent of capital at the expense of its variable constituent",[7] i.e. in the *one-sided*, subjectless alteration in the technical composition of capital. Only the 'subjectification' of the material foundations of social production would mean the creation of a social subject. The second, abstractly social aspect of form as the means of production's inner value-form is the active aspect; the aspect of the means of production as directly useful can only assert itself in opposition to the latter.

The dual social form of the object in production is hence the 'ground' of this society in two ways. First, machinery is the basis of the *dominance* of one class over another: it *establishes* the proletariat as such; second, it is the basis of the *societation* of labour processes

7 *Capital*, I, p. 773.

precisely by virtue of the development of an 'inner value-form' of the means of production. This is the locus of the rationality of the social structure of production, through which *direct* forms of use value are destroyed and the *mediation* is no longer effected through the spontaneous agency of the individual, but through society in general. Hence, machinery and technology establish the developing existence of society as a subject, in the sense of the requisite level of the productive forces. However, in contrast to Marx's own period, this dual basis no longer asserts itself through a spontaneous mediation of classes; rather, this process of mediation is itself a product of the scientific and technical intellect. The "scientifically arranged processes of production"[8] must be investigated in terms of this 'arrangement'. It is no use merely presupposing this intellect as mysteriously antecedent to capital and then confirming that the result of scientific and technological research are appropriated and used by capital; this does not explain the specific form of development of that intellect.

As Grossmann's critique of Borkenau indicates,[9] at the surface level it is not so much that the deductive form of thought sets its stamp on mechanics (the basic form of machinery), as the other way round: mechanisms and mechanical-dynamic structures set their stamp on the specifically deductive form of thought by supplying the understanding, in sensuous terms, with the abstract, naturo-analytic form as its material, as the content of formal thought. The 'whole' is given *a priori*, albeit in a social form which simultaneously provides the 'knowledge' that the whole is analytic (in the sense that

8 Ibid, p. 780.

9 H. Grossmann, "Die gesellschaftlichen Grundlagen der mechanistischen Philosophie und die Manufaktur", *Zeitschrift für Sozialforschung*, Vol. IV, No. 2. [Grossmann's article is a critique of F. Borkenau, *Der Übergang vom feudalen zum bürgerlichen Weltbild*, Paris 1934.—*Ed.*]

the apparatus, say a mechanism or gear-system, is previously assembled from parts). Theoretical deduction presupposes practical mechanical synthesis; fundamental principles are given, not merely as 'intuition' but as conclusive 'evidence'. At the same time, in the *functioning* of the mechanical works, the system should be constructed 'free of contradictions'. On the other hand, should the functioning cease, then deduction directly becomes theoretical analysis (*theoretische Analytik*), i.e. if repair work is initiated, or further development is undertaken on forms of use which have ceased, or appear to have ceased, to be purposive.

The empirical-analytic form of thought (conceived in philosophy, for example, as the prior intelligibility of perception and intuition) presupposes deduction as a 'functioning whole', just as deduction presupposes practical-active analysis, i.e. division of labour. However, it is not until they become an element in the capitalist production of commodities that logical necessity and certainty, as requisites of the functioning of mechanics, are stripped of their character of mere need, mere want. Although the system of gears and mechanisms may previously have been more or less purposive to labour, in capitalist production their functioning becomes an absolute necessity, and repair or crisis is inevitably the contradiction (as shortcoming and loss) of profit. Consequently, the dual social form of the mechanical means of production is first expressed in the category of *'regularity'*, but in advanced commodity production as *'causality'*, i.e. the necessary, coercive relation of cause and effect. Traditional logic anticipated techno-logic, just as commercial capital anticipated industrial capital.

The technical relations which are *developed* (not merely *reflected*) in the social understanding—materially, as the functional nexus in machinery and technology of use-form and value-form—finally obtain an autonomous

subjective form (for the mediation of capital and labour) in the shape of the technical intelligentsia. On the other hand, this autonomy is in turn the presupposition for the dual social form to set its stamp on the nature-given form of 'brain'. As a moment of use value, the intellect is tied to matter; as deductive, discursive logic, its material production of knowledge achieves an abstract independence (expressed in institutional terms as training at the levels of primary, technical and higher education). At the same time, this is the presupposition for industrialization of the social dissemination of the knowledge required for production and for the production of knowledge itself; i.e. it is the presupposition for the separation of the *means* of thought (laboratories, libraries, data processing machines, etc.) and thought-*power* (*Denkkraft*) itself. This is the signal for the real societation of the understanding, which, under the conditions of bourgeois society, can only be achieved via the detour of the dequalification of individual thinking, i.e. via the manufactured stultification and artificial stupefaction of those layers of the intelligentsia which used to be the creators and carriers of culture. Doubts that human development will survive this passage through the 'de-utopianization' of life (as a precondition for its brutalization generally) are too wide-spread to be written off just as an ideology of bourgeois downfall based on cultural pessimism. This is why it is all the more important to recognize the class dictates (which becomes interest-free and sublimated in the technological division of labour) for the structure that they really are, namely, 'the inner value-form of things'.

However, in contrast to ideology, the fetish character of the 'inner value-form' of the means of production is necessary for their continuing development—analogous to the way in which the results of mathematical operations often have to disappear in the resultant

formula before the latter can provide the basis for more complex relations to be calculated. And precisely because the genesis of technological development must disappear in the result, proletarian consciousness hardens into a false, ahistorical immediacy. The illusion develops that the individual tool, machine, apparatus, in fact the entire technology of the production process, is always a means, always an instrument, which in itself anyone can appropriate and use. The weapon or tool appears to have the same form—in terms of structure and shape—in the hands of the oppressed as it does in the hands of the oppressor, although the goals may have changed drastically. The functioning, mediating instrument seems completely indifferent to its two extremes—bourgeois private property and proletarian labour—although in the final analysis it is this mediation alone that can link the two classes, since in the long run sheer political-military force is not an adequate basis for maintaining social cohesion in a system of production. This is the source of the increasingly revolutionary role of the scientific-technical intelligentsia as the subjective side of this fateful mediation of classes; this intelligentsia both *co-founds* the link between classes, as well as having its own *existence* within this mediation.

The reason why the surface appearance of the means of production is dominated by the semblance of indifference is to be found in the fact that in industrial production the living dialectic of the material interaction with nature is no longer experienced, if for no other reason than that, as far as the workers are concerned, the means used to work upon nature-given material are simply the conditions for their abstract activity. The construction of particular ploughs and looms revealed both the social existence of the peasant and handicraft workers of a particular historical epoch as class-specific occupations, as well as the basis and degree of societation

of this agrarian and handicraft form of production. The class, as an occupational estate, existed simultaneously in the natural form of its means of labour. It was only with the *separation* of the worker from the means of production, and the *mediation* of this development of the (constantly evolving) means of production to the worker via the activity of the intellect, that the means of labour assumed a historical form which no longer corresponded to the individual's activity. The paradox is that although machinery and technology were created as the purposive basis of bourgeois class rule, they appear as their opposite in the social mediation of individual capitals through the market: that is, they appear as a neutral, indifferent basis for the societation of the production process through the division of labour. They appear specifically 'class neutral', particularly in comparison to objects from the sphere of consumption, where cars, home furnishings, fancy packaging and buildings still directly exhibit both forms of their social nature, namely, utility and domination. By contrast, the highest stage of the developmental forms of the means of production, as 'rationality of the inner value-form', produces the opposite appearance: the melancholic sameness of proletarian working conditions vaunts itself as the 'transcendence of class society', for the simple reason that capital, as 'inner social value-form of the means of production', presents itself abstractly as the latter's societal nature and universal validity: in fact, as society-in-itself, taking on material shape as the universally valid coercion characterizing labour conditions.

This novel semblance may be the reason why there has been no machine-wrecking in the Twentieth Century, even though the same class relations of production are manifested, albeit in a subjectless form, in this system of machinery and technology. Machine-wrecking has today turned into its opposite: 'machinolatry'. The

critique of the genesis of these socially dual, class-specific characteristic forms now has the task of calling the mechanisms of this fetishism by their real name.

Translated by Pete Burgess

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Outlines of a Critique of Technology

In spite of their differences, one tradition unites Marxists as diverse as Kautsky and Lenin, Trotsky and Stalin, Mandel and Althusser: 'technicism'—an ideology which maintains that science and technology are 'neutral' and can be abstracted from capitalist relations of production. Capitalist production as a body is thus posited as a potential basis for socialism: Fordism without Ford in Trotsky's version: the 'democratic' adoption of nuclear programmes for many European Communist Parties.

The Introduction by Monika Reinfelder lucidly reconstructs this tradition and examines some alternative critical views of technology—from Lukács through to Marcuse and Castoriadis (Cardan). Despite these, the Introduction concludes that "though we may have broken the spell of technicism, the task of elaborating the significance of Marx's critique of political economy for a critique of technology is still before us."

Panzieri's pioneering essay establishes the basis on which machinery is theorized in *Capital*, contrasting this with the orthodox view. Kapferer's concern is to overcome that "schism of thought" within Marxism whereby "on the one hand, all phenomena contained in the world of consciousness . . . are understood historically as time-bound (while) questions of logic, mathematics and science are seen as ruled by timeless standards." In the closing essay, H-D Bahr theorizes machinery as the *purpose-built basis* of the *specifically capitalist mode of production*, i.e. of *value-in-process*, thus linking the critique of technology to a deepened understanding of the value-form.

This book attempts an innovatory initial synthesis, linking studies on the philosophy of science, the labour process and capitalism as a mode of production. It also helps us to grasp the implications of new forms of revolutionary struggle developing in Europe.

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