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INTRODUCTION

This first English translation of Karl Marx's Notes on Machines is a tiny section of his Foundations for A Critique of Political Economy. The Foundations were written by Marx during 1857-8, and are notes to himself as a preparation for Capital. As he did not have to make concessions to a readership the notes are dense and elliptical.

There is no need for piecies in publishing Marx and none are given. The notes attempt to understand how the means of labour, e.g. tools, become as machines and machine processes the conditions of labour. That is, how the actual processes of production are structured by capital into creating labour for the sake of production itself. Thus at a theoretical level Marx analyses the need, for example in our own society, for planned obsolescence.

The way Marx shows machinery and automatic processes come to stand against the labourer, shows that he is concerned with actual relations of production, not psychological states; with they way "the production process has ceased to be a labour process in the sense that labour regulated it as a unifying activity". Marx is careful to point out that these relations of production are not inherent in machines, for he sees automatic production as ultimately being in contradiction with production for profit. Marx was wrong if he foresaw the automatic collapse of capital but we can see from his conclusion - that "The constant flow of reproduction becomes an externally necessary precondition of the mode of production based on capital". - that modern 'consumer' capitalism does not contradict Marx's analysis; even though he did not foresee that consumption itself could come to stand over and against the consumer.

These notes, all of which appear in Capital in one form or another show Marx's thought at its most intense. In a revolutionary critique his prose articulates the circularity of the processes he is trying to grasp, the reciprocities and contradictions between the modes and relations of production.

Notes

1. When discussing the way in which capital as a human process turns against men, Marx uses the Hegelian term Aufhebung. This has been translated by the term 'sublation' the strict technical equivalent as used by the first English Hegelians. There are two reasons for this. First the word is English, secondly it does not attempt to annihilate Marx's actual thought processes. Aufhebung has a double meaning; it can mean to abolish and to preserve. In its dialectical use it means both simultaneously. Milligan in his notes on his translation of the 1844 manuscripts, rejects the term sublation on the grounds that it "is likely to be unintelligible to the general reader". But his 'simplicity' is misleading and he fractures the term, translating it sometimes in a positive manner sometimes as a negative. The problem of the nature of the dialectic in marxism, the problem of historical change, has not been solved but we cannot struggle with the difficulties in Marx's texts by pretending that they are written in everyday English. For the dialectic as Marx uses it cannot be divided into its parts. It is neither the Liberal compromise of theses, antithesis and synthesis, (nor the infinite leapfrogging of totalisations). The development of capital in its fixed form, as plant, machinery and long range transport and communication; and its circulating form as an increasingly immediate global monetary system, abolishes labour as the directive control of production and in that very process throws up the preconditions for the complete human control over the production of life.
2. All of Marx's emphases have been underlined twice, and words and phrases not in German in the original, including those that are in English, have been underlined once. 'Fixed-capital' and 'circulating capital' were in French in the original but these have been translated throughout.

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Karl Marx

NOTES ON MACHINES

Capital which consumes itself during the production process, or fixed capital, is means of production in the strongest sense. In a wider sense, the whole production process, materially considered, and each of its moments, e.g. circulation, is just a means of production for capital, for which value only exists as its own goal. Materially, raw material itself is considered as a means of production for the product, etc.

But the conception that the use value of fixed capital is consumed during the production process is identical with that of it only being used as a means in this process, as a mere agent for the transformation of the raw material into a product. As such a means of production its use value rests in the fact that it is only the technological condition for the ongoing of the production process (the place where production goes on), like the building, etc., or that it is the immediate condition solely for the working of the means of production, like all matieres instrumentales. Once again, both are just material presuppositions of the ongoing of the overall production process, or of the application and upkeep of the means of labour. In this sense alone it is only applicable within and for production, and has no other use value.

Originally, when we were considering value passing over into capital, we simply included the labour process in capital, and capital appeared according to its material conditions, its material existence, as the totality of conditions of the process which divided accordingly into certain qualitatively different portions, the material of labour (this rather than raw material is the correct and conceptual expression), the means of labour and living labour. On the one hand, capital, according to its natural existence, was divided into these three elements; on the other, it was the moving unity of the labour process itself (or the uniting of these elements one with the others into a process) which was the basis of the product. In this form the material elements - material of labour, means of labour and living labour - appear only as the essential moments of the labour process itself, the labour process which capital appropriates to itself. But this material side - or its determination as use value and real process - is quite different from its formal determination. In the latter:

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1. the three elements in which it appears for the exchange with the capacity to work, for the real process, appear only as quantitatively different portions of it, as value quanta, whose unity it conceives as their sum. The material form, use value, in which these different portions exist does not effect the homogeneity of this latter determination. According to the formal determination capital is apparently only divided quantitatively into portions;

2. within the process itself the form is divided according to the element of labour and the two other elements only in such a way that the former was determined as constant value and the latter as evaluating. But insofar as the differentiation into use values, the material side, came into the relation, it fell quite outside the formal determination of capital. But now, in the difference between circulating capital (raw material and product) and fixed capital (means of labour), the difference between the elements as use value is the same as the difference within capital as capital, according to its formal determination. The mutual relation of the factors which was formerly only quantitative appears now as a qualitative difference within capital itself as determining its general motion (turnover). Material of labour and product of labour, the neutral precipitate of the labour process, are also, of course, as raw material and product, no longer materially determined as material and product of labour, but as the use value of capital itself in its various phases.

As long as the means of labour remains a means of labour in the true sense of the word, just as it was historically and immediately introduced by capital into its valuation process, it undergoes only a formal change from the fact that it is now no longer only that it appears from the material side as a means of labour, but equally as

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a particular mode of existence of capital, determined by the general process of capital: as fixed capital. But once introduced into the production process of capital, the means of labour undergoes various metamorphoses, of which the latest is the machine, or rather an automatic system of machinery (system of machines: the automatic system is only the most perfect and adequate form of machinery, that first transforms it into a system), regulated in its motion by an automaton, a motive force moving of itself; this automaton consists of numerous mechanical and intellectual organs, such that the workers themselves are only determined as its conscious organs. In the machine, and even more in machinery as an automatic system, the means of labour is transformed in its use value, i.e. in its material existence, into an existence adequate for fixed capital and for capital overall, and the form in which it was introduced as the immediate means of labour into the productive process of capital is sublated by a form imposed by capital itself, and corresponding to it. In no relation does the machine appear as the means of labour of the individual worker. Its differentia specifica is not, in fact, as it is for the means of labour, that of mediating the activity of the worker on the object; but the very activity of the worker is now so placed that it is limited to mediating the labour of the machine, the action of the machine on the raw material; to supervising this action and protecting it from disturbance. Contrast a tool which the worker animates like an organ with his own skill and activity, and whose manipulation therefore depends on his virtuosity. The machine, however, which possesses ability and strength instead of the worker, is itself the virtuoso, possesses its own soul in the mechanical laws operating within it, and consumes coal, oil, etc. (materies instrumentales) to maintain its continuous motion just as the worker consumes food. The activity of the worker, reduced to a mere abstraction of activity, is determined and regulated in all its aspects by the motion of the machinery, not vice versa. The science which constrains the inanimate members of the machinery through its construction to work functionally as an automaton does not exist in the consciousness of the worker, but acts through the machine as an alien power over him, as the power of the machine itself. The appropriation of living labour by objectified labour - of the valuating power or activity by value-for-itself which is part of the concept of capital, is posed in production based on machines as a characteristic of the production process itself, both in its material elements and its material movement. The production process has ceased to be a labour process in the sense that labour regulated it as its dominating unity. It appears rather as conscious organs at various points in the mechanical system in the form of individual living workers; dispersed, subsumed under the general process of the machinery, itself only a member of the system whose unity does not exist in living workers, but in living (active) machinery, which seems to confront the worker as a powerful organism in respect to which his own individual activity is insignificant. In machinery objectified labour faces living labour in the same labour process as the power dominating it that capital is according to its form: the appropriation of living labour. The assumption that the labour process is a mere moment of the process of capital valuation is also posed on the material side by the transformation of the means of labour into machinery, and of living labour into a mere living accessory to this machinery: its means of action. The increase in the productivity of labour and the maximum negation of necessary labour are, as we have seen, necessary tendencies of capital. The realisation of these tendencies is the transformation of the means of labour into machinery. In machinery, objectified labour materially opposes living labour as the power dominating it and as the active subsumption of the latter under the former, not only insofar as it is appropriating it to itself, but in the real production process itself; the relation of capital as value appropriating to itself the value realising activity is posed in fixed capital which exists as machinery as equivalent to the relation of the use value of capital to the use value of the capacity to work; further, value objectified as machinery appears as a premise with respect to which the value-realising power of the individual working capacity dwindles to an infinitely small quantity; in the enormous mass production which accompanies machinery any relation to the immediate needs of the producer and thus to immediate use value disappears in the product; it is predetermined in the form in which the product is produced and in the relations in which it is produced that it is produced only as a bearer of value, and that its use value is only an ad hoc condition. Objectified labour itself appears immediately in machinery,

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not only in the form of a product, nor of a product used as a means of labour, but of the productive force itself. The evolution of the means of labour into machinery is no accident for capital, it is the historical transformation and readaption of the means of labour inherited from tradition into a form adequate to capital. The accumulation of science and ability, of the general productive forces of the social brain, therefore remains, in respect to labour, absorbed into capital, and thus appears as the property of capital, and more precisely of fixed capital, to the extent that it enters the production process solely as the means of production. Machinery thus seems to be the most adequate form of fixed capital and fixed capital the most adequate overall form of capital if capital is considered in its internal relations. On the other hand, insofar as fixed capital is tied to its reality as determined use value, it does not correspond to the concept of capital, which, as value, is indifferent to any determined form of use value, and can take on and cast off each of such forms as indifferent incarnations. From this side, i.e. if capital is considered in its external relations, circulating capital seems to be the adequate form of capital, as opposed to fixed capital. ✓

Further, insofar as machinery is developed with the accumulation of social science, of overall productivity, the general social labour is expressed in capital, not in labour. The productivity of the society is commensurable with its fixed capital, existing in it in objectified form and conversely, the productivity of capital develops with this general progress which capital appropriates gratis. Here we shall not examine the development of machinery en detail, but only in the general aspect in which in fixed capital the means of labour in its material aspect loses its immediate form and confronts the worker materially as capital. In machinery knowledge seems to be an alien knowledge outside the worker; and living labour seems to be subsumed under independently operating objectified labour. The worker seems to be superfluous to the extent that his action is not conditioned by the needs (of capital).

Thus the full development of capital takes place - or capital reaches the stage of imposing the form of production corresponding to it - only when the means of labour is not only formally determined as fixed capital, but is sublated in its immediate form and fixed capital seems to confront labour inside the production process as the machine; the whole productive process does not present itself as subsumed under the immediate ability of the worker, but as a technological application of science. The tendency of capital is, therefore, to give a scientific character to production, and immediate labour is confined to a mere moment of this process. The recent evolution of capital shows the same thing as the transformation of value into capital: that it presupposes on the one hand a determined historical development of the productive forces (including science) among these productive forces) and on the other hand stimulates and accelerates this development. ✓

The quantitative extent and efficiency (intensity) which capital develops as fixed capital thus indicates overall the degree to which capital has developed as capital, as power over living labour, and the degree to which it has subjected the overall production process. The same for its aspect as an expression of the accumulation of objectified productive forces, likewise of objectified labour. But if capital is capable of giving itself its first adequate image as use value inside the production process in machinery and in other forms of real existence of fixed capital, e.g. railways etc. (to which we shall return later), this does not at all imply that this use value - machinery in itself - is capital, or that its subsistence as machinery is identical to its subsistence insofar as it is capital; as little as gold will cease to have a use value as gold on the day when there is no more money. Machinery will not lose its use value on the day when it ceases to be capital. It does not at all follow from the fact that machinery is the most adequate form of the use value of fixed capital that its subsumption under the social relations of capital is the ultimate and most adequate social relation of production for the use of machinery. ✓

Insofar as labour time - the mere quantum of labour - is imposed as the unique

determining element by capital, immediate labour and its quantity disappear as the determining principle of production - of the creation of use value - and are reduced quantitatively to a tiny proportion that may - qualitatively - be absolutely indispensable but is a moment subordinate to the general scientific labour, on the one hand to the technological applications of the natural sciences, as on the other to the general productivity derived from social articulation in general production: the general productivity which seems to be a natural gift of social labour (although it is a historical product). Thus capital works for its own dissolution as the dominant form of production.

Therefore, if on the one hand the transformation of the productive process from a simple labour process into a scientific process which submits natural forces to its service and makes them work in the service of human needs seems to be the property of fixed capital confronting living labour; if individual labour as such ceases to seem productive, or rather, is only productive in the common labour which submits natural forces to itself, and this elevation of immediate labour to social labour seems to be a reduction of individual labour to impotence in the face of the community of labour represented and concentrated in capital; on the other hand the maintenance of labour in one branch of production by the work of coexisting labour in another branch seems to be only a property of circulating capital. In small circulation capital advances the worker his wages, which the worker exchanges for products necessary to his consumption. The money he receives has this power only because others work simultaneously alongside him; and only because capital has appropriated his labour can it give him with the money control over the labour of others. This exchange of his labour for another's does not here seem to be mediated and conditioned by the simultaneous coexistence of the other's labour, but by the advance that capital makes. It appears as a property of that part of the circulating capital which is ceded to the worker, and of circulating capital overall, that the worker during production can make the necessary exchange for his consumption. It does not appear as the exchange of simultaneous labour powers but as a material exchange of capital; as the existence of circulating capital. Thus all labour powers are transposed into powers of capital; in fixed capital the productivity of labour (which is placed outside it and as (in fact) existing independently of it); and in circulating capital, on the one hand the fact that the worker has set himself the conditions for the repetition of his labour, and the other the exchange of this labour is mediated by the coexisting labour of others appears in such a way that it is capital which makes him the advance, and on the other hand creates the simultaneity of all the branches of labour (these last two determinations really belong with accumulation). Capital poses itself as mediator between the various labourers in the form of circulating capital.

Fixed capital in its determination as means of production whose most adequate form is machinery, produces only value, i.e. increases the value of the product in two aspects only:

(1) insofar as it has value, i.e. is itself the product of labour, a certain quantum of labour in an objectified form;

(2) insofar as it increases surplus labour with respect to necessary labour, enabling labour, through its increase in productivity, to create a greater mass of products necessary for the sustenance of the capacity of living labour in a shorter time.

Therefore, the bourgeois statement that the worker shares with the capitalist because the latter, with fixed capital (which is on the other hand the product of labour and nothing but alienated labour appropriated by capital) facilitates labour for the workers (rather, it always subtracts from labour any independence or attractive character with machines) or shortens it, is absolutely senseless. Capital rather uses the machine only insofar as it allows the worker to work a larger part of his time for capital, to relate himself to a larger part of his time as time that does not belong to him, to work

longer for someone else. It is true that with this process the quantum of labour necessary for the production of a determined object is reduced to a minimum, but only because a maximum of labour is valued in the maximum of such objects. The first aspect is important because capital here - wholly unintentionally - reduces human labour (the expenditure of energy) to a minimum. This will be useful to emancipated labour, and is the precondition of its emancipation. What has been said reveals the absurdity of Lauderdale's thesis that tries to make fixed capital a source of value, autonomous and independent of labour time.¹ It is such a source only insofar as it is itself objectified labour time and insofar as it creates surplus labour time. Machinery itself historically presupposes for its employment - see Ravenstone above - superfluous hands. Only given a superfluity of labour power does machinery come in to replace labour. Only in the imagination of economists does it succour the individual worker. It can only work with masses of workers whose concentration in the face of capital is, as we have seen, one of the historical presuppositions of capital itself. Machinery does not intervene to replace lacking labour power but to reduce present masses to the necessary level. Only where labouring capacity is present in mass does machinery intervene (return to this point).

Lauderdale thinks he has made a great discovery when he says that machinery does not augment labour productivity because it rather replaces it or does what labour cannot do by its own powers. It is part of the concept of capital that the increased productivity of labour is posed rather as the increase of a power outside it than as the growth of its own power. The instrument of labour makes the worker independent - makes him a proprietor. Machinery - as fixed capital - makes him dependent, makes him appropriated. This effect of machinery occurs only insofar as it is determined as fixed capital, and it is so determined only insofar as the worker faces it as a wage labourer and the active individual overall relates himself to it as a mere worker.

Whereas up to now fixed capital and circulating capital have appeared merely as different transitory determinations of capital, they have now crystallized as particular forms of existence, and circulating capital appears beside fixed capital. There are now two different kinds of capital. If we consider a capital in a determined branch of production it appears to be divided into these two parts or divides itself in a determined proportion between these two species of capital.

The difference within the production process originally between means of labour and material of labour, and product of labour, appears now as the difference between circulating capital (the two former) and fixed capital. The distinction in the purely material side of capital is now taken up in its form which appears as what makes the distinction.

For the thesis (of Lauderdale etc.) which wants to make capital as such create value separately from labour, and thus also surplus value (or profit), fixed capital - namely that capital whose material existence or use value is machinery - is still the form which gives the most credence to their superficial fallacies. Against this, e.g. in Labour Defended that the constructor of a road can 'share with its user, not the 'road' itself'.²

Circulating capital - once it is supposed that this really does go through its various phases - the increase or decrease, the length or brevity of the period of circulation, the greater or lesser facility or difficulty with which the various levels of circulation are passed through determines a diminution of the surplus value which could be created in a given space of time without these interruptions - either because the number of reproductions is reduced or because the quantum of capital engaged in the productive process contracts. In either case, it is not a question of a diminution of the pre-existing value, but of a diminution in its rate of increase. But hardly has fixed capital developed to a certain extension - and this extension, as has been pointed out, is the measure of the overall development of large-scale industry - and therefore

increased in relation to the development of the productive forces of the same - it is itself the objectification of these productive forces, these forces as a pre-existing product - , from this moment on any interruption of the production process acts directly as a diminution of capital itself, of its pre-existing value. The value of fixed capital is reproduced only to the extent that it is employed and consumed in the production process. If it is not used it loses its use value without its value passing into the product. Therefore, the greater the scale of development of fixed capital, in the meaning we are using, the more the continuity of the production process or the constant flow of reproduction becomes an externally necessary precondition of the mode of production based on capital.

Also, from this point of view, the appropriation of living labour by capital acquires an immediate reality in the machine: on the one hand it is the analysis and application of mechanical and chemical laws springing directly from science which enables the machine to perform the labour which was previously carried out by the worker. The development of machines in this way only takes place when large-scale industry has already reached an advanced stage, and all the sciences are prisoners in the service of capital; and on the other hand the existing machinery itself already furnishes great resources. Then invention becomes business and the application of science to immediate production a determining and encouraging criterion for production itself. But this is not how machinery arose on a large scale, and even less how it appeared in detail. This is by analysis - by the division of labour, which more and more transforms the operations of the workers into mechanical operations so that at a certain point mechanisms can come in their place (An economy of power). Thus the determined mode of labour transferred from the worker to capital in the form of the machine, and his own labouring capacity devalued by this transformation appear here directly. Hence the struggle of the workers against machinery. What was the activity of living labour becomes the activity of machines. Thus the appropriation of labour on the part of capital, the capital which absorbs living labour 'as if there was love for it in its body'³ is presented to the worker in a materially tangible form.

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Q The exchange of living labour for materially objectified labour, i.e. the positing of social labour in the form of an opposition between capital and wage labour, is the final development of value relations and of production based on value. Its premise is and remains the mass of immediate labour time, the quantum of promised labour, as the decisive factor in the production of wealth. But to the extent that large-scale industry is developed, the creation of real wealth comes to depend (less and less) on the labour time and the quantum of labour employed compared with the power of the agents set in motion during that labour time, which in its turn - in its powerful effectiveness - is not minimally related to the immediate labour time that their production cost, but depends rather on the general state of science and of the progress of technology, or of the application of this science to production. (The development of this science, in particular of natural science, and with it of all the other sciences, is in its turn again in a relation with the development of material production). E.g. agriculture becomes merely the application of the science of metabolism so that it is regulated in the mode most advantageous to the entire social body. True wealth is revealed rather - and this is the sign of large-scale industry - in the enormous disproportion between the labour time employed and its product, as also in the qualitative disproportion between labour reduced to its pure abstraction and the power of the production process which it supervises. Work no longer seems to be included in the production process as man rather stands apart from the production process as its regulator and guardian (what has been said of machines also applies to the combination of human activities and the development of human commerce). It is no longer the worker who inserts a modified object as an intermediate members between himself and the object; it is the natural process transformed by him into an industrial process which he inserts as a means between himself and inorganic nature, thereby rendering himself master of it. He stands beside the production process rather than being its principal agent.