Wage Slave X
Capitalism, Technology and the Environment

Retrieved on 9 December 2010 from libcom.org

theanarchistlibrary.org

Capitalism, Technology and the Environment

Wage Slave X

Marxism is often accused of being blind to capitalism's ravaging of the natural environment. Marxism is most often portrayed, both by its critics and by many of its proponents, as endorsing capitalism's treatment of, and relationship with nature, and even of supporting its increased extension or intensification. Ever-increasing production and development of the technological means of securing it are widely seen as being ends-in-themselves for Marxism. In fact, this is true of the dominant varieties of Marxism during the 20th century. However, it is not true of Marx himself, and thus it is possible to forge a critical form of Marxism which rejects that perspective. It is towards the latter goal that I see this text as contributing. While a few Marxologists have undertaken extensive research in order to establish that Marx was in fact far from being blind to capitalism's fundamental antagonism towards nature (see Paul Burkett, Marx and Nature (1999) and John Bellamy Foster, Marx's Ecology (2000)), I will here, at the outset, content myself with two short quotes from Marx's mature writings which clearly illustrate his awareness of this reality.

"It is not the unity of living and active humanity with the natural, inorganic conditions of their metabolic exchange with nature, which require explanation or is the result of a historical process, but rather the separation between these inorganic conditions of human existence and this active existence, a separation which is completely posited only in the relation of wage labour and capital." (Grundrisse, p.489 (Penguin, 1973))

"Capitalist production … disturbs the metabolic interaction between man and the earth … [A]ll progress in capitalist agriculture is progress in the art, not only of robbing the worker, but of robbing the soil; all progress in increasing the fertility of the soil for a given time is a progress towards ruining the more long-lasting sources of that fertility. The more a country proceeds from large-scale industry as the background of its development, as in the case of the United States, the more rapid is this process of destruction. Capitalist production, therefore, only develops the techniques and the degree of combination of the social process of production by simultaneously undermining the original sources of all wealth — the soil and the worker." (Capital, vol. 1, p. 638 (Penguin edition, 1976)

1. My concern here is not to detail the specific interrelations between the operation of capital and the natural environment, nor to propose some sort of eco-Marxist strategy for resisting capital's threats to people and nature. My primary concern, rather, is to focus on the basic approach that a new 21st century Marxism should take in regard to the question of the general relationship between capitalism and the natural environment, of analyzing its historical trajectory, and, by im-

development of the base or infrastructure of capitalist society (as opposed to what occurs at the 'superstructural' level of politics, culture, and ideology) as inherently historically 'progressive'. It thus also involves a thoroughly productivist attitude, since it sees all capitalist infrastructure development as developing the productive forces, seen in a purely quantitative way, as increasing the overall productivity of society, and thus as moving us closer, on an objective level, at least, towards communism.

For me, all of these factors, (1) economic determinism (with historical materialism as a 'science' of capitalism), (2) the base/superstructure model, (3) a teleological and progressivist conception of history, and (4) positivism and productivism, are inter-linked, and a thorough critique of them should be unified in considering their various inter-connections. An absolutely fundamental tenet of positivistic traditional or classical forms of Marxism, regarded as a bedrock inheritance from Marx, is the following pair of equations concerning mature capitalism (however defined): the relations of production are reactionary and negative for humankind, while the forces of production (developed) are progressive and positive for humankind. Traditional Marxism simplistically endorses and even lauds capital's development of the technological productive forces, while it reserves its opposition only for the specific usage that is made of them by way of capitalist relations of production; rather than seeing that it is the possibilities opened up by capital's development of technology (and then not necessarily by all of it), the possibility of going far beyond and in an entirely different direction than that taken under the direction of capital that is what is truly progressive about capitalist 'progress'.

decline, together with the most powerful technological forces of production and of destruction continually being advanced, hell-bent on maximum domination and exploitation, while the other is driven by association, co-operation and holding in common. The one is characterized by mass death and catastrophic destruction, while the other is characterized by harmonious co-existence and community. These opposing futures and the tendencies moving in their respective direction represent, alternatively, the negative and the positive sides of capitalism's 'progress'; and the basis of our understanding of them is to be found in the work of Marx, in both his praise of capitalism's making finally possible the full development of the human being and his many contributions to a ruthless critique of the whole panoply of capitalist civilization.

13. One of IP's principal tasks today is to contribute to a contemporary renewal or renaissance of Marxism, to a new critical Marxism, in opposition to the ossified traditional or classical Marxism that dominated the 20th century. For me, the critique of traditional Marxism — which, while it was embodied principally in the doctrines and perspectives of the 2nd, 3rd and 4th Internationals, contaminated also the main currents of the communist left — encompasses a number of factors. On the strictly theoretical level, the main factors include economic determinism (often combined with a view of historical materialism as a 'science' which uncovers all of the 'laws' governing capitalist society), the base/superstructure model of social functioning, a teleological (and linear/progressivist) conception of history, with communism seen as being the inevitable end result, and what has been called a 'positivist' or uncritical stance towards capitalist development. This positivist orientation involves seeing all

plication, of the relationship between a post-capitalist society and the environment.

This text is conceived as a contribution to larger effort, which is to establish as fundamental to a new, critical Marxism appropriate to the 21st century that the technology developed by capitalism in its historical transition to its real domination over the whole world possesses an immanent antagonism (tending towards catastrophe) to nature, just as it possesses an immanent antagonism (tending towards catastrophe) to living labour and the workers engaged in it. (In fact, in both cases, it is humanity in general that is ultimately threatened with catastrophe.) The idea is that over the course of the many years of capital's historical development, of its continual 'revolutionizing of production', with modern science at its service, that it has actually built into its technology this antagonistic orientation, which serves to facilitate its maximization of opportunities for domination and exploitation of both living labour and nature. Of course, in capitalist society, especially where the form of domination at the political level takes the democratic form, this project is widely seen as 'civilizing' and 'spreading prosperity', and so science for the most part willingly supports it.

Fundamental to my whole approach to capitalism's relationship to nature is that it is, in the end, essentially the same as capital's relationship to wage labour. Without keeping this focus firmly in mind here in this text, one will indeed wonder why I am going on at such length (especially in the quotes from Marx) about capitalist technology's relation to the worker. Capital dominates both, living labour and nature, in order to exploit them both. In both cases, capital uses technology as a mediating factor in order to realize, enforce and reproduce at a higher level these relations of domination and exploitation. In

both cases, the relationships and the processes involved are linked and analogous. Capital is antagonistic toward the natural environment just as it is antagonistic to wage labour. Capital's domination and exploitation of nature, given the latter's finite limits and specificities, leads to destruction, degradation and despoliation of that nature, just as its domination and exploitation of wage labour, given the physical limits and specificities of human beings, leads to destruction, degradation and exhaustion of the working class. Further still, just as the working class fights back against capital's depradations, so too does nature in ways we are all too familiar with today, such as irreversible climate change, widespread industrial diseases such as cancer, 'natural disasters' of all sorts, etc. But in reality, it is not nature taking revenge on humanity. That would be to personify or subjectify nature, to ascribe to it intentionality. In fact, all of these environmental catastrophes, which constitute an expanding environmental crisis, result from capital's technological transformation (and mutation (thus: trans-mutation?)) of natural ecosystems and processes into monstrously destructive forces for humankind which previously, naturally, they were not. Highly developed capitalist domination of humanity and nature has intervened in and transformed the myriad intricate and inter-related natural processes of the planet to such an extent that the current 'natural environment' we live within cannot be truly said to be natural; it has been adulterated, contaminated, poisoned and destroyed to such an extent that it is more accurately described as the capitalistically modified 'natural' environment.

Capital's relationship with nature has a history of its own; it has a trajectory of development, of 'advancement', of 'progress'. But, we need to ask, an advancement

the rate of profit falls, as a result of the rising organic composition of capital, i.e. the growth of the productive forces, the greater the pressure on each capital entity — nation or firm — to accelerate the development of those self-same productive forces in the endless quest to get a jump on its competitors, and to grab a surplus-profit."

This immanent historical tendency of capital, which strengthens the more capital develops, the more capital advances to its real domination over labour and society, and over nature, the more rapid is the movement of capitalism's destruction of the environment towards global ecocide.

12. Traverso has also importantly brought to light the somewhat misleading nature of the modern communist slogan, made famous by Rosa Luxemburg nearly 100 years ago, i.e. 'socialism or barbarism', often interpreted as meaning forward into socialism or relapse into barbarism. The same applies to the concept of 'retrogression', used as an antonym of 'progress'. For us in IP, barbarism and retrogression are defining features of capitalist decadence. The problem with the concepts of barbarism and retrogression is that they suggest a return to humanity's past, to a more primitive stage of our evolution. So unless barbarism is defined clearly as not historically specific, as a phenomenon that can recur in history in its different eras and phases, it is preferable to see the two opposing poles of the modern alternative facing humanity as two opposing possible futures, with numerous conflicting tendencies pushing in one case in one of those directions, in another case in the other direction. Both outcomes need to be seen as equally modern, and equally technologically and socially developed. One is driven by competition in the context of a chronic, structural economic crisis, and historical

of science more in keeping with a post-capitalist society.

11. While it was previously pointed out that capitalist 'production for production's sake' will "sooner or later … lead to the exhaustion of the finitely limited resources provided by nature", in reality, capitalism's own chronic, structural crisis makes this eventuality more a matter of sooner than later. It is this sooner that we are now rapidly approaching. And Marx provided us with the bases for understanding why this is so. As he wrote in the Grundrisse:

    "Thus the more developed capital already is, the more surplus labour it has created, the more terribly must it develop the productive force in order to realize itself in only smaller proportion, i.e. to add surplus value — because the barrier always remains the relation between the fractional part of the day which expresses necessary labour, and the entire working day. It can move only within these boundaries. The smaller already the fractional part falling to necessary labour, the greater the surplus labour, the less can any increase in productive force perceptibly diminish necessary labour; since the denominator has grown enormously. The self-realization of capital becomes more difficult to the extent that it has already been realized."

    And, as Mac Intosh in his text "Marxism and the Holocaust" draws the implications of this most significant tendency characterizing capitalism's decadence: "However, this very contradiction increases the pressure on every capital entity, on every business, to expand the forces of production, to develop and implement new technologies, increase its productivity, in a desperate attempt to escape the downward course in the average rate of profit, and to obtain a surplus-profit by producing commodities below their socially average value. Therefore, the faster

and progression toward what? Capitalism has transformed nature over the years no less than it has transformed labour and the working class. Capital has to such an extreme extent, by today's advanced stage in its historical development, interfered with, appropriated, manipulated, in a word, messed with the earth's overall natural environment that it is in fact increasingly difficult any longer to find any feature, any aspect, any part of it that hasn't been changed in one way or another as a result. This change, this messing with nature by capital has by now done such catastrophic damage to the natural, evolving, inter-connected, highly complex and self-sustaining ecosystems and processes of the planet that the question of sustainability itself in regard to capitalist economic processes in interaction with the natural environment has become an increasingly important concern for the capital class itself (at least at the political level).

The damage to the natural environment by capital can be seen on the smallest of scales. However, it is the overall result of capital's entire ensemble of processes on a global scale that should be the primary concern of communists, of internationalist pro-revolutionaries today. Just as the totality of capitalist production and circulation, operating on the basis of competition is anarchic, because at that level capital operates blindly, driven solely by separate, competitive interests concerned only with value maximization, so too, it seems clear to me, the overall result of capitalist production, circulation and consumption on the natural environment is essentially anarchic and blind; which is to say that, in the context of the transition to real domination, it is inherently and unavoidably destructive and catastrophic for the environment, and, consequently also for humankind.

2. How did this come to be? one might ask. Since the dawn of its existence, humankind has been subject to the forces

of nature. As well as providing humanity with its fruits and various 'gifts', many of nature's forces and conditions have served as threats to the survival and welfare of humankind. Technology originates from the need and the will of human beings to protect themselves from these threats and to take greater advantage of nature's offerings. These origins are innocent enough: to meet basic needs of shelter, food, clothing, etc., and to alleviate discomfort and harm. As technics are devised and then gradually developed over time to accomplish these tasks, the technics themselves become increasingly tested in practice, and consequently modified, refined, and made more complex. The technics are thereby improved in their efficiency, at accomplishing the same task quicker or with greater ease, in a word, with less living labour. But the technics are also often made more powerful, capable of greater tasks than were previously possible. As this process of technical development takes place over long periods of time, technical means are developed which are increasingly powerful, which give their possessor power over whatever it is they are capable of being applied to. From early on, some of the most significant of these means were both productive and destructive, capable of being used for either material production or for destruction, whether, e.g. for hunting or killing threatening predator animals or for fighting (or fighting off) another tribe or group of humans, whether in defense or in conquest. Thus, from the earliest times, humankind's technical implements were capable of being applied to the land and natural products of it, to other animals, and of course, to other humans. Somewhere along the way, improvements in technics permitted the production of a surplus-product, freeing up an elite minority from the necessity of onerous labour; then, class societies and civilizations arose with small ruling minorities monopolization. In this process, every capital unit extracts or appropriates from nature the most that it can. Human-generated climate change actually results from the accumulated output, in atmospheric emissions of carbon-based ('greenhouse') gases as a byproduct of capitalist industrial production and transportation. It results from a relentless pursuit of profit, blind-folded to the reality of its 'collateral damage' to ecosystems and the atmosphere of the earth. This damage is in fact capitalism's unabashed abuse of its natural environment by means of its (members', agents') operation of its own specific means of production, transportation and destruction.

Capitalist science remains largely blind to this damage, as long as it serves profit-maximization and power consolidation. In its fragmented, specialized form of existence, the damage largely does not appear. However, more recently we have seen the rise of a new cross-disciplinary ecological science, which has emerged only because the accumulated damage to the natural environment has become so great, and on a global scale, that certain fractions of capital in whose interest a long-term sustainable environment figures prominently have seen the need to provide the material resources necessary for such a new science. Ecological science, being as it is cross-disciplinary, is in fact unlike most science under capital's real domination, since it goes beyond separation by way of specialization (division of scientific labour), to try to connect various disparate scientific research results and to employ new categories (such as 'ecosystem') of theorization to establish a broader, more unified, more concrete understanding of what is really taking place in the world. Capitalism has been forced by the dire results of its own activities on its own interests to secrete ecological science, even as the latter is a form

"More and more impregnated with positivism and evolutionism, Marxist thought [after Marx] conceded a monopoly of critique of civilization to the romantic, conservative right. This romantic right found its propagandist in Oswald Spengler and its most profound philosopher in Martin Heidegger (some of the most original postwar Marxists were among Heidegger's students).

Along with the idea of Progress, Auschwitz disposed once and for all of the conception of socialism as the natural, automatic and ineluctable outcome of history. Auschwitz's challenge to Marxism is twofold. First, history must be rethought through the category of catastrophe, from the standpoint of the defeated. Second, socialism must be rethought as a radically different civilization, no longer founded on the paradigm of the blind development of the forces of production and the domination of nature by technology. Socialism must be based on a new quality of life; a new hierarchy of values; a different relationship with nature; egalitarian relations between sexes, nations and 'races'; and social relations of sisterhood and solidarity among peoples and continents. This means reversing the line of march by the Western world for several centuries. It means jettisoning the naïve optimism of a way of thinking that claimed to be the conscious expression of the 'movement of history', and of a movement that believed it was 'swimming with the tide'. It also means restoring socialism's utopian dimension." (p.22)

10. The reality of irreversible (human-caused) climate change that we now know faces humankind with catastrophic consequences results from the same underlying cause that also leads to natural resource depletion. It is the same drive to separately, competitively exploit all of nature to the maximum in order to maximize capital val-

ing control over the most powerful of these technical means in order to maintain and, whenever possible, increase their class power and protect their accumulating wealth. Technology thus has a long history, in both the economic and political realms, and since the dawn of class-divided societies, its most highly developed forms have been brought into being in the service of a project of maintaining and accumulating class power and wealth. Of course, during all this time most of the technics developed in such socieities were concerned with material production, with producing the means of life of the whole society, from raw materials, with technical means, by living labour.

As technology and the scientific knowledge underlying it gradually developed, there eventually arose the idea of humankind's (potential) 'conquest' or domination of nature, not just as a dream as it had previously been for a few, but in reality, in a future historically linked to their time. This idea only really became popular with the modern Enlightenment and the concomitant early development of the bourgeoisie. Without going into dates and details, we know that a number of technical inventions in the period of the rise of the bourgeoisie within feudal society gave their masters enormous productive and economic power in comparison with all that had existed hitherto. Increasing domination over nature in the economic realm led to increasing domination over the rest of society, and eventually political supremacy. The process of primitive accumulation undertaken by the ruling bourgeois class dispossessed the bulk of previously semi-independent producers from their means and conditions of production, creating an ever-growing market of "free labourers" renting out their labour-power to capitalists. The latter, as Marx so well documents, began the pro-

cess of socializing the means of production, by putting together in common work these wage labourers, in a united organized process of production, usually in a single place of work, the workshop. Initially using the same technical means as they had previously as independent producers, the workers were soon to be subjected to technical means and instruments of production, fixed capital, which were owned and directed by the capitalists, and legally protected by the capitalist state. From then on was set in motion an historical process of a constant revolutionizing of the means of production as a result of the expansion of capital and the development of the law of value. Figuring centrally in this project of class domination and accumulation of surplus-value by exploiting living labour in the production process was, and still is, increasingly so in fact, the harnessing and shaping of science to service these aims.

Thus, prior to capitalism, because of the relatively under-developed state of the technological productive forces, with mostly individual producers working independently — even if on a common project under a single master — with their own separate tools and other instruments of production, (a) these producers were still subjects of the labour process and in of control their instruments, and (b) the natural environment was degraded or destroyed by human activity only as a result of either massive over-working by large numbers of producers on a limited natural resource or by reckless deployment of large concentrations of the most powerful means of destruction at the disposal of the then ruling class. Human degradation and destruction of nature did indeed occur, but the scale of it was minute in comparison with today's damage. It was only with capital's historic expansion, permitting its constant revolutionizing of the means of

relation to its treatment of nature.

10. Another striking parallel here, along with those noted earlier, is between the catastrophic threat capitalism poses to the planet and the biosphere and the catastrophic threat it poses to racialized minorities or human groups seen as 'Other' and a problem to be 'eliminated'. It is the same real domination of capital, with its same specifically capitalist technology, under the conditions of permanent crisis, historical decline or decadence, which threatens both humanity with genocide and the planet with ecocide. In the case of genocide (and of war, when the 'Other' is capable of fighting back), it is the state with its ideological technics and its means of destruction, rearing its ugly head from time to time here and there; while in the case of ecocide, it is industrial, productive capital, operating every day of the year throughout the world on a passive (but passive-aggressive, as we noted) nature. These processes are distinct, but of course they are very closely connected, as any look at the history of the development of both industrial and military technology will attest, and was of course confirmed by an honest ruling class mouthpiece when he admitted that there had developed, by the 1950s, at least in the USA and the USSR, a fully intertwined 'military-industrial complex'.

This double threat posed by capitalism today is well illustrated in a passage from Enzo Traverso's book Understanding the Nazi Genocide: Marxism After Auschwitz (Pluto, 1999), a passage which reflects clearly the approach to the critique of technology in capitalism in relation to both the working class and the environment that I am trying to develop here:

individual value of his product to a point where it falls below its socially determined value." (Ibid., p. 1037–1038; emphases in original)

Where Marx speaks of production "in contradiction and in indifference to" the producer and "at the expense of the individual human being", we can, in hindsight, easily substitute "nature" for "the producer" and "the natural environment" for "the individual human being", and recognize equally accurate claims being made. That is yet another case of the parallel treatment, as subordinate objects — subordinate to capitalist technology — of labour and nature under the real domination of capital.

However, there is a further insight here, concerning 'production for production's sake' with its concomitant blind and exponentially expanding development of the technological forces of production under real domination. While Marx doesn't mention it here, it is not difficult to see that sooner or later capitalist production, on this basis, will lead to the exhaustion of the finitely limited resources provided by nature, and, consequently catastrophe, not only for nature, but also for humankind. It is exactly this that we are witnessing today, with the exhaustion of profitably harvestable forests due to extensive over-logging, the exhaustion or elimination of arable land due to overly intensified agricultural practices (whether industrial or pre-industrial) and ever-expanding urbanization, the strong tendency towards depletion of drinkable fresh water sources, and, of course, the tendency to depletion of global oil reserves (i.e. 'Peak Oil'). Marx's analysis here clearly establishes the basis, and the inherent, unavoidable tendency, for capitalism in its developed phase of real domination to exhaust the many resources of nature necessary for human life; that is to say, capitalism's inherently catastrophic course in

production (and of destruction), bringing about the development of massively powerful machinery and other technical means (chemical processes, forms of combination and organization, etc.) used in large-scale industry that, on the one hand, the direct producers lost their role of subjects in the labour process to these machines (and the science underlying them), and, on the other hand, large-scale destruction and long-term degradation of the natural environment first appeared in history, and began to accumulate.

3. I think we can justifiably speak of the degradation and debasement of humankind, just as we can speak of a comparable degradation of the environment, as a result of the utilization of the technology that capital has brought into being, especially during the past 100 years. This is so, I think, even though much of this technological development has brought innumerable benefits and improvements in the lives of much of humankind. I think we can say this generally about the history of capitalism, but certainly we can just restrict ourselves to the 20th century if we so choose. And this degradation is not just a matter of the evil or malevolent or deliberate mis-uses or abuses of the technological means it has developed or come into control of. The great bulk of this degradation of the human species, and of course of the whole earth and the atmosphere surrounding it, has resulted from the 'proper', prescribed usage of such technologies. An obvious example is the development of nuclear power and of nuclear weapons and the threat of their use. The mass destruction and death of the 20th century, the inter-imperialist and 'civil' wars, the numerous instances of 'ethnic cleansing' and genocide perpetrated on humanity by the various factions and gangs of the capitalist class have been facilitated by the great advancement in

technological forces of both production and destruction capital has made. On the level of consciousness, the triumph of what Marcuse has called "technological rationality" or what Adorno has called "instrumental reason" — a rationality that nullifies or marginalizes critical reason — within the thought and activity of the population at large in advanced capitalist society has itself greatly contributed to capital's increasing domination of labour, and of the working class' inability to develop (thus far) a revolutionary consciousness (on a large scale).

Perhaps the most prosaic such degradation as a result of capitalist technology is what it does to the individual worker who must operate it and work in submission to it. One need only consult certain well-known passages in Capital, vol.1, especially in the chapter on "Machinery and Large-Scale Industry", for vivid descriptions of this debasement. Modern automated production of 100+ years later is no less degrading and mind-numbing, even if it involves less manual labour. And then of course, there are the innumerable environmental damages inflicted by capital's deployment of its technological forces, damages which have debased humankind's relationship with nature, thereby diminishing our humanity (or human-ness, whatever that may be). The point here is that there is a clear parallel between the fate of the natural environment and the fate of humankind under the transition to the real domination of capital, central to which is the development and utilization of an increasingly powerful, specifically capitalist technology.

4. Sooner or later, the question must arise, namely, why write about the environment now? The reason is not that the question of the environment, of capitalism's relation to it, and of the future possible relation to it by socialism/communism wasn't of importance until re-

The latter has already been argued in detail, so that we may be quite brief here. It is a form of production not bound to a level of needs laid down in advance, and hence it does not predetermine the course of production itself. (Its contradictory character includes a barrier to production which it is constantly striving to overcome. Hence, crises, over-production etc.) This is one side, in contrast to the former mode of production; if you like, it is the positive side. On the other hand, there is the negative side, its contradictory character: production in contradiction, and in indifference, to the producer. The real producer as a mere means of production, material wealth as an end in itself. And so the growth of this material wealth is brought about in contradiction to and at the expense of the individual human being. Productivity of labour in general = the maximum of profit with the minimum of work, hence, too, goods constantly become cheaper. This becomes a law, independent of the will of the individual capitalist. And this law only becomes reality because instead of the scale of production being controlled by existing needs, the quantity of products made is determined by the constantly increasing scale of production dictated by the mode of production itself. Its aim is that the individual product should contain as much unpaid labour as possible, and this is achieved only by producing for the sake of production. This becomes manifest , on the one hand, as a law, since the capitalist who produces on too small a scale puts more than the socially necessary quantum of labour into his products. That is to say, it becomes manifest as an adequate embodiment of the law of value which develops fully only on the foundation of capitalist production. But, on the other hand, it becomes manifest as the desire of the individual capitalist who, in his wish to render this law ineffectual, or to outwit it and turn it to his own advantage, reduces the

ous buildings capital produces, the factories, the offices, the schools, the prisons, the hospitals, the commercial and residential buildings, we are talking here about the entire technological infrastructure of capitalist society as it evolves towards the real domination of capital. All of this becomes increasingly specifically capitalist in both its form and its content. Thus, it is the development of capitalist productive technology, and its extension into the realms of circulation and consumption, that is the central driving force of the process of the transition from the formal domination of capital to its real domination.

9. One of the crucial insights found in the work of Marx, I think, for helping us today to better understand capital's inherent and unalterable antagonism towards the natural environment, leading ultimately to catastrophic destruction of the latter, to what some have called ecocide, is his analysis of the phenomenon of 'production for production's sake' in connection with the transition to the real domination of capital. I allow myself to take a lengthy quote from the "Results …" which is rich in conceptual material for our theoretical task today.

"'Production for production's sake' — production as an end in itself — does indeed come on the scene with the formal subsumption of labour under capital. It makes its appearance as soon as the immediate purpose of production is to produce as much surplus-value as possible, as soon as the exchange-value of the product becomes the deciding factor. But this inherent tendency of capitalist production does not become adequately realized — it does not become indispensable, and that also means technologically indispensable — until the specific mode of capitalist production and hence the real subsumption of labour under capital has become a reality.

cently. It has always been important, but in Marxist revolutionary theory it has indeed taken a secondary position to the various questions concerning specifically social relations and events, as distinct from social-natural ones. In fact, Marx and Engels themselves had contributions to make to a critique of capitalism's relations with the natural environment, about which I will return to later. The reasons why it is imperative for us in the pro-revolutionary milieu to address these social-natural questions today are (1) a number of threats to the very survival of both the environment and humankind existing within this environment, chief among them the recently scientifically demonstrated reality of human-caused climate change and the prospect for significant increasing of such change within the next several decades; and (2) just as important, the rise to close to the top of the list of concerns, worries, fears of the public at large in most countries around the world about these environmental threats concomitant with the publicizing of these scientific conclusions through the mass media. It is for these reasons that the questions about the environment and an advanced society's relations with it are now of paramount interest for all concerned with the future of humankind.

Traditionally, Marxist revolutionary theory has posited chronic economic crisis and tendencies towards its collapse as hallmarks of capitalism's downfall and as precursors of its political overthrow and economic abolition on the part of its gravediggers. Now, however, it is easy to see chronic environmental crisis and tendencies towards ecological collapse, which would, if allowed to run their course, threaten the very survival of the human species. There is a very fascinating symmetry here, although the processes involved — economic-social and

social-natural — are clearly different, even if connected, and there is no possibility of a Marxist environmental crisis theory comparable to Marxist political-economic crisis theory. Questions concerning capitalist society's metabolism (following Marx in using this term) with the natural environment involve both components of political-economic and social revolutionary theory and components of natural science. Essentially, the natural science uncovers the natural processes involved in this metabolism between humanity and nature, its conditions of functioning, and its results, as humanity 'progresses' its means and practices of interacting with nature. Revolutionary theory then takes those findings and incorporates them into its comprehension of capital and its historical tendencies. A perspective for the future, concerning (a) capitalism's evolving relationship with the environment and (b) a possible course of opposition to this process on the part of the proletariat and humankind, is then developed.

5. As far as I am concerned, and as was claimed in the previous two points, there can no longer be any debate about the claim that capitalist society's relationship with the natural environment has become catastrophic, not just for the health and very survival of that environment, but also for humankind itself, which requires that environment in order to reproduce itself through history. And it is equally undeniable that capitalist society's relationship with the natural environment has been facilitated or mediated by the technology of that society. For the past 150–200 years, that technology has primarily been (various forms of) large-scale industrial productive technology. The question eventually must arise: is it merely the specific usage that capitalism makes of this (and associated) technology that is the determinant factor here, or

etc. as the means of production in a given firm or (more like a 5 to 10 year stretch) a given sector of a given economy. The process develops over time, as capital continually refines and perfects its own specific means of production within its own specific mode of production. This process, a historical process, involves imbuing the specific technological devices and equipment with specifically capitalist imperatives, specifically capitalist aims and interests. In order to accomplish this, capital practically takes a hold of an increasing quantity of scientific research, funding it and its subjects, and providing it with its direction, its focus, its aims. (Marx: "Invention then becomes a business, and the application of science to direct production itself becomes a prospect which determines and solicits it." Grundrisse, p. 704.)

What we are really talking about, then, is the development of specifically capitalist means of production. That is, fixed capital ("the most adequate form of capital as such"), the technical means by which capital extracts surplus-value from wage labour. As Marx said, " … the introduction of machinery into one branch of industry leads to its introduction into other industries and other branches of the same industry" ("Results …", p. 1036). This development of fixed capital, at a certain technological level of development spreads its tentacles throughout society and, with increasing production, come increasing markets, and increasing population; and with these come the modern means of industrial transportation, of large-scale shipping, of modern industrial ports, of railways, and eventually of automotive transportation, with its roads and bridges, and airplanes, which develop and become integrally inter-linked with this developing fixed capital. And needless to add, these are all developed under the direction of capital. Along with all of the vari-

izes' the production process and the society itself that encompasses that production.

We are talking about, first of all, the process of the socialization of production, for the first time in history on a large scale, spreading throughout (most of) European and then also (North) American society. Socialization of production under capitalist social relations, in a situation where the mass of labourers have been separated from the means and conditions of production, is a very significant historical process. The means of production are transformed by capital from the private property of the individual producers into the common machinery or equipment privately owned by the capitalist or the firm. It should be clear to all that there are major ramifications resulting from this, both for the wage labourers and for the entire society whose material production we are concerned with. The workers clearly lose control over the means of production, as the capitalist takes control with his more efficient, more productive equipment or machinery. This is a major loss for the workers' autonomy in the labour process and in the workshop itself, so also in the general relationship, in the struggle itself between wage labour and capital. But it was a previous private producers' autonomy and consciousness, with an attitude combining both craft pride and (an individualistic) productivism.

With socialized production, the workers are stripped of the autonomy they had under the formal domination of capital and submitted to the subordinate position of working (with) the equipment or machinery provided by capital. Obviously we are talking about a process that occurs over an extended period of time here, not just five or ten years, even if a given year can be specified as when capitalist machinery definitively replaced workers' tools,

is it rather the technology itself that is determinant owing to its limited possibilities of use? This question needs to be unpacked, although it usually isn't, with the positivist, productivist, traditional Marxist invariably asserting that it is only the usage that capitalism makes of this essentially 'neutral' technology that is at fault. (While the technophobic pro-environment opponent of this destruction lays all of the blame on the technology by itself, as a completely autonomous force, thereby letting capital off the hook.) Obviously the capitalist's usage of the technology is at fault, and an essential part of the problem. But the question is really whether this technology itself is actually neutral, capable of an entirely opposing deployment; or, in fact, has not capital itself already developed and perfected this technology in its own image, with its own imperatives and aims, its own perspective — which is of course that of the maximum domination and exploitation of everything that exists — to such an extent that any possible usage of it (e.g. by associated producers) will prove damaging (and ultimately destructive) to the people and the natural environment that it interacts with? This is the real question posed here.

How one answers this question determines how one sees humankind's future relationship with technology after the emancipation of the proletariat from the dictatorship of the capitalist class: as either (a) a further and even intensified development of the technology bequeathed by capitalism in the same direction as was previously driven by the law of value, or (b) a radical rupture with that trajectory by means of a primary focus given to further technological development at the service of qualitative rather than strictly quantitative criteria and aims, with a principle focus given to the quality of the relations between the people of the society and between nature and

the people which this technology mediates.

6. Science during the era of the political-economic domination of capital has been made to serve the purposes of capital's historical project. To some this may sound tendentious or debatable. Marx more or less took it for granted; see especially his "Fragment on Machines" in the Grundrisse. It really shouldn't be open to dispute, but it certainly goes against both the dominant capitalist ideology and that of traditional or classical Marxism. Science, like technology, is typically seen as politically 'neutral'. But science does not exist in a vacuum, it does not pursue entirely impartial, non-partisan objectives, and, as everyone should know, it requires significant material resources and financial support in order to function at all, increasingly so the more it develops. An old saying has it that 'he who pays the piper calls the tune', and given that science is at all times (in the modern era) of great potential value to increasing economic productivity or otherwise improving the efficiency or power of just about any technological device or apparatus or mode of administration that exists and is of use to the capitalist class, it should be clear that for the past few hundred years, and on an increasing scale matching that of capital's own growth, science has largely been made to serve capital's domination of the world, both social and natural.

   This science serves as a means for the continuous development of the technical-organizational forces of production and administration. All of these forces serve to continuously increase the wealth and the (political and social) power of the ruling capitalist class which commands them and assures their development. For they are not only productive and organizational forces which increase society's productivity and efficiency — which are

forces belonging to labour (i.e. capital appropriated them from labour).) This suggests that there is an intimate, "intrinsic" connection between capitalist relations of production and the forces of production developed under the specifically capitalist mode of production, that is to say, that these technological forces of production cannot really be separated from the relations of production of the social formation which gave rise to them.

8. Internationalist Perspective (IP) has made the conceptualization and theorization of the process of the transition from what Marx called the formal to the real subsumption of labour under capital a cornerstone of our work of theoretical deepening in attempting to understand, especially, the changes to the capitalist system over the past 60+ years. Marx used another term as interchangeable with "the real domination of capital over labour". That term is "the specifically capitalist mode of production", and he claimed that this developed mode of production is, for all intents and purposes, an entirely new mode of production in relation to the merely formally capitalist mode of production. (Reference?) But what exactly did Marx mean by a specifically capitalist mode of production based on the generalization of the extraction of relative surplus-value as the hegemonic form of exploitation of the working class? It can't just be the simple process of replacing individual tools and other implements held by separate producers but working together in one workshop (i.e. formal domination) with new equipment as means of production held by the capitalist — end of story (as so many in the pro-revolutionary milieu who dismiss or minimize the significance of the distinction insist). It is that, in fact, but that actually involves quite a lot, and it implies or leads to a lot more; and it goes on, over time, as the capitalist class continually 'revolution-

are subsumed veil the particular interests that organize the apparatus. In other words, technology has become the great vehicle of reification — reification in its most mature and effective form." (pp.168–169) And from Marx: "The development of the means of labour into machinery is not an accidental moment of capital, but is rather the historical reshaping of the traditional, inherited means of labour into a form adequate to capital. The accumulation of knowledge and of skill, of the general productive forces of the social brain, is then absorbed into capital, as opposed to labour, and hence appears as an attribute of capital, and more generally of fixed capital, in so far as it enters into the production process as a means of production proper. Machinery appears, then, as the most adequate form of fixed capital, and fixed capital, in so far as capital's relations with itself are concerned, appears as the most adequate form of capital as such." (emphases in original, Grundrisse, p. 694)

And: "Since — within the process of production — living labour has already been absorbed into capital, all the social productive forces of labour appear as the productive forces of capital, as intrinsic attributes of capital, … these social productive forces of labour, came into being historically only with the advent of the specifically capitalist mode of production. That is to say, they appeared as something intrinsic to the relations of capitalism and inseparable from them" ("Results of the Immediate Process of Production", in Capital, vol.1 (Penguin, 1976), p.1052). (In both these passages Marx refers to productive forces as appearing as forces of capital rather than labour under the real domination of capital; this 'appearance', however, is not at all 'illusory'; said forces really do belong to capital under capitalism, even though they were originally, in a relatively under-developed state of becoming,

invariably portrayed as socially progressive, permitting increased output, and potentially consumption, of goods and services for the general population and improved security and provision of public services for everyone — they are also forces which in every case permit the ruling class to increase its domination over, and its exploitation of, both the whole of society/humanity and the natural world.

Capitalist science — and surely we can use this term for science under the historical reign of capital — serves this purpose, this project, by making the whole field of its study, of its scope, into measurable, quantifiable, manipulable objects and processes of control and exploitation. And this scope, this field ultimately reaches the entirety of society and the entirety of nature. It begins with the historically progressive project of comprehending the world, by developing an accumulating understanding of the 'laws of nature' (physics, astronomy, chemistry). Before long, it turns to the study of the biological realm, and of the human being itself, as it differentiates itself from the rest of the animal world. The human social realm itself becomes the ultimate 'frontier', the final mystery for science. Scientific management of production employing any (and potentially all) natural resources in existence, together with potentially limitless administration and social and political control over society are the planned outcome of this historical project of capital and of the trajectory of the science which serves it.

Science under the domination of society by capital has itself been transformed by capital, by its needs and its aims, but also by its ideological vision of the world itself. That vision, coming out of Descartes' isolated subject of consciousness, seeing the external world as a homogenous res extensa, and then, as Marx so well described

in the opening paragraphs of the Grundrisse, with the bourgeois viewpoint as that of the isolated, autonomous individual a la Robinson Crusoe. "In this society of free competition, the individual appears detached from the natural bonds etc. which in earlier historical periods make him the accessory of a definite and limited human conglomerate." And: "Only in the eighteenth century, in 'civil society', do the various forms of social connectedness confront the individual as a mere means towards his private purposes, as external necessity." Bourgeois society "produces this standpoint, that of the isolated individual", and in the thought of its leading spokesmen (Smith and Ricardo) "it appears as an ideal". Of course, this isolated individual not only confronts "social" but also natural connectedness in his pursuit of his private aims.

Following on Lukacs' insights on this, the isolated individual viewpoint, in which contemplation as opposed to practice is the mode of orientation, the understanding of the world is fragmented, fractured, partial. And, correspondingly, the world in the vision of the bourgeoisie is a fragmented, fractured world. It is a world of separated, isolated facts and objects, taken out of their concrete connectedness with each other and with the larger natural and social context in which they exist. Abstraction and generalization are the means to obtain knowledge of the world on this basis. Concepts and categories for classifying the properties of objects and conditions in the world by means of quantifiable measurement are developed in order to be able make general(izable) predictions about different kinds of phenomena. Science proceeds on this basis during the bourgeois epoch to make comprehensible in a quantified format, using empirically based concepts, the natural and then social world for the purposes

of the bourgeoisie's, then the capitalist class' historical project of controlling and exploiting the world, nature and society, to the greatest extent that it can. While not true of absolutely all of modern science, the bulk of all actual scientific research in capitalist society serves this end. The development of the technological productive forces, as fundamental as it is to the progress of capitalist society, obviously plays a large role in the direction taken by such science, of its priorities, of what it chooses to investigate, and what it either chooses to ignore or is incapable of comprehending. This approach to understanding the world is perfectly suited to the law of value and its increasing hegemony over capitalist society.

7. Technology, such as it has developed in history thus far (specifically over the most recent 200 years), is the ideal form for capitalist reification. The commodity form and capitalist social relations find their ideal vehicle for transforming and controlling every field of human activity and even the subjectivity of those involved with the functioning of technology in its ever expanding varieties. The mediating function that technology plays in the production process, but also in so many more spheres of social activity in capitalist society, is the ideal means by which to ensure the enforcement and reproduction of capitalist social relations. By mediating between people and between people and nature, specifically capitalist technology is able to ensure that capitalist relations are dominant in all specific relationships between said people and between them and the natural environment they interact with by means of that technology. As Herbert Marcuse wrote in One-Dimensional Man: "Only in the medium of technology, man and nature become fungible objects of organization. The universal effectiveness and productivity of the [technological] apparatus under which they