CHAPTER TWO

The Production of Nature

"SCIENTIFIC TRUTH," Marx wrote in a famous statement, "is always paradox, if judged by everyday experience, which catches only the delusive appearance of things."[1] The idea of the production of nature is indeed paradoxical, to the point of sounding absurd, if judged by the superficial appearance of nature even in capitalist society. Nature is generally seen as precisely that which cannot be produced; it is the antithesis of human productive activity. In its most immediate appearance, the natural landscape presents itself to us as the material substratum of daily life, the realm of use-values rather than exchange-values. As such it is highly differentiated along any number of axes. But with the progress of capital accumulation and the expansion of economic development, this material substratum is more and more the product of social produc-

tion, and the dominant axes of differentiation are increasingly societal in origin. In short, when this immediate appearance of nature is placed in historical context, the development of the material landscape presents itself as a process of the production of nature. The differentiated results of this production of nature are the material symptoms of uneven development. At the most abstract level, therefore, it is in the production of nature that use-value and exchange-value, and space and society, are fused together. The function of this chapter, then, is to renovate our conception of nature in such a way that the dualistic world of bourgeois ideology can be reconstituted as an integrated whole. This will allow us to treat the real patterns of uneven development as the product of the unity of capital, rather than blindly to situate the process in the false ideological dualism of society and nature. The problem will be to separate the essential moments of the production of nature from its various appearances.

Marx nowhere talked explicitly about the production of nature. But in his work there is implied an understanding of nature which leads firmly in this direction. In fact, Marx did not have a single, coherently elaborated concept of nature at all, rather he used "nature" in a variety of ways. These different uses of the concept were not random, however, and a close reading of Marx's work demonstrates a rational progression in his treatment of nature. In the end we are not at all left with a fully constructed concept but do have a sketchy framework of the conception of nature implied by Marx's analysis and critique of the capitalist mode of production.

I do not accept that there is a radical break between the so-called young Marx and the mature Marx;[2] there is, rather, a rich and complex development in his thought, and this is reflected in his treatment of nature. Throughout his work, Marx treats nature as a differentiated unity, but at different periods the emphasis upon unity and differentiation varies. His earlier work, particularly the *Economic and Philosophical Manuscripts* (in Marx, 1975 edn) emphasized the unity of "man and nature." Here he borrowed heavily from the idealist Hegelian tradition as well as

from Kant. Only with *German Ideology* did Marx (writing with Engels) come round to a more materialist vision of nature. Rather than discussing the philosophical aspects of the supposed unity of "man and nature," Marx was more concerned with the actual processes which might achieve this unity. This led him to discuss the function of human labor, putting it at the center of the relationship between human beings and nature. Further, he began to treat the whole question as a historical one not an abstract philosophical puzzle. In *Grundrisse*, many of these insights were extended and others added, particularly concerning the historical dimensions of the human relation with nature. In *Capital*, and especially in volume one which Marx completed for publication, the treatment of nature is still sporadic, but there for the first time we see a consistent logical progression in the different treatments of nature. The discussion of nature occurs only in fragments because *Capital* was not intended to analyze nature, specifically, under capitalism. It was intended as a critique of capitalist production, and as such required Marx to develop at least partially his conception of nature. Pursuing his primary task, however, did not require him to present or even develop a completed conception of nature. But insofar as the analysis in volume one presents a logical progression of concepts and ideas in building Marx's critique, so the conception of nature also receives this treatment.

The first discussion of nature in *Capital* repeats some of the abstract philosophical tone of the earlier work, but achieves something extra; it simultaneously lays the foundation for a more concrete and more developed treatment of the relation with nature under capitalism. Thus in the later discussions of the division of labor, manufacturing, and modern industry, Marx explicitly picks the theme up again in order to show precisely what becomes of nature under the actual conditions of capitalism. Elsewhere in *Capital*, for example in his discussion of rent, there are further vignettes of a more concrete, materialist conception of nature, but these are nowhere pulled together or even explicitly discussed. It is this task which will be attempted here. This involves not a compilation of references to nature and the attempt to force upon them an internal

philosophical coherence, but rather a serious understanding of the direction and intent of Marx's work and an attempt to expand and expound the conception of nature which at least in part exemplifies this intent. As such it is an essay in politics and theory, not in philosophy.

In volume one of *Capital* Marx exemplifies his own dictum that "rising from the abstract to the concrete" is the scientifically correct method. Beginning with the concrete commodity, he derives a number of theoretical abstractions: exchange-value, use-value, value, surplus value, abstract labor, socially necessary labor time. As the analysis proceeds, these concepts are progressively developed until they accurately reproduce the concrete in thought. His treatment of the relation with nature follows this procedure. But integrated into this logical development in the text is a historical development; the logic of Marx's argument mirrors, however generally, the actual historical development that occurred.[3] The development of the conception of nature therefore expresses this "logico-historical" methodology, even if it is nowhere laid out completely or succinctly, as is done for the analysis of money for example, but must be pieced together from fragmented discussions of nature. Thus in the first part of *The German Ideology*, in isolated passages of *Grundrisse*, and more systematically if less obviously in *Capital*, we get occasional glimpses of a logico-historical derivation of the societal relation with nature. The first major task has been to detect these clues; the second is to lay them out and complete the jigsaw puzzle. Marx has given us the four corners and most of the straight edges; he has also given us most of the common pieces necessary to complete the picture, but these pieces are presented in the context of wholly different analyses. What must be done in order to recognize their significance is to turn these pieces over and, as it were, to reveal their nature-face.

The place to begin is with production in general, since this is the most basic material relation between human beings and nature. "*Production in general* is an abstraction, but a rational abstraction in so far as it really brings out and fixes the common element" in all epochs of production. "Some determinations belong to all epochs, others only to a few.

[Some] determinations will be shared by the most modern epoch and the most ancient." Thus "the elements which are not general and common, must be separated out from the determinations valid for production as such, so that in their unity—which arises already from the identity of the subject, humanity, and of the object, nature—their essential difference is not forgotten."[4] With production for exchange, the general determinants of the relation between human societies and nature remain valid, but as we saw in the critique of Schmidt, the dialectic of use-value and exchange-value adds a new dimension to the relation with nature, a dimension which is specific to production for exchange rather than production in general. Finally, there have been many modes of production based on market exchange, but with the victory of capital over the world market, a wholly new set of very specific determinants enter on the scene; the relation with nature is again revolutionized.

From production in general to production for exchange to capitalist production, the logical and historical arms of the argument imply and lead to the same concretely observable conclusion: the production of nature. In perhaps his clearest statement expressing the reality of the production of nature, Marx wrote as part of a critique of Feuerbach's idealism: "So much is this activity, this unceasing sensuous labor and creation, this production, the basis of the whole sensual world as it now exists, that were it interrupted only for a year, Feuerbach would not only find an enormous change in the natural world, but would very soon find that the whole world of men and his own perceptive faculty, nay his own existence, were missing."[5] So completely do human societies now produce nature, that a cessation of productive labor would render enormous changes in nature, including the extinction of human nature.

I. Production in General

In his initial derivation of the abstract moments of the commodity, Marx depicts production as a process by which the form of nature is altered. The producer "can work only as nature does, that is by changing the form of matter. Nay more, in this work of changing the form he is con-

stantly helped by natural forces." By his or her industry, the producer "changes the forms of the materials furnished by nature, in such a way as to make them useful to him. The form of wood, for instance, is altered, by making a table out of it. Yet, for all that, the table continues to be that common, every-day thing, wood." Insofar as labor produces useful things that fulfill human needs, "it is an eternal nature-imposed necessity, without which there can be no material exchanges between man and nature, and therefore no life."[6] But labor effects more than just a simple change in the form of matter; it produces a simultaneous effect on the laborer. "Labour is, in the first place, a process in which both man and nature participate, and in which man of his own accord starts, regulates, and controls the material re-actions between himself and nature. He opposes himself to nature as one of her own forces, setting in motion arms and legs, head and hands, the natural forces of his body, in order to appropriate nature's productions in a form adapted to his own wants. By thus acting on the external world and changing it, he at the same time changes his own nature."[7] The metabolism of human beings with nature is the process whereby human beings appropriate the means to fulfill their needs and return other use-values to nature. At this abstract level, clearly, the relation with nature (the material exchange) is a use-value relation; as pure use-value does nature enter the relation with human beings. This is the amplified and concretely developed version of Marx's earlier, more abstract claim that "*Industry* is the *real* historical relationship of nature . . . to man."[8]

Human beings are born with certain natural needs—food, sex, warmth, social interaction—and they are born into a world where nature provides, either directly or indirectly, the means for fulfilling these needs. Means of subsistence are those material necessities consumed directly from nature in order to fulfill natural needs. Where means of subsistence are not naturally available in the appropriate quality or quantity, means of production—the objects of production to be worked on and the instruments with which the work is accomplished—are appropriated from nature and employed by living labor in order to produce

consumable products. By producing the means to satisfy their needs, human beings collectively produce their own material life, and in the process produce new human needs whose satisfaction requires further productive activity. These needs and their mode of satisfaction are, at the most general level, the determinants of *human* nature, for in all of this, people are natural beings; they bring to production their natural abilities (physical and mental) which are exercised on and through the objects and instruments of production. There is, therefore, an abstract identity of the human social being with nature: "Man is directly a natural being . . . equipped with natural powers [and] has real, sensuous objects as the object of his being and of his vital expression. . . . A being which does not have its nature outside itself is not a natural being and plays no part in the system of nature."[9]

The production of consciousness is an integral part of this general production of material life. At its most general, consciousness is simply the consciousness of human practice:

> The production of ideas, of conceptions, of consciousness, is at first directly interwoven with the material activity and the material intercourse of men, the language of real life. Conceiving, thinking, the mental intercourse of men, appear at this stage as the direct efflux of their material behaviour. . . . Men are the producers of their conceptions, ideas, etc.—real, active men, as they are conditioned by a definite development of their productive forces and of the intercourse corresponding to these.[10]

Consciousness of needs, of the means to satisfy these needs, and of the forces affecting both the needs themselves and the means to satisfy them (e.g., science, early natural religion, etc.)—these are central to the constitution of human consciousness. In this way, consciousness as such is the *natural* product of productive human activity, and of the social relations into which human beings enter with one another in order to produce.

The picture drawn here suggests a general unity of nature with society. It is a unity of nature with society in which "the restricted relation

of men to nature determines their ["men's"] restricted relation to one another, and their restricted relation to one another determines men's restricted relation to nature."[11] This is not the unity of nature which preoccupies the physicist, nor that which is idolized by the "back to nature" wing of the ecological movement. For the physicist, the unity of nature is a product of severe conceptual abstraction; for the "back to nature" aficionado the unity of nature is a product of wishful thinking. Both are ideal abstractions. The unity of nature implied in Marx's work derives from the concrete activity of natural beings, and is produced in practice through labor. The labor of natural beings pulls in the different facets of nature binding them into a whole. Human beings survive and develop as social beings by working in cooperation with nature. But this unity of nature is not undifferentiated; it is a unity, not an abstract identity, and it is necessary to understand the role played by human productive activity in the differentiation of nature.

In the first place, there is a crucial distinction between human beings and animals, and here too labor plays a central role. As Marx pointed out, human beings "can be distinguished from animals by consciousness, by religion or anything else you like. They themselves begin to distinguish themselves from animals as soon as they begin to *produce* their means of subsistence."[12] It is human productive activity, not as a general concept but as a concrete historical act designed to create means of subsistence, that differentiates human beings from animals. Engels makes the same point more explicitly in his unfinished essay entitled "The Part Played by Labour in the Transition from Ape to Man." Labor, he says, is "the prime basic condition for all human existence, and this to such an extent that, in a sense, we have to say that labor created man himself." From the start, human nature was a human product, and this applies not simply to consciousness, but even to human physiology. The development of the hand, from a means of locomotion into a sophisticated limb for the manipulation of tools, is accomplished gradually by thousands of years of labor. Or as Donna Haraway has written: "Humankind is self-made in the most literal sense. Our bodies are the

product of the tool-using adaptation which pre-dates the genus *Homo*. We actively determined our design through tools that mediate the human exchange with nature."[13]

In addition to human physiology, human consciousness and the material means of subsistence, the production and reproduction of material life entails the production of workers, that is, the reproduction of labor power. Some form of social relations are implied in this reproduction process, and the most basic is the division of labor between the sexes. This is the first truly social division of labor, but its origins lie in pre-human social organization. As it is inherited by human society it is therefore simultaneously natural and social, illustrating again the unity of nature. A biological differentiation in nature is reproduced as a social division of labor. This division of social labor is basic to the process of reproduction, but spills over to the sphere of production also. The sexual division of labor thus becomes general throughout society, and in this way, again through purposeful human activity, human nature itself begins to be differentiated. The division of labor produces a systematic division of social experiences upon which human nature is constantly shaped and reshaped.

Now this view of production in general offers some insights concerning nature, but is fairly limited. A number of assumptions are implied, particularly that of harmonious ecological and social balance, at the center of which lies an exact, ongoing match between the production and consumption of use-values. But year-to-year, there is the continual possibility that production and consumption do not match and that either famine or social surplus will occur. At first this mismatch is entirely accidental and due to natural causes such as inclement weather or particularly fertile soils, but precisely to forestall the disastrous effects attendant upon a shortfall of production vis-à-vis consumption, every society grows "to provide a fund of social insurance against elementary disasters which may threaten the annual produce." Where surplus was at first simply a natural possibility, it becomes a social necessity. The creation of this permanent social surplus allows not only the most basic

survival of the society but also the further division of labor and even population growth;[14] the surplus becomes necessary as a means to combat social crisis at its most basic level.

The realization of a permanent social surplus, however, is not an automatic result of the possibility of surplus, but requires specific types of social and economic organization which are consistent with the individual's production of more than simply the immediate means of subsistence. But this increased production, and the increased division of labor that accompanies it, in turn present new possibilities. In short, the permanent surplus becomes the basis of the division of society into classes. Again this appears first as a possibility whereby one part of society ceases to perform productive labor, in part or in whole, and obtains leisure at the expense of the remaining working population. "Something which is at first voluntary and intermittent later becomes obligatory and regular." And according to Engels, this transformation to a society characterized by the appropriation of surplus is necessarily accompanied by the development of the state and slavery, and the solidification of this division between producers and consumers of surplus into a division of social classes: "the first great social division of labor was bound, in the general historical conditions prevailing, to bring slavery in its train. From the first great social division of labour arose the first great cleavage of society into two classes: masters and slaves, exploiters and exploited." But this development too depends upon a "social revolution to break up egalitarian primitive society and give birth to a society divided into classes."[15] Social development splits the harmonious balance of nature. In one form or another, this surplus is appropriated from nature and in order to expedite its regular production and distribution specific social institutions and forms of organization are required. This in turn alters the social relation with nature. No longer does the abstract natural individual ("man") fit simply into an equally natural environment, since the relation with nature is mediated through the social institutions.

The production of a permanent social surplus therefore has a seemingly contradictory effect. It provides the means by which human beings

can develop more control over their relation with nature, since they can regulate more effectively the necessary supply of use-values for satisfying natural needs. In short, the production of a permanent social surplus allows human society to begin the long process of emancipating itself from the constraints of nature. On the other hand, however, this increased control is necessarily social control, and although it assists the emancipation of human society as a whole from nature, it does so only by developing the internal differentiations within society, and by enslaving a large part of the population. The precise form taken by this contradictory relation depends on the specific kind of society that develops, and it is to this more concrete examination that we must now turn. As Marx noted:

> To the extent that the labour-process is solely a process between man and nature, its simple elements remain common to all social forms of development. But each specific historical form of this process develops its material foundations and social forms. Whenever a certain stage of maturity has been reached, the specific historical form is discarded and makes way for a higher one.[16]

II. Production for Exchange

The surplus may take many forms, depending partly on what natural conditions permit or encourage food reserves, population growth, unproductive occupations, etc. In some forms it is useful, in others not. If in a non-useful material form (e.g., a wheat supply over and above what can be consumed or usefully stored), the surplus product may be exchanged for other use-values. The production of a surplus is a necessary if not sufficient condition for the regular exchange of use-values to occur. With production for exchange, the relation with nature is no longer exclusively a use-value relation; use-values are not produced for direct use but for exchange. As specific use-values are exchanged against each other in specific quantities, they become socially transformed into commodities, existing simultaneously as exchange-values as well as use-

values. The exchange-value of a commodity expresses the quantitative relation in which it can be exchanged for other commodities; with production for exchange, exchange-value not use-value is the immediate reason for production. Indeed, the commodity's direct use-value to its owner is that of being a depository of exchange-value. The production of material life is therefore not just a natural activity in which nature provides the subject, object, and instrument of labor. In an exchange economy, the appropriation of nature is increasingly regulated by social forms and institutions, and in this way, human beings begin to produce more than just the immediate nature of their existence.

All of this presupposes the development and extension of the division of labor; production for exchange can persist only incidentally where such a division of labor does not exist. In the first place, there is a division of labor between those activities that are tied to the land and those that are not—a separation between agriculture and commerce. With the generalization of commodity production, various commercial activities and institutions are necessary to facilitate an exchange of products. The market function, insofar as it is separate from production, develops in order to simplify and centralize the complex exchange transactions that occur. To facilitate further this complex of exchanges, the money commodity is developed. Its use-value is precisely its ability to represent "pure exchange-value."[17] The creation of a market and of these other institutions is synonymous with the development of central places and ultimately towns, and numerous other ancillary activities also begin concentrating in towns, contributing to their development. In this way the division between agriculture and commerce implies the separation of town and country which is, in turn, "the foundation of every division of labor that is well developed, and brought about by the exchange of commodities."[18]

The production of a permanent surplus and the development of the division of labor provide the necessary economic foundation (if the broader social conditions are favorable) for the development of social classes. The fundamental difference here is between the class which per-

forms the sum of social labor and the class or classes which perform no labor but nonetheless appropriate the social surplus. This class differentiation springs from the prior differentiation between productive and unproductive labor but does not necessarily remain synonymous with it. Many ruling classes perform no labor at all, while others may perform necessary social functions which are, nonetheless, unproductive of social value. The point is that with the development of social classes, access to nature is unequally distributed (both qualitatively and quantitatively) according to class. The ruling class, whether or not it directly controls the social means of production, certainly controls the surplus appropriated from nature through the human labor of others, while the laboring class works the means of production. With landed property, the unequal access to nature is readily apparent, and takes on a very visible, spatial dimension with the separation between town and country.

With the division of society into classes the state makes its historic appearance as a means of political control. As Engels put it, at "a definite stage of economic development, which necessarily involved the cleavage of society into classes, the state became a necessity because of this cleavage."[19] The function of the state is to administer the class society in the interests of the ruling class, and this it does through its various military, legal, ideological, and economic arms. The state is also charged with regulating the oppression of women, for the division of labor between the sexes becomes a radically different social relation with the emergence of private property and production for exchange. It is not just class exploitation and private property which emerge together, but with them slavery and the oppression of women.

The division of labor within the family is subordinated to the broader social division of labor now thoroughly rooted in class structure and the production process. What was at first only a "latent form of slavery" in the family develops into a full-blooded slavery where wife and child become the property of the husband/father. The abstract unity previously attributed to relations between the sexes develops into its opposite. In those realms where women had effective control over the production

process, most notably in agriculture, men take over. Where responsibility for social reproduction had been shared, women were increasingly forced to carry the full burden with the evolution of modes of production based on commodity exchange. Not that they ceased laboring. Just that while women were forced to accept responsibility for all of the household tasks associated with child-rearing, as well as some commodity production, the male was specializing more and more exclusively in the production of commodities for exchange. The rationale for this development was closely linked with the origins of private property. The inheritance of private property could only be assured through patrilineal family relations, and it was the enforcement of this that wrote the final chapter of what Engels referred to as the world-historical defeat of the female sex: "The overthrow of mother right was the *world-historical defeat of the female sex*. The man took command in the home also; the woman was degraded and reduced to servitude; she became the slave of his lust and a mere instrument for the production of children."[20] He goes on to demonstrate the way in which the privatized family developed in response to the developing social, political, and economic relations between men and women. He traces the movement from group marriage to pairing marriages to monogamy as the predominant forms of family, concluding that monogamy, which ever only applied to women in any case, is a finely tuned historical mechanism for the oppression of women.

Through the production of these social divisions on the basis first of sex and class, human societies provoke a further transformation in human nature. For as Marx said in the sixth thesis on Feuerbach, "the human essence is no abstraction inherent in each single individual. In its reality it is the ensemble of the social relations."[21] And as the ensemble of social relations changes, so too does human nature.

One of the divisions of labor which develops alongside production specifically for exchange is the division between manual and mental labor. This opens up profound new vistas for the human production of consciousness, since hereafter, certain aspects of nature are available

to some classes only as a conceptual abstraction, not as a physical partner or opponent in the work process. Just as the process of exchange abstracts in practice from the use-value of the commodities being exchanged, so the human consciousness can abstract itself from the immediate material conditions of existence. This potential for abstract thought arises as a result of the abstraction in practice that accompanies the exchange process, a "direct efflux" of consciousness from material behavior which leads to its own negation. That is, as soon as abstract thought and conceptualization develop, and are socially institutionalized with the division of mental from manual labor, it is no longer sufficient to view consciousness simply as a "direct efflux" of material behavior. Now, for the first time, consciousness can "really flatter itself that it is something other than consciousness of existing practice."[22] Of course, mental labor may remain tied to the task of finding new objects of labor, developing new instruments of labor, and reorganizing the work habits of the subjects of labor. But some forms of mental "labor" may cease to be labor at all, productive or unproductive, since at this stage nature appears accessible to some individuals, indeed to entire classes, without the performance of labor but through "pure contemplation."

With production for exchange rather than direct use, there arises first the possibility and then the necessity for alienation of the individual. The production of surplus and the consequent increase in social wealth does not guarantee a more wealthy laboring class, given the emergence of class distinctions, and so there is a purely quantitative alienation of work. The surplus labor of the laboring class is appropriated by the ruling class. But qualitatively too, the relation of the laboring class with nature is altered, for though they relate to nature directly through the use of their labor power, they are alienated from their own product. The product's owner, on the other hand, is alienated from any direct, practical relation with nature because he is deprived of his own labor. Now the worker's alienation is not simply alienation from the product but, due to the increased specialization of labor, it is also alienation from one's fellow workers and oneself. Yet predictably, this alienation calls up its

opposite; increased competition and specialization in the work process (or even in control over the work process) conjures up the necessity of developing the natural powers of cooperation. While the detrimental effects of alienation fall uncompensated on the laboring class, the benefits of cooperation rarely accrue to them. They relinquish the quantitative gains of increased cooperation, in the form of surplus labor converted into exchange-value, and the material benefits of cooperation pertain mostly at the level of the productive forces rather than the level of the laboring individual. With the development of production for exchange, in short, the human individual becomes a societal product:

> this positing of prices and their circulation etc. appears as the surface process, beneath which, however, in the depths, entirely different processes go on, in which this apparent individual equality and liberty disappear. It is forgotten, on one side, that the ***presupposition*** of exchange value, as the objective basis of the whole of the system of production, already in itself implies compulsion over the individual, since his immediate product is not a product for him, but only ***becomes*** such in the social process, and since it ***must*** take on this general but nevertheless external form; and that the individual has an existence only as a producer of exchange value, hence that the whole negation of his natural existence is already implied; that he is therefore entirely determined by society; that this further presupposes a division of labour etc., in which the individual is already posited in relations other than that of mere ***exchanger***, etc. That therefore this presupposition by no means arises either out of the individual's will or out of the immediate nature of the individual, but that it is, rather, ***historical***, and posits the individual as already ***determined*** by society.[23]

The alienation of the laborer implies, along with a strictly material alienation, a certain alienation of consciousness. These develop together. While abstract thought originates as the privilege of the few, it quickly becomes the property of everyone. This emancipation of consciousness from immediate human practice is the event from which the possibility of ideological consciousness arises. Immediate self-consciousness can

be substituted by social ideology. "The ruling ideas of each age have ever been the ideas of its ruling class," wrote Marx and Engels in the *Communist Manifesto*.[24] For the laboring class, in whatever mode of production, there is a constant battle at the level of the individual as well as the class, between the spontaneous consciousness of the daily work experience and the ruling ideas disseminated by the ruling class which, however successful and however much they appear to be rooted in immediate experience, are always imbued as abstract ideology. The feudal peasant understood that three days a week she and he worked gratis for the Lord of the Manor, but they may also have understood this reality as the result of their just and proper place in God's world.

With production for exchange, the production of nature takes place on an extended scale. Human beings not only produce the immediate nature of their existence, but produce the entire societal nature of their existence. They develop a complex differentiation in the relation with nature, a societal nature differentiated according to sex and class, mental and manual activity, production and distribution activities, and so on. Within production, there is a further complex division of labor. But the unity that previously characterized the relation with nature does not simply degenerate into random chaos. The unity is reproduced in a more advanced form. For with the generalization of commodity production and exchange relations, previously isolated, localized groups of people are knitted together in a concrete social whole. They are united as a societal whole no longer through the general unity of social individuals, but through the societal institutions that have necessarily developed to market and the state, money and class, private property and the family. Society as such, clearly distinguishable from nature, emerges. Through human agency, a cleavage is created between nature and society, between a first nature and a second nature. The latter comprises exactly those societal institutions which facilitate and regulate the exchange of commodities, both directly and indirectly. Isolated local unity gives way to a more extensive societal unity. Second nature is produced out of first nature.

What precisely is meant by "second nature"? Not until exchange economies began to develop state institutions did the idea of second nature begin to emerge. Among the ancient Greeks, Plato was particularly aware of the way in which human activity had transformed the earth's surface. Not until Cicero, however, does it seem that the concept of second nature was actually coined, and with him the second nature was clearly the nature produced by human activity, in opposition to the inherited non-human nature. Writing in a tone that even two thousand years later retains an almost modern ring, Cicero, in *De Natura Deorum*, has Balbus the Stoic make the following observation:

> So we see how the evidence of our senses leads to the inventions of the mind which are then realized by the hand of the craftsman, so as to satisfy all our needs and keep us safely housed and clothed, to give us cities, walls, homes and temples. By our human skills of hand we find ourselves food in plenty and variety. The land offers many fruits to the searching hand, which can be either eaten on the spot or preserved to be eaten later. We feed also on the creatures of the land and sea and air, which we catch or rear for the purpose. We can break in and ride four-footed animals and make their speed and strength our own. On some we place yokes and others we use as beasts of burden. For our own purposes we exploit the keen senses of the elephant and the sagacity of the dog. From the depths of the earth we extract iron, so necessary for the tilling of the soil. We search out deeply buried veins of copper, silver and gold, for both use and ornament. We cut up trees and make use of all sorts of wild and cultivated plants, to make fires to warm our bodies and to cook our food, and also for building, so that we may have a roof over our heads to keep out the heat and cold. We use these materials also to build ships, which sail in all directions to bring us all the needs of life. We alone can tame and control the most violent forces of nature, the sea and the winds, through our knowledge of navigation, and so we enjoy the benefit of all the riches of the sea. We have also taken possession of all the fruits of the earth. Ours to enjoy are the mountains and the plains. Ours are the rivers and lakes.

> We sow corn and plant trees. We fertilize the soil by irrigation. We dam the rivers, to guide them where we will. One may say that we seek with our human hands to create a second nature in the natural world.[25]

This conception of second nature carries down virtually intact to the eighteenth century. Thus Count Buffon, the famous French scientist whose chief concerns included the transformations of nature wrought by human beings, wrote that a "new nature can come forth from our hands." This process he called "the seconding of nature."[26] By the eighteenth century, however, it had become clear that it was not just the material creations of human labor but also the institutions, the legal, economic, and political rules according to which society operated, that comprised the second nature.

In the relation with nature, therefore, "exchange value . . . plays . . . an accompanying role to use value."[27] It does so in two senses: first, the use of natural material is regulated by the quantity of exchange-value its employment will bring, and this applies as much in the labor market as the raw material market. But also, since the material aspects of the second nature were produced as commodities, nature has been produced with an exchange-value component. (In this case it is not abstract external nature which exercises an oppressive control over human beings but the weight of dead labor.) The use-value of nature remains important, of course; only with difficulty (and great expense) can a butcher do the job of a cobbler using the tools and materials of a carpenter. But it is no longer the abstract possibility or impossibility of production that dictates the use of nature. It is the relative cheapness or expense of using various use-values that counts. Use-value is transformed into exchange-value (in calculation as well as practice) in the production process. Hence, just as "use value falls within the realm of political economy as soon as it becomes modified by the modern relations of production, or as it, in turn, intervenes to modify them,"[28] the same is true of exchange-value and nature. Exchange-value falls within the realm of nature as soon as a

second nature, through the production of commodities, is produced out of the first. The relation with nature is mediated by exchange-value as well as use-value determinations.

Without admitting exchange-value into nature, the relation between first and second nature cannot be concretely understood. It would be difficult to move beyond the limited, ambiguous, and potentially ideological claim that on the one hand nature is social while on the other society is natural. Equally limited and problematic is the claim that they are "interrelated" and "interact" with each other, for interaction is no substitute for the dialectic, the key to which is in the production process. Elements of the first nature, previously unaltered by human activity, are subjected to the labor process and re-emerge to be social matter of the second nature. There, though their form has been altered by human activity, they do not cease to be natural in the sense that they are somehow now immune from non-human forces and processes—gravity, physical pressure, chemical transformation, biological interaction. But they also become subject to a new set of forces and processes that are social in origin. Thus the relation with nature develops along with the development of the social relations, and insofar as the latter are contradictory, so too is the relation with nature.

So long as surplus labor is manifested mainly in agricultural commodities, economic and political power is closely tied to land ownership. Agricultural labor produces for direct or nearly direct consumption; few intermediary processes intervene. But with the continued division of labor, an increasing number of processes come to intervene. A group of laborers and a group of merchants, neither of whom are immediately tied to the land, begin to distinguish themselves. The production of a second nature has hastened the emancipation of society from first nature, and in the process has sharpened the contradiction, wholly internal to second nature, between a ruling class that is directly tied to the primitive second nature of agricultural land, and on the other side, a rising bourgeoisie whose political base is dependent on control of the market and the town. As this contradiction develops, it becomes necessary for the bourgeoisie

to extend its control to cover not just the exchange process but also the production process. This in order to ensure the continual supply of commodities for exchange. Through this combined control of production and distribution, they are better able to guarantee the continued production of social wealth; production for exchange, in general, gives way to capitalist production specifically. But unlike the initial development of production for exchange, this is not a gradual, inexorable, "natural" transformation. A product of second nature, it involves a political struggle, culminating in bourgeois revolution. That is, it involves the defeat of one ruling class and the ascent of another, and with this there comes a new, more specific relation with nature.

III. Capitalist Production

The contemporary relation with nature derives its specific character from the social relations of capitalism. Capitalism differs from other exchange economies in this: it produces on the one side a class who possess the means of production for the whole society yet who do no labor, and on the other side a class who possess only their own labor power which they must sell to survive. "Nature does not produce on the one side owners of money or commodities," Marx notes, "and on the other men possessing nothing but their own labor-power. This relation has no natural basis, neither is its social basis one that is common to all historical periods. It is clearly the result of a past historical development, the product of many economic revolutions, of the extinction of a whole series of older forms of social production."[29]

The laboring class under capitalism is deprived not only of the commodities it produces, but of the very objects and instruments necessary for production. Only with the generalization of this wage-labor relation does exchange-value become a consistent expression of what underlies it—*value*. The value of a commodity, expressed in exchange as exchange-value, is a measure of the socially necessary labor time required for the commodity's production. The commodity of labor power is no exception; the laborer's wage is a measure of the labor time socially

necessary for the reproduction of the laborer. Under capitalism, therefore, the surplus product appears in the form of *surplus value*. The value of a laborer's labor power represents only a certain fraction of the value produced during a day's work. With the laborers' historic freedom from the means of production, they are totally dependent upon selling their own labor power. The capitalist on the other hand, freed from the need to labor, is totally dependent on reinvesting some portion of the surplus value in order to create more. Both the realization and reinvestment of surplus value takes place under competitive conditions resulting from private ownership of the means of production, and this forces individual capitals, if they are to reproduce themselves at all, to do so at an extended scale. The specific class structure of capitalism, therefore, makes capital accumulation the necessary condition for the reproduction of material life. For the first time, "accumulation for accumulation's sake" is a socially imposed necessity. The process of accumulation is regulated by the law of value, which operates "only as an inner law, *vis-à-vis* the individual agents, as a blind law of nature."[30]

Derivative of the specific class relations of capitalism, this structure of economic relations is unique to capitalism, and implies a sharply different relation with nature. In that the relation with nature is socially mediated, capitalism is no different from any previous mode of production. But it differs markedly in the substance of this social mediation and in the complexity of the relation with nature. The logic of social mediation is not the simple rationale that springs immediately from the need to produce and consume use-values, nor even the rationale of production for exchange. Rather it is the abstract logic that attaches to the creation and accumulation of social value which determines the relation with nature under capitalism. Thus the movement from the abstract to the concrete is not simply a nice conceptual idea that Marx dreamed up, but is the perpetual translation actually achieved in the relation with nature under capitalism; abstract determinations at the level of value are continually translated into concrete social activity in the relation with nature. This makes for a unique but very complex determination of the relation with

nature—nature as object of production, human nature, the reproduction process, human consciousness. As with production in general and production for exchange, we shall examine the relation with nature under capitalism through these general aspects of the relation with nature. We begin with nature as an object of production.

Under dictate from the accumulation process, capitalism as a mode of production must expand continuously if it is to survive. The reproduction of material life is wholly dependent on the production and reproduction of surplus value. To this end, capital stalks the earth in search of material resources; nature becomes a *universal means of production* in the sense that it not only provides the subjects, objects, and instruments of production, but is also in its totality an appendage to the production process. Thus it "appears paradoxical to assert, that uncaught fish, for instance, are a means of production in the fishing industry. But hitherto no one has discovered the art of catching fish in waters that contain none."[31]

Under capitalism the appropriation of nature and its transformation into means of production occur for the first time at a world scale. The search for raw materials, the reproduction of labor power, the sexual division of labor, and the wage-labor relation, the production of commodities and of bourgeois consciousness, are all generalized under the capitalist mode of production. Under the banner of benevolent colonialism, capitalism sweeps before it all other modes of production, forcibly subordinating them to its own logic. Geographically, under the banner of progress, capitalism attempts the urbanization of the countryside. "The history of classical antiquity is the history of cities, but of cities founded on landed property and on agriculture . . . the Middle Ages (Germanic period) begins with the land as the seat of history, whose further development then moves forward in the contradiction between town and countryside; the modern [age] is the urbanization of the countryside, not ruralization of the city as in antiquity."[32]

Integral to this expansion of capitalism, the capitalist state develops. Like all previous states, its central function is social control on behalf of the ruling class, which means that in capitalist society it becomes

manager of that which private capital is unwilling or unable to do. By repressive, ideological, economic, and an array of other social means, the state attempts to manage the suppression of pre-capitalist societies abroad and the repression of the working class at home, and at the same time attempts to ensure the economic conditions necessary for accumulation. In short it expedites and arbitrates the stable expansion of capitalism.[33] Thus the contradictory character of the relation with nature, along with its complexity, begins to emerge more concretely. Under capitalism, the second nature is increasingly wrenched from the first, but this is achieved as part of a quite opposite but mutual process: the generalization of the capitalist relation with nature, and the practical unification of all nature in the production process.

The social division of labor and the advance of the productive forces develop apace—the second nature experiences continuous internal differentiation. Here scientific labor is of increasing importance and puts itself to the fore as a separate activity. Its main function is to facilitate the production of nature in the form of productive forces: "Nature builds no machines, no locomotives, railways, electric telegraphs, self-acting mules, etc. These are products of human industry; natural material transformed into organs of the human will over nature, or of human participation in nature. They are *organs of the human brain, created by the human hand*; the power of knowledge, objectified." Thus the "fitting technical foundation" for capitalist industry was only established with the construction of "machines by machines."[34] The proliferation of different social divisions and subdivisions of labor necessitates the parallel growth of social cooperation between them if the mode of production is to function as a whole. For the purpose of ensuring social cooperation, entire specializations have emerged, most notably the myriad so-called service activities from banking to mass transit. The abstract cooperation with nature that characterizes human productive activity takes a quite concrete character under capitalism. It develops as an antidote to the "anarchy in the social division of labour," an anarchy which is the logical outcome of competition based on private ownership of the means of production.

Along with the social division of labor there develops a technical division of labor within the work place, and it is here that we begin to see some of the basic elements of the production of human nature under capitalism. The production of a single commodity is broken down into numerous detail operations so that the individual worker's activity is increasingly restricted to only a few motor functions. This too necessitates extensive use of workers' "natural powers of co-operation," but under the control of capital this exercise of cooperation achieves not the development of the individual's natural powers but rather the exact opposite. Like the other natural constituents of the labor process, the laborer's powers of cooperation are alienated; they confront him as the powers of capital. This is precisely the case with fixed capital which represents not only a huge investment of scientific and manual abilities, but also represents an enormous exercise of cooperation among workers. Confronted with the capitalist's machinery, "the labourer is brought face to face with the intellectual potencies of the material process of production" and the intellectual impotencies of his or her individual nature. Manual, intellectual, and cooperative prowess confronts the laborer "as the property of another and as a ruling power. . . . In order to make the collective labourer, and through him capital, rich in social productive power, each labourer must be made poor in individual productive powers." As in the simple production of use-values for direct consumption, the individual realizes his or her nature in the labor process. But the conditions of contemporary labor are such that it converts the laborer not into the romantic, dignified self-made man of Hollywood fame, but, "by forcing his detail dexterity at the expense of a world of productive capabilities and instincts," it converts him or her into a "crippled monstrosity." As far as the worker is concerned, the mode of production based on the development of capital makes a "speciality of the absence of all development":

> all means for the development of production transform themselves into means of domination over, and exploitation of, the producers; they mutilate

> the labourer into a fragment of a man, degrade him to the level of an appendage of a machine, destroy every remnant of charm in his work and turn it into a hated toil; they estrange from him the intellectual potentialities of the labour-process in the same proportion as science is incorporated in it as an independent power; they distort the conditions under which he works, subject him during the labour-process to a despotism the more hateful for its meanness; they transform his life-time into working-time, and drag his wife and child beneath the wheels of the Juggernaut of capital.[35]

This is the fate of human nature under capitalism.

Engels showed that with the development of commodity economies, "the single family" becomes the "economic unit of society."[36] With the victory of a specifically capitalist form of private property, the family form is further revolutionized. In particular, while the family remains an economic unit, its economic function is very specialized and it is no longer *the* economic unit of society. Surplus value is produced not in the family but in the factory and in other work places. Engels stressed that the single family will only cease to be a fundamental economic unit of society with the "transfer of the means of production into common ownership," but capitalism itself begins the process of breaking down the single family by pulling women into the labor force in larger and larger numbers, and by transferring surplus value production from the family to the factory and the public workplace.[37]

As wage labor is consigned to the realm of public activity outside the home, a number of functions connected with the reproduction of labor power are privatized in the nuclear family. The latter is made the domain of "women's work," although most working-class women also work outside the home. The private-family mode of reproduction has a number of advantages for capitalism: the costs of reproduction are borne by the private family and the woman in particular, since she is not paid for her work of reproducing labor power; the private family socializes the next generation of workers to accept "natural" authority; and it requires privatized consumption, with all its ideological and eco-

nomic consequences. But the class structure of capitalism pervades every aspect of the social structure, and reproduction is no exception. The bourgeois family is different in many ways from the working-class family. Thus the bourgeois family probably purchases labor power ("maid," "nanny") to perform their housework, while the working-class wife not only does her own family's housework but may also sell her labor power, like her husband, for a wage. Hence the "double burden" of working-class women. In all of this, although the family is privatized, reproduction is only partly so. The state is heavily involved in the organization of reproduction. It not only controls such crucial processes as education, but through the legal system, controls the form of the family itself; it manages the oppression of women through marriage and divorce laws, abortion legislation, inheritance laws, and so on.[38]

The production of labor power, like any other commodity, is susceptible to the periodic fluctuations of the accumulation cycle. And as with the production of other commodities, attempts have been made to regulate the fluctuations through a wide array of technological innovations—contraceptives, medical technologies, genetic engineering. In this sphere too, the production of nature is an accomplished fact. The commodity produced is, in its very form, a social product. Commonly seen as the first step in the production of nature, test-tube babies are more correctly seen as the last stage. What began on the one side with the indeliberate production of the hand and on the other with the most primitive means for regulating pregnancy, has come together into a single process—the production of life itself.

With the generalization of the wage-labor relation, consciousness develops apace. Religious ideologies which emphasized one's rightful place in God's universe remained but were of limited use in justifying the wage-labor relation. Thus the rise of bourgeois society is complemented by the rise of bourgeois consciousness based on relations of exchange rather than production. If production relations under capitalism are characterized by the exploitation of labor for the sake of extracting surplus value, the exchange relations under capitalism are based on the

principles of equality and freedom. Freedom to exchange one's property and the exchange of equivalents are the principles that characterize exchange, and it is from them that bourgeois ideology is derived. Thus Marx notes sarcastically, referring to the sphere of exchange, "there alone rule Freedom, Equality, Property and Bentham."[39] The wage slavery, the inequalities, and the class basis of property ownership that define the production process are dissolved in the market where buyer and seller confront each other as equals. Everyone is a consumer. With mass consumption, advertising, television, spectator sports, and so on, bourgeois ideology marks the most successful separation of consciousness from the immediate production process. Where it is most successful, as in the United States, it leads to the conclusion that class differences no longer exist; virtually everyone has become middle class.

This homogenization of consciousness receives a boost from the development of the production system itself. In order to accumulate, capital must continuously develop the technical means of production and this implies the continuous advance of science. If science rises with the immediate task of developing the productive forces, it soon takes on an important ideological function, to the point where it operates almost as a secular religion. But this homogenization of consciousness is only ever tendential. It can occur only to the extent that consciousness is separated from the immediate work process, and while this is facilitated by the increased division of labor and by the abstractness of scientific thought, the capitalist mode of production remains based on the fundamental distinction between a working class and a class that owns capital. This leads in the opposite direction, toward a differentiation of cultures along class lines, and of course a further differentiation on the basis of gender and race. Consciousness is still a direct efflux of material practice, if one admits the function of ideology, but just as the society is differentiated, so too is the consciousness. The more focused the class struggle in practice, the more focused is the differentiation of consciousness. "The mode of production of material life conditions the general process of social, political and intellectual life. It is not the consciousness of men that

determines their existence, but their social existence that determines their consciousness."[40]

In its ability to produce nature, capitalism is not unique. Production in general is the production of nature:

> Animals and plants, which we are accustomed to consider as products of nature, are in their present form, not only products of, say last year's labour, but the result of a gradual transformation, continued through many generations, under man's superintendence, and by means of his labour. . . . In the great majority of cases, instruments of labour show even to the most superficial observer, traces of the labour of past ages.[41]

Where capitalism is unique is that for the first time human beings produce nature at a world scale. Hence Marx's brilliant observation, over 120 years ago, that "the nature that preceded human history . . . today no longer exists anywhere (except perhaps on a few Australian coral-islands of recent origin)."[42] This insight is today, of course, conventional geographic wisdom, although it is not generally interpreted in terms of the production of nature.

The development of capitalism, however, involves not just a quantitative but a qualitative development in the relation with nature. It is not merely a linear expansion of human control over nature, an enlargement of the domain of second nature at the expense of the first. With the production of nature at a world scale, nature is progressively produced from within and as part of the so-called second nature. The first nature is deprived of its firstness, its originality. The source of this qualitative change in the relation with nature lies in the altered relation between use-value and exchange-value. At "different stages of the development of economic relations, exchange value and use value were determined in different relations."[43] Under capitalism, then, the role of exchange-value is no longer merely one of accompanying use-value. With the development of capitalism at a world scale and the generalization of the wage-labor relation, the relation with nature is before anything else an exchange-value relation. The use-value of nature remains fundamental, of course,

but with the advanced development of productive forces, specific needs can be fulfilled by an increasing range of use-values and specific commodities can be produced from a growing array of raw materials. The transformation to an exchange-value relation is something achieved in practice by capitalism. Capitalist production (and the appropriation of nature) is accomplished not for the fulfillment of needs in general, but for the fulfillment of one particular need: profit. In search of profit, capital stalks the whole earth. It attaches a price tag to everything it sees and from then on it is this price tag which determines the fate of nature.

Once the relation with nature is determined by the logic of exchange-value, and first nature is produced from within and as a part of second nature, first and second nature are themselves redefined. With production for exchange, the difference between first and second nature is simply the difference between the non-human and the humanly created worlds. This distinction ceases to have real meaning once the first nature too is produced. Rather, the distinction is now between a first nature that is concrete and material, the nature of use-values in general, and a second nature which is abstract, and derivative of the abstraction from use-value that is inherent in exchange-value. The earlier conceptual opposition of human and non-human worlds remains strongly embedded today and indeed was unchallenged until into the nineteenth century. The new notion of second nature was furthest developed not in Count Buffon's France, where the old opposition remained in sway, but rather in Hegel's Germany, with its exceptional philosophical tradition. Hegel's was the idealist second nature. It was not simply the material world transformed and created by human action, but rather the manifestation of free will through a system of right as the economic and political institutions of modern society. It was not the built structures that occupied Hegel's second nature but the legal system, the laws of the market, and the ethical rules of modern society—"the realm of freedom made actual, the world of mind brought forth out of itself like a second nature."[44]

The reality from which Hegel's idealist conception of nature was derived also threw up a material conception of second nature more

advanced than Cicero's and Buffon's, and more appropriate for the reality of emerging capitalism. The best description of this second nature is provided by Alfred Sohn-Rethel:

> In German the world of "use" is often called "the first or primary nature," material in substance, while the sphere of exchange is termed a "second, purely social, nature" entirely abstract in make-up. . . . [First nature is] concrete and material, comprising commodities as objects of use and our own activities as material, inter-exchange with nature; [second nature is] abstract and purely social, concerning commodities as objects of exchange and quantities of value.[45]

The same piece of matter exists simultaneously in both natures; as physical commodity subject to the laws of gravity and physics it exists in the first nature, but as exchange-value subject to the laws of the market, it travels in the second nature. Human labor produces the first nature, human relations produce the second.

What is an abstract potential in the origins and fundamental character of human labor becomes a reality for the first time under capitalism. It is not just the immediate or the local nature of human existence that is produced under capitalism but nature as a totality. The mode of production based on capital strives toward the "universal appropriation of nature as well as of the social bond itself by the members of society. Hence the great civilizing influence of capital; its production of a stage of society in comparison to which all earlier ones appear as mere *local developments* of humanity and as *nature idolatry*."[46] Material nature is produced as a unity in the labor process, which is in turn guided by the needs, the logic, the quirks of the second nature. No part of the earth's surface, the atmosphere, the oceans, the geological substratum, or the biological superstratum are immune from transformation by capital. In the form of a price tag, every use-value is delivered an invitation to the labor process, and capital—by its nature the quintessential socialite—is driven to make good on every invitation.

This may appear to be the logic of Marx's argument, but did he not

also make clear in *Capital* that the labor process still employs "many means of production, provided directly by nature, that do not represent any combination of natural substances with human labour"?[47] Does this not render dubious the notion that nature is produced? It is necessary to look at two kinds of cases here. First, it is quite possible that in political economic terms, the natural substance embodies no exchange-value but is nevertheless, in use-value terms, profoundly altered by human labor, either directly or indirectly. This can happen with, for example, agricultural land where improvements to the land have returned all of their value and therefore been completely devalorized, but where the fertility and physical structure of the soil is greatly altered.[48] This can also be the case with more obvious products of labor such as buildings, which no longer have any economic trace of their origins in the production process, but certainly retain the physical characteristics of human artifice. More commonly, some aspects of nature may have been altered dramatically in their physical form by human activity, without this having been in any way an investment of socially necessary labor time. The production of toxic shock syndrome, cancer, and other humanly produced diseases are as much examples of this as the alteration of climate through human activity. As elements of first nature they are very much produced, though not commodities.

But there is a more stringent case where, indeed, even the form of natural substance has not previously been altered by human activity. Substantial parts of the geological substratum would probably count here, if one went deep enough. So too would the solar system, if one went far enough, that is beyond the moon and beyond some of the planets and beyond the assorted debris that has been jettisoned in space. But these rather extreme examples hardly testify to the falsity of the "production of nature" thesis, especially when one looks at more down-to-earth examples of supposedly unproduced nature, such as Yellowstone Park or Yosemite. These are produced environments in every conceivable sense. From the management of wildlife to the alteration of the landscape by human occupancy, the material environment bears the stamp of human

labor; from the beauty salons to the restaurants, and from the camper parks to the Yogi Bear postcards, Yosemite and Yellowstone are neatly packaged cultural experiences of environment on which substantial profits are recorded each year. The point here is not nostalgia for a pre-produced nature, whatever that might look like, but rather to demonstrate the extent to which nature has in fact been altered through human agency. Where nature does survive pristine, miles below the surface of the earth or light years beyond it, it does so only because as yet it is inaccessible. If we must, we can let this inaccessible nature support our notions of nature as Edenic, but this is always an ideal, abstract nature of the imagination, one that we will never know in reality. Human beings have produced whatever nature became accessible to them.

The unity of nature toward which capitalism drives is certainly a materialist unity but it is not the physical or biological unity of the natural scientist. Rather it is a social unity centered on the production process. But this unity should not be taken as implying an undifferentiated nature. There is, as was seen above, a distinction between first and second nature. But in light of the production of nature by capitalism, and the drive to make this process universal, how relevant is this distinction in contrast with the unity of nature? Certainly the economic structure presents itself as a second nature: "the laws of economy in all unplanned and unorganized production confront men as objective laws, against which they are powerless, hence *in the form of natural laws*." Thus Marx saw his task in *Capital* as one of laying bare "the economic law of motion of modern society." His "standpoint, from which the evolution of the economic formation of society is viewed as a process of natural history, can less than any other make the individual responsible for relations whose creature he solely remains, however much he may subjectively raise himself above them." Human beings certainly make their own history, but they do so not under conditions of their own choosing, rather under conditions given and transmitted from the past.[49]

But there is a potential problem with viewing the laws of economy and society in such a seemingly naturalistic fashion, for as Marx him-

self also said, in the famous letter to Kugelmann of 11 July 1868: "No natural laws can be done away with. What can change, in changing historical circumstances, is the *form* in which these laws operate."[50] If the economic laws of capitalism are indeed natural laws, Marx would seem to be saying that they, and by implication capitalism, cannot be done away with. Yet this would make no sense coming from Marx, the committed revolutionary who devoted his life to the struggle for socialism. Nor was this just a slip on Marx's part, a reversion to viewing nature as crudely outside society, since the reference to natural law here was not a reference to gravity or the laws of physics, but to the distribution of social labor. (It was this seeming contradiction, incidentally, which led Schmidt to see in Marx a distinction between logico-epistemological categories and economic ones, and from there to prepare his accusation of utopianism.)

The solution lies not in philosophical distinctions between categories but, as ever, in human practice, specifically in human history. For like gravity, the laws of the market can be obeyed or opposed, and in this way we can change the form in which they operate and in which they are experienced. But unlike gravity, there is nothing natural about the law of value; no society has lived without experiencing the operation of gravity, but many have lived without the law of value. However much it and other laws of the market are experienced in the form of natural laws, they are not equatable to gravity. This is precisely Marx's point when he says that the defeat of capitalism makes possible the end of the natural history of human beings and the beginning of true history, the end of societal laws experienced in the form of natural laws, and the beginning of truly social control over history. With its tremendous development of the productive forces, capitalism has put the question of the production of nature on the agenda. But it is a question that the capitalist mode of production itself is incapable of solving. It has unified nature for the future but cannot do it for the present.

The distinction between a first and second nature is therefore increasingly obsolete. As a philosophical distinction between abstractly or

ontologically equivalent or even similar realities, it was obsolete as soon as it no longer referred to the division between the human and non-human worlds. As a division between materiality and abstraction, the distinction between first and second nature certainly captured the complexity of societal organization and its distance from primal nature. But the ability of capital to produce the material world "in its own image"[51] rendered this distinction a victim of itself—an abstraction that had lost touch with a changing reality and the potential of human history. The production of first nature from within and as a part of second nature makes the production of nature, not first or second nature in themselves, the dominant reality. But there remains an important distinction to be made.

Engels hints at the distinction when he notes that our "mastery" of nature "consists in the fact that we have the advantage over all other creatures of being able to learn its laws and apply them correctly."[52] The production of nature is only possible given the identification and application of natural laws. But the identification of natural laws inevitably involves a clear knowledge of the limit of these laws, and thus the distinction between laws which are in reality natural and those which under a specific form of society are made to appear natural. This is not a philosophical distinction but a practical one. The difference between gravity and the law of value does not concern what can and cannot be produced, since the effect of gravity can quite easily be opposed and altered and quite opposite results obtained, simply by the identification and social application of other laws of nature. We do this every time we make an airplane fly, for example. The fundamental distinction that must be made is, rather, between what can and what cannot be *destroyed*. This distinction is realized in the practical process of social history, not as a process of philosophical speculation. Looking backward in history, the indications are that while the law of gravity cannot be destroyed, however much it can be opposed or the actual form of its operation socially determined, the "law" of value can be destroyed. Looking forward in history, only by discovering and identifying natural

laws will we actually be able finally to distinguish and reveal the natural laws that underlie human nature. This can be accomplished only in the process of destroying and overthrowing the social pyramids that present themselves as natural laws. Those in a society with the most accurate comprehension of human nature are not the high priests who preach the naturalness (meaning the inevitability) of so much of human and societal behavior. Rather it is those who have the most acute sense of what social monstrosities can be destroyed; it is they who best understand that human beings can create something more human.[53]

In its uncontrolled drive for universality, capitalism creates new barriers to its own future. It creates a scarcity of needed resources, impoverishes the quality of those resources not yet devoured, breeds new diseases, develops a nuclear technology that threatens the future of all humanity, pollutes the entire environment that we must consume in order to reproduce, and in the daily work process it threatens the very existence of those who produce the vital social wealth. But in the same breath capitalism must develop as part of itself the very force that can reveal how unnatural and vulnerable this mode of production is, and how historically temporary it can be. It is not just the relative recency of capitalism that points to it being temporary, but the production of its own internal contradictions which guarantee that temporary character.

The production of nature is the means by which these contradictions are made concrete. In early societies, the contradictory relation with nature was expressed in crises of scarcity, and the effect was immediate. And as central as the production process was, crises of scarcity also represented the peripheral limits of society; natural scarcity determined the limits of social development. Under capitalism, social crises still focus on the production process but now lie at the heart of a complex social system. The production of nature is universal but the internal contradictions in this process are made equally universal. Today crisis does not spring from the interface between society and an external nature but from the contradictions at the heart of the social production process itself. Insofar as social crises are still attributed to natural scarcity today, this should be seen as a produced scarcity in nature.

Whether in the form of nuclear energy or in the revolt of the working class, the contradiction written into the production of nature emanates from the form of capitalism itself. Thus we should understand Marx not at all metaphorically when he writes that capitalism creates "barriers in its own nature," the final one of which is the working class, which it differentiates from the rest of humanity as the wage slaves of capital. This "barrier in its own nature" will, "at a certain stage of its development, allow [capitalism] to be recognized as being itself the greatest barrier to [its own development], and hence will drive toward its own suspension."[54] In the process of struggle against capital, it is the working class that will win the chance truly to define human nature. This is not at all to suggest that the working class today is somehow by definition more natural than the other classes. As a class alienated from control of the society that employs them, the working class are in every way unnatural and a product of capitalism. Nor is it meant to imply the inevitability of socialism. It is meant to suggest, however, the inevitability of revolt; it is a law of nature that the human animal, deprived of the means to fulfill its natural needs, will react to this deprivation, sometimes violently and sometimes also socially organized. The form of the revolt is governed by no natural law but is a social product. The victory of this revolt would bring with it the historically unique opportunity for human beings to become the willing social subjects not the natural subjects of their own history.

IV. Conclusion

When he taught at Yale, the great imperial geographer Isaiah Bowman used to tell his classes "that one could build a city of a hundred thousand at the South Pole and provide electric lights and opera. Civilization could stand the cost." This was at the time when the Peary expedition had just reached the Pole, in 1909. And while the notion of an urban South Pole probably represented a rather extreme corrective to his earlier attraction to environmental determinism, Bowman was undoubtedly correct. In the same vein he used to claim "that we could also build a mountain range in the Sahara high enough to evoke rainfall." And in more general

terms, twenty years later, he noted more precisely that "man cannot move mountains"—not, that is, without first "floating a bond issue."[55]

Predictably, the production of nature has followed a path guided less by the extreme unthinkability of the physical event, more by the profitability of the economic event. Predictably too, perhaps, it is in North America, which trail-blazed the expansion of world capitalism from 1918 until 1973, that we find some of the most accomplished examples of the production of nature. Thus in his iconoclastic analysis of *Megalopolis* Jean Gottmann offers the following:

> The Promethean endeavors that had long been confined to the dreams of European people, resigned to a status quo in their homelands, broke out of old bounds in this wilderness. . . . While there was in time an end to the expanse of free land, the great cities of Megalopolis developed, through a finer division of labor, more exchange of services, more trade, and more accumulation of capital and people, a boundless vista of unlimited resources for an affluent society.
>
> The expansion of Megalopolis could hardly have happened without such an extraordinary Promethean drive. As the frontier becomes more urban in its nature, as the wilderness to be tamed shifts in obvious fashion from the woods and the prairies to the city streets and human crowds, the vultures that threatened Prometheus may be more difficult to keep away.[56]

The potentially contradictory mix of opportunity and apocalypse in this vision is not wholly different from Marx's treatment of nature. Marx and Engels traditionally viewed the substance of the relation with nature in terms of growing mastery or domination over nature, although not in a one-dimensional sense: "Mastery over nature began with the development of the hand, with labour, and widened man's horizon at every new advance."[57] As the sun rose on capitalism, this progressive mastery of nature moved up a gear; for the first time historically, economic growth in the form of capital accumulation became an absolute social necessity, and the continual extension of the domination of nature became equally necessary. But capital, and the bourgeois society which nurtures

it, usher in not just a quantitative but a qualitative change in the relation with nature. Capitalism inherits a global world market—a system of commodity exchange and circulation—which it digests then regurgitates as the world capitalist system, a system of production. To achieve this, human labor power itself is converted into a commodity, produced like any other commodity according to specifically capitalist social relations. The production of nature at the global scale, not just an increased "mastery" over nature, is the goal of capital.

This is the logical if unstated conclusion of Marx's conception of the relation with nature, and in part of Engels's work, although the idea of a "dialectic of nature" clearly led Engels along a quite different and I believe erroneous path. The question is why they retained the language and in part the conception of "mastery" and "domination" over nature. In practice, the relation with nature progressed beyond one of mastery and domination as soon as the distinction between a pre-human first nature (the mastered) and a human second nature (the master) was rendered obsolete. "Mastery" does not at all describe the relation between the new first and second natures, the distinction between materiality and abstraction which fell heir to the earlier, simpler distinction. Matter is not somehow dominated or mastered by a world of abstractions—this would lead quickly to idealism—but specific pieces of matter the world over are produced (that is, their form is changed) according to the abstract laws, needs, forces, and accidents of capitalist society. The reality of the production of nature is much more obvious today in the late twentieth century than it was in the middle of the nineteenth, and this more than anything else explains why Marx could cling to the obsolete notion of mastery. A further century of capitalist development whipped on by the inexorable pursuit of relative surplus value should have made the idea of the production of nature into a dreadful cliché. That it has not, that far from being a cliché it is a novel, still almost quixotic idea, is testimony to the power of the ideology of nature.

The production of nature should not be confused with *control* over nature. Although some control generally accompanies the production

process, this is by no means assured. The production of nature is not somehow the completion of mastery over it, but something qualitatively quite different. Even Engels was careful to distinguish between mastery (which has far greater connotations of control than "production") and control: "Let us not . . . flatter ourselves overmuch on account of our human victories over nature," he says, then gives a paragraph of examples illustrating the cost of these victories and the "revenge" of nature. At each step, he concludes,

> we are reminded that we by no means rule over nature like a conqueror over a foreign people, like someone standing outside nature—but that we, with flesh, blood and brain, belong to nature, and exist in its midst, and that all our mastery of it consists in the fact that we have the advantage over all other creatures of being able to learn its laws and apply them correctly.[58]

The idea of revenge by nature carries something of the dualistic implications inherent in "mastery," but nonetheless, the essential point is a marvelous insight given the context (to which Engels elsewhere in the same work succumbed) of nineteenth-century scientific triumphalism. Thus the industrial production of carbon dioxide and of sulfur dioxide into the atmosphere have had very uncontrolled climatic effects: if it still has something of a speculative ring, the possibility of a greenhouse effect and the consequent melting of the ice caps has been supported by increasing numbers of scientists, while many of those rejecting the idea expect an equally dramatic cooling; and the increased sulfur dioxide content in the air is responsible for acid rain. Even, or perhaps especially, the production of the human hand was in no way a controlled process. And the most complete and elaborate of human productions, the capitalist system, is at the same time the most anarchic. Just as pollutants are integral products of the production process though not its immediate goal, much of the production of nature is not the deliberate goal of production. The production process is quite deliberate, but its immediate goal, profit, is reckoned in terms of exchange-value not use-value. The issue of control is vitally important, therefore, but only once it is viewed

in context. The first question is not whether or to what extent nature is controlled; this is a question framed in the dichotomous language of first and second nature, of pre-capitalist mastery and non-mastery over nature. The question really is *how* we produce nature and *who* controls this production of nature.

Capitalism develops the forces of production to the point where the unity of nature again becomes a possibility. But under capitalism this unity is only ever a tendency, continually promised by the drive toward universality. Capitalism creates the technical means but cannot itself fulfill the promise. The option as Marx said is socialism or barbarism; either is a unity of nature. The cruel irony of this option is more acute today, for with the threat of nuclear war, barbarism unifies nature only by obliterating it. But the class society that threatens the final barbaric defeat also offers the ambition of socialism. Socialism is neither a utopia nor a guarantee. It is however the place and the time where and when the unity of nature becomes a real possibility. It is the arena of struggle to develop real social control over the production of nature. Early in his life, Marx pictured communism as the "genuine resolution of the conflict between men and nature."[59] Whether this is true, remains to be seen—and to be done.

What is certain is the struggle over this conflict, the revolt against deprivation. In many ways it is a struggle to control what is "socially necessary." Like pollution, much of the production of nature is the indeliberate, uncontrolled result of the production process. They may be integral products of the labor process, but pollution and many other produced parts of nature are not bearers of "socially necessary labour time." The struggle for socialism is the struggle for social control to determine what is and is not socially necessary. Ultimately it is the struggle to control what is and is not value. Under capitalism, this is a judgment made in the market, one which presents itself as a natural result. Socialism is the struggle to judge necessity according not to the market and its logic but to human need, according not to exchange-value and profit, but to use-value.

Later in his life Marx was less speculative as regards the relation with nature, more circumspect about what communism may or may not be. The following passage from *Capital* addresses this issue, but compared with his earlier writing is politically more concrete, succinct, and resolute:

> the realm of freedom actually begins only where labour which is determined by necessity and mundane considerations ceases; thus in the very nature of things it lies beyond the sphere of actual material production. . . . Freedom in this field can only consist in socialised man, the associated producers, rationally regulating their interchange with nature, bringing it under their common control, instead of being ruled by it as by the blind forces of nature; and achieving this with the least expenditure of energy and under conditions most favourable to, and worthy of, their human nature. But it nonetheless still remains a realm of necessity. Beyond it begins that development of human energy which is an end in itself, the true realm of freedom, which, however, can blossom forth only with this realm of necessity as its basis. The shortening of the working-day is its basic prerequisite.[60]

The shortening of the working day is, as we might put it, the transitional demand. It is cast still in terms of exchange-value. The shorter the working day, the lesser the mass of surplus value produced in the form of profit for the capitalist class. The ultimate demand is for workers' control, control over the production process and hence control over the production of nature; that is, the overthrow of capitalism and its control of society through control of the exchange-value system. This is in order to control the sphere of use-values. The concept of "production of nature" in this way does what Schmidt's "concept of nature" wanted to do but never could: it "changes into the concept of political action."[61]

There will be those who see this analysis, indeed the very idea of the production of nature, as a sacrilegious effrontery, and a crude violation of the inherent beauty, sanctity, and mystery of nature. The meaning of nature to them is not only sacred, it transcends such vulgar considerations as production through real labor, sweat. About vulgarity they

are not wrong; they would simply escape it and thus deny it. But it is real. Contemporary industrial capitalism and all it implies is a vulgarity of capitalism, it is not a vulgarity of necessity. It is a product of present reality, not a phantom of marxist theory. Others will complain that if not quite vulgar, still for a theory of nature it is terribly anthropocentric. But like the explicitly romantic charge of vulgarity, this too is a product of nostalgia. As soon as human beings separated themselves from animals by beginning to produce their own means of subsistence, they began moving themselves closer and closer to the center of nature. Through human labor and the production of nature at the global scale, human society has placed itself squarely at the center of nature. To wish otherwise is nostalgic. Precisely this centrality in nature is what fuels the crazy quest of capital actually to control nature, but the idea of control over nature is a dream. It is the dream dreamt each night by capital and its class, in preparation for the next day's labor. Truly human, social control over the *production* of nature, however, is the realizable dream of socialism.