

Marx's ecology in historical perspective

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'For the early Marx the only nature relevant to the understanding of history is human nature... Marx wisely left nature (other than human nature) alone.' These words are from George Lichtheim's influential book *Marxism: An Historical and Critical Study*, first published in 1961.¹

Though he was not a Marxist, Lichtheim's view here did not differ from the general outlook of Western Marxism at the time he was writing. Yet this same outlook would be regarded by most socialists today as laughable. After decades of explorations of Marx's contributions to ecological discussions and publication of his scientific-technical notebooks, it is no longer a question of whether Marx addressed nature, and did so throughout his life, but whether he can be said to have developed an understanding of the nature-society dialectic that constitutes a crucial starting point for understanding the ecological crisis of capitalist society.²

A great many analysts, including some self styled eco-socialists, are prepared to acknowledge that Marx had profound insights into the environmental problem, but nonetheless argue that these insights were marginal to his work, that he never freed himself from 'Prometheanism' (a term usually meant to refer to an extreme commitment to industrialisation at any cost), and that he did not leave a significant ecological legacy that carried forward into later socialist thought or that had any relation to the subsequent development of ecology.³ In a recent discussion in the journal *Capitalism, Nature, Socialism* a number of authors argued that Marx could not have contributed anything of fundamental relevance to the development of ecological thought, since he wrote in the 19th century, before the nuclear age and before the appearance of PCBs, CFCs and DDT--and because he never used the word 'ecology' in his writings. Any discussion of his work in terms of ecology was therefore a case of taking 120 years of ecological thinking since Marx's death and laying it 'at Marx's feet'.⁴

My own view of the history of ecological thought and its relation to socialism is different. In this, as in other areas, I think we need to beware of falling into what Edward Thompson called 'the enormous condescension of posterity'.⁵ More specifically, we need to recognise that Marx and Engels, along with other early

socialist thinkers, like Proudhon (in *What is Property?*) and Morris, had the advantage of living in a time when the transition from feudalism to capitalism was still taking place or had occurred in recent memory. Hence the questions that they raised about capitalist society and even about the relation between society and nature were often more fundamental than what characterises social and ecological thought, even on the left, today. It is true that technology has changed, introducing massive new threats to the biosphere, undreamed of in earlier times. But, paradoxically, capitalism's antagonistic relation to the environment, which lies at the core of our current crisis, was in some ways more apparent to 19th and early 20th century socialists than it is to the majority of today's green thinkers. This reflects the fact that it is not technology that is the primary issue, but rather the nature and logic of capitalism as a specific mode of production. Socialists have contributed in fundamental ways at all stages in the development of the modern ecological critique. Uncovering this unknown legacy is a vital part of the overall endeavour to develop an ecological materialist analysis capable of addressing the devastating environmental conditions that face us today.

I first became acutely aware of the singular depth of Marx's ecological insights through a study of the Liebig-Marx connection. In 1862 the great German chemist Justus von Liebig published the seventh edition of his pioneering scientific work, *Organic Chemistry in its Application to Agriculture and Physiology* (first published in 1840). The 1862 edition contained a new, lengthy and, to the British, scandalous introduction. Building upon arguments that he had been developing in the late 1850s, Liebig declared the intensive, or 'high farming', methods of British agriculture to be a 'robbery system', opposed to rational agriculture.⁶ They necessitated the transportation over long distances of food and fibre from the country to the city--with no provision for the recirculation of social nutrients, such as nitrogen, phosphorus and potassium, which ended up contributing to urban waste and pollution in the form of human and animal wastes. Whole countries were robbed in this way of the nutrients of their soil. For Liebig this was part of a larger British imperial policy of robbing the soil resources (including bones) of other countries. 'Great Britain', he declared:

-deprives all countries of the conditions of their fertility. It has raked up the battlefields of Leipsic, Waterloo and the Crimea; it has consumed the bones of many generations accumulated in the catacombs of Sicily; and now annually destroys the food for a future generation of three millions and a half of people. Like a vampire it hangs on the breast of Europe, and even the world, sucking its lifeblood without any real necessity or permanent gain for itself.⁷

The population in Britain was able to maintain healthy bones and greater physical proportions, he argued, by robbing the rest of Europe of their soil

nutrients, including skeletal remains, which would otherwise have gone into nurturing their own soils, allowing their populations to reach the same physical stature as the English.

'Robbery', Liebig suggested, 'improves the art of robbery.' The degradation of the soil led to a greater concentration of agriculture among a small number of proprietors who adopted intensive methods. But none of this altered the long term decline in soil productivity. England was able to maintain its industrialised capitalist agriculture, by importing guano (bird droppings) from Peru as well as bones from Europe. Guano imports increased from 1,700 tons in 1841 to 220,000 tons only six years later.

What was needed in order to keep this spoliation system going, Liebig declared, was the discovery of 'beds of manure or guano...of about the extent of English coalfields'. But existing sources were drying up without additional sources being found. By the early 1860s North America was importing more guano than all of Europe put together. 'In the last ten years,' he wrote, 'British and American ships have searched through all the seas, and there is no small island, no coast, which has escaped their enquiries after guano. To live in the hope of the discovery of new beds of guano would be absolute folly.'

In essence, rural areas and whole nations were exporting the fertility of their land: 'Every country must become impoverished by the continual exportation of corn, and also by the needless waste of the accumulated products of the transformation of matter by the town populations.'

All of this pointed to 'the law of restitution' as the main principle of a rational agriculture. The minerals taken from the earth had to be returned to the earth. 'The farmer' had to 'restore to his land as much as he had taken from it', if not more.

The British agricultural establishment, needless to say, did not take kindly to Liebig's message, with its denunciation of British high farming. Liebig's British publisher, rather than immediately translating the 1862 German edition as in the case of previous editions, destroyed the only copy in its possession. When this final edition of Liebig's great work was finally translated into English it was in an abridged form under a different title (*The Natural Laws of Husbandry*) and without Liebig's lengthy introduction. Hence, the English-speaking world was left in ignorance of the extent of Liebig's critique of industrialised capitalist agriculture.

Nevertheless, the importance of Liebig's critique did not escape the attention of one major figure residing in London at the time. Karl Marx, who was then completing the first volume of *Capital*, was deeply affected by Liebig's critique. In 1866 he wrote to Engels, 'I had to plough through the new agricultural chemistry

in Germany, in particular Liebig and Schönbein, which is more important for this matter than all of the economists put together.' Indeed, 'To have developed from the point of view of natural science the negative, ie destructive side of modern agriculture,' Marx noted in volume one of *Capital*, 'is one of Liebig's immortal merits'.⁸

Marx's two main discussions of modern agriculture both end with an analysis of 'the destructive side of modern agriculture'. In these passages Marx makes a number of crucial points: (1) capitalism has created an 'irreparable rift' in the 'metabolic interaction' between human beings and the earth, the everlasting nature-imposed conditions of production; (2) this demanded the 'systematic restoration' of that necessary metabolic relation as 'a regulative law of social production'; (3) nevertheless the growth under capitalism of large-scale agriculture and long distance trade only intensifies and extends the metabolic rift; (4) the wastage of soil nutrients is mirrored in the pollution and waste in the towns--'In London,' he wrote, 'they can find no better use for the excretion of four and a half million human beings than to contaminate the Thames with it at heavy expense'; (5) large-scale industry and large-scale mechanised agriculture work together in this destructive process, with 'industry and commerce supplying agriculture with the means of exhausting the soil'; (6) all of this is an expression of the antagonistic relation between town and country under capitalism; (7) a rational agriculture, which needs either small independent farmers producing on their own, or the action of the associated producers, is impossible under modern capitalist conditions; and (8) existing conditions demand a rational regulation of the metabolic relation between human beings and the earth, pointing beyond capitalist society to socialism and communism.⁹

Marx's concept of the metabolic rift is the core element of this ecological critique. The human labour process itself is defined in *Capital* as 'the universal condition for the metabolic interaction between man and nature, the everlasting nature-imposed condition of human existence'.¹⁰ It follows that the rift in this metabolism means nothing less than the undermining of the 'everlasting nature-imposed condition of human existence'. Further there is the question of the sustainability of the earth--ie the extent to which it is to be passed on to future generations in a condition equal or better than in the present. As Marx wrote:

- . *From the standpoint of a higher socio-economic formation, the private property of particular individuals in the earth will appear just as absurd as private property of one man in other men. Even an entire society, a nation, or all simultaneously existing societies taken together, are not owners of the earth. They are simply its possessors, its beneficiaries, and have to bequeath it in an improved state to succeeding generations as **boni patres familias** [good heads of the household].¹¹*

The issue of sustainability, for Marx, went beyond what capitalist society, with its constant intensification and enlargement of the metabolic rift between human beings and the earth, could address. Capitalism, he observed, 'creates the material conditions for a new and higher synthesis, a union of agriculture and industry on the basis of the forms that have developed during the period of their antagonistic isolation'. Yet in order to achieve this 'higher synthesis', he argued, it would be necessary for the associated producers in the new society to 'govern the human metabolism with nature in a rational way'--a requirement that raised fundamental and continuing challenges for post-revolutionary society.¹²

In analysing the metabolic rift Marx and Engels did not stop with the soil nutrient cycle, or the town-country relation. They addressed at various points in their work such issues as deforestation, desertification, climate change, the elimination of deer from the forests, the commodification of species, pollution, industrial wastes, toxic contamination, recycling, the exhaustion of coal mines, disease, overpopulation and the evolution (and co-evolution) of species.

After having the power and coherence of Marx's analysis of the metabolic rift impressed on me in this way, I began to wonder how deeply embedded such ecological conceptions were in Marx's thought as a whole. What was there in Marx's background that could explain how he was able to incorporate natural-scientific observations into his analysis so effectively? How did this relate to the concept of the alienation of nature, which along with the alienation of labour was such a pronounced feature of his early work? Most of all, I began to wonder whether the secret to Marx's ecology was to be found in his materialism. Could it be that this materialism was not adequately viewed simply in terms of a materialist conception of *human* history, but also had to be seen in terms of *natural* history and the dialectical relation between the two? Or to put it somewhat differently, was Marx's materialist conception of history inseparable from what Engels had termed the 'materialist conception of nature'?¹³ Had Marx employed his dialectical method in the analysis of both?

The search for an answer to these questions took me on a long intellectual journey through Marx's works, and the historical-intellectual context in which they were written, which eventually became *Marx's Ecology*. Let me mention just a few highlights of the story I uncovered--since I do not have the time to explore it all in detail here, and because part of my purpose here is to add additional strands to the story. My account differs from most present-day accounts of Marx's development in that it highlights the formative significance of Marx's doctoral thesis on Epicurus, the greatest of the ancient materialists, and goes on to situate Marx and Engels' lifelong engagement with developments in the natural sciences. This includes Marx and Engels' opposition to the natural theology tradition, particularly as manifested by Malthus, their treatment of Liebig's work on nutrient cycling and

its relation to the metabolic rift, and finally their creative encounter with Darwin, co-evolution, and what has been called 'the revolution in ethnological time' following the discovery of the first prehistoric human remains.¹⁴

In most interpretations of Marx's development his early thought is seen as largely a response to Hegel, mediated by Feuerbach. Without denying Hegel's significance I argue that Marx's formative phase is much more complex than is usually pictured. Along with German idealism Marx was struggling early on with ancient materialist natural philosophy and its relation to the 17th century scientific revolution, and the 18th century Enlightenment. In all of this Epicurus loomed very large. For Kant, 'Epicurus can be called the foremost philosopher of sensibility,' just as Plato was the foremost philosopher 'of the intellectual'. Epicurus, Hegel claimed, was 'the inventor of empiric natural science'. For Marx himself Epicurus was the 'the greatest figure of the Greek Enlightenment'.¹⁵

For Marx, Epicurus represented, most importantly, a non-reductionist, non-deterministic materialism, and articulated a philosophy of human freedom. In Epicurus could be found a materialist conception of nature that rejected all teleology and all religious conceptions of natural and social existence. In studying Epicurus's natural philosophy Marx was addressing a view that had had a powerful influence on the development of European science and modern naturalist-materialist philosophies, and one that had at the same time profoundly influenced the development of European social thought. In the Epicurean materialist worldview knowledge of the world started with the senses. The two primary theses of Epicurus's natural philosophy make up what we today call the principle of conservation: nothing comes from nothing, and nothing being destroyed is reduced to nothing. For Epicureans there was no scale of nature, no sharp, unbridgeable gaps between human beings and other animals. Knowledge of Epicurus provides a way of understanding Marx's deep materialism in the area of natural philosophy. His study of ancient and early modern materialism brought Marx inside the struggle over the scientific understanding of the natural world in ways that influenced all of his thought and was deeply ecological in its significance, since it focused on evolution and emergence, and made nature not god the starting point. Moreover, Marx's dialectical encounter with Hegel has to be understood in terms of the struggle that Marx was carrying on simultaneously regarding the nature of materialist philosophy and science.

Darwin had similar roots in natural philosophy, linked to the anti-teleological tradition extending back to Epicurus, which had found its modern exponent in Bacon. We now know, as a result of the publication of Darwin's notebooks, that the reason that he waited so long--20 years--before making public his theory on species transmutation was due to the fact that his theory had strong materialist roots, and thus raised the issue of heresy in Victorian England. Darwin's view

went against all teleological explanations, such as those of the natural theology tradition. He presented an account of the evolution of species that was dependent on no supernatural forces, no miraculous agencies of any kind, but simply on nature's own workings.

Marx and Engels greeted Darwin's theory immediately as 'the death of teleology', and Marx described it as 'the basis in natural science for our views'.¹⁶ Not only did they study Darwin intensely, they were also drawn into the debates concerning human evolution that followed immediately on Darwin's work, as a result of the discovery of the first prehistoric human remains. Neanderthal remains had been found in France in 1856, but it was the discovery of prehistoric remains that were quickly accepted as such in England in Brixham Cave in 1859, the same year that Darwin published his *The Origin of Species*, that generated the revolution in ethnological time, erasing forever within science the biblical chronology for human history/prehistory. Suddenly it became clear that the human species (or hominid species) had existed in all probability for a million years or longer, not simply a few thousand. (Today it is believed that hominid species have existed for around 7 million years.)

Many major works, mostly by Darwinians, emerged in just a few years to address this new reality, and Marx and Engels studied them with great intensity. Among the works that they scrutinised were Charles Lyell's *Geological Evidences of the Antiquity of Man* (1863), Thomas Huxley's *Evidence as to Man's Place in Nature* (1863), John Lubbock's *Prehistoric Times* (1865), Darwin's *Descent of Man* (1871), along with a host of other works in the ethnological realm, including Lewis Henry Morgan's *Ancient Society* (1881).

Out of their studies came a thesis on the role of labour in human evolution that was to prove fundamental. Inspired by the ancient Greek meaning for organ (*organon*)--or tool, which expressed the idea that organs were essentially the 'grown-on' tools of animals, Marx referred to such organs as 'natural technology', which could be compared in certain respects to human technology. A similar approach was evident in Darwin, and Marx was thus able to use Darwin's comparison of the development of specialised organs in plants and animals to that of specialised tools (in chapter 5 of *The Origin of Species* on 'Laws of Variation') to help explain his own conception of the development of natural and human technology. The evolution of natural technology, Marx argued, rooting his analysis in *The Origin of Species*, was a reflection of the fact that animals and plants were able to pass on through inheritance organs that had been developed through natural selection in a process that might be called "'accumulation" through inheritance'. Indeed, the driving force of evolution for Darwin, in Marx's interpretation, was 'the gradually accumulated [naturally selected] inventions of living things'.¹⁷

In this conception, human beings were to be distinguished from animals in that they more effectively utilised tools, which became extensions of their bodies. Tools, and through them the wider realm of nature, as Marx said early on in his *Economic and Philosophic Manuscripts*, became the 'inorganic body of man'. Or as he was to observe in *Capital*, 'thus nature becomes one of the organs of his [man's] activity, which he annexes to his own bodily organs, adding stature to himself in spite of the Bible'.¹⁸

Engels was to develop this argument further in his pathbreaking work, 'The Part Played by Labour in the Transition from Ape to Man' (written in 1876, published posthumously in 1896). According to Engels' analysis--which derived from his materialist philosophy, but which was also influenced by views voiced by Ernst Haeckel a few years before--when the primates, who constituted the ancestors of human beings, descended from the trees, erect posture developed first (prior to the evolution of the human brain), freeing the hands for tool-making. In this way:

- . *...the hand became free and could henceforth attain ever greater dexterity and skill, and the greater flexibility thus acquired was inherited and increased from generation to generation. Thus the hand is not only the organ of labour, it is also the product of labour.*¹⁹

As a result early humans (hominids) were able to alter their relation to their local environment, radically improving their adaptability. Those who were most ingenious in making and using tools were most likely to survive, which means that the evolutionary process exerted selective pressures toward the enlargement of the brain and the development of language (necessary for the social processes of labour and tool-making), leading eventually to the rise of modern humans. Thus the human brain, like the hand, in Engels' view, evolved through a complex, interactive set of relations, now referred to by evolutionary biologists as 'gene-culture co-evolution'. All scientific explanations of the evolution of the human brain, Stephen Jay Gould has argued, have thus far been theories of gene-culture co-evolution, and 'the best 19th century case for gene-culture co-evolution was made by Frederick Engels'.²⁰

All of this points to the fact that Marx and Engels had a profound grasp of ecological and evolutionary problems, as manifested in the natural science of their day, and were able to make important contributions to our understanding of how society and nature interact. If orthodoxy in Marxism, as Lukács taught, relates primarily to method, then we can attribute these insights to a very powerful method, but one which, insofar as it encompasses *both* a materialist conception of natural history and of human (ie social) history, has not been fully investigated by subsequent commentators. Behind Marx and Engels' insights in this area lay an

uncompromising materialism, which embraced such concepts as emergence and contingency, and which was dialectical to the core.

Engels' *Dialectics of Nature* is known to incorporate numerous ecological insights. But it is frequently contended that Marxism after Marx and Engels either missed out on the development of ecological thought altogether or was anti-ecological and that there were no important Marxian contributions to the study of nature after Engels until the Frankfurt School and Alfred Schmidt's *The Concept of Nature in Marx*, first published in 1962.²¹ This position, however, is wrong. There were in fact numerous Marxist contributions to the analysis of the nature-society relation, and socialists played a very large role in the development of ecology, particularly in its formative stages. The influence of Marx and Engels' ideas in this respect was not confined to the 19th century.

But it is not just a question of the direct inheritance of certain propositions with respect to nature-ecology. Marx and also Engels employed a materialist conception of nature, which was not at all foreign to the major revolutions in science of their day (as evident in Darwin's theory), and which they combined with a dialectic of emergence and contingency. A very large part of this was reflected in both socialist and scientific thought in the immediately succeeding generations. Among the socialists who incorporated naturalistic and ecological conceptions into their thinking, after Marx and up through the 1940s, we can include such figures as William Morris, Henry Salt, August Bebel, Karl Kautsky, Rosa Luxemburg, V I Lenin, Nikolai Bukharin, V I Vernadsky, N I Vavilov, Alexander Oparin, Christopher Caudwell, Hyman Levy, Lancelot Hogben, J D Bernal, Benjamin Farrington, J B S Haldane and Joseph Needham--and in the more Fabian tradition, but not unconnected to Marx and Marxism, Ray Lankester and Arthur Tansley. Bukharin employed Marx's concept of the metabolism of nature and society in his writings, and situated human beings in the biosphere. 'Human beings,' he wrote:

- . *...are both products of nature and part of it; they have a biological basis when their social existence is excluded from account (it cannot be abolished!); if they are themselves the summits of nature and its products, and if they live within nature (however much they may be divided off from it by particular social and historical conditions of life and by the so called 'artistic environment'), then what is surprising in the fact that human beings share in the rhythm of nature and its cycles?*²²

Kautsky in his *The Agrarian Question*, following Liebig and Marx, addressed the problem of the soil nutrient cycle, raised the question of the fertiliser treadmill, and even referred to the dangers of the intensive application of pesticides--all in 1899! Luxemburg addressed ecological problems in her letters, discussing the

disappearance of songbirds through the destruction of their habitat. Lenin promoted both conservation and ecology in the Soviet Union, and demonstrated an awareness of the degradation of soil fertility and the breaking of the soil nutrient cycle under capitalist agriculture--the Liebig-Marx problem. The Soviet Union in the 1920s had the most developed ecological science in the world. Vernadsky had introduced the concept of the biosphere in a dialectical framework of analysis that reaches down to the most advanced ecology of our day. Vavilov used the historical materialist method to map out the centres of the origin of agriculture and the banks of germ plasm throughout the globe, now known as the Vavilov areas. Oparin, simultaneously with Haldane in Britain, developed the first and still to this day most influential explanation for the origin of life on earth based on Vernadsky's biosphere concept--a theory that was to have an important impact on Rachel Carson's concept of ecology.²³

Yet this early Marxist ecological thought, or rather the traditions that sustained it, largely died out. Ecology within Marxism suffered something of a double death. In the East in the 1930s Stalinism literally purged the more ecological elements within the Soviet leadership and scientific community--not arbitrarily so since it was in these circles that some of the resistance to primitive socialist accumulation was to be found. Bukharin was executed. Vavilov died of malnutrition in a prison cell in 1943. At the same time in the West, Marxism took an often extreme, avidly anti-positivistic form. The dialectic was seen as inapplicable to nature--a view often associated with Lukács, though we now know that Lukács's position was somewhat more ambiguous. This affected most of Western Marxism, which tended to see Marxism increasingly in terms of a human history severed for the most part from nature. Nature was relegated to the province of natural science, which was seen as properly positivistic within its own realm. In Lukács, Gramsci and Korsch, marking the Western Marxist revolt of the 1920s, nature was increasingly conspicuous in its absence. Nature entered into the Frankfurt School's critique of the Enlightenment, but the nature under consideration was almost always human nature (reflecting the concern with psychology), and rarely so called 'external nature'. There was no materialist conception of nature. Hence genuine ecological insights were rare.

If an unbroken continuity is to be found in the development of socialist nature-science discussions and ecological thought, its path has to be traced primarily in Britain, where a continuous commitment to a materialist dialectic in the analysis of natural history was maintained. A strong tradition in Britain linked science, Darwin, Marx and dialectics. Although some of the negative features of this tradition, which has been referred to as a 'Baconian strand in Marxism', are well known, its more positive ecological insights have never been fully grasped.²⁴

Any account of the ecology of British Marxism in this period has to highlight

Caudwell, who, though he died at the age of 29 behind a machine-gun on a hill in Spain, left an indelible intellectual legacy. His *Heredity and Development*, perhaps the most important of his science-related works, was suppressed by the Communist Party in Britain due to the Lysenkoist controversy (he was anti-Lysenkoist) and so was not published until 1986.²⁵ But it contains an impressive attempt to develop an ecological dialectic. Haldane, Levy, Hogben, Needham, Bernal and Farrington--as previously noted--all developed ecological notions (though Bernal's legacy is the most contradictory in this respect). All indicated profound respect not only for Marx and Darwin but also for Epicurus, who was seen as the original source of the materialist conception of nature. The influence of these thinkers carries down to the present day in the work of later biological and ecological scientists, such as Steven Rose in Britain, and Richard Lewontin, Richard Levins and the late Stephen Jay Gould in the US.

I want to concentrate here on two figures who are less well known, more Fabian than Marxist, but clearly socialists--namely Ray Lankester and Arthur Tansley. Ray Lankester taught at University College, London, and Tansley was his student there. Lankester was Huxley's protégé and was considered the greatest Darwinian scientist of his generation. He was the most famous adamantly materialist biologist of his day in Britain. When he was a boy Darwin had carried him on his shoulders. Lankester was also a young friend of Karl Marx and a socialist, though not himself a Marxist. He was a frequent guest at Marx's household in the last few years of Marx's life. Marx and his daughter Eleanor also visited Lankester at his residence in London. Marx and Lankester had in common, above all, their materialism. Marx was interested in Lankester's research into degeneration--the notion that evolution did not necessarily simply go forward--and made an attempt to get Lankester's work published in Russian. Lankester wrote to Marx that he was absorbing 'your great work on Capital...with the greatest pleasure and profit'. Lankester was to become one of the most ecologically concerned thinkers of his time. He wrote some of the most powerful essays that have ever been written on species extinction due to human causes, and discussed the pollution of London and other ecological issues with an urgency that is not found again until the late 20th century.²⁶

Arthur Tansley was the foremost plant ecologist in Britain of his generation, one of the greatest ecologists of all time, and the originator of the concept of ecosystem. He was to become the first president of the British Ecological Society. Tansley was deeply influenced by Lankester, along with the botanist Francis Wall Oliver, in his years at University College, London. Like Lankester, Tansley was a Fabian socialist and an uncompromising materialist. And like Lankester, who wrote a scathing criticism of Henri Bergson's concept of vitalism or the *élan vital*, Tansley was to directly challenge attempts to conceive evolutionary ecology in anti-materialist, teleological terms.²⁷

In the 1920s and 1930s a major split occurred in ecology. In the US Frederic Clements and others developed the important concept of ecological succession (successive stages in the development of plant 'communities' in a particular region culminating in a 'climax' or mature stage linked to certain dominant species). But in a much more controversial move, Clements and his followers extended this analysis to a concept of super-organism meant to account for the process of succession. This ecological approach inspired other innovations in ecological theory in Edinburgh and South Africa. South African ecological thinkers, led by Jan Christian Smuts, introduced a concept of 'holism' in the ecological realm, most notably in Smuts' book *Holism and Evolution* (1926), which was to lead to modern conceptions of deep ecology. Smuts, who was usually referred to as General Smuts because of his military role in the Boer War (he fought on the side of the Boers), was one of the principal figures in the construction of the apartheid system. How much Smuts himself contributed directly to the development of apartheid may be disputed. But he was a strong advocate of the territorial segregation of the races and what he called 'the grand white racial aristocracy'. He is perhaps best remembered worldwide as the South African general who arrested Gandhi. Smuts was South African minister of defence from 1910 to 1919, and prime minister and minister of native affairs from 1919 to 1924. He was sometimes seen as a figure soaked in blood. When the Native Labour Union demanded political power and freedom of speech Smuts crushed it with violence, killing 68 people in Port Elizabeth alone. When black Jews refused to work on Passover Smuts sent in the police, and 200 were killed on his orders. When certain black tribal populations in Bondelwaart refused to pay their dog tax Smuts sent in planes and bombed them into submission. Not surprisingly, Smuts' ecological holism was also a form of ecological racism, since it was a holism that contained natural-ecological divisions along racial lines.

The legendary opponent of Smuts' holistic philosophy, in the great 'Nature of Life' debate that took place at the British Association for the Advancement of Science meetings in South Africa in 1929, was the British Marxist biologist Lancelot Hogben (who had a position at the University of Cape Town at that time). Hogben not only debated Smuts--opposing his materialism to Smuts' holism, and attacking Smuts for his racist eugenics--but also hid black rebels fleeing the racist state in a secret compartment in his basement. Another major opponent of Smuts was the British Marxist mathematician Hyman Levy, who, in his *The Universe of Science*, developed a critique of Smuts' holism along similar lines to those of Hogben.²⁸

In 1935 Tansley found himself increasingly at odds with anti-materialist conceptions of ecology that were then gaining influence, and entered the lists against ecological idealism. Tansley wrote an article for the journal *Ecology* entitled 'The Use and Abuse of Vegetational Concepts and Terms' that declared

war on Clements, Smuts and Smuts' leading follower in South African ecology, John Phillips. In one fell swoop Tansley attacked the teleological notions that ecological succession was always progressive and developmental, always leading to a climax; that vegetation could be seen as constituting a super-organism; that there was such a thing as a biotic 'community' (with members), encompassing both plants and animals; that 'organismic philosophy', which saw the whole universe as an organism, was a useful way to understand ecological relations; and that holism could be seen as both cause and effect of everything in nature. Smuts' holistic view, Tansley claimed, was 'at least partly motivated by an imagined future "whole" to be realised in an ideal human society whose reflected glamour falls on less exalted wholes, illuminating with a false light the image of the "complex organism".' This was quite possibly a polite way of referring to the system of racial stratification that was built into Smutsian holistic ecology.

In combating this type of mystical holism and super-organicism, and introducing the concept of ecosystem in response, Tansley turned to the systems theory utilised in Levy's *The Universe of Science* and at the same time referred to materialist conceptions of dynamic equilibrium in natural systems going back to Lucretius (Epicurus's Roman follower and author of the great philosophical poem *The Nature of Things*). 'The fundamental conception,' represented by his new ecosystem concept, Tansley argued, was that of:

- . *...the whole system (in the sense of physics), including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment of the biome-the habitat factors in the widest sense. Though the organisms may claim our primary interest, when we are trying to think fundamentally we cannot separate them from their special environment, with which they form one physical system... These **ecosystems**, as we may call them, are of the most various kinds and sizes. They form one category of the multitudinous physical systems of the universe, which range from the universe as a whole down to the atom.*

Following Levy, Tansley emphasised a dialectical conception:

- . *The systems we isolate mentally are not only included as part of larger ones, but they also overlap, interlock, and interact with one another. The isolation is partly artificial, but it is the only possible way in which we can proceed.*

Rather than seeing ecology in terms of natural, teleological order, Tansley emphasised disruptions to that order, referring to 'the destructive human activities of the modern world', and presenting human beings as an 'exceptionally powerful biotic factor which increasingly upsets the equilibrium of pre-existing ecosystems and eventually destroys them, at the same time forming new ones of very different

nature'. 'Ecology,' he argued, 'must be applied to conditions brought about by human activity,' and for this purpose the ecosystem concept, which situated life within its larger material environment, and penetrated 'beneath the forms of the "natural" entities', was the most practical form for analysis. Tansley's ecosystem concept was, paradoxically, more genuinely holistic and more dialectical than the super-organicism and 'holism' that preceded it, because it brought both the organic and inorganic world within a more complex materialist synthesis.²⁹

At this point you may think that I have deviated from my path in addressing Tansley so extensively. But an analysis that is materialist and at the same time dialectical is bound to provide a more powerful set of insights into both ecology and society, natural history and human history. The Marxian materialist perspective was bound to such an approach. Figures like Bukharin, Vernadsky, Vavilov, Oparin, Caudwell, Haldane, Hogben, Needham and Levy--but also Lankester and Tansley--shared, albeit with considerable variance among them, both a materialist conception of nature and history and a commitment to dialectical readings of human and natural relations. The fact that these thinkers to varying degrees also sometimes lapsed into mechanicalism should warn us to approach their work cautiously, but it should not blind us to their genuine insights.

Some environmental commentators of course continue to claim that Marx believed one-sidedly in the struggle of human beings against nature, and was thus anthropocentric and unecological, and that Marxism as a whole carried forth this original ecological sin. But the evidence, as I have suggested, strongly contradicts this. In *The German Ideology* Marx assailed Bruno Bauer for referring to 'the antitheses in nature and history as though they were two separate things'. In fact, 'the celebrated "unity of man with nature",' Marx argued, 'has always existed in industry...and so has the "struggle" of man with nature.' A materialist approach will deny neither reality--neither unity nor struggle in the human relation to nature. Instead it will concentrate on 'the sensuous world', as Marx said, 'as consisting of the total living sensuous *activity* of those living in it'.³⁰ From this standpoint, human beings make their own environments, but not under conditions entirely of their choosing, but rather based on conditions handed down from the earth and from earlier generations in the course of history, both natural and human.

Notes

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at the Marxism 2002 conference, London, 6 July 2002.

- . G Lichtheim, *Marxism: An Historical and Critical Study* (New York, 1964), p245.
- . On the strengths of Marx's ecological analysis see J B Foster, *Marx's Ecology* (New York, 2000), and P Burkett, *Marx and Nature* (New York, 1999).
- . For a detailed breakdown of the various criticisms of Marx on the environment see J B Foster, 'Marx's Theory of Metabolic Rift', *American Journal of Sociology*, vol 105, no 2 (September 1999), pp366-405.
- . M de Kadt and S Engel-Di Mauro, 'Failed Promise', *Capitalism, Nature, Socialism*, vol 12, no 2 (June 2001), pp52-55.
- . E P Thompson, *The Essential E P Thompson* (New York, 2001), p6.
- . J Liebig, *Die Chemie in ihrer Anwendung auf Agricultur und Physiologie*, vol 1 (Brunswick, 1862). Except where otherwise indicated all of the brief quotes from Liebig in the text below are taken from an unpublished English translation of the 1862 German edition by Lady Gilbert contained in the archives of the Rothamsted Experimental Station (now IACR-Rothamsted) outside London.
- . The translation of this passage from the introduction to the 1862 edition of Liebig's work follows Erland Måröld in 'Everything Circulates: Agricultural Chemistry and Recycling Theories in the Second Half of the Nineteenth Century', *Environment and History* 8 (2002), p74.
- . K Marx, *Capital*, vol 1 (New York, 1976), p638.
- . Ibid, pp636-639; K Marx, *Capital*, vol 3 (New York, 1981), pp948-950, 959.
- . Ibid, vol 1, pp283, 290.
- . Ibid, vol 3, p911.
- 零. Ibid, vol 1, p637; Ibid, vol 3, p959.
- . F Engels, *Ludwig Feuerbach and the Outcome of Classical German Philosophy* (New York, 1941), p67.
- . The phrase 'the revolution in ethnological time' is taken from T R Trautmann, *Lewis Henry Morgan and the Invention of Kinship* (Berkeley, 1987), pp35, 220.
- . See J B Foster, *Marx's Ecology*, op cit, pp49-51.
- . See the discussion ibid, pp196-207, 212-221.
- . K Marx, *Theories of Surplus Value*, vol 3 (Moscow, 1971), pp294-295.
- . K Marx, *Early Writings* (New York, 1974), p328; K Marx, *Capital*, vol 1, op cit, pp285-286. See also J B Foster and P Burkett, 'The Dialectic of Organic/Inorganic Relations: Marx and the Hegelian Philosophy of Nature', *Organization and Environment*, vol 13, no 4 (December 2000), pp403-425.
- Zeroth. F Engels, *The Dialectics of Nature* (New York, 1940), p281.
- . S J Gould, *An Urchin in the Storm* (New York, 1987), pp111-112.
- . See N Castree, 'Marxism and the Production of Nature', *Capital and Class* 72 (Autumn 2000), p14; J B Foster, 'Review of Special Issue of Capital and Class', *Historical Materialism* 8 (Summer 2001), pp465-467.

- . N Bukharin, *Philosophical Arabesques* (written in 1937-1938), ch 8. Quotations from draft of forthcoming English translation.
 - . See the discussion in J B Foster, *Marx's Ecology*, op cit, p241-244; R Carson, *Lost Woods* (Boston, 1998), pp229-230.
 - . N Wood, *Communism and British Intellectuals* (New York, 1959), p145.
 - . Lysenkoism was an erroneous doctrine associated with the work of the Russian agronomist Trofim Denisovich Lysenko that de-emphasised genetic inheritance in favour of a notion of the plasticity of the life cycle. For a balanced discussion of Lysenkoism see R Levins and R Lewontin, *The Dialectical Biologist* (Cambridge, Mass, 1985), pp163-196.
 - . See the more detailed discussions of Lankester in J B Foster, *Marx's Ecology*, op cit, pp221-225; and J B Foster, 'E Ray Lankester, Ecological Materialist: An Introduction to Lankester's "Effacement of Nature by Man"', *Organization and Environment*, vol 13, no 2 (June 2000), pp233-235.
 - . For biographical information on Tansley see P Anker, *Imperial Ecology: Environmental Order in the British Empire* (Cambridge, Mass, 2001), pp7-40.
 - . Ibid, pp41-75, 118-149; J C Smuts, *Holism and Evolution* (London, 1926); L Hogben, *The Nature of Living Matter* (London, 1931); H Levy, *The Universe of Science* (New York, 1933). For Smuts' racial views see J Smuts, *Africa and Some World Problems* (Oxford, 1930), pp92-94.
 - . Ibid, pp152-156; A G Tansley, 'The Use and Abuse of Vegetational Concepts and Terms', *Ecology*, vol 16, no 3 (July 1935), pp284-307.
0. K Marx and F Engels, *Collected Works*, vol 5 (New York, 1975), pp39-41.