

## MARXISM AND THE ENGELS PARADOX

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### *Introduction*

FOR MARXIST philosophy, in so far as it still forms an independent reflection upon the concepts that inform a Marxist practice, dialectics involves the conscious interception of the object in its process of development,<sup>1</sup> where the object is man's production of history. The ultimate possibility of human self-liberation is grounded in the postulate that man is a world-producing being. For Hegel, from whom Marx derived the dialectic, philosophy remained a speculative affair, a set of ideas remote from human praxis. Marx sought to actualize the philosophical interception as a practical interception, to abolish concretely the historical alienation of man from his species nature, an alienation viewed speculatively by the Helgelians. In the practical abolition of historical alienation, philosophy as the expression of abstract propositions pertaining to the human condition would also be abolished.

In the formulation adduced by Friedrich Engels, however, dialectics are situated prior to the anthropological dimension. A set of static tenets drawn from Hegelian metaphysics, they are "located" in physical nature. It is the purpose of this paper to investigate what Gustav Wetter has described as "the curse put upon the dialectic by its transference to the realm of Nature."<sup>2</sup>

This problem has been discussed before by non-Marxist writers.<sup>3</sup> The main reason for the present approach is that it endeavours to assess the relationship of Marxism to science from within a Marxist perspective, and it further attempts to demonstrate some of the consequences for Marxist philosophy that arise out of a commitment to what I term the "Engels paradox". In the course of the critique (which encompasses several strands of contemporary natural-dialectic theory rather than concentrating upon Engels' own ideas) what I hope to be a more useful view of the natural sciences with the purview of the Marxist tradition will be sketched.

### *Fundamentals of Engels' Naturdialektik*

Dialectical materialism (the term belongs to Plekhanov) developed out of Engels' work on natural science<sup>4</sup> and with the exception of a

small number of scientists of Marxist persuasion it remained largely identified with the ruling philosophical paradigm in Soviet and Eastern European culture. Its exponents within the Marxist tradition differed widely in their emphases: Lenin, Trotsky, Stalin and Mao Tse-tung all made contributions. In 1947, an international journal devoted to dialectical materialism was founded, *Dialectica*, and many leading Western scholars were moved to pronounce on the matter one way or the other. Some natural scientists were seeking an alternative to the idealist frameworks of Eddington,<sup>5</sup> Jeans<sup>a</sup> and Russell (in his period expounding neutral monism).<sup>7</sup> The startling investigations in micro-physics and the apparent breakdown of mechanical principles of causality there, as in biology, and the developments in restructuring several axiomatic systems in mathematics had given philosophical idealism a new lease of life. To these trends, dialectical materialism was occasionally counterposed, and the kinds of argument propounded by those deploying the categories of Engels' Hegelian positivism<sup>8</sup> will be examined here.

What then is the basis of Engels' position? Unlike Marx, who posited the operation of dialectic at the level of social reality, Engels depicted social man as subject to universally operable laws of material nature, conceived as dialectical, whereby he effectively *dehumanized* man of his self- and world-producing attributes by assimilating him as a totality of physical properties into the system of laws of an *anthropomorphized* naturalism. This, then, formed his paradoxical legacy to Marxist philosophy. The anthropomorphic nature of Engels' cosmology derived from his panlogistic ascription of the dialectical categories from Hegel, intended to deal with a human reality, to the world of inanimate matter. In contradistinction to Hegel, Engels did not consider matter to be a manifestation of spirit in self-estrangement, yet he could still write :

“. . . the same **dialectical** laws of motion force their way through (Nature) as those which in history govern the apparent fortuitousness of **events**.”<sup>9</sup>

Strangely, however, Engels' own criticism of Hegel was that he foisted onto Nature laws of *thought* not originally deduced from the natural sphere itself :

“This is the source of the whole forced and outrageous treatment; the universe, willy-nilly, is made out to be arranged in accordance with a system of thought which itself is only the product of a definite stage of evolution of human thought.”<sup>10</sup>

These words ought to haunt all latter-day practitioners, for Engels' own approach involved the claim that the dialectical laws were

deduced originally from the analysis of matter and its laws of motion, quite independently of any historical specificity. Engels was quite as guilty of panlogism as Hegel, but with even less theoretical justification: after all, Engels had rejected Hegelian pan-animism and contended that in all things matter was the prime cosmological dynamic.<sup>11</sup> It is perhaps useful to illustrate the panlogistic fallacy. Popper has shown how Sir James Jeans, who expressed the idealist conception of the universe as a pure mathematical thought because mathematics appeared inherently able to order its elements, was guilty of the same type of error wherein the question "how can English describe the world?" is answered by "because the world is intrinsically British."<sup>12</sup>

Leaving aside the formalism of the categories themselves found in Engels' exposition, we find ourselves confronted with an epistemology of a mechanistic-materialist type. Such an epistemology theoretically reduces man to the status of a mere predicate of the movement of external events, which either trigger in him pre-determined responses or which he passively reflects. The development of this aspect of Engels' representationism was Lenin's early philosophical forte; in his *Materialism and Empirio-Criticism*, he advanced the concept of "reflectionism" (*Otrozhenie*) wherein cognition was conceived of as a copy, a photographic image or static isomorphism corresponding to external, material forms. Leninists have cited Marx to support this view as an expression in keeping with Marxist epistemology, and their particular reference has been the Preface to the Second Edition of *Capital* (1873), focusing upon;

"My own method is not only fundamentally different from the Hegelian dialectical method, but is its direct opposite . . . in my view . . . the ideal is nothing other than the material when it has been transposed and translated inside the human head."

This will not suffice, of course, for the imputation to Marx of a mechanistic representationism. The whole of Marx's work sprang from his transformative critique of Hegelian idealism and his disavowal of Feuerbachian materialism. In Marx's account, human activity is objective activity, neither an activity devoid of real human sensuousness nor the simple perception of reality, but conscious interpenetration. The result of Lenin's standpoint with regard to cognition and his adherence to Marxism as a philosophy of history and political practice was a view of Marxism through deterministic-dogmatic lenses—it became for him "cast of one piece of steel . . . objective truth."<sup>13</sup> Between 1909 and 1914, having reconsidered Hegel's work, Lenin revised his approach to these questions in his *Philosophical Notebooks* (1914-1916), asserting there that intelligent idealism is closer to intel-

thesis"? If we restrict our scope to the oft-cited exemplar of the transformation of water to ice, do we find there the generic agency for the quantity-quality leaps (i.e., temperature), if that is what we are to call it? Hardly, for the quality "transformed" may be of constant quantity. Similar difficulties bedevil the application of these dialectical categories to natural phenomena, which we shall see as we proceed.

*Base and Superstructure as Dialectic*

The post-Marxian hypostatization of Marx's categories of "base" and "superstructure" is frequently the starting point for their counterposition in a "dialectical relationship"—in effect, the situating of human relations within metaphorical boundaries ("economic" and "political/ideological/juridical" chunks of the social world) and the assertion of what amounts to a facile interactionism<sup>17</sup> between them. It is clear that whereas Hegel saw historical development as ideational development, Marx stressed the obverse with his analyses of historically structured constraints, the institutionally differentiated availability of means and permissibility of ends, and the stock of rationalizations associated with specific modes of production<sup>18</sup>. The relations of production form the

"real base on which the legal and political superstructure arises and to which *certain forms of the social consciousness correspond.*"<sup>19</sup>

Neither the contents of consciousness nor consciousness in general is involved (though Marx certainly conceived of consciousness itself as "a social product").<sup>20</sup> What we have is a recognition of the fact that societal rules (organized in accordance with ruling-class projects) become individual vocabularies of thought and action: simply to speak of buying something assumes markets and commodity production, let alone the invocation of a rhetoric of "industrial relations" and "the national interest". This does not mean that such socially given vocabularies directly determine what one thinks, just the general and routine cognitive channels along which one normally travels. Marx's conception of history

"rests on the exposition of the real process of production, starting out from the simple material production of life, and on the comprehension of the form of intercourse connected with and created by this mode of production . . . From this starting-point, it explains all the different theoretical productions and forms of consciousness, religion, philosophy, ethics, etc., and traces their origin and growth, by which means the matter can of course be displayed as a totality (and consequently, also the reciprocal action of these various sides on one another)" (<sup>21</sup>—my italics).

*The reciprocal* action of all aspects of human activity reveals man as

producing the conditions that produce him. Human ideas modify, through *praxis*, the very existential substratum of ideas themselves; history is the unfolding of man shaping his world, both the continuation of

“traditional activity in completely changed circumstances and (the modification of) the old circumstances with a completely changed activity.”<sup>22</sup>

This must be, contrary to *Lobkovicz*<sup>23</sup>, both a sequential and an immediate process. But what is the dialectical aspect of historical materialism? Plekhanov, Lenin, and later in a much cruder manner, Stalin, all portrayed what Engels termed Marx's "historical materialism" in terms of the hypostatizations mentioned earlier, according to each sector a different historical "importance". The political superstructure was sometimes viewed as a direct emanation from the economic base, representing its every option and imperative, its every essential counterpart, whilst at other times it was seen as playing a markedly independent role, almost to the point of concession to the claims of bourgeois pluralist political theory. Stalin's *Concerning Marxism in Linguistics* (dealing chiefly with the Soviet linguist Marr and his voluntaristic approach to language) legitimized the Party's monopoly of theory in the declaration that

“. . . the superstructure is created by the base precisely to serve it, to actively help it to take shape and consolidate it, to actively fight for the elimination of the old, moribund base, together with its superstructure.”<sup>24</sup>

As Harris has put it, such a perspective would imply that "gasometers produce poetry via men"<sup>25</sup>. or, at the very least, that technological forces in themselves dispose toward one particular political framework. In Stalin's work, the category of *contradiction* (relating in Marx to the organization of the social productive forces and relations of production) was deployed just as crudely. Witness :

"We are for the withering away of the State. But at the same time, we stand for the strengthening of the dictatorship of the proletariat, which is the mightiest and strongest State power that has ever existed . . . Is this contradictory? Yes, it is contradictory. **But** this contradiction is bound up with life, and it fully reflects Marx's dialectics.”<sup>26</sup>

Ambiguous categories employed in a political context are often susceptible to the caprice of expedient use. The law of the transformation of quantity into quality as applied to historical change was relegated to the domains of class societies alone (Russia had, of course, since become "classless"), and the law of the negation of the negation was also negated (undialectically — it was simply erased in 1934). Stalin

selected his Hegelian taxonomy according to the dictates of his political practice and its legitimation.

Marx's own "dialectic" of history involved revealing that whilst all hitherto existing societies had manifested a unity of opposed forces (the symbiotic antagonism of classes),

"the bourgeois relations of production are the last antagonistic form of the social process of production; not in the sense of individual antagonism, but of conflicts arising from conditions surrounding the life of individuals in society. At the same time the productive forces developing in the womb of bourgeois society create the material conditions of the solution to that antagonism. With this social formation, therefore, the pre-history of human society comes to an end."<sup>28</sup>

Each new form of social order in human pre-history develops through the *contradictions* (antagonisms between collectively organized interests and felt needs, tensions between preceptions of actuality and ideas of potentiality, etc.) which produce *negative*, transcendent social forces that can shatter the old set of socio-economic arrangements but *maintain and further develop* its material and cultural heritage along *qualitatively* different lines. Finally, with the communist phase, the *absolute* development possible in human pre-history (capitalistic civilization) has given way to its ultimate *negation*, the *higher synthesis* of human existence. (Marx himself never outlined his schema in these terms—indeed, his only excursion into Hegelian dialectical categories such as these appears in his discussion of the labour theory of value<sup>28</sup>—yet such an outline would indicate the appropriate manner in which one could label Marx's historiography "dialectical"). Those who consistently emphasized the activist, voluntaristic aspect of human intervention in the shaping of history include Luxemburg, Gramsci and Lukács, who maintained (in a spirit that contrasts with the positivism of Stalin and his disciples) that a constant mental restructuralization of the human world alone informs the ability to reshape it collectively :

"According to this interpretation of Marxist thought, ideas . . . do not reflect passively what is already inherent in the social reality. They have nothing in common with the famous 'mirror image' persisting in many popular textbooks of a positivistic brand. The truth is understood here as a process, the very pronouncement of an idea being a powerful factor in making its content true through the praxis it *initiates*."<sup>29</sup>

Echoes of this anti-mechanistic trend come from Connolly, who once claimed that "the only true prophet is one who helps carve out the future he announces", and from Gramsci, who noted that "in reality one can forecast the future only to the extent to which one acts and undertakes conscious efforts supporting the forecast *result*."<sup>30</sup> Marxism

itself as a theory is related (both by inner logic and empirical address) to those social actors constituting the proletariat, and its perceived relevance will depend upon the material conditions under which actors are receptive to a dereification of their labour situation in capitalist society. There is no "inevitability" in human dialectic—only interception. Marx's "iron laws" working towards "inevitable results" belong to specific models with stringent conditions (part of Marx's method of successive approximation<sup>31</sup> prior to organization and action). In his concrete analyses of socio-economic practice, Marx spoke only of tendential laws, even spelling out the contrary conditions necessary to negate them. History as a dialectical totality still includes material nature (the history of man's relationship to matter is the root of historical materialism), but "only in so far as (Nature) enters and conditions the historical process of social reproduction . . . The dialectical principle is not a general principle equally applicable to any subject matter"<sup>32</sup>. It is through the process of dominating and humanizing the natural environment that the autonomy/determinism, subject/object, praxis/process polarities manifest themselves; the multiplex tensions between human action materially constrained into anti-human rationalities and the unfolding of the conditions ripe for human disalienation. Such polarities are historical, not ontological, in the Marxist account. Their transcendence expresses not a logic of ultimate ends, a secular eschatology<sup>33</sup> but the creation of social relations through which the mass of humanity can become aware of the truly ontological constraints and maximize their freedom within them, uncluttered by the reifications of social structures built to accommodate the struggle with nature (division of labour, class power, alienated skills and faculties). As Sartre put it,

"Individual dialectics (individual praxis, efforts, activities, production), which, after having created by the same stroke man's domination over nature (thesis) and the anti-humanity of the domination of unorganised materiality over man (anti-thesis), create progressively by their unified efforts a truly human order (*le règne humain*)—that is, free relations among men (synthesis)."<sup>34</sup>

Nature does not exist detached from its human significance. There is only nature at the human level. "Matter could be matter only for God or for pure matter, which would be absurd" (Sartre). Man himself is the self-mediating natural being, touching, tasting, working upon and transforming his natural world and thereby himself. The direct assimilation of natural material by the infra-human species through immediate organic activity gives way in man to an indirect assimilation through social relations geared to the objectification of human powers, wherein "man accomplishes his own exchange of

material with nature".<sup>16</sup> It is thus clear that, even whilst men are not all fully incorporated into the decision processes which guide the project of natural transformation (and hence, of their own transformation), i.e., whilst they still appear, to varying degrees in different areas of their existence, as determined objects in a total process, nature is nevertheless *nature-for-man*, and as such partakes of humanly constructed "laws". For the natural-dialectician, it is man who is fully subordinate to pre-ordained, universal and pre-human laws as a natural being. His self-mediations, and hence the possibility of his becoming an autonomous subject in a total praxis, are both implicitly ruled out in such a conception. Communism, following the logic of this schema, arrives out of the independent movement of materiality (i.e., its "law-governed" movement, where "law" is intrinsically natural), and duly reflects the stage of development of that materiality as its inevitable culmination. But on such a vision, what could communism look like? Certainly, it could not involve the abrogation of the coercive dialectical laws, for they pre-date man and will post-date him, being cosmological. Thus, we would have a vision of a **different** but non-libertarian society in which human consciousness still reflects the state of matter and thereby man is permanently incorporated into a determinate ontological system.

Engels' *Naturdialektik* formed a peculiar contribution towards Marx's perspective on the uniting of natural and social science; ironically, it served to split man **off** from nature only to re-assimilate his physical attributes. The reflexive social being of Marx's anthropology hardly figures in Engels' dialectics. Contradictions are incapable of resolution by man as they form part of an alien rationality which he can only contemplate from without. Marx's contradictions are resolved through the media of capitalist development and revolutionary anti-capitalist transformation into a situation

"... where man does not reproduce himself in any determined form, but produces his totality . . . Where he does not seek to remain something formed by the past, but is in the absolute movement of becoming . . . In bourgeois political economy—and in the epoch of production to which it corresponds—this complete elaboration of what lies within man appears as the total alienation . . . as the sacrifice of the end in itself to a wholly eternal **compulsion**."<sup>17</sup>

For Marx, human autonomy (in the "evolution of all human powers as such, unmeasured by any previously established yardstick") is a fully realizable goal.

#### *Naturdialektik* : **The Orthodox Critique**

Karl Popper's criticisms of Engels' dialectics hinge upon the con-

ceptual imprecision of the dialectic triad applied in scientific methodology and upon the resultant arbitrariness of its application. Engels applied the triadic formulation to such diverse entities as plant growth and liquids and to mathematical operations. In the case of plant growth, the seed = thesis, the plant = antithesis, and new seeds form from the plant = synthesis: or, seed is negated by plant germination and the production of new seeds by the plant is the negation of the negation and a new development at a higher level of existence. Mathematical processes are exemplified where, for instance, a thesis (a) is multiplied by its antithesis ( $-a$ ), from which we derive ( $-a^2$ ), which is hardly a "higher synthesis", so we take instead the negative ( $-a$ ) and *multiply it by itself* in order to arrive at the result ( $a^2$ ), which Engels considered something of a "higher synthesis". For liquids, the thesis water is negated by heat to produce the higher synthesis of steam, etc. What is immediately striking is the looseness of the whole procedure. Various processes and phenomena can be described according to various categorical systems; the point is that the categories should have *analytical* value, or serve as heuristic devices. Neither is afforded by the Engels taxonomy. As H. B. Acton has remarked, it is with some embarrassment that we find the Marxist philosopher Plekhanov devoting pages to the dispute about whether it is the stalk of the barley, or the whole plant, or the fertilized ovum that is the correctly negated negation of the barley seed.<sup>17</sup> When oats and barley must of necessity "grow according to Hegelian laws", whether the sequence is triadic (seed—plant—seed) or tetradic (seed—stalk—flower—seed), we are nowhere nearer to understanding oats or barley as physico-chemical entities. And if the negated negation is to lead to a higher synthesis in the natural world, it has still to be explained how the negated (a), that is ( $-a$ ), when negated, i.e., ( $-(-a)$ ), can only give us the original property, viz. ( $+a$ ).<sup>18</sup> Following Engels' own operations, why is it that multiplication alone yields his "higher synthesis?" In what sense can ( $a^2$ ) be considered "higher" than (a) or ( $-a$ ) when in the sense of being numerically greater this need not be the case, as if  $a = \frac{1}{2}$  then  $a^2 = \frac{1}{4}$ ?<sup>19</sup> Popper devotes much of his argument to refuting the idea of logically admissible contradiction, noting that when two contradictory statements are admitted, any statement whatsoever must be admitted—a relevant rebuttal to the notion of a "dialectical logic" (as something claimed to supersede the canons of formal logic), but clearly not germane to a conception of contradiction that situates it in antagonistic, empirical forces located in society. Popper is quite right to emphasize the purely descriptive nature of Engels' usage of dialectics, and alleges that only a loosely metaphorical and ambiguous way of speaking could make it appear that such dialectics "can be both a theory describing certain typical

developments and a fundamental theory such as logic.<sup>40</sup> The concept of a dialectical logic confuses propositions in their *relations* to each other with their *subject-matter* as such. Logic deals with relations between propositions but is neutral toward empirical content. Talk of dialectics as "dynamic logic", or of formal logic as insisting upon certain theoretical positions with regard to the world, is misplaced: even if a different form of logical structure were available, it would still have to start out from common usages as thought that did not express itself in accordance with the laws of logic would have no coherent speech equivalent.<sup>41</sup> One shift from the axiomatic basis of the formal logic of finite structures has come from a different quarter: Weyl and Brouwer have both noted the possibility of a modal logic that omitted the "law of the excluded middle", and Cicourel has taken this up in his examination of the methodological problems of measurement in the human sciences.<sup>42</sup> A further ramification of the problem of logical properties for socio-cultural phenomena can be found in the fact that those properties defining logical equivalence (reflexivity, symmetry and transitivity) depend upon A invariably equalling A (where A is a social object or event). This can never be guaranteed in conditions of a changing definition of situations, a flexible symbolic environment.<sup>43</sup> However, all logic is basically a formalization of laws of meaningful discourse, and men obeyed its rules long before their formalization took place, in just the same way that Monsieur Jourdan in Molière's play was talking prose before his realization of that fact. It might be insisted by a dialectician that social acts are alogical, but that cannot be translated to mean that all acts follow a "dialectical logic", for the term "logic" therein would become meaningless.

Further issues have been raised with regard to the confusions about objective contradiction and formal logic. The elementary principle of contradiction asserts simply that no *statement* can be at once both true and false. Only elliptical, or partial, expressions of propositions would lead one to believe that the obverse can be tenable.<sup>44</sup> If contradiction is alleged to exist within some natural phenomenon, wherein contradiction has been loosely defined as "conflicting force(s)", a species of teleology underpins it, even animistic assumptions. For instance, to denote the countervailing activities of the elements in lichen as contradictions in that latter sense is to impute a set of goals to those activities rather than to delineate a set of effects. In so many of the instances wherein Marxists deploy the term "contradiction" the more apposite term "contrary" would avoid many unfortunate implications. A useful rule would be to substitute the term "denial" for "contradiction" in order to specify precisely the accuracy of usage. The notion of the proletariat as the contradiction of the capitalist

order, i.e., as its living denial, obviously depends upon the consciousness of the constituent proletarians or upon a teleological conception of historical development when stated independently of praxis. The substitution which I have suggested may assist Marxists to maintain at the forefront the activist-voluntarist notion of revolutionary change.

It is central to this argument that when two different defining systems are employed, there is no contradiction. Thus, a spurious "contradiction" would be to posit death as both a beginning and an end. Clearly, the reasons that explain why it is an end differ from those which explain why it might be called a beginning as well. Disparate phenomena referred to with the same noun have also been spuriously used in the construction of "contradictions". One common instance of this is the statement: "The subject is the predicate, that is, the different is the identical", cited by *Hawemann*.<sup>49</sup> This treats the term "subject" as if it had a single possible referent, and such errors may be found in the common parlance of those Marxists who use contradiction for the purposes of proving their dialectical credentials.

Returning to the main issue of whether or not dialectics understood as a set of axioms constitute nontrivial, heuristic exegesis, the work of Henry Margenau is instructive. Concentrating upon the dialectic triad applied to explaining the process of scientific advancement: 'Margenau begins by conceding more than Popper. He raises the example of the evolution of the number continuum in support of the triadic-dialectic interpretation of the origins of scientific innovation. Positing the discovery of rational fractions as thesis (although with no explanation as to why to commence the "thesis" at this point), Margenau states that the antithetic consequence (appearing as if the inevitable corollary of the thesis) was the discovery of irrational numbers. Arising from the conflict perceived between the two theoretical systems came the modern, embracive theory of the number continuum. The problem of light conceptualized as both waves and particles is also raised, but this appears to lack any "synthesis" or commensurate resolution. Apparently inscrutable phenomena (e.g., energy) are frequently defined operationally, but this is a heuristic device and is neutral to any so-called dialectical determination of truth. Finally, Pauling's theory of resonance (which rescued elements of the originally inadequate schemata by proposing a theory wherein the bond and no-bond alternative ceased to be exclusive) is submitted to support the triadic formula. However, on the basis of these examples, Margenau omits to explain how they are resolved in the "higher synthesis" which dialectics demand. The work of theory construction is constrained into accordance with the triadic formula only at the expense of social and historical accuracy. Its metascientific

function would be to reify finite provinces of theory and to dehistoricize theory itself. Margenau himself demolishes the notion of dialectics as predictive of concrete developments in theory construction. His argument merits account. If we make a proposition (i) stating that a point on a plane may progress in nonlinear motion, we have not said much at all. If we also state proposition (ii), "all motions, unless they are rectilinear, proceed in three steps. The first is towards a certain line, the second away from it, the third again approaches the line but at a smaller angle than the first", it will be evident that this expresses (i) in the form of thesis, antithesis and synthesis. Now (ii) will be as trivial as (i) because a line (L) can always be drawn to make it true. But, as Margenau notes, it is nontrivial, and it ceases to be true, when the line L is specified in advance.<sup>47</sup> No line is ever drawn in advance when dialectics are applied to problems in the natural sciences. "Their whole complex formalism therefore reduces itself to the modest assertion which is the counterpart of proposition (i): Science may progress deviously."<sup>48</sup>

#### *Haldane's Position*

Insofar as Popper and Margenau demonstrate the pseudo-synthetic nature of natural-dialectic statements about scientific investigations and the phenomena investigated, their critique holds good. (It is important to note here that two distinct "natural-dialectics" operate, one concerned with acts of cognition and theory construction, the other directly with the objects of cognition). J. B. S. Haldane, however, claimed analytic value for the schema. His introduction to Engels' *Dialectics of Nature* (London, 1946 edition) was a guarded statement emphasizing the incorrect as well as the correct postures of Engels in the field of contemporary science; he readily admitted that much of Engels' work on mathematics, electricity, cosmology and the section on Protozoa was inadequate (although most of these inaccuracies reflected the prevailing state of theory of some of "the best astronomers and zoologists of his day"). Nowhere here does Haldane consider the essence of Engels' dialectics—for that we must turn to a lecture delivered by him at Birkbeck College, London, in 1938 where he outlined his own position clearly.<sup>49</sup> Commenting upon the works of Engels on Feuerbach and Diihring, he noted :

"Had these books been familiar to my contemporaries, it was clear that we should have found it much easier to accept relativity and quantum theory, that tautomerism would have seemed an obvious hypothesis to organic chemists, and that biologists would have seen that the dilemma of mechanism and vitalism was a false dilemma."<sup>50</sup>

A shifting philosophical foundation for the natural sciences occurred

at the time of the dissemination of the new theoretical work in physics—Bohr, de Broglie, Bachelard and others were prepared to entertain the use of natural-dialectic in various (often contradictory) ways—but of them all, it was Haldane who most clearly spelt out the utter disorientation of the sciences and the epistemological confusion that resulted from it, and who embraced most comprehensively the natural-dialectic position inherited from Engels. His concerns centred upon quantum theory (the discontinuity of material organization seemed to support the notion of a dialectical "leap"—"nature is infinitely more complex than the mechanistic materialist thought") and other changes of state in matter (water, boiled and frozen; changes in passing along a homologous series such as the paraffins, etc.), all to be regarded as exemplars of the transition of quantitative changes into qualitative ones (even though some of the so-called "quantitative" additions were in fact qualitative ones). Assessing his new ruling paradigm, Haldane noted: "We now speak of discontinuous changes of state in single molecules or atoms, which change their properties when they absorb energy in certain definite amounts."<sup>81</sup> This is hardly a derivative from the taxonomy of Engels, and qualifications of an empirical type are required. For instance, under what conditions do such changes occur? Are the changes uniform? The agencies that affect the "transformations" are by no means homogeneous enough to stand in the premises informing a nomothetic taxonomy. To be sure, such premises are never made explicit.

When Haldane proceeds to deal with the central "Law of the Unity (Interpenetration) of Opposites", he falls far short of providing the crucial qualifications:

“. . . the union of opposites . . . is very often a hard physical fact. An electron is completely hard in the sense of being indivisible, a gas completely soft in the sense that it opposes no resistance to division, if this is done slowly enough. Hardness and softness are united in ordinary solids. Acetic acid is an acid, ammonia a base; glycine, which is one of the essential constituents of proteins, is both an acid and a base at once, and therefore has some new properties."<sup>82</sup>

There is no distinction drawn here between phenomena observed through the mediations of instrumentation and purely sensory-perceptual operations. (We ignore the issue of new findings about elementary particles as irrelevant to the logical issues involved here). There is also no hint of the "struggle" between the opposites tending to the emergence of a higher synthesis. Haldane appears to have considered himself at liberty to locate dialectics (so to speak) in any phenomena whose state at any time appears commensurate with his categories. The endeavour is vacuous. There is no standardization

of assumptions and experientially relative descriptions are mixed up with operational constructions.

Natural-dialectics did not replace the waning schemas of atomism and holism, mechanism and vitalism in scientific discourse because of this lack of rigour and absence of heuristic benefit. The more fruitful introduction of cybernetic considerations meant that concepts of dialectical leap and negated negations lost ground to concepts of self-organization and system :

"Driesch . . . was led to believe in a vital force, because the development of sea urchin embryos seemed to be determined 'from inside' since they reached the same final form even though crassly mutilated. By the early 1920's biologists were thinking in terms of organization (there is a classic paper by Paul Weiss, which bears this out) and it became obvious that in a wholly pedestrian manner the whole of an organization is more than the sum of its parts. The mystique behind equifinality . . . evaporated like the apparent magic of purposiveness. Von Bertalanffy's thinking in this direction exerted considerable influence, not only in biology (Haldane's **field—JC**) but in the social sciences also, and he gave the name *system* to the organization which is recognized and studied (we speculate about the system which is the organization of a leopard and not about the leopard itself) . . . He called the search for unifying principles which relate different systems, General Systems **Theory**."<sup>83</sup>

Pask here shows how at least one line of development arose out of the failure of atomism and mechanism in biology independent of dialectics. And it was in this direction that many useful and important strides were taken—it was functional for students of brain physiology, homeostasis, computers, librarianship and most structures with finite variables entering into definable states of internal organization.

The phenomena cited by Haldane have received quite adequate alternative explanatory ordering without the invocation of dialectics—in a most fundamental sense, natural-dialectics became the collective *panchreston*, exhausting both prevalent knowledge and laying down formal schemata for what "shall be found" in the future. Ultimately, it degenerates into tautology.

### *Sartre's Position*

In his critique of dialectical reason, Jean-Paul Sartre vacillated on the issue of its scientific and ontological, as opposed to its human-historic, status. Witness :

"Ought we then to deny the existence of dialectical connections at the centre of inanimate nature? Not at all. To tell the truth, I do not see that we are, at the present state of our knowledge, in a position either to affirm or to deny. Each one is free to *believe* that physio-chemical laws express a dialectical reason or *not to believe* it."<sup>84</sup>

There are several issues involved here. The duality of man as both a natural and a social being (and the duality of the environment for him as both physical and symbolic) enables him to separate himself from nature whilst also being a part of it and inter-changing with it. This underlies the subject/object duality, which could be expressed in terms of man both *being* and *having* a natural body. However, if matter is antecedent to mind (i.e., corporeality is prior to cognition) as the materialist contends, then the comprehension of *matter* on the basis of a schema developed within materialism to deal with the complex *praxiology* of *social man* is to reverse the logical basis of the enterprise as it historically developed. Laws pertaining to one stage (level) of development cannot meaningfully be deduced from laws of another (e.g., we do not analyse the biological structure of the vocal cords to decipher the grammatical structures of language). It is necessary to disentangle the peculiar qualities of the social world from the biological, physiological, macrophysical, chemical, micro-physical systems through which matter has passed/exists. Failure to do so results in the fallacious application of mechanistic, social-darwinist, racist, organicist, biological-reductionist and psychologistic theories to that social world.<sup>88</sup> Conversely, any explanation of the world of inanimate matter which seeks to posit categories properly relevant only to the human world in its existential dimension as a social-symbolic matrix will be simply anthropomorphic.

#### *Gramsci and Lefebvre: The Dialectics of Humanized Nature*

From the point that man and nature are conceptualized as a totality, any phylogenetic account of man is also an account of his humanization of nature. Antonio Gramsci's critique of Lukács' review of Bukharin's book on materialism condemned Lukács' imprecision over the relationship of man to nature and the implications of this for dialectical materialism.<sup>89</sup> Thus he wrote :

“. . . if human history should be conceived also as the history of nature (also through the history of science), how can the dialectic be separated from nature?<sup>90</sup>

It is important to stress that Gramsci never wrote of a dialectic *within* nature. His view is that there can be no conception of nature that is not based upon active human penetration and comprehension—there is only the *transformation* of reality, never its static depiction. The dialectician of nature wishes to fit his scientific findings in accordance with a static schema—an exercise which is perfectly in harmony with the undialectical operations of the mathematician whose reasoning remains utterly external to real objects. Natural-dialectics

therefore remain grounded in a logic of exteriority, which is profoundly undialectical in the **Marxian** sense. That is not to say that the processes through which data are gathered and observations made by the natural-dialectician represent the undisturbed reflections of the Savant; rather that their theoretical ordering is conducted in a manner that defies the fluidity of the process of knowing, or constrains its results into an undisturbed finality, the Laws of Dialectic. For Marx, the act of cognition was also an act of creation, a product of self-activity and the historically available modes of concrete frames of reference into which the object could be integrated. Henri Lefebvre, the French Marxist thinker, commented appropriately :

“‘Pure’ Nature, that supremely concrete existence, is also, for us, the emptiest of abstractions. It lies on this side, of all determinations, as indifference or a spontaneous Becoming (Selbstbewegung) as yet indeterminate for us, except in the *most* general and abstract *laws* of the dialectic. To insist on determining Nature independently of the activity which—grounded in Nature—penetrates it and ‘comprehends’ it, by linking its scattered elements organically together, is to pose an insoluble problem, a metaphysical problem which can be answered only by a *myth*”<sup>58</sup> (my italics).

This view (apart from the peculiar reference to those "laws" which I have italicized) expresses the **Marxian** notion of praxis as a medium for knowledge as well as conscious object-creation and project-realization. It asserts that the ultimate criterion for truth must be the same for all men as the species ultimately knows only the functions of its activities. This functional relativism is neither idealism nor philosophical realism—it establishes a "social universality". As C. W. Morris put it, discussing pragmatism, "universal truth" may mean more than "independent of any particular experience" and "true for all *observations*"—but it cannot mean *less*.<sup>59</sup> Science viewed as praxis is thereby assimilable into the human dialectic. The structure and content of the sciences will be a function of the relations and rhetoric of a community of practitioners in their mediation of natural processes. This notion locates the sciences within the purview of social praxis whilst demystifying the "dialectics of science" themselves. From this point, we find in the works of Kuhn, Weigert and others a realization of metascience as essentially **sociological**.<sup>60</sup>

Lefebvre, however, stipulated earlier in his work that

“... the laws of the human reality cannot be entirely different from the laws of Nature. The dialectical chain of fundamental categories may therefore have a universal **truth**.”<sup>61</sup>

I can find no coherent argument to substantiate **this** point in Lefebvre's own account. Indeed, insofar as it panders to a form of

reductionism which is theoretically dehumanizing, it marks a curious schism in his humanistic approach to dialectical materialism.

### *Vigier's Position*

There are two principal approaches towards "explanation" to which the two types of dialectics are related: the naturalistic and the hermeneutic ("natural-dialectic" and "hermeneutic-dialectic") modes. The naturalistic mode presupposes understanding reduced to the level of explanations that subservise the manipulation of the world which, insofar as man is reduced to an object within it, includes him. The hermeneutic mode conceives of explanation as subserving understanding that precedes, pervades and persists beyond it, and conceives of manipulation as exercised by man over the world and the unappropriated areas of his situation (in terms of his understanding of himself and the world-as-he-encounters-it).<sup>62</sup> Translating positivism into a doctrine embracing the human world of social action, what is left out of the picture is that within such a scientism all we obtain are the necessary, never the sufficient, conditions for action to take place. We then use our own concept of "what is specifically human action" to make operative sense of these abstracted elements of behaviour:

**"It is only because I already know what seeing is that I can interpret the physiological processes involved in seeing as so involved."<sup>63</sup>**

The approach to human reality must, therefore, be within the hermeneutic mode of knowing. For Vigier in particular, Marx is supposed to have worked entirely within the naturalistic mode, and this is supposed to lend credence to the idea of a cosmological dialectics: Marx, according to Vigier, applied to the study of man

**". . . the same procedure as the entomologist studying societies of ants or bees."<sup>64</sup>**

The Marxian analysis of alienation, reification, ideology, commodity fetishism, false consciousness and praxis count for nothing--there is only the flat expanse of an arid scientism, its surface rippled with the occasional contradiction, its co-ordinates in literal correspondence with its material infra-structure. Jean-Pierre Vigier, Master of Research at the National Centre for Scientific Research in Paris and head of an experimental group at the Institut Henri Poincaré, comprising fellow Marxists Bohm and Terletski, has, in reply to Sartre and Hyppolite during a debate held in December of 1961 in Paris, adduced a case for natural-dialectics which involves him in some tortuous logic. Basically, Vigier proceeds from a standpoint that

identifies the dialectics of nature as an approach that pre-dated Engels' work, and maintains that aside from the pre-Socratic philosophers like Heraclitus "one sees dialectical analyses spring up prior to Marxism",<sup>65</sup> especially after the Renaissance. Sorokin<sup>66</sup> has traced many examples of broadly "dialectical" approaches in the history of philosophy, but the term is used so broadly as to link Platonic interchanges to the complex Hegelian metaphysics. Vigier's statement seems to imply that the tentative gropings of earlier scholars and scientists who did not comprehend natural processes and phenomena as mechanical, unilinear or constant-properties were in fact towards an explicitly Engels-type taxonomy such as his own. Continuing his account, Vigier postulates that only in terms of the dialectical *analysis* can the *true movement* of nature be explained. He notes that "scientific understanding progresses as this analysis permits us to arrive at the internal contradictory properties of the system analysed". Dialectic thus guarantees the revelation of dialectic. Not only is this an unwarranted imputation of the rules of analytical reasoning to the objects studied, but it bypasses the problem of how a purely taxonomic device can have analytical power in the first place. Gurvitch's "dialectization of dialectic", positing a dialectical relation between the dialectical method and the "real dialectical relationships continuously going in this reality"<sup>67</sup> falls into such a welter of confusion that any precise referents which dialectics once subsumed are now irretrievably lost. Vigier approaches the same confusion. When a small group of Freudians began to treat the functional conceptions of id, ego and superego as if they had neurophysiological correlates, their topographical search effectively precluded the former usage of the terms in anything like their original deployment. Natural-dialecticians are in a similar predicament.

The use of natural-dialectic often involves the danger of ruling in advance the kind of characteristics one is going to find in a system before one has marshalled either the analytical equipment or the evidence. When Lenin wrote in the fifth chapter of his *Materialism and Empirio-Criticism* that "the electron is as inexhaustible as the atom", he stated it by fiat, unsubstantiated by any contemporary scientific evidence. Much of what the natural-dialectician says about, for instance, quantum phenomena, can be cheerfully admitted by any scientist irrespective of his philosophical commitment (if he has one), and it is in this way that Havemann, for example, the apostle of "non-dogmatic Diamat", can allege that

"Quantum mechanics . . . can receive . . . a complete and on every point accurate interpretation on the basis of dialectical **materialism**."<sup>68</sup>

and in so saying, cannot refute the statement of the same theory

by Max Born uncluttered by Engels' terminology. However, whilst Havemann would wish to render the dialectical "laws" non-axiomatic (with no discussion of their consequent cognitive utility), Vigier attempts to offer more precise definitions for their assertion:

"The internal antagonisms, that is to say, the assemblage of forces that necessarily evolve along opposing lines, illustrate the notion of contradiction. The unity of opposites is understood as the unity of the elements of one level which engender the phenomena of a higher level. The transformation of quantity into quality is interpreted as the abrupt rupture of equilibrium in the interior of a system (for example: the destruction of one of the antagonistic forces) that modifies the equilibrium and engenders a qualitatively new phenomenon within which new contradictions appear."<sup>10</sup>

But what are these "forces", "elements" and "systems", and at what times and places are we to expect these antagonisms, unities and transformations to occur? Vigier tightens things up by proposing the transition from the inorganic to the organic as an exemplar of the quantity-quality leap.<sup>10</sup> Yet research on nucleoproteins reveals that the "essential difference between an inorganic crystal and a nucleoprotein is . . . its degree of complexity."<sup>11</sup> One incidental point about the notion of a transformation of quantity into quality, apart from its logical inadequacies already noted, is that it gives rise to the impression that the "leap" is an intrinsic product of the internal development of the phenomena. This is a dangerous nonsense. The exogenous variable in the case of the origin of organic matter was almost certainly some medium rich in the raw materials required for the manufacture of proteins and nucleic acids. To conceive of the transformations as intrinsic to the phenomena is to indulge in metaphysics. To conceive of qualitative transformations (i.e., transitions from one quality to another) as products solely of *size*, increase of scale or unit additions of homogeneous matter is to seriously avoid the issue of altered *relationships* between existing elements. Thus, dialectics is, in its naturalistic mode, antagonistic towards cybernetics. Not only does the persistence of this schema tend to dogmatically over-ride alternatives, but it has a history of practice wherein phenomena themselves have been ruled out of court due to the inaccessibility of a suitable method of integrating their dimensions into the existing state of natural-dialectics. Such was the case with quantum phenomena during the period of High Stalinism in the Soviet Union, although Soviet scientists were busy making fullest use of it.<sup>12</sup> It is little wonder that, today, Soviet physicists pay only lip-service to dialectics in prefaces or official addresses and then disregard its implications.<sup>13</sup>

Vigier moves on to consider the notion of *totality*. His demarcation of "totalities" (organized beings, great geological masses, the

earth, the solar system, the galaxies) is more interesting, though strictly a departure from both Engels' taxonomy and Marx's totality of class society. Here, too, however, we are left without rules governing the location of the boundaries of the various totalities and the relationships of the spheres of analysis to one another. Vigier asserts that a particular dialectic corresponds to each of the levels,<sup>74</sup> although again it is left unclear which dialectic applies to what level. As Sartre noted, a theory of realms in nature subject to differential laws would suggest to the natural-dialectician that dialectic itself must pass from the simple to the complex. If this is true for Vigier, then the concept of dialectic itself becomes logically unavailable for dealing with the move from one level to another. Either we have discrete levels or some incomprehensible "dialectical" movement from one level of dialectic to another. Vigier, in reply, ceases to provide clear exposition of his case. For him to admit of dialectic as a set of static categories *outside* the realms would obviously involve him in the logic of exteriority alien to a dialectical rationality. For him to account for the complications undergone by dialectic throughout the levels in a dialectical manner would involve him in Gurvitch's unhappy formulation—a dialectization of dialectic. What could this mean? Would a negated negation at one level be dialectically negated at another, resulting in a triple negation whose only logical product could be back to square one—i.e., negative? Here, natural-dialectics become

Marx demystified the Hegelian dialectic: Vigier's contribution leads to its utter obfuscation.

### *Naturdialektik: An Ideology of Science*

It is instructive to ponder the mood in which Engels appears to have originally thought up the foundations of his peculiar contribution to what has unfortunately come to be known as "orthodox Marxism". Writing to Marx, he stated that he was in bed one morning when some "dialectical ideas about the natural sciences" crossed his mind. After briefly mentioning one or two barely developed points, he concluded :

**"If you think that I have got hold of something here, please keep it to yourself. I do not want some lousy Englishman to steal the idea. And it will take a long time to get it into shape."<sup>75</sup>**

We have travelled far from Engels' bedroom ratiocinations. From simply poetic restatements of phenomena<sup>76</sup> to complex, logically tortuous exegesis, we encounter the same kinds of problems, problems quite insoluble within the confines of the schema alone. The political implications of natural-dialectic have been quite varied, but all

disastrous for Marxism in its claims to be a rational and revolutionary critique of the world. Its epistemological basis (crude representationism verging upon the mechanistically-materialistic) almost certainly provided a theoretical backdrop to the quietism and determinism of the German SPD long after Engels had ceased to write on science and politics. The young Lenin also suffered from its implications until he re-read Hegel and then revisited Marx's work. Perhaps the most dramatic sequence of events in the chronicles of the role of dialectics in the history of science were those leading up to and including the Lysenko affair.

In 1906, Stalin, then a young Bolshevik, had written that neo-Lamarckian theory was supplanting neo-Darwinism, and that this "proved" once more that the law of the transformation of quantity into quality was correct. The Lamarckian myth, that acquired characteristics are inherited, found its first "dialectical" expression in the work of Kammerer (who shot himself at Hochschneeberg when it was found that his "evidence" in support of Lamarckism had been faked), then in the work of Michurin (whose idea that treatment such as grafting can alter the genetic structure of plants and animals gained him such fame in Russia) and ultimately with Trofim Lysenko, whose work in genetics successfully terminated Russia's scientific contribution to that field for many years, and tarnished her reputation for scientific integrity for even longer.

In the eyes of the young Ukrainian agriculturalist Lysenko, heredity could be affected by quantitative changes to the structure of living organisms; species could be genetically altered through grafting. His work, *Heredity and its Variability*, meshed in with the prevailing orthodoxy of Stalinist Diamat (natural-dialectic materialism). However, cytology and chromosomology, particularly the work of Weismann, were gravely undermining the Lamarckism on which Lysenko's schema was based. Eventually, the support for, and the evidence behind, Mendelian genetics became so strong that Lysenkoism was held to be a farcical, politically-sustained dogma in the eyes of scientists all over the world (including, to his credit, Haldane). The state bureaucracy in the USSR closed down every school of genetics in the country.<sup>17</sup>

Many fascinating pseudo-problems have been debated in Soviet philosophical circles (the journal, *Under the Banner of Marxism*,<sup>18</sup> has been filled with them), and the famous Minin-Deborin debate became so intractable that only Stalin's intervention with the Absolute Truth could halt the interminable wrangling. Official Diamat was the conceptual cure-all, the philosophers' touch-stone, and whatever progress has been made by Soviet scientists and technologists has been effected with Engels' albatross around their necks.

Natural-dialectics have figured in many revisions of Marxism as an integral part. Its forced amalgamation with Freudian **meta-psychology**,<sup>79</sup> its alignment with scientism, its susceptibility to universal application have all been involved in its general role of theoretical dehumanization. Mao Tse-tung's inimitable variants on the same theme,<sup>80</sup> so closely modelled on Soviet writings that he decided to stop the publication of his "On Dialectical Materialism" after only two instalments had appeared,<sup>81</sup> pale in comparison with his analyses of the class composition of Chinese society. A pity, one might think, that great revolutionaries, even though they now hold the prestigious positions accorded to charismatic bureaucrats, once wasted their energies on sterile and irrational doctrines under the illusion that they formed a crucial part of their theoretical **armoury** against imperialism.

Lacking familiarity with Marx's philosophic-anthropological foundations for a "scientific socialism", the natural-dialecticians have derived the political justification for revolution from a universalized hypostatization of Hegelian categories. They have forgotten that "there is no need to show that there are sudden leaps and jumps in nature to justify revolution in **society**".<sup>82</sup> A further attempt to impose a largely mythical justification for the accordance of communism with human nature has been the issue of primitive communism. Class societies are seen as the negation of the original state of primitive communist civilization through the move to conquer material scarcity, and communism in its classless, industrialized version is the negation of the negation, the original element (communism) elevated to a new stage. Despite Gordon Childe's hotly disputed claims to the contrary,<sup>83</sup> this issue remains unsettled, but in no sense could it be considered either a pre-requisite for, or a crucial issue in, the contemporary struggle for the communist transformation. For Marx, as for us, there is no fixed human nature—in his analysis of man as a historical, social being, an anthropogenetic (i.e., self-producing), man is free from the coercive play of natural forces to which **infra-human** forms are subjected. Man as a world- and self-producing being may be changing his environment faster than he can biologically adjust to it. As Dobzhansky has pointed out :

**"Other organisms adapt to their environments by changing their genes in accordance with the demands of their surroundings. Man and man alone can also adapt by changing his environments to fit his genes . . . It has even been argued that *Homo Sapiens* has already emancipated himself from the operation of natural selection."**<sup>84</sup>

In this light, it is a *superorganic* naturalism that comprehends **the** nature of the human condition--and that is an historical materialism.

The crucial Marxian concept of a humanized naturalism finds an interesting echo in the work of Washburn et al. on the feedback relationship between brain and cultural development, in particular the division of labour as a historical event,<sup>85</sup> and Penfield and Boldrey in a pioneering work<sup>86</sup> illustrated the amazingly large area of the cortex devoted to the fingers and thumbs, a development contingent upon the use of humanized chunks of nature—tools.

Marxism has never been, in its humanistic form, hostile to any scientific findings or theoretical expressions. In its function as an ideology-critique, it has sought to demythologize our taken-for-granted categories of thought derived from the pre-theoretical premises of an alienated social order. One example of this, among many, is its forceful usefulness against zoomorphic and neo-behaviouristic approaches to the nature of man; another would be its dereification of the categories of bourgeois economics. Its purpose was never to mystify our praxis of world-production—the result of Engels' contribution. In our expunction of his schema from Marxist philosophy, I submit that we render both that philosophy and its associated revolutionary practice some service.

#### NOTES

1. Cf. Jean Hyppolite, *Studies on Marx and Hegel* (Ed. & Transl. by John O'Neill, Heinemann, 1969), "Marx and Philosophy", pp. 93-105.
2. Gustav W. Wetter, *Dialectical Materialism* (Routledge & Kegan Paul, 1959).
3. See: Karl R. Popper, "What is Dialectic?" in *Conjectures and Refutations* (Routledge & Kegan Paul, 1963). Sidney Hook, *Dialectical Materialism and Scientific Method* (The Committee on Science and Freedom), and his *From Hegel to Marx* (Ann Arbor, 1966).
4. Friedrich Engels, *Dialectics of Nature* (Lawrence & Wishart, 1946 ed.) and *Anti-Diihring* (Moscow, 1959).
5. Sir Arthur S. Eddington, *The Nature of the Physical World* (Cambridge University Press, 1928; from the Gifford Lectures of 1927).
6. Sir James Jeans, *The Mysterious Universe* (Cambridge University Press, 1948; first edition, 1931).  
Bertrand Russell, *The Analysis of Matter* (1926) and *An Outline of Philosophy* (1928). C. E. M. Joad (*Philosophical Aspects of Modern Science*, Allen & Unwin, 1963 ed.) has roundly criticized each of the aforementioned excursions into philosophical speculation by natural scientists.  
Dr. F. A. Haye's term, borrowed by Z. A. Jordan in his study, *The Evolution of Dialectical Materialism* (Macmillan, 1967).
9. F. Engels, *Anti-Diihring* (op. cit.), p. 17.
10. F. Engels, *Dialectics of Nature* (op. cit.), p. 26.
11. See Engels to Mehring, 14th July, 1893 (*Selected Correspondence*, Moscow, n.d. pp. 541-2).

12. Karl R. Popper, op. cit.
13. V. I. Lenin, *Materialism and Empirio-Criticism* (Moscow, 1909), p. 257.
14. V. I. Lenin, *Collected Works* (Moscow, 1961 ed.), xxxviii, p. 195; cited in Shlomo Avineri, *The Social and Political Thought of Karl Marx* (Cambridge University Press, 1968), p. 70.
15. Cf. Georg Lukács, *History and Class Consciousness* (Merlin Press, 1971).
16. F. Engels, *Dialectics of Nature*, p. 26.
17. Alasdair MacIntyre's term, in his "A Mistake About Causality in the Social Sciences", in P. Laslett & W. G. Runciman (Eds.), *Philosophy, Politics and Society* (Oxford: Basil Blackwell, 1967).
18. Karl Marx, "Preface to a Contribution to the Critique of Political Economy 1859", in Marx & Engels, *Selected Works* (Lawrence & Wishart, 1968).
19. *Ibid.*, p. 182.
20. Marx & Engels, *The German Ideology* (Lawrence & Wishart, 1965), p. 42 et seq.
21. *Ibid.*, p. 50.
22. Marx & Engels, *The German Ideology*, p. 60.
23. N. Lobkovicz, *Theory and Practice (History of a Concept from Aristotle to Marx)* (University of Notre Dame Press—London, 1967).
24. J. V. Stalin, *Concerning Marxism in Linguistics* (Moscow, 1950), cited in Nigel Harris, *Beliefs in Society. The Problem of Ideology* (C. A. Watts, 1968), p. 170.
25. Harris, *ibid.*
26. J. V. Stalin, *Collected Works*, 12, pp. 278-81.
27. Marx, "Preface . . ." (op. cit.).
28. See Marx's preface to the Second Edition of *Capital*<sup>1</sup>: "Nearly thirty years ago, when Hegelianism was still fashionable, I criticized the mystifying aspect of the Hegelian dialectic. But at the very time I was working at the first volume of *Das Kapital*, the peevish and arrogant mediocrities who nowadays have the ear of the educated public in Germany, were fond of treating Hegel much as in Lessing's day the world of Moses Mendelssohn used to treat Spinoza, namely, as a 'dead dog'. That was why I frankly proclaimed myself a disciple of that great thinker, and even, in *Das Kapital*, toyed with the use of Hegelian terminology, when discussing the theory of value".
29. Z. Bauman, "Modern Times, Modern Marxism", *Social Research*, Vol. 34, No. 3 (Autumn 1967), p. 414.
30. Antonio Gramsci, "Critical Remarks on the 'Popular Outline of Sociology,'" in *Collected Works* (Warsaw, 1962), Vol. 1, pp. 121-2; cited in J. J. Wiatz, "Sociology—Marxism—Reality" in *Social Research* (as note 29).
31. Paul M. Sweezy's term. See his "The Use of Abstraction", *The Theory of Capitalist Development* (Modern Reader ed. 1968).
32. Herbert Marcuse, *Reason and Revolution* (Humanities Press, 1963), p. 314.
33. Cf. Ralph Dahrendorf's criticisms of Marxism in his paper "Out of Utopia: Toward a Reorientation of Sociological Analysis", *American Journal of Sociology*, Vol. 64, pp. 115-27.
34. Jean-Paul Sartre, *Critique de la Raison dialectique* (Paris, 1960), Vol. 1, p. 377.
35. Marx, *Capital*, Vol. 1, Chapter 5, para. 12

36. Marx, *Pre-capitalist Economic Formations* (English translation of section from the *Grundrisse der Kritik der politischen Oekonomie*, Berlin, 1953, by Cohen), ed. E. Hobsbawm (Lawrence & Wishart, 1964), pp. 84-5.
37. H. B. Acton, *The Illusion of the Epoch* (Cohen & West, 1962)—the discussion of G. V. Plekhanov, *In Defence of Marxism* (London, 1947) on p. 99. Plekhanov also considered that the transition from 9 to 10 or 90 to 100 in counting could be treated as an exemplar of the ubiquitous quantity-to-quality axiom. In the sense that numerical superiority is 'higher' in such transitions (although in what sense are they syntheses?) he might at least be countenanced with some semblance of reason. Yet if qualitative superiority is contended to be a feature of upward numerical transitions universally (as the dialectical laws apply universally), he is far from establishing his case. As Marcel Granet has shown, in classical Chinese civilization, to say 13 was to say 'ill luck'—a qualitative inferior! (See Plekhanov's "Sudden Changes in Nature and History" in his *Fundamental Problems of Marxism*, p. 97, and J. J. Maquet's summary of Granet's work in his *Sociologie de la Connaissance*, 1949, p. 189 et seq.).
38. Sidney Hook, *Dialectical Materialism and Scientific Method* (op. cit.), p. 16.
39. Karl R. Popper (op. cit.), p. 316.
40. *Ibid.*, p. 323.
41. Cf. A. MacIntyre's critique of Marcuse's notion of a one-dimensional logic in *Dissent*, Spring 1965 and *Marcuse* (Fontana/Collins, 1970), PP 74-86.
42. Aaron V. Cicourel, *Method and Measurement in Sociology* (Free Press of Glencoe, 1964), pp. 31-3.
43. *Ibid.*, p. 27.
44. Irving M. Copi, *Introduction to Logic* (Macmillan, 1964), p. 272.
45. Robert Havemann, *Dialektik ohne Dogma? Naturwissenschaft und Weltanschauung* (Hamburg, 1964), p. 48; cited in N. McInnes, "Havemann and the Dialectic", *Survey*, January 1967, p. 34.
46. Henry Margenau, *The Nature of Physical Reality* (Yale, 1958), pp. 20-4.
47. *Ibid.*, p. 23.
48. *Ibid.* It ought to be pointed out that Margenau's only reference to works on natural-dialectics is to J. B. S. Haldane's *The Marxist Philosophy and the Sciences* (Allen & Unwin, 1938).
49. Published in *Keeping Cool and Other Essays* (Chatto & Windus, 1944), pp. 152-165.
50. *Ibid.*, p. 152.
51. *Ibid.*, p. 158.
52. *Ibid.*, p. 160.
53. Gordon Pask, *An Approach to Cybernetics* (Hutchinson, 1968), p. 14.
54. Jean-Paul Sartre, *Critique ...* (op. cit.), p. 129.
55. Cf. L. Zivkovic, "The Structure of Marxist Sociology", *Social Research*, Vol. 34, No. 3 (Autumn 1967), p. 481. The work of G. H. Mead on symbolic communication and the emergence of consciousness and Noam Chomsky on the stimulus-free, open-rule structure of language reinforce the anti-reductionist position.
56. Antonio Gramsci, *The Modern Prince* (Lawrence & Wishart, 1957), p. 106 et seq.
57. *Ibid.*, p. 109.

58. Henri Lefebvre, *Dialectical Materialism* (Cape, 1968), p. 143.
59. Charles W. Morris, Introduction to G. H. Mead's *Mind, Self and Society* (Phoenix ed., 1967), p. xxix.
60. Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962); Andrew J. Weigert, "The Immoral Rhetoric of Scientific Sociology", *The American Sociologist*, Vol. 5, No. 2 (May 1970), and see also, especially Chapter 2, Gerard Radnitzky, *Contemporary Schools of Metasciences*, Vol. 2, *Continental Schools of Metascience* (Akademiforlaget, Goteborg, Sweden, 1968).
61. Lefebvre, *op. cit.*, p. 107.
62. John O'Malley, "The Eternal Triangle of Theory, Praxis and Process", *The Human Context* (July 1969). The mutual implication of man with nature has been formally recognized within scientific methodology in terms of the inclusion of the experimenter into the experimental system in microphysics where the measurements are so acute that allowances must be made for the act of experimental penetration itself. At a more general level, Heisenberg has noted: "(the) special questions of the theory of perception are . . . connected with (a) problem facing physical theory: that of giving information about the more general interrelations of nature, of which we, ourselves, are a part. Science cannot evade this issue if it is to remain true to itself" (*Philosophic Problems of Nuclear Science*, New York: Pantheon Books Inc., 1952, p. 22). The world of scientifically definable phenomena becomes an "objective world . . . a product of our active intervention and improved techniques of observation" (*Ibid.*, p. 79).
63. O'Malley, *op. cit.*, p. 309.
64. Jean-Pierre Vigier, "Dialectics and Natural Science" (transcript) in George Novack (Ed.), *Existentialism versus Marxism* (Dell Publishing Co., 1966—London, W. I. R. Publications), p. 225.
65. *Ibid.*, p. 245.
66. Pitirim A. Sorokin, *Sociological Theories of Today* (Harper International, 1966), p. 462.
67. G. Gurvitch, *Dialectique et Sociologie* (Paris, 1962); cited in Sorokin "Dialectic Theories of Social and Cultural Systems" in *op. cit.*; it is left unclear how the dialectics of concepts and objects are united, i.e., whether the dialectics of the concepts are in correspondence with the dialectics of the objects, or whether they are part of a different order of dialectics.
68. R. Havemann, *op. cit.*, p. 96—in McInnes, p. 35.
69. Vigier, *op. cit.*, pp. 248-9.
70. *Ibid.*, p. 250.
71. Alan Isaacs, *The Survival of God in the Scientific Age* (Pelican, 1966), p. 43; based upon Schrodinger's account, *What is Life?* (Cambridge University Press, 1944).
72. Albert Camus, citing Roger Callois, in *The Rebel* (Peregrine, 1965 ed.), p. 188. Camus concludes that "for Marxism to remain infallible, it has been necessary to deny all biological discoveries made since Darwin", a verdict upon a Stalinized Engels-type dialectic, hardly upon contemporary Marxist philosophy.
73. See L. Infield, in *Przeglad Kulturalny*, No. 47, 1961.
74. Vigier, *op. cit.*, p. 250.
75. Engels to Marx, from *Gesamtausgabe*, Section 3, Vol. 4, pp. 396-8.
76. These occur in *Voprosy Filosofii*; see J. M. Bochenski, *Soviet Russian Dialectical Materialism* (Diamat) (D. Reidl, Holland, 1963).

77. This brief account is based upon C. D. Darlington's *Genetics and Man* (Penguin, 1966), pp. 221-8.
78. See J. M. Bochenski, *op. cit.*, esp. p. 36 et seq.
79. For example, Reuben Osborn, in his *Marxism and Psychoanalysis* (Barrie & Rockliff, 1965), suggests that "the law of the unity of opposites has an obvious common-sense aspect, supported by innumerable examples from science". Without any organizing principles to determine the relevance, centrality or universality of his examples, Osborn cites phenomena as disparate as metabolism (involving anabolic and katabolic processes), bodily movement (with the "opposition of flexor and tensor muscles", and even dream forms as the "dialectical opposite" of the waking life thought processes (pp. 101-125 and *passim*). Given the misuse of the term "opposite", its confusion with "opposition", and the blandness of the selection of data (whither the non-confirming examples?), it becomes clear that the laws of dialectic can subsume whatever the user wishes.
80. For example, his "On Contradiction" in *Selected Writings* (Peking, 1967).
81. Stuart Schram, *Mao Tse-tung* (Penguin, 1967), p. 223.
82. S. Hook, *From Hegel to Marx* (*op. cit.*), p. 76.
83. Gordon Childe, *Social Evolution* (Fontana, 1963), p. 55 & p. 70.
84. T. Dobzhansky, "The Present Evolution of Man", *Scientific American*, September 1960.
85. S. L. Washburn & F. C. Howell, "Human Evolution and Culture" in S. Tax (Ed.), *Evolution after Darwin* (Chicago: University of Chicago Press, 1960), Vol. 2.
86. W. Penfield & E. Boldrey, *Brain* (1937—publisher's name obliterated in copy).

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