Is *The Dialectical Biologist* Dialectical?

Reexamining the Legacy of 20th Century 'Marxist' Biology

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ABSTRACT

Since its publication in 1985, evolutionary biologists Richard Levins and Richard Lewontin's book *The Dialectical Biologist* has remained a key reference in the history and philosophy of biology. Nevertheless, one of the book's central claims, that it embodies a Marxist dialectical materialist approach to biology and to science in general, has remained contested, being treated as confused or ambiguous at best. Addressing this common reaction to the *The Dialectical Biologist*, this paper seeks to explicate the ways in which the book, on the level of both form and content, can be considered to embody a genuine dialectical approach to science. It outlines Levins and Lewontin's commitment to a clearly defined version of dialectical materialism, related to the principles put forward by Friedrich Engels. It then situates this version of dialectical materialism within the context of debates on the relation between dialectics and the natural sciences within Marxist theory. Against this theoretical background, *The Dialectical Biologist* is cast as an attempt to embody just the kind of dialectical analysis of the natural sciences demanded by its philosophical commitments. Importantly, this dialectical aspect only becomes clear through close attention to the text on the multiple levels of content, style, and argumentative structure. This paper's reading of the dialectical approach to science aims to facilitate fruitful engagement with an important text in the history of 20th century biology, particularly in a time where Lewontin's work and legacy are being remembered and re-examined.

KEYWORDS

biology, evolutionary theory, philosophy of science, science and ideology, dialectical materialism, Marxism

INTRODUCTION

The passing of American evolutionary biologist Richard C. Lewontin on 4 July 2021 has both coincided with and contributed to a renewed interest in his life and work. Alongside general reflections on his legacy (Newman et al. 2021), recent publications have focused on the continuing relevance of his work to scientific themes such as genetic linkage (Dietrich, Harman and Lamm 2021) and human genetic variation (Edge, Ramachandran and Rosenberg 2022). This paper aims to contribute to this process of remembering and revisiting by examining the 1985 book *The Dialectical Biologist*, written by Lewontin along with co-author and fellow Harvard evolutionary biologist Richard Levins.

In this book, Levins and Lewontin claim to apply what they call their dialectical materialist method to issues in biology, ecology, and society across a number of essays. My contention is

that this core claim has often been misunderstood, and that the dialectical method in *The Dialectical Biologist* is only rendered fully visible when located on multiple levels, spanning content, argumentative structure, and style. Further, far from just an idiosyncratic quirk on the part of the authors, the dialectical method employed in the book should be seen as embodying a particular kind of approach to science envisioned by a vision of dialectical materialism first developed by Friedrich Engels.

The structure of the paper is as follows. In the first part of the paper, I briefly outline the misinterpretation to which I am responding. In the second part, I describe the features of Levins and Lewontin's version of dialectical materialism. In the third part, I situate this particular version of dialectical materialism, which I call the dialectics of objective contradiction, against other versions of dialectical materialism. Here, I argue that the dialectics of objective contradiction uniquely entails the view that all aspects of natural scientific practice, including internal ones, can in principle be subjected to dialectical analysis. In the fourth part, I pose that, throughout *The Dialectical Biologist*, Levins and Lewontin apply just such a dialectical analysis. I argue that a focus on the content and argumentative structure of representative sections of the book is necessary to grasp the full extent of what is meant and intended by this application of the dialectical method. Finally, I will reflect on the way in which the scope of this approach extends to the general question of the relation between science and ideology which remains of interest today.

WHERE IS THE DIALECTICAL METHOD?

One of the central claims made by Levins and Lewontin in *The Dialectical Biologist* is that the essays comprising the book are concrete applications of the dialectical method (2009, viii). The assertion that the book puts the dialectical method into practice, however, does not translate automatically into a clear understanding of what the authors mean by dialectics. Even the final chapter of the book, intended as an explicit discussion of dialectics, does not fully allay this problem. As a result, readers can be left wondering why Levins and Lewontin, to put it bluntly, make such a big deal of the dialectical method. The issue is well portrayed in a book review by Daniel Simberloff:

> The biggest problem with *The Dialectical Biologist* is that, while the Preface implies that the essays will be examples of science conducted dialectically and that these examples will help us to think and work under the same inspiration, none of the thirteen essays reports on empirical research performed dialectically. Instead, the

> first six are more or less didactic tracts telling us how to do science or how to think about certain questions. Six of the remaining seven are largely polemics about the role of science and scientists in perpetrating various capitalist horrors. (1987, 232)

Simberloff was by no means alone in his frustration with the supposed dialectical aspect of the book. Another reviewer, while broadly positive about the book, was similarly sceptical of the role of the dialectical method. Philip Kitcher argues that 'an extreme version of liberal Neo-Darwinism' could be developed to be compatible with Levins and Lewontin's insights that would allow skipping the practice of 'puzzling out the principles of a "dialectical biology"' (Kitcher 1989, 265-266). These reviews suggest that even a sympathetic reader might conclude that, while the book might be insightful in a number of ways, the authors' insistence that these insights are the result of the dialectical method is puzzling. Their continued reference to dialectical materialism appears, from this perspective, as an excess that simply reflects personal ideological commitments but adds little in terms of substance.

Following my own reading of *The Dialectical Biologist*, I will argue that Simberloff's disappointment frustration stems from a failure to appreciate its presence, not only at the level of content, but also at the level of structure. While the presence of the dialectical method throughout the book is by no means fully transparent, it would be a mistake to claim that it makes no substantial difference. Rather, I will show that what Levins and Lewontin describe as the dialectical method is present throughout the text, and that an appreciation of this presence is necessary for a full understanding of the authors' philosophical project.

THE DIALECTICAL MATERIALISM OF LEVINS AND LEWONTIN

Dialectical materialism is a philosophical tradition which has its roots in the materialist reinterpretation, by Karl Marx and Friedrich Engels, of German Idealist philosopher G. W. F. Hegel's idealist philosophy. It has been prominently associated with various Communist and Marxist political movements, perhaps most famously with Soviet leader Josef Stalin's interpretation in his 1938 work *Dialectical and Historical Materialism*, which became the official interpretation of Marxism of the Soviet Union. Many philosophical doctrines have claimed the name of dialectical materialism in different historical and geographical contexts, and not always in direct association with Marxist governments. Therefore, even when Levins and Lewontin are open about their adherence to dialectical materialism as well as their political and philosophical loyalties and feuds, a reader with a minimal acquaintance of the complex history of the tradition

is left wondering where exactly they are positioned within the tradition. In this section, I thus seek to make Levins and Lewontin's views on dialectical materialism explicit.

In the concluding chapter of *The Dialectical Biologist*, Levins and Lewontin designate the dialectical method as a way of thinking, expressed in 'habits of thought' and 'forms of questioning', to be applied as both critical and constructive tools to the natural sciences and history, and the relationship between them (2009, 268). Levins and Lewontin view the interaction between ideology, philosophy, and scientific theory from a Marxist perspective, according to which worldviews and ideological positions are socially rooted, structurally reflecting the organisation of the societies in which they appear.

This outlook is made particularly clear through their description of their recurring ideological enemy, Cartesian reductionism. Cartesian reductionism is described as a philosophical position which applies four ontological commitments to the study of the natural world: a natural set of units comprises any whole system; units are internally homogeneous; units have ontological priority over wholes; causes are properties of subjects and effects are properties of objects, and the two are absolutely separate (2009, 269). Rather than arising out of nowhere, the Cartesian view of the physical world, they write, is one 'that mirrors the structure of the alienated social world in which it was conceived' (2009, 270). That social world is the bourgeois world that came into existence in Europe in the seventeenth and eighteenth centuries, characterized by individualism and property enclosure. A bourgeois society is alienated in a dual sense: first, participants in social relations generally act in ways which reinforce a view of themselves as atomistic individuals who act autonomously of the social structures in which they are embedded in the pursuit of their own particular interests. Second, bourgeois society privileges private property in a way which places those who primarily work on or cultivate it, such as farmers and workers, in an alienated relationship to the work (2009, 270). Just as the bourgeois social world consists of clearly definable autonomous actors and relations, the Cartesian natural world consists of strict causal relationships between distinct units.

Levins and Lewontin hold a complex view of the social world as consisting of both real and ideological manifestations which combine in a blur. The alienated world they describe is real insofar as it applies to social institutions and structures, such as the enclosure of farmland, and ideological insofar as it is expressed in dominant ideas about how society is, and therefore should be, structured. As a result, the existing social order not only creates an ideology in its image which retroactively justifies its existence and seeming inevitability, but also enables the future reproduction of the same social structures (2009, 270).

Levins and Lewontin apply a similar dynamic to their description of the alienated Cartesian physical world as 'not only a structure of knowledge, but a physical structure imposed on the world,' which shapes future interactions with that world in a very real way (2009, 270). For example, medical research into tuberculosis designates a specific bacillus as the cause of the disease, rather than a multitude of other possible causes, which in turn prompts the development of a specific type of medical therapy, rather than a range of other available solutions (2009, 270). Their point is that any phenomenon can be conceived of as being the result of a number of heterogeneous causes at different scales. The choice of the efficient cause is more a matter of embeddedness in a social context or institution, with its associated pragmatic, epistemic, and ideological limits, than it is of objective rationality. Thus, the fact that the issue of tuberculosis is posed as a problem in the social context of medical research and treatment facilities, which have specific preferred pragmatic and philosophical ideas about how to understand disease, its causes, and its treatment, means that the developed solution reflects the alienated social structure within which such medical institutions exist. The ideas and practices of medical institutions as they exist in bourgeois society exclude a priori the conclusion, seen by Levins and Lewontin as a viable alternative, that the real causes of tuberculosis are the conditions created by unregulated industrial capitalism (2009, 270). Thus, knowledge is structured in ways that reflect and ultimately reproduce existing social structures.

In contrast to Cartesian reductionism, the key starting point of the dialectical viewpoint is that 'things are assumed from the beginning to be internally heterogeneous at every level' (2009, 272). From this basic insight, Levins and Lewontin derive their criticism of the reductionist idea that things are a priori separable into specific homogeneous wholes, rather holding that 'the 'correct' division of the whole into parts varies, depending upon the particular aspect of the whole that is in question' (2009, 272).

They go on to set up a number of basic principles of the dialectic, which can be understood as corresponding negations of the commitments of Cartesian reductionism. Whole things are comprised of heterogeneous rather than homogeneous parts, which do not have a prior independent existence or individual properties as parts (2009, 273). Rather, the properties of particular parts are always dependent on the particular whole of which they are a part (2009, 273). Parts and wholes are not fixed because cause and effect are interchangeable, meaning that particular parts interact with each other and the whole to recreate both themselves and their constituent whole in different ways (2009, 274). Because both parts and wholes can be seen alternatively as causes and effects, as subjects and objects, all components in systems change (2009, 275). To Levins and Lewontin, the dialectical vision of change as an inherent feature of

all things is in direct contrast to the bourgeois conception of change, which 'occupies an apparently contradictory position' (2009, 275). While change was an important part of bourgeois ideology, which emphasized the temporary nature of ideas, the fluidity of social status, and the social desirability of innovation against the static feudal order, the legitimation of a victorious bourgeois order required change to be confined narrowly, as technical or legal balancing, adjusting, or balancing, while fundamental change was denied in favour of stability and continuity (2009, 275). Thus, even evolutionary theory is alleged to embrace a view of change as a superficial expression of what is already there on an underlying level, such as the idea that the diversity of animal life is the result of an endless recombination of an unchanging underlying 'idioplasm' (2009, 38). By contrast, the dialectical view sees systems as undergoing constant change, affecting individual variables, the systems in which they exist, the way in which these systems interact, and the very laws according to which these changes manifest (2009, 277). Change, as radical and qualitative change, is the foundational fact, rather than an aberration from a normal state of balance which needs to be explained.

Two features characterise the heterogeneity embraced by Levins and Lewontin, from which the positions described previously are derived. The first feature involves the idea that 'there is no basement', i.e., that there is no fundamental ontological unit in the sense of the indivisible philosophical atom (2009, 278). Secondly, heterogeneity is understood not as a simple plurality, recognising the coexistence of different incommensurable variables, but rather as a union of opposed processes within the same object, resulting in the kind of change described in the previous paragraph (2009, 278). This idea of the opposed forces, or put differently, the contradictions internal to phenomena, objects, and systems is therefore the central idea of the dialectical materialism put forward by Levins and Lewontin.

Levins and Lewontin's adhere to a particular version of Marxist philosophy, the nature of which is made clear by the way in which it understands the implications of this principle of contradiction. In a moment of self-reflection on their position within the dialectical philosophical tradition, they distinguish between three ways of understanding contradiction. First, contradiction can be viewed as an epistemic principle, under which the scientific endeavor consists of a succession of antithetical theories, each resolving past problems while going on to create new ones. In Levins' and Lewontin's view, Thomas Kuhn's theory of scientific revolutions acknowledges such a principle in certain respects (2009, 280).

Secondly, contradiction can also be viewed as possessing an additional political dimension, commonly exemplified through the Marxist notion of class struggle. As a result, contradiction

between opposed political interest groups is the driving force of societal change manifesting in human social existence (2009, 279). I will refer to this view as the dialectics of political contradiction. Most likely, one can find examples of such theories in the lineage of the Marxism of Hungarian philosopher György Lukács and the Critical Theory of the Frankfurt School.

Thirdly and finally, contradiction can be viewed as a foundational ontological fact, applying not only to human knowledge and social being, but also to nature as a whole—contradiction is objective. Such a dialectic of objective contradiction is the one to which Levins and Lewontin themselves subscribe, tracing it back to Friedrich Engels's unfinished 1883 work *Dialectics of Nature*, and by extension, to his earlier 1878 book *Anti-Dühring* (2009, 279). According to this view, contradictions are all-present in nature, and the opposing forces behind them are responsible for driving change in the physical and biological world (2009, 280).

Levins and Lewontin add an important qualification. They are critical of previous dialectical approaches to science which sought 'to make the identification of contradictions in nature a central feature of science, as if all scientific problems are solved when the contradictions have been revealed' (2009, 279-280). I argue that Levins and Lewontin see the primary value of the dialectical method for science in its ability to make sense of the complex way in which scientific, social, and ideological factors are entangled. To think dialectically in this context means not only to see the ways in which nature is dialectical, but to see the connections between the human investigation of nature and social and political matters, such as ideology. This allows them to speak of science and politics in the same breath.

As aforementioned, readers of the book remarked on the ambiguous nature of the category of dialectics. One of the core ambiguities at the root of Levins and Lewontin's use of the term dialectics—the question of whether it describes a scientific or philosophical method or a metaphysical position—can now also be understood as a deliberate one. Because the world, both social and natural, is dialectical in the sense of being moved by contradictory forces, it is necessary and justified to think of it in dialectical terms.

DIVERGING DIALECTICAL MATERIALIST VIEWS OF SCIENCE

In the previous section, I have set out the dialectical materialism of Levins and Lewontin as a dialectics of objective contradiction, characterized by its metaphysical commitment to dialectical contradiction as an objective feature of all ontological domains, including thought, society, and nature. As the authors themselves have pointed out, the dialectics of objective contradiction is not the only available version of a materialist dialectic. In this part, I contrast the dialectics of

objective contradiction with the dialectics of political contradiction. Following a brief exposition of this philosophical position, I will argue that the two versions of dialectics entail different conceptions of natural scientific practice and its relation to the dialectical method.

According to Paul Burkett, so-called Western Marxism is distinguished from Soviet Marxism by the fact that the latter endorse a dialectics of nature, while the former reject it (2001, 4485). In the terminology I have been using, this split corresponds, respectively, to the dialectics of political contradiction and the dialectics of objective contradiction. A typical example of the Western Marxist rejection of the dialectics of nature can be found in a standard reading of a founding text of Western Marxism, György Lukács's *History and Class Consciousness*.

According to Lukács, capitalist social life is characterized by reification, a process by which the way in which subjects relate to their external environment and themselves is altered: the products of their own active labour appear to them as completely autonomous and thing-like, with their own subjective input made invisible to themselves (1971, 86–87). This change in the structure of the subject's relation to the world also extends to its view of nature. Famously, Lukács pronounces that 'nature is a social category' (1971, 234). He goes on to elaborate on this idea as expressing the fact the way in which nature appears to humans and the qualities that are ascribed to it are mediated by social being (1971, 234). As Andrew Feenberg points out, this claim leads to a standard (critical) interpretation of Lukács as endorsing the idea that 'nature is a purely social category, and the natural world therefore has no independence of humanity and the human understanding of it' (Feenberg 1981, 205). Lukács himself later explicitly distanced himself from such a reading (1971, xvi–xvii). However, even in further sections of *History and Class Consciousness* itself, it already becomes clear that Lukács holds a more nuanced, if not always fully consistent, view of nature than the one often ascribed to him. Thus, he acknowledges that nature is dialectical, though he continues to separate it from the dialectics of society, which involves direct interaction between subject and object (1971, 207). By contrast, nature contains 'merely objective dialectics' (1971, 207). Thus, rather than endorsing a radical social constructionist idea of nature as a pure social construct, Lukács implicitly endorses a dualism between nature on the one hand, and social, historical reality on the other (Feenberg 1981, 210).

The nature-society dualism has implications for Lukács's view of the methodology and practice of the natural sciences. Here, we find a recognition of dual aspects of science which correspond roughly to the divide between internalism and externalism in the historiography of science. Internalism holds to the independence of scientific development and objectivity from social factors, while externalism stresses the influence of social, cultural, and economic factors. Though

Lukács separated the purely objective dialectics of nature from the societal dialectics, he makes sure to place ‘the growth of knowledge about nature’ within the category of societal dialectics (1971, 207). By this, he means the role of social structures and dynamics in structuring the formation and development of scientific disciplines, which are features characteristic of an externalist view of science (1971, 27–28).

However, as the above dichotomy dictates, Lukács views the internal validity of the natural sciences differently. He describes the natural scientific method as thoroughly undialectical, as it completely rejects ‘the idea of contradiction and antagonism in its subject matter’ (1971, 10). While he critiques the use of this method in the social and historical sciences, whose subject are dialectical by definition, he also writes that ‘when the ideal of scientific knowledge is applied to nature it simply furthers the progress of science’ (1971, 10). In other words, the scientific method within its proper realm of application is legitimate, and the validity of scientific knowledge is independent of non-scientific considerations. If Lukács is taken as representative of the dialectics of political contradiction, this position can primarily be distinguished from the dialectics of objective contradiction by a scepticism or pessimism concerning the possibility of applying the dialectical method to the internal practices of the natural sciences.

From the perspective of the dialectics of objective contradiction, Burkett criticises Lukács for maintaining a hard and fast distinction between these internalist and externalist perspectives on scientific practice. He writes that scientific practice itself is characterized by ‘internal social relations’ which justify its subjection to ‘a dialectical analysis of the internal relations of science *together with* the internal relations of the economic structure’ (Burkett 2001, 4487). The dialectical method can be successfully applied to the practices of natural science at the same time as to social facts and institutions. While the possibility of such a dialectical analysis seems to follow from a commitment to the dialectics of objective contradiction, merely establishing such a theoretical possibility gives little further indication of how its practical implementation would look. In the following part of the paper, I will argue that Levins and Lewontin’s *The Dialectical Biologist* should be read precisely as attempting to live up to the requirements of such a critique.

THE DIALECTICS OF THE DIALECTICAL BIOLOGIST

In this final section, I seek to show that Levins and Lewontin’s attempt to apply dialectics to scientific practice in just such a combined analysis of social and scientific relations which does not limit itself to an externalist critique, but also reaches into the internal aspects of science. Levins and Lewontin’s philosophical motivations for such an attempt would follow from their

adherence to a dialectics of objective contradiction and the view of natural science it entails. As discussed earlier, the view of dialectics in *The Dialectical Biologist* combines method with worldview: because the ontology of the world is dialectical, the world must also be approached and understood dialectically. In my examination of selected readings from the text, I will not only analyse the content of the arguments, but also engage with their argumentative structure and style. In my view, this engagement is necessary to reveal the multiple dimensions of the dialectical approach within.

The first part of *The Dialectical Biologist* consists of three chapters which are tied together by a thematic focus on evolution. Here, Levins and Lewontin move through a critique of evolutionary theory's focus on adaptation to an alternate conception of evolution as a co-creative process between organism and environment.

In the first chapter, Levins and Lewontin tell the story of the development of Darwinian evolutionary theory. Through this story, they link evolutionary theory to a general scientific ideology which they term 'evolutionism,' and which they argue can be found in all natural and social scientific disciplines (2009, 9). Evolutionism is characterized by a set of philosophical views about change, order, direction, progress, and perfectibility, of which some, but not all, must be instantiated in any specific case (2009, 9). These views are roughly as follows: change rather than stability is a primary ontological feature of the world; evolutionary processes result in ordered hierarchies of some kind; evolutionary processes have a temporal direction; evolutionary processes imply moral progress; evolutionary process tend towards perfection (2009, 9–23). An in-depth examination of these views is neither possible nor necessary here. What is of importance is that Levins and Lewontin provide a history of the development of scientific disciplines in terms of their alignment to the underlying ideology of evolutionism.

Against this backdrop, they engage with a number of methodological problems in evolutionary theory, including the origins of life and qualitative changes in organisms and selection pressures. In general, these sections follow a set argumentative sequence—first presenting an orthodox 'Darwinian' or geneticist approach to a particular biological problem—explaining the methodological limits of said approach, and then outlining the preferred, and presumably also dialectical, solution to the methodological deadlock.

I will provide just one detailed example of such an engagement: the discussion of the relation between organism and environment. Levins and Lewontin discuss how, in its characterisation of natural selection, evolutionary theory set up a dichotomy between active, changing organisms and passive, fixed environments which results in a systematic undervaluing of the latter category

(2009, 52). In contrast to this dichotomy, they emphasize a reciprocity between organism and environment which is expressed in several ways, such as the active selection of environments, the variable effects of environments depending on genotypes, and the modification of environments by organisms (2009, 57–58). Further, they argue that organisms possess internal environments, and that every part of an organism can variably serve as an environment to another part in a process of mutual adaptation (2009, 58). Though they do not explicitly state it, Levins and Lewontin clearly intend for these processes to be understood dialectically, by the notion of the interchangeability of the relations of cause and effect between parts.

However, Levins and Lewontin do not only seek to supply dialectical concepts for solving methodological problems in biology. Rather, their very mode of argumentation is dialectical in its frequent creation of associations between different conceptual levels. Strikingly, in the final paragraph they establish an explicit link to Engels's *Dialectics of Nature* by arguing that understanding environment as a product of organisms, in turn shaping the further evolution of those organisms, can account for the specificity of human evolution:

> The labor process by which the human ancestors modified natural objects to make them suitable for human use was itself the unique feature of the way of life that directed selection on the hand, larynx, and brain in a positive feedback that transformed the species, its environment, and its mode of interaction with nature. (2009, 58)

This change in narrative pace, where concepts previously developed in the specific context of evolutionary biology are suddenly deployed in a new context to draw out their social and political implications, is characteristic of Levins and Lewontin's rhetorical *approach*. They continuously draw on varied sources outside of direct scientific practice, such as philosophy and history, to set the stage for the problems they engage with and seek to resolve. Once Levins and Lewontin offer a solution to a specific problem, they rarely leave it to stand still, but go on to recontextualize it within the wider context of the scientific approaches from within which the problem initially emerged.

The same argumentative strategy is employed in the following two chapters. Chapter Two focuses on the explanatory problems associated with the concept of adaptation. Here, Levins and Lewontin argue that the concept of adaptation itself implies that, with any given adaptation in an organism there is a pre-existing problem which occasions the adaptation. They deny the real existence of such a problem, which they instead take to be a carryover from the old theological notion of ideal types (2009, 67). In analysing the evidentiary standards for adaptationist

explanations, they conclude that there is no rule dictating the degree of divergence from prediction which would require such an explanation to be abandoned. As a result, the idea that changes in an organism occur as a result of adaptation practically functions as a self-confirming and therefore irrefutable metaphysical postulate (2009, 76). In Chapter Three, they critique the inability of the same concept of adaptation to account for organisms as playing active roles in constructing their environments, proposing the use of coupled rather than simultaneous differential equations to correctly describe such coevolutionary systems (2009, 105). Both cases deal with very broad methodological problems, which both initially emerge from and are always re-embedded within the historical and ideological narrative structures provided by the authors. In their writing, Levins and Lewontin continuously cross the boundaries between philosophy, history, and science.

I began this part of the essay by arguing that we ought to view *The Dialectical Biologist* as an attempt to apply the dialectical method to scientific practice in the manner required by the dialectics of absolute contradiction. For this to be the case, the book's content could not limit itself to an externalist picture of science but would also need to involve an application of dialectics to the internal aspects of scientific method and practice itself. From the examples discussed in this section, this demand is met—in every case I have covered, a scientific methodological problem has been at the centre of discussion.

The fact that philosophical and historical issues also featured heavily in these cases should not detract from this insight. By contrast, this continuous blurring of the lines separating philosophy, history, the internal and external aspects of science should be understood as a conscious implementation of the dialectical method. Levins and Lewontin's look to negate dichotomous philosophical positions and affirm the 'unity and interpenetration of the seemingly mutually exclusive' (2009, 133). In arguing that 'the main issue for science is the study of that unity and contradiction', they simultaneously demonstrate by their very argumentative method that for science to take on such a challenge, it must sometimes make use of methods and tools from fields which it normally considers separate from itself (2009, 133).

There is further evidence that this analysis fits the authors' views on the relation between science, philosophy, and history. In a section of the chapter 'Dialectics and Reductionism', which contains perhaps some of the most profound and pithy philosophical argumentation in the entire book, Levins and Lewontin reflect on the role of abstraction in science. After pointing out the self-evident need for *some* kind of abstraction in science, they argue that, in their preferred materialist science, 'the process of abstraction is explicit and recognized as historically contingent within the science' (2009, 149). An abstraction is used legitimately if its abstract nature is clear and its

specific function as an abstraction transparent. However, legitimate abstractions, which are the 'epistemological consequences of the attempt to order and predict real phenomena', can all too easily become ideals, abstract entities which take ontological precedence over the material objects in which they become manifest (2009, 152).

While Darwinian evolution, as a mode of explanation, overturned an idealistic paradigm, Levins and Lewontin argue that much of their criticism of modern evolutionary theories can be led back to idealisations of the abstractions used in Darwin and Mendel's works (2009, 150). It is precisely at this point that dialectical materialism sees philosophy and history as playing a proper role in science, by reconstructing the historical context under which ideals became abstractions and engaging in a substantive critique of their shortcomings relative to the current problems of science. Levins and Lewontin's own arguments throughout the book are, both in substance and in form, precisely an attempt to implement such a constructive critique of science which is also applicable to its internal aspects.

The final part of *The Dialectical Biologist* provides further support for our characterisation of the book's central methodological commitment to an internalist dialectical analysis of science. Levins and Lewontin introduce this part, titled 'Science as a Social Product and the Social Product of Science', in terms that make clear their wish to go beyond an externalist critique of science. They write that:

> Many people will now admit that the problematic of science – what questions are thought to be worth asking and what priority will be awarded them—is also strongly influenced by social and economic factors. And everyone agrees that the findings of science, the facts, may have a profound effect on society, as best shown by the atomic bomb. But nothing evokes as much hostility among intellectuals as the suggestion that social forces influence or even dictate either the scientific method of the facts and theories of science. [...] Our view is different. We believe that science, in *all* its senses, is a social process that both causes and is caused by social organisation. (2009, 4)

The final sentence appears to express that science is subject to social influence, not just partially, through a set range of recognized 'externalist' factors, but through and through. And if science itself is conceived as a thoroughly social process, it is one which also reflects back on other areas of social organisation, such as history and philosophy. Not only, then, is this a clear statement of intention. It also reflects remarkably accurately the discrepancy of views, detailed in the preceding

part of the paper, on the objectivity of the internal aspects of science that is found between the dialectics of objective contradiction and the dialectics of political contradiction.

Given that my entire argument in this part of the paper has consisted of an attempt to show that Levins and Lewontin are engaged in exactly the kind of practice which they have endorsed here, it may be asked why I have brought out the seemingly strongest piece of textual evidence last. In fact, this statement by the authors refers specifically to the third part of the book, while my claim has been that it should be seen as true for the entire book. I have attempted to demonstrate this by making explicit the implicit affinities between substantial content, argumentative structure, and philosophical commitments through which the authors enact their application of the dialectical method. In my view, only such a multi-layered reading of the text can fully bring to the surface the ways in which Levins' and Lewtonin's text can be understood to be dialectical.

CONCLUSION

Levins and Lewontin attempt to enact a view of dialectics as encompassing the natural world through *The Dialectical Biologist*. This conclusion only becomes plausible when the book *as a whole* is viewed as an attempt to apply a dialectical method consistently to all its parts, irrespective of differences in subject matter. In making this argument, I have responded to a common charge against Levins and Lewontin's work, namely that their self-professed embrace of a dialectical method amounts to a bandying and political posturing which, even on the most favourable interpretation, distracts from their substantive scientific arguments.

The argument to which I have responded is by no means limited to responses to Levins and Lewontin's work. For example, remarkable similarities can be found decades earlier, in the late 1930s, in the reception of British evolutionary biologist JBS Haldane's espousal of a view of evolution based on Marxist dialectics and commendation of the relevance of the dialectical method to biological research (Haldane, 1937; 1939). Haldane's claims were met with criticisms in their own time and have remained controversial since then. In a reply, the economist Abba P. Lerner criticised Haldane as using the scheme of dialectics as a convenient 'pigeon-hole' into which to bend the existing facts of biology, an approach which holds no additional value for science if one is not already 'suffering from an overpowering emotional urge to embrace the dialectic' (1938, 232–233). In a later survey of the relation between Haldane's ideological development and scientific research, Arthur Shapiro also remained unconvinced of the idea that a conscious embrace of Marxist dialectics would carry tangible benefits for biological research (1993, 69–73).

Haldane's critics, like some of Levins' and Lewontin's readers, share a scepticism towards the idea, advanced by these Marxist scientists, that Marxism, an explicitly politically charged philosophical worldview, could contribute positively to what we have called the internal aspect of scientific production. There are certainly good reasons for such scepticism. No one will solve the problems of quantum mechanics or evolutionary biology simply on account of reading the complete works of Marx and Engels or identifying as a Marxist-Leninist. But by reengaging with Levins and Lewontin's text on a close level, I hope to have shown that their claim to provide an internalist dialectical critique of science is more nuanced than philosophical pigeon-holing and ideological rubber-stamping. Insofar as we reflect on the scientific legacy of Lewontin, we must also reflect on the ways in which his work offered a view of biology which continues to challenge established ways of conceiving of the relation between science, society, and ideology.

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