

## Revolution in Ideology: Crafting a Holistic Scientific Dialectic

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**Ideology drives scientific research far more than is acknowledged. Since science itself is conducted by individuals, each scientist has a biased conception of themselves and their surroundings relative to the rest of the universe, even if it is never explicated. This sense of relation to the greater universe is what defines the ideology of the individual. It is this sense of relation and self that creates the individual, who goes on to investigate the natural world by the scientific method. In this paper I will examine extant scientific ideology, particularly in Western science, and propose changes that could be helpful.**

The actions and consciousness of an individual are inseparable from that individual's ideology. Ideology itself, especially as it relates to science, is a nebulous concept. Western culture proclaims the scientific method to be a ruthlessly objective process, so how can it be ideological? The scientific process becomes ideological because it is necessarily conducted by individuals and groups of scientists. Each one of these scientists has a conception of themselves and their surroundings relative to the rest of the universe, even if it is never explicated. This sense of relation to the greater universe is what defines the ideology of the individual. This sense of relation and self creates the individual, who goes on to investigate the natural world by the scientific method. The examination of ideology, although largely ignored in Western science, is a crucial prerequisite step of scientific methodology. However, this is not the case in all cultures.

### Dialectical Materialism and Science

For example, planned scientific development for a sustainable future in Cuba is a result of the principles of Marxist-

Leninist dialectical materialism adopted by the Cuban state in the wake of the 26<sup>th</sup> of July Movement. Dialectical materialism also had a strong positive effect on the development of science in the Soviet Union.<sup>1</sup> The principles of dialectical materialism outlined by Lenin, especially *das Andere seiner* (the contradictory nature of phenomena), the negation of the negation, and the universal interconnectedness<sup>2</sup> have particularly profound implications on the philosophy and praxis of science. These implications include a holistic view of ecology and biomedical research that is entirely at odds with popular Western reductionist ideology. Furthermore, dialectical materialism, although it is a philosophical fundament of Marxist materialism, may have the potential to unite Christian theology with a scientific dialectic, although it clashes harshly with traditional Christian views of humans having a special place in the universe. Marxist-Leninist dialectical materialism is an ideology that is capable of revolutionizing the epistemology, methodology, and real-world implications of scientific thought.

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<sup>1</sup> Graham, 1987.

<sup>2</sup> Lenin, 1927.

### History and Explanation of Dialectical Materialism

The evolution of dialectical materialism must be detailed further before its scientific implications can be discussed. It began with Hegel, a German idealist. He wrote that dialectics govern the development of spirit, but did not apply it to Nature or Society. Then comes Karl Marx, who is credited with “inverting” Hegelianism by applying dialectical materialism to political economy and the development of society. Engels provides three main points that define dialectical materialism: the law of unity and conflict of opposites, the law of passage of quantitative changes into qualitative changes, and the law of negation of the negation.<sup>3</sup> As it concerns the relation of society to the individual, György Lukács of the Budapest School provides a useful working definition: “the premise of dialectical materialism is ... not men’s consciousness that determines their existence, but, on the contrary, their social existence that determines their consciousness.... Only when the core of existence stands revealed as a social process can existence be seen as the product, albeit the hitherto unconscious product, of human activity.”<sup>4</sup> Lukács’s basic assertion is that the individual is the product of their social existence. This creates a point of intersection with scientific methodology, because scientific experimentation is the product of scientists, who are themselves products of cultural processes. It is essential to question the underlying ideology that drives modern science and to examine how dialectical materialism might change the direction of scientific thought. Vladimir Lenin, the leader of the October Revolution, is responsible for the first extension of dialectical thought into evolutionary

biology.<sup>5</sup> He also significantly expanded on the concept of the union of analysis and synthesis, which will be discussed later in the context of mathematical philosophy. Lenin is a remarkably influential figure in the history of dialectical materialism, and not just for his academic work in epistemology and dialectics. As the face of the Bolshevik Revolution and Marxism-Leninism, his writings on dialectical materialism were perhaps the strongest ideological influence on the formation of the U.S.S.R. (until Stalin wrote *Dialectical and Historical Materialism* in 1938), as well as being an archetype for future Marxist revolutionaries such as Fidel Castro and Che Guevara. His work on the unity of opposites<sup>6</sup> sets the stage for a holistic ecological dialectic. Several of the most radical and revolutionary philosophical minds in history dedicated their entire lives to developing dialectical materialism (as a component of Marxist thought). It is a multifaceted and rich ideology, and the stages of evolution it underwent in space and time is a testament to the ideal itself. It is an ideology based in interconnectedness, in processes instead of the immediacy of things, and in conflicting but unified forces. An understanding of its relevant stages of development sets the stage for scientific epistemology and application.

### Applying Dialectical Materialism to Science

The ideology of dialectical materialism is well-suited to be an epistemological foundation in the world of modern science. Marx’s dialectical method is based upon a conception of Nature as a unified whole that is in perpetual motion.<sup>7</sup> This is evident when one considers the natural selection among populations and the

<sup>3</sup> Engels, 1940.

<sup>4</sup> Lukács, 1971, p. 76.

<sup>5</sup> Op. cit. ref. 2

<sup>6</sup> Ibid.

<sup>7</sup> Stalin, 1940.

interaction of that natural selection with the surrounding environment. There is a great deal of evidence for a reciprocal codetermination between organism and environment.<sup>8</sup> Organisms within a population can outperform other organisms within the same population because of genetic favorability that happens to be advantageous in their environment. These organisms who are better suited for the environment in which they live are more likely to reproduce and succeed from a biological standpoint, which can slowly drive genes at a population level. However, this is only one side of the process. Just as an organism is meaningful within context of its environment, the environment itself is defined by the physical structures and the organisms it contains. This is an example of the concept of Nature as a unified whole. The perpetual motion of the universe and the contradictory nature of phenomena are closely related to this idea. Organisms and populations are constantly reforming and changing their own environment. They necessarily need to consume and produce to survive. This creates a dialectic of production and consumption that perpetuates the environment itself. For example, there is a baseline atmospheric oxygen content (approximately 18%) that is required for terrestrial species to survive and reproduce. Animal populations continuously consume this atmospheric oxygen that is necessary for survival while producing carbon dioxide, and the dialectic of production and consumption is fulfilled because plant life is simultaneously doing the inverse.<sup>9</sup> Modern science illuminates a natural world that is much less static than traditional models would suggest. The very cells in the human body undergo constant replacement and renewal, yet the individual continues to function.<sup>10</sup> Dialectical materialism was

created before mankind had the technology for modern scientific experimentation, but the march of scientific progress reveals its astonishing capacity to understand and describe the world. Science describes a world that is deeply interconnected, a unified world in perpetual motion, and a world that affirms the epistemological assumptions of dialectical materialism. Closer inspection proves that this foundational idea of Marxist-Leninist thought is incredibly effective as an ideological basis in science as well.

### **Application to Ecology and Conservation Biology**

Dialectical materialism is particularly useful as a scientific ideology in the fields of ecology and conservation biology. Although ecology is traditionally investigated as a field separate from sociology and class structures, to make the distinction between ecology and sociology is to limit the scope of ecological understanding. Although studying ecological problems involves predicting naturally occurring disasters, it is much more important to be able to predict and understand causal relationships between sociological and geopolitical forces and the natural world. Environmental degradation does not just take the form of obvious catastrophes such as the British Petroleum Deepwater Horizon oil spill or the Exxon Valdez oil spill. Instead, it often takes the form of carbon dioxide emissions from agriculture and transportation that result in problems such as ocean acidification. A reductionist view of science that considers ecology to be a distinct field unaffected by outside forces is wholly inadequate to understand ecological and conservation science in a global economy in which the exploitation of natural resources is

<sup>8</sup> Lewontin-Levins, 2007.

<sup>9</sup> Ibid.

<sup>10</sup> Bergmann et al., 2009.

incredibly lucrative. In this instance, dialectical materialism is essential because conservation science and socioeconomic issues are not just related, but innately intertwined. The two fields are a shining example of the contradictory nature of phenomena. The environmental and the economic are constantly at odds with each other, but reside in a dialectic exchange that makes them inseparable. Critics of dialectical materialism as a scientific ideology (or reactionaries resistant to change) might question the need to have an underlying mindset during the scientific process. This questioning is reliant upon the idea that there is not already a foundational ideology. This paper suggests not that scientists needlessly adopt a philosophy to inform the scientific process, but to critically examine what is already present and suggest an alternative and viable competing ideology. In ecological terms, the notion of the climax community is a classic example of traditional reductionism gone wrong. The climax community is a term used historically used to describe the “final” (or “steady state”) stage of succession within an ecosystem. In other words, it is a term based upon a teleological conception of what an ecosystem ought to be when it reaches its completion. While the climax community is often a useful term, it is not strictly correct from an ecological standpoint. Evidence suggests that plant species spread out along soil-based and nutritional environmental gradients,<sup>11</sup> which means that communities do not progress towards a teleological end, but develop according to their own environmental specifications in nonparametric distributions. While dialectical materialism does not imply explicit answers to scientific questions such as succession within communities, it does preempt answers founded on overly simplistic and unidirectional motion of

ecological communities. Dialectical materialism is capable of addressing and understanding the complex relationships between ecology and other fields of study.

### **Applying Dialectical Materialism to Christianity**

The holistic codetermination of dialectical materialism is also its greatest point of departure from traditional Christian theology. The Imago Dei (humans made in the image of God) is a fundamental aspect of Christian thought. There are many interpretations of the idea from all over the globe, but they all rely on humankind occupying a special place in the universe because they are made in the image of God. Although dialectical materialism can deconstruct interpretations of the Imago Dei made by those such as Martin Luther who used it to argue for mankind’s dominance over nature, it can also address modern interpretations. For example, Pope Benedict XVI wrote that “its nature as an image has to do with the fact that it goes beyond itself and manifests something that it is not...It is the dynamic that sets the human being in motion toward the totally Other. Hence it means the capacity for relationship; it is the human capacity for God.”<sup>12</sup> The Pope believes the Imago Dei to be a relational concept rather than an ideology of domination, but this still requires an understanding of nature that is inherently hierarchical. Man, as the reflection and image of God, still occupies a special place that is separate from all else. This is vastly different than conceptions of nature based upon dialectical materialism. Murray Bookchin developed the ideology of dialectical naturalism to explore the deep interconnectedness of social development and ecological thought. He realized that the innate developmental causality of nature resulted in a process (natural selection) that

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<sup>11</sup> Whittaker, 1953.

<sup>12</sup> Ratzinger, 1995, p. 7.

requires ever-increasing complexity and interconnectedness of systems.<sup>13</sup> This makes a statement such as the Imago Dei or any theological concept of mankind's dominion over the Universe reductive and incoherent when one considers the developmental ontology of ecological systems. In short, arguments that place humans as separate from nature require a rejection of the history of the evolution of the species and of any future changes caused by natural selection. Furthermore, they require a lack of understanding how scientific advancement influences ecological perspectives by relying on pre-scientific suppositions. That is not to say that Christian thought is wholly incompatible with Marxist-Leninist ideology. In fact, Liberation Theology and Marxism-Leninism in Latin America have combined with great success in cases such as the 26<sup>th</sup> of July Movement in Cuba and the Fifth Republic Movement in Venezuela. Furthermore, Christianity is held by many within socialist movements to be an easy stepping stone to Marxism and criticism of hegemonic states. For example, one of the largest issues in America for the Christian Right is abortion (the pro-life movement). While this is a valid issue, as part of the political right they often advocate for increased military spending and economic policy that favors entrenchment of existing class structures, neither of which do anything to promote life. The American Cardinal Joseph Bernardin provides an answer to this hypocrisy, as well as an avenue for an integration with Marxism-Leninism (and dialectical materialism as a result). He developed the Consistent Life Ethic, which argues against fascism, militarism, capital punishment, unequal class structures, and abortion.<sup>14</sup> This bridges the gap between Marxism-Leninism and American Evangelical Christians without

requiring them to compromise their existing beliefs. The Cardinal agrees with them on many issues, but only asks for a consistency of belief to other avenues, which includes nationalistic and militaristic thinking. This intersects with Marxism because Western hegemony and imperialism is inherently anti-revolutionary and seeks to dominate the proletariat. Marxism-Leninism is portrayed (by those on both sides) as innately antagonistic to Christianity, and vice versa. However, this does not have to be the case. Liberation Theology and the writings of those such as Cardinal Bernardin give some hope for an integration of causes that are separated historically but not necessarily ideologically.

### **Application of Dialectical Materialism in Cuba**

The implementation of dialectical materialism and Marxist ideology in science is not merely a theoretical exercise. Cuba is an excellent case study. Cuba's dedication to agriculture, medicine, and ecology are often misconstrued as reactionary to the Special Period in which their trade relations with the Soviet Union worsened while American hegemony in the form of economic strangulation increased. However, this is revisionist history that ignores the origins of the modern Cuban state after the overthrow of Fulgencio Batista in 1959. Although Fidel Castro is a Marxist-Leninist, he was influenced by some principles of Maoist thought, particularly a dedication to farmers and agronomy. As the son of a farmer, this was a natural ideological step to take. Even in the early 1960s, Cuba was performing experiments regarding Voisin's rotational grazing system, polyculture, and biological pest control.<sup>15</sup> The agricultural autonomy and success of Cuba in the face of American blockade is nothing short of astonishing.

<sup>13</sup> Bookchin, 2005.

<sup>14</sup> Bernardin, 1988.

<sup>15</sup> Op. cit. ref. 8



Actions such as the institution of the Voisin system of rotational grazing, the adoption of Article 27 of the Constitution (tying environmental conservation to sustainable socioeconomic development and establishing a responsibility for both the state and citizens to protect the environment), and the creation of approximately 1,400 micro reservoirs for energy, water resources, and fish and agricultural production have contributed to a planned agronomy that is environmentally and economically sustainable.<sup>16</sup> Furthermore, they have seen significant progress in reforestation after the environmental damage caused by the American-backed Batista dictatorship. A dedication to medical autonomy and biomedical advancement is another platform of the Cuban Communist Party. This goes all the way back to the origins of the 26<sup>th</sup> of July Movement that deposed Batista. The influence of Che Guevara on modern Cuban medical policy and research is often understated. Che was an Argentine physician that was driven to Marxism largely because of his interaction with poverty and American imperialism as a physician in Latin America. He rose to be Fidel Castro's second-in-command and an important advisor in the 26<sup>th</sup> of July Movement, and his relationship with Castro (a lawyer who came from a family of farmers) influenced the future of healthcare in Cuba. A focus on biomedical advancement and healthcare availability in the Communist Party of Cuba is a core tenet that came from the origin of the party itself and the context of its founding. Some of the more notable achievements of Cuban biomedical science are an infant mortality rate of 6.5 per 1,000 births (tied for best in the Western hemisphere with Canada), eradicating poliomyelitis, malaria, and infant

AIDS, a proactive system of psychiatry focused on community integration (instead of a reactive and ineffective system such as in the U.S.), Meningococcus B and Hepatitis B vaccines, and self-production of 90% of the medicine needed for Cubans.<sup>17</sup> Cuba paid particularly close attention to the HIV crisis from its beginning (as opposed to labelling it a gay plague and letting the damage accumulate), which resulted in the production of anti-retroviral medications, the development of SUMA (ultramicroanalytic system for HIV detection), a 100% HIV-free blood bank, and limiting the spread to HIV/AIDS to only .03% of the at-risk population through extensive testing and education.<sup>18</sup> Cuba's scientific advancements are remarkable, especially for such a small country. When one considers the achievements of Cuban biomedical science in light of 50 years of economic warfare from an American state widely held to be the only true superpower, the results are astounding. This is a country that is vastly outperforming what one might expect in terms of scientific output, especially considering the relative poverty of Caribbean nations and the long-term effects of hostile American economic policies. Dialectical materialism is a large part of this success. The Communist Party of Cuba is able to achieve such scientific success because of a dialectical philosophy that recognizes the effects of sociological factors, interconnectedness to other fields, and prioritizing the development of processes over things. The Marxist-Leninist ideology of dialectical materialism has not just enabled Cuba to make an exceptional amount of scientific progress since the 1959 revolution, but to lay a permanent and sustainable foundation for future scientific progress.

<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

## Potential for Mathematical Resolution

Although dialectical materialism seems intuitively qualitative, it is uniquely capable of addressing problems in the traditional methodology of mathematics. In *Marx's Mathematical Manuscripts* he explores the genesis of differentiation. Marx believes that algebra and calculus represent the contradictory nature of phenomena and the inversion of the method. He provides a proof using the product rule of differentiation for the function  $f(x)=uz$ , which provides the derivatives  $dz/dx$  and  $du/dx$  as symbolic differentials without algebraic equivalents that are themselves mathematical starting points.<sup>19</sup> This proof demonstrates how algebra can reverse itself into the differential, even when  $dz/dx$  and  $du/dx$  have no actual algebraic existence. Although they are not independently existing as algebraic concepts, they are completely operational for algebraic use because of this inversion. This is an example of how a dialectic perspective differs from a traditional Western reductionist perspective. The calculus is typically portrayed as an idea with its own sort of abiogenesis or independent point of origin. However, it necessarily does not have an independent origin because its symbols are only meaningful algebraically. Dialectical materialism and historical materialism repeatedly insist that events along a historical timeline are only meaningful within context of the circumstances that develop them, and mathematics is no different in this regard. Marx used dialectical materialism to isolate methodological problems in mathematics, specifically regarding the necessary reversal of algebra to create the calculus. Andy Blunden writes that the formal idea of mathematical proof, which necessarily leaves out the reversal of a concept to

resolve its own problems of origin, cannot explain how new mathematical knowledge is developed.<sup>20</sup> Moreover, this relationship between calculus and analysis represent the unity of analysis and synthesis in dialectics. The analysis (breaking down a concept into its constituent parts) and synthesis (reconstructing these parts into a coherent whole) relationship in dialectical materialism results in a new understanding of the concept at hand by continuously breaking it down and putting it back together again. Analytic algebra and calculus are required at alternating points when evaluating derivations or integrations, but this union allows one to evaluate otherwise meaningless concepts. This union is itself a form of reciprocal determination in which algebraic forms are required even at the highest levels of calculus, while multivariate spaces are necessary to understand vibrations of things such as Riemann zeros.<sup>21</sup> Karl Marx uses proofs to highlight implicit problems in historical conceptions of mathematics and mathematical methodology itself, and offers dialectical materialism as a solvency to those problems.

## Conclusion

Dialectical materialism is a revolutionary ideology capable of building a holistic view of ecology, mathematical development, and scientific epistemology itself. The ideal of an objective science is an ideology in itself, and recognizing existing ideology is the first step to reforming it. Cuba acts as an archetype for the results of revolutionary ideology, and it is replicable in the West as well. Not only does it function as an agent of reform in mathematics, but in other fields such as punctuated equilibrium in evolutionary biology.<sup>22</sup> Although dialectical materialism

<sup>19</sup> Marx, 1983.

<sup>20</sup> Blunden, 1984.

<sup>21</sup> Sautoy, 2003.

<sup>22</sup> Gould, 1987.

conflicts with some Christian views on the relation between humans and nature, the Christian Left (and even a Cardinal in the Roman Catholic Church) make strong arguments for the integration of Marxist-Leninist thought with Christian theology. Dialectical materialism focuses on processes

instead of things, interconnectedness, and reciprocal codetermination, which allows it to be a foundation for a holistic understanding of science in a world which requires a revolution of ideology.

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