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ARTIGO - ARTICLE

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**Reevaluating evolutionary paradigms:  
The impact of Darwin's competitive vision and Humboldt's  
holistic approach on modern ecology**

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**Abstract:** This article critically examines the contrasting perspectives of Charles Darwin and Alexander von Humboldt on evolution and the interconnectedness of nature, arguing that Darwin's emphasis on competition has contributed to contemporary ecological crises. While Darwin's theory of natural selection revolutionized biological sciences by focusing on individual competition and the "survival of the fittest," it reflects the competitive and anthropocentric values of Victorian England. In contrast, Humboldt's holistic vision, articulated in his work *Kosmos*, emphasizes the intricate interdependencies within ecosystems, anticipating modern ecological principles. By exploring the cultural contexts that shaped their theories, this article contends that the widespread adoption of Darwin's competitive framework has fostered exploitative attitudes toward nature, legitimizing environmental degradation and contributing to the current ecological crisis. Embracing Humboldt's interconnected perspective is posited as essential for addressing ecological catastrophes by promoting sustainable practices and fostering a more harmonious relationship with the natural world.

**Keywords:** Charles Darwin; Alexander von Humboldt; Evolution; Natural selection; Ecology.

*Reavaliando paradigmas evolutivos:  
O impacto da visão competitiva de Darwin e da abordagem holística  
de Humboldt na ecologia moderna*

**Resumo:** Este artigo examina criticamente as perspectivas contrastantes de Charles Darwin e Alexander von Humboldt sobre a evolução e a interconectividade da natureza, argumentando que a ênfase de Darwin na competição contribuiu para as crises ecológicas contemporâneas. Embora a teoria da seleção natural de Darwin tenha revolucionado as ciências biológicas ao focar na competição individual e na "sobrevivência do mais apto", ela reflete os valores competitivos e antropocêntricos da Inglaterra vitoriana. Em contraste, a visão holística de Humboldt, articulada em sua obra *Kosmos*, enfatiza as interdependências complexas dentro dos ecossistemas,

antecipando os princípios ecológicos modernos. Ao explorar os contextos culturais que moldaram suas teorias, este artigo argumenta que a ampla adoção do modelo competitivo de Darwin incentivou atitudes exploratórias em relação à natureza, legitimando a degradação ambiental e contribuindo para a crise ecológica atual. A adoção da perspectiva interconectada de Humboldt é apresentada como essencial para enfrentar as catástrofes ecológicas, promovendo práticas sustentáveis e fomentando uma relação mais harmoniosa com o mundo natural.

**Palavras-chave:** Charles Darwin; Alexander von Humboldt; Evolução; Seleção natural; Ecologia.

## 1. Introduction

The theory of evolution, as proposed by Charles Darwin in his seminal work *On the Origin of Species* (Darwin, 1859), revolutionized the understanding of how species evolve and adapt over time. Darwin's focus on natural selection, emphasizing competition and the survival of the fittest, provided a powerful framework for explaining the mechanisms of evolution. However, his approach has been criticized for its individualistic perspective, which overlooks the mutual organization and interdependence of nature's organisms (Kropotkin, 1902; Gould, 1988). This oversight stands in stark contrast to the holistic vision proposed by Alexander von Humboldt, who, almost half a century before Darwin, conceptualized nature as a "Kosmos," where all living things are interconnected and interdependent (Humboldt, 1845).

Alexander von Humboldt's comprehensive observations during his extensive travels led him to perceive nature as a unified whole, emphasizing the intricate web of life and the interconnections between organisms and their environments (Wulf, 2015). His work laid the groundwork for ecological thinking, highlighting the importance of mutualism, interdependence, cooperation, and symbiosis in the natural world. In contrast, Darwin's theory emerged from the socio-economic milieu of Victorian England — a society that celebrated competition, individualism, and imperial conquest — which may have influenced his emphasis on struggle and competition as the driving forces of evolution (Desmond & Moore, 1991).

The dominance of Darwin's individualistic vision has been argued to contribute to the ecological crises we face today by promoting a worldview that justifies the exploitation and domination of nature (Merchant, 1980; Foster, 2000). This perspective fosters an anthropocentric approach, treating nature as a resource to be used rather than a complex system of which humans are a part. The neglect of the interconnectedness and mutual dependencies within ecosystems has led to unsustainable practices, biodiversity loss, and environmental degradation.

This article explores the contrasting views of Darwin and Humboldt on the evolution of species and the interconnectedness of nature. By examining the cultural contexts that influenced these divergent perspectives, it aims to provide a comprehensive understanding of the historical and contemporary implications of their ideas. The discussion will highlight the shift from Darwin's competitive interpretation of evolution to Humboldt's ecological and interconnected perspective, reflecting the evolution of biological and ecological thought. Furthermore, it will argue that embracing Humboldt's holistic vision is crucial for addressing the current ecological catastrophe, as it underscores the necessity of recognizing the complex web of life and the importance of sustainable interactions with our environment (Capra, 1996).

## **2. Discussion**

### **2.1. Darwin's Theory of Natural Selection and Its Socio-Economic Underpinnings**

Charles Darwin's theory of natural selection, as articulated in *On the Origin of Species* (Darwin, 1859), posits that individuals within a species exhibit variations in their traits, and those with advantageous characteristics are more likely to survive and reproduce. This differential survival and reproduction lead to the accumulation of favorable traits in populations over generations. While revolutionary in explaining the mechanism of evolution, Darwin's emphasis on competition and survival of the fittest reflects the socio-economic ideologies of Victorian England—a period marked by industrial capitalism, imperialism, and social stratification (Desmond & Moore, 1991; Young, 1985).

The Industrial Revolution had entrenched a capitalist economy that celebrated individual success and competition (Hobsbawm, 1968). The *laissez-faire*

economics of the time, influenced by thinkers like Adam Smith, promoted the idea that competition leads to progress and prosperity (Smith, 1776). Darwin's theory mirrored these ideas, suggesting that natural competition drives evolutionary progress. This alignment between biological theory and economic ideology reinforced the notion that competition is a natural and beneficial force in both nature and society (Bowler, 1976). Herbert Spencer, contemporaneous with Darwin, extended the concept of natural selection to social theory, coining the phrase "survival of the fittest" and advocating Social Darwinism (Spencer, 1864). This interpretation applied biological concepts to justify social hierarchies, imperialism, and colonialism, suggesting that societal progress results from the competition and dominance of superior individuals or races (Hofstadter, 1955). Social Darwinism provided a pseudo-scientific rationale for the exploitation of resources and people, underpinning policies that prioritized economic growth over social and environmental considerations (Paul, 1988).

## **2.2. Darwin's Vision and the Ecological Catastrophe**

The anthropocentric and competitive interpretation of Darwinian evolution has been implicated in contributing to the ecological crises of the modern era (Merchant, 1980; Foster & Clark, 2016). By framing nature as a competitive arena where only the strongest survive, it fosters a worldview that legitimizes the exploitation of natural resources and the environment. This perspective underpins industrial practices that prioritize short-term gains and economic growth over ecological sustainability (Foster, 2000).

Environmental historians argue that the adoption of Darwinian competition into economic and industrial practices accelerated environmental degradation (Worster, 1994). The relentless pursuit of resources, justified by the belief in human superiority and entitlement over nature, has led to deforestation, pollution, biodiversity loss, and climate change (Rockström et al., 2009). The concept of dominion over nature, reinforced by a misapplied Darwinian ethos, neglects the limits of ecosystems and the consequences of disrupting natural balances (White, 1967).

Furthermore, the reductionist approach inherent in the competitive model overlooks the complexity and interconnectedness of ecological systems (Levins &

Lewontin, 1985). By focusing on individual species or resources without considering their roles within larger ecological networks, environmental policies have often failed to prevent, and sometimes exacerbated, ecological catastrophes (Carson, 1962). The anthropocentric exploitation of the environment, grounded in an individualistic interpretation of Darwinism, necessitates a reevaluation of our relationship with nature to mitigate ongoing ecological crises (Katz, 1999).

### **2.3. Humboldt's Holistic Vision of Nature and Its Relevance**

Alexander von Humboldt's conception of nature as an interconnected whole, as presented in *Kosmos* (Humboldt, 1845), offers an alternative framework that emphasizes the relationships and interdependencies among organisms and their environments. Humboldt's extensive empirical observations led him to recognize patterns and connections across different scales of biological organization and geographical regions (Wulf, 2015). He introduced the idea of vegetation zones and highlighted the impact of climate and geography on the distribution of species, laying the groundwork for biogeography and ecology (Egerton, 2009).

Humboldt was acutely aware of human impacts on the environment. He documented deforestation, soil erosion, and the effects of monoculture on biodiversity during his travels in the Americas (Humboldt & Bonpland, 1807). His writings emphasized the delicate balance of ecosystems and warned against unsustainable exploitation of natural resources. By advocating for a holistic understanding of nature, Humboldt anticipated modern ecological principles that recognize the importance of biodiversity and ecosystem services for the sustainability of life on Earth (Kremen & Ostfeld, 2005).

The relevance of Humboldt's vision in addressing current ecological challenges lies in its recognition of the intrinsic value of nature and the necessity of preserving ecological integrity (Næss, 1973). His approach encourages sustainable interactions with the environment, emphasizing conservation, restoration, and the responsible stewardship of natural resources (Miller, 2005). By fostering an ecological consciousness that values interconnectedness, Humboldt's perspective provides a foundation for developing policies and practices aimed at mitigating ecological catastrophes (Folke et al., 2016).

#### **2.4. Cultural Contexts Influencing Darwin and Humboldt**

The development of Darwin's and Humboldt's theories cannot be divorced from their cultural and intellectual contexts. Darwin's work emerged during a time when British society was grappling with issues of class, empire, and industrialization (Porter, 2000). The competitive ethos of capitalism and the success of the British Empire reinforced beliefs in progress through struggle and conquest. These societal values likely influenced Darwin's emphasis on competition and natural selection as the primary drivers of evolution (Young, 1985).

In contrast, Humboldt's ideas were shaped by the Enlightenment and Romantic movements, which valued reason, emotion, and a deep appreciation for nature's beauty and complexity (Gascoigne, 2003). His education in Germany exposed him to thinkers like Goethe and Kant, who emphasized holistic understanding and the interconnectedness of phenomena (Richards, 2002). Humboldt's exposure to diverse cultures and ecosystems during his travels fostered an appreciation for the plurality of perspectives and the importance of understanding nature in its totality (Pratt, 1992).

The differing cultural contexts led to divergent scientific paradigms. Darwin's England prioritized empirical observation and the mechanistic explanations characteristic of the scientific revolution (Shapin, 1996). Humboldt's Germany was more receptive to integrative approaches that combined science, art, and philosophy (Cunningham & Jardine, 1990). Understanding these contexts is crucial for appreciating how each scientist's worldview shaped their contributions to science and how these contributions have influenced subsequent thought (Livingstone, 2003).

#### **2.5. The Interconnectedness of Nature in Modern Ecological and Evolutionary Theories**

Modern ecological and evolutionary theories have increasingly recognized the importance of interconnectedness, cooperation, and complexity in natural systems (Levin, 1998; Morowitz, 2002).

Concepts such as mutualism, symbiosis, and co-evolution demonstrate that interactions among species can drive evolutionary change and contribute to ecosystem stability (Janzen, 1980; Thompson, 2005). Lynn Margulis's

endosymbiotic theory, for example, posits that key organelles in eukaryotic cells originated from symbiotic relationships between distinct organisms (Margulis, 1970).

The field of systems ecology builds on Humboldt's holistic vision by studying ecosystems as integrated wholes, focusing on energy flow, nutrient cycling, and the dynamic interactions among biotic and abiotic components (Odum, 1983). This approach acknowledges that changes in one part of the system can have cascading effects throughout the ecosystem, emphasizing the need for comprehensive management strategies (Gunderson & Holling, 2002).

Furthermore, complexity science and network theory have provided tools to analyze the intricate connections within ecological communities (Barabási & Albert, 1999; Sole & Bascompte, 2006). Understanding these networks is essential for predicting ecosystem responses to disturbances and for developing conservation strategies that maintain ecological resilience (Peterson et al., 1998).

## **2.6. Implications for Addressing Ecological Catastrophes**

Embracing Humboldt's holistic perspective is imperative for addressing the ecological catastrophes stemming from the anthropocentric and competitive exploitation of nature. Recognizing the interconnectedness of ecological systems highlights the importance of biodiversity and the ecosystem services it provides, such as pollination, climate regulation, and nutrient cycling (MEA, 2005). Conservation efforts must therefore focus not only on individual species but also on preserving the integrity of ecosystems and the processes that sustain them (Soulé & Wilcox, 1980).

Incorporating indigenous and traditional ecological knowledge, which often embodies a holistic understanding of nature, can enhance conservation strategies and promote sustainable resource management (Berkes, 2012). These knowledge systems, like Humboldt's approach, emphasize the interconnectedness of all life forms and the importance of maintaining balance within ecosystems (Gadgil et al., 1993).

Moreover, transitioning to sustainable economic models that value ecological health over mere economic growth is crucial (Jackson, 2009). Concepts such as the circular economy and ecosystem-based management integrate ecological

principles into economic practices, aiming to reduce environmental impacts and promote long-term sustainability (Korhonen et al., 2018; Grumbine, 1994).

### 3. Conclusions

The contrasting perspectives of Darwin and Humboldt offer valuable insights into the evolution of biological and ecological thought. While Darwin's theory of natural selection has profoundly influenced our understanding of evolution, its individualistic and competitive emphasis reflects the socio-economic context of Victorian England and has contributed to anthropocentric attitudes that underlie ecological degradation. Humboldt's macroscopic vision, on the other hand, underscores the interconnectedness of nature and provides a framework for sustainable interactions with the environment.

Addressing the ecological catastrophes of the modern era requires a paradigm shift from viewing nature as a resource to be exploited to recognizing it as a complex system of which humans are an integral part. Embracing Humboldt's holistic approach can inform environmental policies, conservation efforts, and sustainable practices that prioritize ecological integrity and the well-being of all life forms. By integrating this perspective into science, education, and societal values, we can work towards mitigating environmental crises and fostering a more harmonious relationship with the natural world.

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