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Unity and Disunity in Evolutionary Biology

Deconstructing Darwinism

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This volume is dedicated to the memory of Mark B. Adams (1944–2024).—The Editors

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Part I

Introductory Essays

Toward a New Historiography

David Ceccarelli, Maurizio Esposito, and Richard G. Delisle

Abstract

The history of evolutionary biology presents well-established categorizations and labels that have significantly influenced the imaginary of evolutionism. The somewhat uncritical understanding and use of such labels demand a thorough reconsideration of traditional narratives, thus paving the way for new research avenues to emerge.

Keywords

History of evolutionary biology · Darwinism · New historiography of evolutionary biology · Presentism · Modern Synthesis · Extended evolutionary synthesis · Darwinian industry

It is not uncommon to see in major areas of research concerned with science and human affairs—the Scientific Revolution, Enlightenment, Materialism, Industrial Revolution, Cold War studies, etc.—that historical studies are accompanied by the rise of complementary or contradictory historiographies. Over time, scholars

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continually devise new methodologies, leading to the critical reevaluation of established concepts, traditions, periodization, and historical vocabulary. Curiously, the field of evolutionary biology has undergone a somewhat different fate. Here, long-standing historiographic labels such as the "Darwinian Revolution," "Eclipse of Darwinism," and "Modern Synthesis" have persisted largely unchanged for decades. Although scientists, philosophers, and historians of biology have increasingly engaged in debates surrounding these labels (especially since the 1980s), they are still used with ease. Their persistence, largely unaltered despite the shifting landscape of scholarship, invites reflection on the underlying factors influencing their longevity and the potential need for reassessment in light of contemporary insights and perspectives. No doubt, historiographical categories have long performed various important functions in evolutionary biology. Labels such as "Darwinism" and "Lamarckism," for example, were long uncritically believed to hold a heuristic value and exploited by scholars to put some order in the disputes between scientists, creating somewhat archetypical conceptual systems whose borders are, however, highly mutable. At the same time, they have served a dual purpose: delineating distinct research traditions and unifying research and institutional networks. Since the late nineteenth century, evolutionary biology frequently saw scientists grappling with the task of accurately labeling their work and rejecting labels perceived as problematic. These efforts were often instrumental in defining the parameters of research programs, establishing and consolidating schools of thought, as well as efficiently marginalizing inconvenient ideas.

By definition, historiographical categories, and particularly "-isms," are complex objects whose uncritical use could lead to ambiguity. The transformation of a scientific research program into a specific label involves complex conceptual, epistemological, and ideological interplays. Primarily, it consists in abstracting various aspects of an argument into one or more explanatory cores. Additionally, it is a process of "reification," merging diverse layers of significance and potential conceptual ramifications into a singular term. As Lovejoy (1960, pp. 4–6) argued, due to their inherent temporality, historiographical labels rarely designate a singular concept, but "distinct and often conflicting doctrines held by different individuals or groups to whose way of thinking these appellations have been applied."[1]

This volume aims to move beyond the static and often uncritical understanding of historiographic labels in evolutionary biology. Through examining the existing debate in the literature, the authors of this volume started from shared questions developing their investigative lines around profoundly intertwined historiographical, epistemological, and sociological issues:

- How are historiographical labels constructed and deconstructed over time?
- What is the relation between evolutionary biology and its history?
- Has the historiography of evolutionary biology been preponderantly whiggish? If yes, what does that mean specifically?

[1] Lovejoy (1960).

- Are scientists' retrospective interest in the history of evolutionism and historians' call for overcoming old-fashioned dichotomies irreconcilable?
- What is the impact of national styles of thinking on our understanding of evolutionary biology?
- What is the part played by mythical consideration in Darwin studies?
- Have historians and philosophers been co-opted by major evolutionists?
- Was pluralism always maintained since the inception of evolutionary biology?
- What is the impact of looking at evolutionary biology through different lenses such as "theory," "paradigm," "research program," and "research tradition"?
- Have evolutionary biologists been actively engaged in rhetorical arguments?
- Is it useful to rethink the periodization of the development of evolutionary biology by proposing a brand new one?
- Is "Darwinism" a social construct mainly generated under the impetus of the English-speaking world?
- To what extent was the Darwinian revolution an "ideological" one?
- Is it constructive to approach the field of evolutionary biology through a "mechanism-centric" view as largely done thus far?
- What is the impact of positivism and analytical philosophy on our view of the development of evolutionary biology?

The volume comprises four sections. The Introductory Essays section gathers reflections on the current state of the historiography within evolutionary biology, setting the stage for the key themes addressed throughout the book. Here, the co-editors examine the methodological and sociological foundations of conventional historiography, the relevance of "Darwin's paradigmatic story" in shaping the contemporary imaginary of evolutionism, and the multi-layered meanings and ideological ramifications of the term "Darwinism."

In Part I, titled "Deconstructing Darwinism," Antonello La Vergata highlights how the term "Darwinism" conceals a spectrum of interpretations that emerged shortly after 1859. Biology exhibited pluralism both before and after Darwin, and this richness and complexity often fostered diverse approaches and interpretations, sometimes exacerbating the apparent gap between the so-called "two cultures." Mark B. Adams's contribution, "The Evolution of 'Darwinism': Up Close and Personal," reveals an enduring tension between scientists' retrospective interest in history and historians' advocacy for transcending outdated dichotomies. The author examines the multifaceted dimensions that concepts like "evolution," "Darwinism," "natural selection," "micro-evolution," and "macro-evolution" have assumed across various contexts, dismantling the conventional "just-so-story" of Darwinism's history that has solidified within the Modern Synthesis narrative. Delving into narratives that have long lingered in the background of traditional historiography is crucial for unveiling new perspectives in contemporary historical research. In this vein, Nicolaas Rupke presents a thought-provoking and bold analysis, deconstructing the portrayal of Richard Owen in evolutionary biology as propagated by the "Darwinian industry." In his "Darwin, Archaeopteryx lithographica, and the Problem of Intermediate Species," Bogdana Stamenkovic critically analyzes

Darwin's interpretation of species genealogy about paleontological evidence, addressing the inherent challenges of reconciling rigid Darwinian gradualism with the notion of "intermediate form." Richard Delisle's chapter further explores the idea that Darwin's long argument is imbued with the classic nineteenth-century epistemological doctrine of uniformitarianism. Here, the notion of "evolutionary contingency" typically associated with Darwinism is deconstructed by examining the influence of Ernst Mayr's and Stephen Jay Gould's contributions on the subject. The section concludes with Joël Dolbeault's reflection on the epistemological nature of Darwin's theory, probing the ongoing relevance of Karl Popper's characterization of Darwinism as a "metaphysical research program."

The second section of the volume, "Around and Beyond the Synthesis," is dedicated to deconstructing the synthesis discourses that have emerged in the history of evolutionary biology. A multifaceted scenario unfolds, where synthesis attempts manifest as polycentric phenomena spread across various geographical contexts and historical phases. In "Typology/Population Distinction and Its Role in the Marginalization of 19th-Century Non-Darwinian Theories in Modern Historiography," Michał Wagner posits that historical narratives, such as Mayr's "essentialist story," played a crucial role in oversimplifying the species concept within non-Darwinian theories of the nineteenth century, strengthening the connection between Darwinism and the Modern Synthesis as well as fostering unity within the scientific community. The rhetoric of unity conceals a much more intricate history, wherein research traditions, levels, and languages of analysis present themselves in all their complexity. Joël Dolbeault's chapter "Fisher, Wright and Haldane: Three Philosophical Conceptions of Evolution," for example, discusses the different philosophical underpinnings that characterized the works of the advocates of the so-called early synthesis. In their chapter, Jan Badke, Alexander Böhm, Stefan Reiners-Selbach, and Vera Straetmanns challenge the perception of Darwinism as a dominant theory during the interwar period, a time marked by the emergence and diversification of various research pathways. In German theoretical biology, scientists attempted to overcome theoretical and methodological fragmentation by developing a philosophical framework that could unify biological knowledge, a process that marginalized the discussion of Darwinism. Among the various dynamics characterizing the context of the Modern Synthesis, the tendency to overlook figures who were not entirely aligned with its agenda also emerges clearly. Silvia Caianiello delves into this phenomenon in her work, "The Strange Story of Mosaic Evolution," focusing on the case of Gavin de Beer, whose formulation of "mosaic evolution" posed a significant challenge to the predominant selectionist explanation of macroevolutionary trends. The section concludes with Carlos Ocha inviting readers to reconsider the assumptions of the Extended Evolutionary Synthesis, discussing potential alternative theoretical scenarios that could offer a more comprehensive integration among the various multilevel phenomena that characterize biological evolution.

The third section, "Deconstructing the Historiography of Evolutionary Biology," offers a critical analysis of pivotal concepts, themes, and episodes in the history of evolutionary biology. It begins with Maurizio Esposito's reconstruction of the

emergence and evolution of crucial philosophical foundations of "evolutionism," i.e., the concepts of materialism and the historicization of nature, which set the conditions of possibility for modern evolutionary biology and, most notably, predate Darwinism. In his chapter, "What if Darwin had published his 1844 Essay?" Derek Partridge challenges the conventional notion that Darwin's evolutionary theory evolved through a strictly gradual and linear process of theoretical refinement and empirical analysis. Partridge examines the main discontinuities within Darwinian theory from the 1840s to the late 1850s through a counterfactual historical lens. Focusing on a wider time frame, David Ceccarelli questions the semantic stability of historiographical labels such as "Darwinism," "Lamarckism," and "non-Darwinian evolution" by examining how scholars assessed Darwin's endorsement of the inheritance of acquired characters during the 1909, 1959, and 2009 celebrations of the publication of the *Origin of Species*. Building upon the analysis of shifting perspectives on evolutionary theory, Juan Manuel Rodríguez Caso delves into the case study of the reception of the Anglo-centric literature on Darwinism in Mexico, showing how such incorporation sometimes led to misinterpretations and the propagation of controversies. In the following chapter, "Historicity, Temporalities and Causality: A Confusion at the Heart of Debates on Darwinism," Mathilde Tahar explores Darwin's multi-layered conceptualization of time in evolution, discussing its philosophical underpinnings and developments in the context of twentieth-century evolutionary biology. The book closes with a contribution by Erica Torrens, Juan Manuel Rodríguez Caso, and Ana Barahona, which critically analyzes the "tree of life" imaginary, discussing its epistemological and ontological commitments as well as its enduring presence despite the growing recognition of its limitations in representing phylogenetic complexity when compared to alternative visualizations.

Through diverse and frequently hybridized methodological approaches, this volume endeavors to challenge and deconstruct the binary oppositions and rigid categorizations prevalent in the historiography of evolutionary biology by favoring a polycentric reading of the history of evolutionary debates; incorporating global and local contexts; highlighting the importance of both professional specificities and contaminations in knowledge production; grappling with the inherent tension between presentist and relativist narratives; and recognizing both the advantages and the burden of embracing pluralism. This list of endeavors can pave the way for innovative avenues, thus laying the foundation for a new historiography of evolutionary biology. More than 40 years after *The Evolutionary Synthesis: Perspectives on the Unification of Biology* (1980), edited by Ernst Mayr and William Provine, it is now obvious that this earlier attempt at presenting the development of evolutionary biology proves too narrow and too biased to make sense of its inherent complexity.

Reference

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"Reformist" and "Radical" Historiographies Behind and Beyond the Unity and Disunity of the Evolutionary Thought

Maurizio Esposito

Abstract

We are in the midst of a revolutionary moment where historians, philosophers, and scientists of different opinions debate how to overcome, update, or replace the received views. This volume is an exemplary instance that records a moment of productive confusion where different alternatives and possibilities are explored and assessed. The fragmentation and disunity of historiography, which, to a certain extent, parallels the disunity of evolutionary biology, should not be a reason to despair. On the contrary, it is a stimulating opportunity to find new insightful ways to understand and rewrite the history of evolutionary thought. Notably, it is an occasion that calls for imagining new historiographies where the traditional place of Darwin and Darwinism in the history of life science is questioned, rediscussed, and reevaluated.

Keywords

Darwinism · History and historiography of biology · Evolutionary biology · Unity and disunity in evolution

History, generally speaking, is the most difficult composition that an author can undertake, or one of the most difficult. It requires a great judgment, a noble, clear and concise style, a good conscience, a perfect probity, many excellent materials, and the art of placing them in

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> good order, and above all things, the power of resisting the instinct of religious zeal, which prompts us to cry down what we think to be true.[1]

There is a thriving intellectual industry behind the history of evolutionary thought. Whether directly linked to Darwin or any other significant figures, the feat of reconstructing the pasts and presents of evolutionary biology is as alive as ever. It would be virtually impossible to follow all the yearly publications dedicated to the field, whether in English or any other language. But, for simplicity's sake, we might divide this intellectual industry into two generic historiographic categories, which I tentatively call *reformist* and *radical* ones. These categories do not pretend to pigeonhole anyone—neither in this monograph nor elsewhere-but I see them as "ideal types" that have the sole aim of charting a contentious and complicated territory, which, as it always is the case, supposes many different shades, exceptions, and overlapping. The *reformist* approaches tend to complexify the extant historiography by either adding more details or reinterpreting the received view of one figure, episode, or idea. For most reformists, the existing historiography is far too simple in that it does not consider or include what it should. From the reformist's standpoint, the received historiography either misses some crucial episodes that should not be missed or misinterprets the well-known ones. In short, the reformist scholar wants to expand, and thus reinforce, the extant tradition by making it more sophisticated and complex. On the other hand, the *radical* approach assumes that the existing historiography needs to be entirely rethought from scratch. This does not mean that the extant historiography is useless; it means that the data and interpretations of the extant historiography need to be *radically* refashioned into a brand-new plot. The word "radical" needs to be understood in its etymological sense as *Radix* (root). A change in the historiographical roots means we must go to the very foundations and reconsider them entirely. Radical approaches require audacity and a sort of stubborn self-righteousness, not only because they disrupt ingrained assumptions that have made the careers of other scholars but also because one needs to wander into unexplored territories where the possibility of making mistakes is painfully high.

Thomas Kuhn's famous distinction between normal science and revolutionary science might help clarify the distinction I am introducing here. The reformist option corresponds to what Kuhn calls "normal science." Reformists accept the general paradigm and aim to improve or advance it by adding more confirmations. To bring closer the example to our discussion, the reformist assumes that the historiography of evolutionary thought based on Darwin and Darwinism is largely fine (let's call it *Darwin's paradigmatic story*, DPS onward). The core idea of DPS is that the history of evolutionary biology hinges essentially around Darwin, whether the plot focuses on forerunners, followers, or critics. Those interested in the "pre-Darwinian" theories of evolution, those who believed in the absolute originality of Darwin, and those who study "non-Darwinian" theories of evolution all wittingly or

[1] P. Bayle, Historical Dictionary, quoted and translated in White (2014), p. 49.

unwittingly share the assumption that Darwin is the referential point from which different plots must branch off.

In this context, the sensible task of DPS's reformists is to pile up more people, institutions, countries, ideas, theories, and contexts that confirm and simultaneously expand the basic paradigmatic story. But as it happens in the context of "normal science," we eventually get to an overgrown and chaotic paradigm, which tends to collapse under the burden of those new data, people, and countless conflicting reinterpretations. To make an analogy with the history of astronomy, adding more and more "epicycles" can only work for a while. The paradigm becomes so chaotic and confusing that only a tiny cohort of highly trained people manage to have a relative familiarity with it. The paradigm grows into something so much articulated that it becomes impervious to any genuine critique and reconsideration. Kuhn called "anomalies" those unexpected difficulties and incongruences emerging along the development of paradigm itself. But "anomalies" in the Kuhnian sense can also exist in historiography, and, in particular in the DPS. As it happens with mature paradigms, the "anomalies" that purportedly contradict the DPS can be easily ignored or normalized.

Kuhn recalled that, in revolutionary periods, entrenched paradigms are challenged, and new, *radical* options are explored. Concerning the historiography of evolutionary thought, I think we are in a sort of revolutionary phase where the time for a *radical* approach is ripe. So far as I can see, we are currently enmeshed in a kind of "hundred flowers campaign" where a hundred schools of thought proliferate. I see this monograph as a telling contribution to a historiographical revolution, where reformists and radicals are quarreling on all sorts of issues: on whether we should rethink natural selection and its role in the history of evolutionary biology; on whether and how we should reassess Darwin's role in this history; on whether there is any coherent historical entity called "Darwinism" or whether we have many, often incompatible, Darwinisms; on whether the debates on modern, unmodern, hardened, softened, or extended syntheses make any historical sense or whether the histories written by scientist-historians should be amended or simply transcended. But, even if my Kuhnian diagnosis of the current situation turns out to be spurious, the monograph undoubtedly displays a genuine desire to embrace an open-minded approach to historiography and a sincere interest, for both young and older generations, to reassess DPS seriously. There is a visible eagerness to revise the assumption that sees any history of evolutionary thought as rooted in Darwin. There is growing and legitimate suspicion that, perhaps, historians have exaggerated the uniqueness and exclusivity of the nonetheless great British naturalist (no one would deny that Darwin was indeed a great naturalist). There is an increasing awareness that evolutionary thought is much more than Darwin, Victorian England, or Lamarck in post-revolutionary France. There is a shared feeling that when one opens a book or reads an article dedicated to Darwin and Darwinism, one starts to smell an unmistakable (or perhaps mystic) scent of incense. One perceives that there is something disturbingly religious in the obsession to show that evolutionary thought is essentially Darwin and evolutionary biology is, and must be, rooted in Darwin. My opinion, and I guess the opinion of a growing number of scholars, is that

we should get through the incense's smoke and look at the history of evolutionary through more secular, disenchanted eyes. Of course, this monograph is not the first to do the job. Many distinguished scholars-including some who have contributed to this monograph-have campaigned for a radical historiography for decades. And if today we have the feeling that the DPS might be on the verge of collapsing, we owe it to them, including, most notably, Mark Adams (2024), to whom this volume is dedicated.

But if DPS eventually collapses, what would be the task of present and future historians? It is still too early to answer this question and I can only provide a few fragmentary suggestions. Like Kuhn reminded us in his *The Structure of Scientific Revolutions* (1962, 1970)], the revolutionary periods are characterized by many engaging debates over the very conceptual foundations of old and new paradigms. No one has the definitive answers on the paths to follow. When something old is about to die and something new arises, confusion and chaos rule. But disagreement, fragmentation, and disunity are signs of vitality, not hopelessness. One task, for instance, could be to explore the new aims, methods, and ambitions that should characterize a new historical and radical plot. We should ask ourselves what the scope of writing a new history of evolutionary thought could be. After all, every new historiography adopts a philosophy that prescribes what is and is not important to tell. We can undoubtedly be oblivious about this philosophy, but we should be equally aware that such obliviousness gives consent. We can legitimately resist embroiling ourselves in metahistorical debates, yet the price for neutrality is to accept or assume previous historiographies.

Today, it is no longer a mystery that DPS was mainly concocted by professional biologists turned historians who shared, wittingly or unwittingly, a particular agenda. The main rationale for this philosophy was to back up some particular scientific options of the moment. Ernst Mayr, perhaps one of the most committed architects of DPS, was crystal clear when, in his great history's *magnum opus*, *The Growth of Biological Thought*, he wrote that: "...most scientific problems are far better understood by studying their history than their logic" (1982, p. 6). History has a pedagogic and propaedeutic role, and the role is to clarify persistent scientific problems. This is undoubtedly a legitimate prospect for a scientist who wants to figure out where evolutionary biology comes from and where it eventually goes. Yet, pedagogical history would not be a satisfactory answer for someone interested in how, when, and why the idea of "evolution" emerged. Of course, no one should dismiss or belittle the extraordinary service biologists like Mayr, Gould, and others have delivered. After all, we would not be here discussing old and new historiography of evolutionary thought if they did not write commendable pieces of scholarship. But, as scholars, the best service we can deliver to our predecessors is not bowing to their wisdom but criticizing them and, eventually, transcending their perspectives. Elsewhere, I suggested that one first step in the process is recognizing that scientists might have different historical interests from historians and philosophers (Esposito 2021). Scientifically oriented historians hoped that they could get more conceptual transparency through history. What would be the interests

and aims underpinning new historiographies? What do we really want or expect from new histories of biology?

As far as I am concerned, a second step could be considering the plot's ambition, scale, and genre. Shall a new history be global or national? General or specific? Shall it include antiquity, early modern, and modern periods? Shall it be mainly intellectual in the sense propounded by historians of ideas? Shall it be more sociological, political, economic, etc.? Shall we use the largely outdated categories of internalism and externalism?[2] If anything, what kind of historical genre would we consider?[3] Although there are many possible answers to these questions, one thing should be clear: a *radical* sort of historiography is, by definition, ambitious. As such, it aims to provide a *novel* understanding of the whole history of evolutionary thought. "Novel" here does not mean there is no connection or continuity whatsoever with the previous "paradigm." It only means we have a *new* historiographic "paradigm," where people, events, theories, and ideas acquire different meanings and relevance. The issue is not to amend one or more details by adding further details and specifications. This is the task of *reformists*, who still cling, implicitly or explicitly, to DPS and intend to it from all threatening "anomalies." The issue here is to entirely rethink a new historiographic framework for the whole history of evolutionary thought, a framework in which all the other specific histories-biographies, national, institutional, intellectual, economic, or political narratives—can be situated.

No doubt, many historians might complain by claiming that we do not need a paradigm. If the old DPS is misleading or uninteresting for us, then we can safely replace it with a proliferation of many different stories. There is not one paradigm, not one history of evolutionary thought, but many overlapping, sometimes contradictory, stories. We have no linear plots but a web of uneven and overlapping narratives covering the globe. In short, we can dispense once and for all from any "master narrative" or "dominant discourses", as a few decades ago some "postmodernists" claimed! We should, therefore, push for pluralism and fragmentation while condemning any form of deceptive unity. For sure, the feat would be politically and morally commendable. Alas, as recent history has repeatedly demonstrated, the postmodern strategy is an excellent medicine for keeping alive the old paradigm, which has become a sort of *zombie* that persists because there are no other more accessible alternatives around. As it might be expected, not everyone has the time and will to read the whole web of all overlapping narratives, which is even difficult, if not impossible, for the insiders. For many, if not the majority, of those who want to learn about the history of evolutionary thought, there is no other option than going back to the old paradigm and, therefore, to the traditional master narratives. DPS is patiently waiting in the doorway to be promptly resurrected once the last version of the postmodern slant goes out of fashion. In short, the appeals for sweeping forms of pluralism are good-intentioned programmatic intents, but they

[2] For the issue, it might be interesting to revisit David Hull's discussion in Hull (2005).

[3] For this, one could reread the classic monograph of Hayden White, *Metahistory*, where the origin and nature of diverse historical genres are introduced and assessed (White 2014).

remain programmatic simply because they are self-defeating in the long term (if not in the short term). The quest for unity might be specious but the celebration of disunity and fragmentation might be intellectually barren. The replacement of a problematic unity with an equally problematic disunity guarantees a frustrating recurrence of the DPS. But if we admit (or at least consider) the inadequacy of postmodern solutions, one question becomes immediately urgent: from where shall we start?

Given the preliminary state of our agenda, I think it is much easier to consider first from where we should not start, i.e., from the widespread intuition, especially popular among scientist-historians, that history itself is a procession of big names and doctrines, all advancing toward the glory of the present. In this volume, La Vergata (2024) puts it straightforwardly: "...many authors still conceive and practise the history of science in the following way: they start with an accepted, familiar idea; they go backwards to its source, minimize oppositions to it, and present us with a coherent history of its triumph. Such an approach can be suitable for clear exposition, but it is essentially a form of fiction or novel" (p. 35). The approach is in fact suitable to clarify particular problems, and this was precisely the kind of history explicitly favored by Mayr and implicitly accepted by Gould. This is a conception of history as a pedagogic tool to understand the present. But I would not define those histories as "fictions" or "novels" because I do not know how a "real" or "realistic" historiography should look like. There are several ways to organize, historically, facts, data, people, and events, and all depend on tour intentions and aims[4] As the Polish American philosopher Alfred Korzybski reminded long ago, "the map is not the territory." We might add that if historical charts represented the past as "it really happened," they would be useless like the 1:1 Borgesian maps. The problem with self-serving narratives is not that they are wrong (or "unreal" like novels)—strictly speaking, all narratives are wrong, or, at least, incomplete like any map—but that they are no longer interesting. They have exhausted their epistemic and heuristic potentials. They do not satisfy the kinds of interests and expectations of the new generations. They refer to a vision of the past that has become what Richard Delisle convincingly shows in the chapter of this volume (2024), an obstacle to move on: a hindrance to think and shape new and more interesting narratives. In short, "presentist" or "whiggish" historical accounts of evolutionary thought have lost their appeal because the historiographical rationales and agendas have changed.[5] A presentist approach is no longer an interesting way to organize historical data. Of course, we should understand the notion of "interesting narratives" as "interesting" for us scholars of the early twenty-first century.

But a careful reader could immediately reply with a reasonable question: how shall we define "interesting" here? After all, what is interesting for someone is

[4] See, for instance, the famous controversy on the nature of historical writing in the 1960s triggered by Carr and Elton (see Carr 1961 and Elton 1967).

[5] On this issue, see Esposito (2021a, b).

uninteresting to someone else. Here, again, Kuhn might help us: to contemporary readers, DPS is as "interesting" as the Aristotelian Physics or Ptolemaic paradigm for a contemporary cosmologist. One might justifiably observe that cosmologists are not interested in Aristotle and Ptolemaic cosmologies simply because the latter were, according to our standards, patently wrong. But suppose we interpret the history of paradigms in the Kuhnian spirit (or, at least, according to my creative interpretation of Kuhn). In that case, we realize that no paradigms can be considered as *absolutely* true or wrong. Those paradigms are held to be true in certain periods because they resonate with a given community's conceptual, social, or political expectations. Paradigms persist as long as they are perceived as "interesting" to most members of a scientific collective. Similarly, I do not think there are *absolutely* true or wrong historiographies but more or less supported, robust, meaningful, coherent, focused, instructive, informative and, especially, interesting ones. And some historiographies are allegedly interesting because they resonate with the curiosities, concerns, and expectations of a specific community. The social mechanisms working behind the preference for certain kinds of historiographies cannot be addressed here. But at least one tentative hypothesis can be tried out and assessed. And my hypothesis hinges on at least three basic elements:

1. The community of scholars focused on the history and philosophy of evolutionary biology is much larger and heterogeneous now than when DPS was concocted.
2. Many members of this community are not primarily biologists and, thus, have interests and aims that differ from those involved in pedagogic historiographies. In other words, if the earlier histories of biology were mainly put forward by biologists who used history as a propaedeutic tool to understand better their discipline, new generations of scholars see history as intrinsically interesting and a self-sufficient discipline.
3. The increasing professionalization of the history of science and philosophy of science has made the disciplines relatively independent and sometimes even impervious to contemporary scientific interests and aims. There are conferences, journals, and departments where specific historical and philosophical issues are hotly debated, independent of what scientists currently do or think.[6]

If these three elements are true (or partially true), we have some element to understand why we are amid a paradigmatic historiographic shift. New people, different training, and readings and, thus, a distinct community with diverse goals and interests make some sort of change expectable. When in the early 1980s Ernst Mayr published his historical magnum opus, *The Growth of Biological Thought*, he could easily expect to monopolize and lead the interests of the majority of those involved in the discussion, whether other scientists or humanists (as M. Adams

[6]Of course, I am not suggesting that scientists are no longer involved. They are and they should be involved. What I am suggesting is that they cannot lead or monopolize the debate anymore.

brillantly shows in Chapter "The Evolution of "Darwinism": Up Close and Personal" (2024) of this volume). This does not mean everyone had to emulate Mayr's scholarship and write like he did. Instead, it meant that anyone interested in the history of evolutionary thought had a limited repertory of topics to address, and those topics hinged around Darwin and Darwinism. An intellectual industry such as Darwin's could only be possible when the interests and careers of many scholars coalesced into one agenda. True enough, one could always be free to explore other topics or other figures, but the risk for mavericks snooping out of the box was to be immediately ostracized or, more plausibly, ignored because they did not fit the real interests and aims of the accepted paradigm. Today, the situation in which the debate is carried on is much more dynamic and confusing because we have no Mayrs or Goulds to push forward a specific intellectual program. As a matter of fact, we do not have one generic Darwinian agenda but many, often incompatible, agendas. Accordingly, we are in a situation where historiographic norms, aims, interests, and goals are constantly challenged and reassessed.

A short consideration of some of the contributions of this monograph is a telling demonstration. When, for instance, Rupke (2024), in this volume, introduces Richard Owen's evolutionary view, which was deeply indebted to Kant and Kantian tradition, he challenges a few fundamental elements of DPS. First, he convincingly shows that Owen was far from being a simple-minded creationist and a staunch opponent of organic transformism. On the contrary, although he rejected Darwin's specific kind of transformism, he was a transformist after all. Perhaps even more importantly, through Owen, Rupke shows us that there were many other alternatives on the nineteenth-century intellectual menu beyond the simplistic dilemma between evolutionism and creationism. When Ceccarelli (2024) persuasively shows in this volume that there have been at least three Darwins and three Darwinisms, each fit for the contextual Darwin's celebrations in 1909, 1959, and 2009, we understand (and are entitled to conclude) that DPS is, in the best case, deeply misleading or highly restrictive. The selective readings of the British naturalist throughout the twentieth and early twenty-first centuries transformed Darwin into a useful flag for various agendas and purposes, most of them extra scientific and eminently political. When Torrens et al. (2024) notice that the very image of the "tree of life" is ambiguous and open to different interpretations, they invite us to question one of the most cherished images of most received historiographic views. When Baedke et al. (2024) argue that in the early twentieth century attempts to unify biology were not customarily subsumed under Darwin and Darwinism, they demonstrate that the plot of Modern Synthesis needs to be dramatically retooled. In short, I venture to say that most, if not all, chapters of this monograph put one or more nails in the coffin containing the corpse of DPS, whether the contributions address historical and historiographic issues or focus on the opportunity (or inconvenience) of keeping some form of "Darwinism" in contemporary evolutionary biology.

So, what do we really expect from new histories of biology? In the fascinating text of Bayle I quoted at the beginning of this short introductory essay, the French skeptic concludes that the historian should resist ". . .the instinct of religious zeal, which prompts us to cry down what we think to be true." No doubt, few historians of science would have today the "religious zeal" that Bayle meant while proffering

these words. But there is a specific sense in which the quote is still actual. Religious zeal does not only apply to traditional religions or divinities. It can also be applied to secular figures. The cult of personality has been a common phenomenon in human history. From Augustus to Napoleon and from Stalin to Mao, the divinization of political figures has been a vast and recurrent social praxis. But the urges of prior or posthumous sanctification not only apply to significant political figures but also affect sportsmen, singers, actors, and to be sure, naturalists and scientists. Even a committed and sophisticated Darwinian like S. J. Gould, in his massive volume, *The Structure of Evolutionary Theory*, noticed the misplaced religious zeal Darwin has often enthused:

> The *Origin*, as a volume of single authorship, maintains a stronger plot line and features fewer inconsistencies than the Bible; but Darwin and the Good Lord do share the common trait of saying something about nearly everything. Wrenched from context and divorced from a crucial assessment by relative frequency, a Darwinian statement can be found to support almost any position, even the most un-Darwinian. . .Since Darwin prevails as the patron saint of our profession, and since everyone wants such a preeminent authority on his side, a lamentable tradition has arisen for appropriating single Darwinian statements as defenses for particular views that either bear no relation to Darwin's own concerns, or that even confute the general tenor of his work. . .(Gould 2002, p. 148)

We can debate whether Gould belongs to the crowd that enthusiastically incensed (and incenses) their Salopian patron saint. I only add that I cannot see any fundamental difference between secular and non-secular patrons. What both have in common, in fact, is a misplaced and committed fetishism that normally blinds most of our critical faculties. Bayle, in this sense, gives a piece of advice that is still meaningful to us: to write good histories, we need, among other things, to refrain from any sort of fetishistic celebration of the figures we are considering in our plot. Unfortunately, the history of evolutionary thought, and evolutionary biology in particular, has been peculiarly affected by an uncompressing religious zeal skirting a cult of personality. I see this monograph as a further attempt to cure the history (and perhaps future historians) of evolutionary thought from such an unnecessary disease. We can continue to enthusiastically study Darwin, Darwinians, and, more generally, different kinds of evolutionism without feeling the urge to canonize anyone. We can lean toward *reformist* or *radical* outlooks and devise more or less convincing plots, but, following Bayle, we can wisely leave the saint patrons to the churches and national heroes to the autocracies.

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Darwin as a Unifying Figure in Evolutionary Biology: A Meta-historical Overview

David Ceccarelli

"The choice of unification is not a free one; if science fails to unite, it will fail to exist" Ackoff Churchman, 1946

Abstract

The idea that the unification in evolutionary biology centered around Darwin's theory has been extensively discussed in the literature. "Darwinism" remains an elusive historiographical category due to its heterogeneity and evolution over time. The legacy of Charles Darwin prompts reflection on the continued relevance of invoking his name in contemporary discussions, highlighting the multilayered meanings and ideological implications embedded in the term "Darwinism."

Keywords

Darwinism · Darwinian age · Modern Synthesis · Extended evolutionary synthesis · Charles Darwin · Unified theory

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1 Unification as a Regulative Ideal

The pursuit of unification has long served as a regulative ideal in modern science. Over time, this principle has faced growing skepticism from epistemologists and historians of science. Scholars increasingly challenged the notion that sciences can be neatly organized into hierarchically structured systems of explanation based on epistemic monism, and increasingly argued for pluralist approaches to scientific knowledge (Kitcher 1999). This shift is particularly evident in the field of life sciences, where the quest for a "unified theory" capable of comprehensively explaining biological phenomena has captivated biologists over the course of several decades, and yet proved to be extremely complicated (Callebaut 2010; Love 2013; Dupré 2015).

It is not easy to determine when biologists embraced unification as a guiding principle. In hindsight, many would point to the advent of evolutionary theory as a pivotal moment that established a cohesive research agenda in the life sciences (Delbrück 1949; Singh 2023). As early as 1876, American biologist Alpheus Packard (1876, p. 592) argued that it was only after the publication of Charles Darwin's *Origin of Species* that the zoological, paleontological, and embryological data collected by the previous generations of naturalists began to be extensively reexamined based on the study of genealogical relationships among life forms. Almost a century later, Theodosius Dobzhansky famously stated that "nothing in biology makes sense except in the light of evolution" (Dobzhansky 1973). However, well before Charles Darwin published the *Origin* in 1859, the idea that biological science should adhere to the epistemological standards of physics had played a significant role in directing naturalists toward the pursuit of "universal" laws or principles. During the eighteenth and early nineteenth centuries, natural history primarily consisted of the meticulous description and categorization of organisms through a rigorous inductive approach, and yet several naturalists proposed "general laws" aimed at unveiling the dynamics underlying phenomena such as hybridization, development, inheritance, and adaptation (Hoquet 2010; Corsi 2011; see also McLaughlin and Demarest 2022).

The endeavor to establish parallels between biological sciences and physics, along with the pursuit of identifying general laws in biology, gained prominence within the epistemological culture of determinism and methodological uniformitarianism. The concept of nomic spatiotemporal invariance (Haufe 2015), asserting that the laws of nature remain consistent over time and that one could generalize retrodictions about the past based on what we observe in the present, served as a foundational methodology in the nineteenth century. This indeed contributed to emancipating science from non-naturalistic approaches, and deeply influenced various disciplines, including modern evolutionary biology (Gould 1965; Ceccarelli 2018; Delisle 2019).

Scholars have often argued that Newton's unification of terrestrial and celestial mechanics represented the paradigm for evolutionary science during the nineteenth century (Depew and Weber 1995; Weber 2011). Michael Ruse (1975, p. 166) wrote that Charles Darwin regarded Newtonian astronomy as a model for science, aspiring

to be the "Newton of biology" by following the methodological ideals of classical mechanics. While Darwin ardently believed that biological evolution adhered to law-like processes, in accordance with the uniformitarian principles advocated, among others, by his mentor Charles Lyell, some scholars have raised doubts about his commitment to emulating Newton's methodology (Pence 2018). Historian Jon Hodge, for instance, argued that Darwin had initially entertained the idea of constructing a theoretical system aligned with Newtonian celestial mechanics. During the nineteenth century, this was perceived as having a threefold pyramidal structure: "at the base were particular astronomical observations [...], in the next level up were lawful generalisations," whereas at the top there were "the lawful causes, the lawful forces of gravitation and inertia" (Hodge 2009, p. 54). To Hodge (Ivi, p. 68), Darwin however gradually moved away from this ideal structure, acknowledging that natural selection lacked a "law of its own."

In spite of this, physics, with its inclination toward generating unifying explanatory frameworks, continued to serve as a reference model in the biological sciences. As Kaufmann and Gare (2015) remarked, many biologists remained "children of Newton" and dreamed of "a grand theory that is epistemologically complete and would allow lawful entailment of the evolution of the biosphere." In line with the nineteenth-century epistemological culture, epistemic monism was often deemed more scientifically reliable and productive than embracing pluralism. This inclination toward a singular perspective was rooted in the belief that a unified framework would offer greater clarity and coherence to scientific discourse. Moreover, the presence of theoretical inhomogeneity was often viewed with skepticism, as it was thought to be potentially detrimental to the construction and preservation of scientific and institutional networks. The lack of theoretical uniformity could indicate weakness, particularly to those on the anti-evolutionary side.

The need to conform to the epistemological standards of physics appears clearly from the works of several evolutionists between the nineteenth and the twentieth centuries. In his brief foreword to neurologist Frederick Tinley's *The Brain from Ape to Man* (1928), American paleontologist Henry Farfield Osborn remarked on the striking contrast between "exact" sciences and biological sciences. In the exact sciences, the "uniformity of laws and principles" allowed for a unified explanatory framework that made physical, chemical, and astronomical phenomena comprehensible. In anatomy, physiology, pathology, and heredity, Osborn highlighted, scientists had not even reached the threshold of exactitude:

> With increasing energy, refinement and ingenuity, we know all the organs revealed in comparative and human anatomy, in both their grosser and their finer structure. We know also the history of the rise of many of these organs in the course of past time and what their functions and relations are, but there is always the Great Beyond of the unknown, and perhaps unknowable, which is summed up in the word life (Osborn 1928, p. xv).

Over time, the attempt to draw parallelisms between the unified explanatory framework of physics and biological sciences has faced criticism for at least two reasons. As early as 1925, philosopher Alfred North Whitehead maintained that modern physics had significantly challenged the traditional deterministic worldview,

which appeared to be a no longer tenable reference model. Moreover, biology had long leaned on the epistemological underpinnings of physics and needed to reestablish itself as an independent science, affirming the specificities of its objects of analysis (Dupré and Nicholson 2018, p. 8). During the twentieth century, several biologists would endorse this view. Evolutionary biologist Ernst Mayr, for example, staunchly championed the autonomy of biology in relation to physics. His central argument revolved around the perception of biology as a marginalized science due to its historical association with vitalism and teleology (Mayr 2004). At the same time, he contended that fundamental principles inherent in the physical sciences, such as essentialism, determinism, reductionism, and the postulation of universal laws, found little, if any, applicability in the realm of biology. This discrepancy resulted in a notable methodological and epistemological gap. Unless one advocates for reducing biological phenomena to their underlying physical components, the endeavor to unify all sciences within a singular framework should be relinquished. If a unification process occurred in biological sciences, Mayr remarked, it took place mainly thanks to the principles outlined by Charles Darwin, who acknowledged the specificity of living phenomena without falling into non-naturalistic fallacies (Ivi, Chap. 2).

2 Darwin as a Unifying Figure in Evolutionary Biology

The claim that the unification in evolutionary biology centered around Darwin's theory has been extensively discussed in the literature. When Packard wrote his brief note on the progress of American zoology in 1876, crediting Darwin with initiating a new phase in the study of natural history, Darwin's theory was far from being the only game in town. Packard himself remarked that, in the USA, this new evolutionary era was marked by the emergence of an "original and distinctively American school of evolutionists" he referred to as "neo-Lamarckians" (Packard 1876, p. 597). Darwin had catalyzed a period of scientific ferment rather than a unanimous consensus among his peers. The *Origin of Species* had certainly contributed to inflaming the already rich debate on species transformation, providing the scientific community with invaluable empirical data and a powerful argument. It unequivocally represented a pivotal and irreversible turning point in the history of biological sciences (Bowler 2013). However, as often discussed in historiography, its reception was far from a straightforward process in the 1860s and 1870s. It sparked a vigorous debate that, over time, fragmented into a multitude of critiques, opinions, and reinterpretations (Moore 1979; Glick 1988; Numbers and Stenhouse 2001; Engels and Glick 2008).[1] Since the early reviews of *Origin*, Darwin's ideas have undergone

[1] As shown by Johnson (2020), Darwin's effort to claim originality and emphasize the explanatory superiority of his theory over rival ones indirectly shows how varied was the theoretical panorama of evolutionary studies during the mid-nineteenth century.

a complex reframing process that, in some sense, echoes the words expressed by the protagonist in Robert Musil's *The Man Without Qualities* (Musil 1996):

> As soon as some leading thinker comes up with an idea it is immediately pulled apart by the sympathies and antipathies generated: first its admirers rip large chunks out of it to suit themselves, wrenching their masters' minds out of shape the way a fox savages his kill, and then his opponents destroy the weak links so that soon there's nothing left but a stock of aphorisms from which friend and foe alike help themselves at will. The result is a general ambiguity (Musil 1996, p. 412)

Between the nineteenth and the twentieth centuries, pluralism and theoretical inhomogeneity continued to prevail in evolutionary biology. This stage was later termed as the "eclipse of Darwinism," which, according to the standard historiographical account, was marked by the waning influence of Darwinian evolutionary theory and the rise of alternative theories that downplayed Darwin's key insights, such as random individual variation, gradualism, branching phylogeny, and natural selection. It was only in the mid-twentieth century that evolutionary biologists regained alignment with the principles of Darwinism. This process, better known as "Modern Evolutionary Synthesis," involved the integration of population genetics, zoology, paleontology, and botany within a revitalized Darwinian paradigm, signaling a return to the foundations of evolutionary thought (Huxley 1942). As Betty Smocovitis (1999, p. 279) highlighted, at this stage Darwin was "reinvented" as the founding father of evolutionary biology, establishing order in a field marked by a plurality of methods, level of analysis, and research traditions (Delisle 2009). In a way, the Modern Synthesis substantiated the pursuit of unification that had long characterized biological sciences. This occurred during an era in which explaining complex phenomena through micro-level theories was considered a significant epistemological virtue, aligning with the call for the "unity of science" and the dismissal of metaphysics championed by philosophers associated with the Vienna Circle (Smocovitis 1992). In the words of Stephen Jay Gould (1994, p. 135), such intellectual context stood out for its emphasis on "the abstract, the simplified, the fully universal, the underlying principles that build the unique and complex from the small and general, all fueled the preference within evolutionary biology for a comprehensive micro-level theory that could build all scales and sizes by smooth extrapolation."

The claim that the Modern Synthesis was also, and most importantly, a "Darwinian" synthesis raises various historical and conceptual issues. First of all, it brings us to the even more trap-laden task to determine which aspects of Darwin's theory of evolution must be maintained in order for an evolutionary theory to be considered "Darwinian." Mayr claimed that the evolutionary synthesis had long been erroneously named "neo-Darwinism," a term which originated in the late nineteenth-century debate on biological heredity to distinguish between those who believed that the inheritance of acquired characters was a source of variability and those who dismissed it as an essentially unconfirmed hypothesis. According to Mayr, the more appropriate name for the Modern Synthesis should be simply "Darwinism," as it did not introduce revolutionary changes to Darwin's theory. Instead, it enhanced it with

a more robust understanding of speciation and eliminated the concept of soft inheritance, which was included in Darwin's original theory. The Modern Synthesis revolved around the more distinctive component of Darwin's original theory of evolution, namely the "interplay of variation and selection"[2] (Mayr 2004, pp. 129–130; see also Hodge 1977; Ruse 1975, 2013).

It is however worth wondering what it means for "selectionism" to be the core of Darwinism. If by core we mean, precisely, an essential component of the *explanans* of the Darwinian evolutionary theory, it must be noted that Darwin used natural selection as the primary agent responsible for the adaptation of organisms, as a complementary and auxiliary agent capable of reinforcing alternative mechanisms (i.e., use and disuse), and that he dismissed it to make sense of some specific evolutionary patterns (Delisle 2021, pp. 95–97). Darwin zealously considered natural selection as his most precious contribution to the debate on species transformation (Johnson 2020); however, especially in his late works, he consistently relied on pluralistic accounts of organic change, to the extent that scholars would employ his "pluralism" against those attempting to equate Darwinism solely with selectionism.

Presumably, the association between Darwinism and selectionism emerged from regarding natural selection as the most original contribution of Darwin to the nineteenth-century debate on species transformation. This view has however diverted attention from the theoretical and historical complexity of Darwinian theory. Darwin's theory had a complex and multilayered structure. Not only is it trivial to consider it "a unitary entity" (Mayr 1985, pp. 755–772, 755), but it also displays a significant diachronic change. Over the course of the years, Darwin refined his "long argument" by incorporating insights from his peers, assimilating criticisms, and broadening the scope of his analysis. The study of his personal writings, correspondence, and publications reveals several changes of opinion on themes such as the endorsement of gradualism, the role of geographic isolation in speciation, and the use-inheritance hypothesis. Over time, scholars have feasted upon such theoretical and historical complexity, dissecting specific theoretical components, extrapolated from various stages of Darwin's intellectual development, which aligned with contemporary theoretical models. As Barzun (1958, p. 75) provocatively argued, "Darwin's hedging and self-contradiction – enabled an unscrupulous reader to choose his texts from the *Origin of Species* or the *Descent of Man* with almost the same ease of accommodation to his purpose as if he had chosen from the Bible."

From a historical perspective, the heterogeneity inherent in and surrounding Darwinism suggests that seeking rigid and enduring conceptual entities in the history of ideas often leads to dead-end alleys (Esposito 2021). On this matter, David Hull famously proposed to treat Darwinism as an evolving conceptual system. In his work "Darwinism as a Historical Entity," featured in the renowned book *The Darwinian*

[2] As outlined by Richard Delisle in this volume, Mayr seemed to have gradually embraced a broader interpretation of Darwinism, departing from the positions he had initially developed and advocated between the 1940s and the early 1960s.

Heritage (1985), Hull contended that, despite frequent assertions about the "essence" of Darwinism, there is no unanimous agreement among scientists regarding its fundamental tenets. Mayr (1985) famously asserted that Darwin's theory encompassed five distinct sub-theories: evolution itself, common descent, gradualism, multiplication of species, and natural selection. In his early "pan-adaptionist" phase, Stephen Jay Gould stated that the "essence" of Darwinism lay in the assertion that "natural selection creates the fit," and that "variation is ubiquitous and random in direction," providing only "the raw material" (Gould 1977, p. 44). According to Richard Lewontin (1974), if Darwinism does possess an essence, it should be identified at a more general level: the replacement of a metaphysical view of organic change with a naturalistic—if not materialistic—conception. Like any successful conceptual system, Hull remarked, Darwinism was "protean" and demonstrated flexibility over time, rendering the pursuit of any essential nature misleading.[3]

Drawing on Stephen E. Toulmin and evolutionary epistemology, Hull argued that both the network of scientists supporting Darwin and the conceptual system identified as "Darwinism" evolved phylogenetically as a lineage (Hull 1985, pp. 778, 781). These two levels, the Darwinians and Darwinism, are undoubtedly interconnected, yet there seems to be a weak causal nexus between them. In the aftermath of the publication of the *Origin*, scientists actively defended Darwin's ideas without necessarily embracing all its tenets. Conversely, scholars who accepted the major principles of Darwin's proposal did not automatically affiliate themselves with the label "Darwinians." Figures like Thomas H. Huxley and George Mivart shared similar criticisms against Darwin's theory, particularly regarding the belief in gradualism and the creative power of natural selection (Ivi, 797). Despite this, they have gone down in history as two distinctly antithetic figures: Huxley, known as Darwin's bulldog and the foremost advocate of Darwinism in the Victorian Age, and, on the opposing front, Mivart, the scientist who articulated some of the most biting criticisms of natural selection, eventually becoming a prominent anti-Darwinian figure. The history of post-Darwinian debates on the theory of evolution is replete with authors whose embrace or rejection of "Darwinism" was often driven more by ideological and philosophical commitments than purely scientific considerations (Ceccarelli 2021).

3 Past and Present Scenarios

In the contemporary debate on evolution, the dynamics surrounding the unifying role of Darwin's figure and the varied interpretations of Darwin's legacy persist. In his contribution to the volume *Extended Synthesis* (2010), Werner Callebaut pointed

[3]This shift in interpreting Darwin's theory as an evolving historical entity poses the problem whether Darwinism needed to preserve its core identity to exist as a "unified" conceptual lineage or if it could undergo continuous change, as long as it maintained a certain level of internal coherence (Hull 1982, 1988).