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ARTYKUŁ ORYGINALNY / ORIGINAL ARTICLE

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The Liminal Nature of the "Eclipse of Darwinism" as a Critical Phase in the History of Evolutionary Biology

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Abstract: The term "eclipse of Darwinism" was popularized by Julian Huxley, who used it to describe the period before the emergence of the evolutionary synthesis. The idea of the "eclipse" was later criticized, because it was used to show the superiority of the synthesis over earlier evolutionary theories. This historiography was opposed by Peter Bowler and Mark Largent. According to Bowler, Darwin was not a central figure in nineteenth-century biology. Rather, most naturalists worked within a different evolutionary paradigm. Largent suggested replacing the term "eclipse" with "interphase of Darwinism", which would better reflect its nature as a preparatory phase for the creation of the synthesis. However, the philosophical presuppositions on which these interpretations were built, while helping them to avoid the errors of their predecessors, also led to new problems. The problems with the interpretations of the "eclipse" can be explained by its "liminal" character. Liminality is an intermediate period between the old and the new. Because of its transgressivity, a liminal period is hard to integrate within a given structure and is mostly excluded from the latter. When analyzing works of historians dealing with the "eclipse" we encounter a common tendency towards excluding this period from historical narratives.

Keywords:

Charles Darwin;
eclipse of Darwinism;
Ernst Mayr;
Peter Bowler;
interphase of Darwinism;
liminality;
axial periods;
historiography of biology;
Darwin industry

When Jean-Paul Sartre reflected on the problem of slime, he noted that its transgressive character causes cognitive dissonance. On the one hand, viscosity disgusts us because, as something intermediate between solid and liquid, it does not fit into the established order of the world, transcending as it does our presup-

posed cognitive categories, while on the other hand, it enriches human life by undermining the latter. [1] But can we speak of transgressivity in the context of philosophy and the history of science? For this purpose, one should go beyond the classical epistemological perspective used in historical research and enrich it with an ontological one. The use of ontology in historical research has been postulated by, among others, Michael Bentley [2] in the context of a broad understanding of history, and David Hull in that of the history of science. According to Hull, most problems in the history of science can be solved through the abandonment of an epistemological perspective in favor of an ontological one – in which historians interpret scientific theories as historical entities. Hull noted that most philosophers of science view scientific theories in an essentialist way, and this perspective leads to a distortion of the history of science. In his view, therefore, historians must abandon essentialism for a population-based approach that better captures the nature of the development of science. [3] Putting aside the validity of Hull's proposal for a new ontology of the philosophy of science, it is worth noting that this ontological perspective provides a new angle for tackling some of the classic problems of the history and philosophy of biology. One such problem is the question of the status of the "eclipse of Darwinism". In this article, it will be argued that the main problems with the interpretation of the latter result from the problematic ontological status of this period, which confronts the historian with a cognitive dissonance similar to Sartre's slime.

The term "eclipse of Darwinism" was popularized by Julian Huxley in his **Evolution: The Modern Synthesis**, and denoted a period at the turn of the nineteenth-century when Darwin's theory of evolution was losing popularity in favour of other, non-Darwinian theories of evolution such as neo-Lamarckism, orthogenesis, and mutationism. The "eclipse" ended with the advent of the modern synthesis. [4] From an ontological point of view, it has an intermediate character, because

[1] See Jean-Paul Sartre, **Being and Nothingness: An Essay on Phenomenological Ontology**, Routledge, London 1969, pp. 610–612.

[2] See Michael Bentley, "Past and «Presence»: Revisiting Historical Ontology", *History and Theory* 2006, Vol. 45, No. 3, s. 349–361, https://doi.org/10.1111/j.1468-2303.2006.00370.x.

[3] See David L. Hull, **Science as a Process: An Evolutionary Account of the Social and Conceptual Development of Science**, The University Chicago Press, Chicago — London 1988, pp. 12–17.

[4] The "modern synthesis", in the context of this article, is to be understood as a synonym for the modern synthetic theory of evolution.

it represents a historical period in which science did not move towards acceptance of Darwinism, but instead entered a state of crisis in which the correct theory was discarded in favor of other, incorrect theories of evolution. It forms a kind of gap in the development of science to which it is difficult to assign an appropriate place in the historical narrative. Following Hull's suggestions, therefore, it will be argued that the "eclipse" has a specific, transgressive ontological status, and because of that can be called a "liminal period". The main problem with the "eclipse" is that it breaks out of historians' conceptions of how science should develop. [5] It is therefore marginalized or ignored in historiographical interpretations, precisely because historians' philosophical preconceptions about the development of science do not allow them to accept such a liminal period.

The present article is divided into three main parts. The first discusses the concept of liminality and shows how it is related to the "eclipse", while the next explores how the "eclipse of Darwinism" has been marginalized in modern historiography. In the final section, the new interpretations of the "eclipse" that have been proposed by the so-called "non-Darwinian industry" — in particular by Peter Bowler and Mark Largent — will be discussed, and their way of dealing with the liminal character of the "eclipse" considered.

The "Darwin Industry" and the "Eclipse of Darwinism"

The concept of liminality was introduced by Arnold van Gennep and further developed by Victor Turner. [6] Originally, liminality was meant to denote a stage within rites of passage that, according to van Gennep, themselves consist of three phases: (a) the moment of separation — when an individual leaves his or her social position; (b) the liminal moment — when the individual remains in a state of limbo between the old and the new state; (c) the moment of incorporation —

[5] This point was dealt with in detail in Chapter 3 of Michał Jakub Wagner, **Interpretacje rozwoju biologii ewolucyjnej na przełomie XIX i XX wieku** [Interpretations of the Development of Evolutionary Biology at the Turn of the Twentieth Century], Liber Libri, Warszawa 2020. The present article should be considered an extension of this book, as it provides new perspectives and arguments pertaining to the topic discussed there.

[6] For more on the history of the concept of liminality and its use in the modern humanities, see Shalini Rana and Digvijay Pandya, "Liminality: A Close Study of Historical Roots and Theoretical Structure", *Language in India* 2021, Vol. 21, No. 10, pp. 21–43, https://tiny.pl/ wfm2q [28.11.2022].

when the individual enters the new state. [7] As Bjørn Thomassen notes, the categories proposed by van Gennep are so universal that they can be applied not only to the stages of a ritual but also to historical periods. [8] Thomassen compares the liminality of the historical period with what Karl Jaspers calls "axial periods". [9] As he writes, "Karl Jaspers' famous description of the axial age bears every element of liminality: it was an in-between period between two structured world-views and between two rounds of empire building [...] it was an age of uncertainty, where possibilities lie open". [10] Such liminal periods are further characterized by him as exhibiting "prolonged intellectual confusion" of a kind characteristic for "revolutionary periods". [11] Because of their revolutionary character, liminal periods are particularly valuable to the historian:

> If historical periods can be considered liminal, it follows that the crystallization of ideas and practices that take place during this period must be given special attention. Once liminality ends the ideas and practices that have become established therein will tend to take on the quality of structure. [12]

Thus, the study of liminal states is important, because from this stage of temporary chaos the status quo emerges. The "eclipse", as a period of crisis, of exchange of ideas, of searching for a new scientific path, corresponds to the general definition of the liminal historical period about which Thomassen writes. It lies between the moment of separation, when science moved from natural theology towards evolutionism thanks to Darwin, and the moment of integration, when a new order was created in science — namely, the modern synthesis. Theoretically, then, there is a continuum — Darwin's scientific revolution, then the period

[7] See Victor Turner, "Liminal to Liminoid, in Play, Flow, and Ritual: An Essay in Comparative Symbology", *Rice Institute Pamphlet — Rice University Studies* 1974, Vol. 60, No. 3, pp. 56–60 [53–92], https://doi.org/10.5433/2176-6665.2012v17n2p214.

[8] See Bjørn Thomassen, "The Uses and Meanings of Liminality", *International Political Anthropology* 2009, Vol. 2, No.1, pp. 16–18 [5–28].

[9] Karl Jaspers, **The Origin and Goal of History**, Yale University Press, New Haven — London 1957, p. 7.

[10] Thomassen, "The Uses and Meanings...", pp. 19–20.

[11] Thomassen, "The Uses and Meanings...", p. 17.

[12] Thomassen, "The Uses and Meanings...", p. 20.

of the "eclipse", and afterwards the emergence of the modern synthesis — which should be reflected in historical work on the development of evolutionary biology.

It seems, then, that the period of "eclipse", representing a liminal state, should be of particular interest to historians, since it preceded the synthetic theory of evolution and represents the moment when the foundations for the emergence of the latter were established. Since the 1980s, historical research has increasingly focused on investigating the "eclipse" as it was viewed at the time when a new order in science was beginning to emerge. As Frederick Churchill wrote: "What we need now is a careful search among historians of biology working in tandem with American social historians and philosophers of science to find better ways of characterizing the peculiar changes that took place in the New Biology between 1880 and 1920". [13] Such an approach was a clear departure from previous historiographical practice, which Vassiliki Smocovitis characterized as follows:

> All historical explanations had focused subsequently on the "removal of these barriers" [that block the further development of science — author's note] so that the proper path toward true scientific knowledge had been cleared of such unnecessary obstructions to scientific progress. Thus the emphasis on explaining reasons for dissent rather than reasons for consent was concomitant with the philosophical commitment that held that science was a linear, progressive activity leading inexorably to truth. [14]

Smocovitis' statement clashed with earlier interpretations of the "eclipse" proposed by biologists and historians such as Julian Huxley and Ernst Mayr. When Huxley proposed the term, he also suggested that this was a time of stagnation in the development of evolutionary biology. [15] A similar view was later promoted by Ernst Mayr. According to Mayr, although Darwin had succeeded in disseminating the idea of evolution, he had not been able to persuade the scientific community to accept the most important element of his theory — the concept of natural selection. [16] As Mayr explained, Darwinism was rejected because contemporary biologists were influenced by a number of non-scientific factors (mainly of a philosoph-

[13] Frederick B. Churchill, "In Search of the New Biology: An Epilogue", *Journal of the History of Biology* 1981, Vol. 14, No. 1, p. 191 [177–191], https://doi.org/10.1007/BF00127520.

[14] Vassiliki B. Smocovitis, **Unifying Biology: The Evolutionary Synthesis and Evolutionary Biology**, Princeton University Press, New Jersey 1996, p. 59.

[15] See Julian Huxley, **Evolution: The Modern Synthesis**, George Allen and Unwin, London 1945, pp. 17–28.

ical and religious kind). [17] The "eclipse" is thus viewed by Mayr as an abnormal period in the history of biology, in which irrational/unscientific influences disturbed the progress of science. [18] The interpretations of Mayr and Huxley created a pejorative image both of this period and of the naturalists active during this time. As later commentators went on to note, [19] by discrediting the biologists who were working during the "eclipse" the architects of the modern synthesis sought to establish their own theory as the one and only proper continuation Darwin's work. In this way, they created a certain dominant interpretation according to which the history of evolutionary biology *de facto* began with Darwin and was continued by the architects of the synthesis. Historians who supported this view are now referred to as the "Darwin industry". [20] Ultimately, the historiography of the "Darwin industry" has removed the period of "eclipse" from the continuum of events and created a simplified historical narrative in which the modern synthesis emerges directly from the Darwinian revolution. But how is this fact to be interpreted in the light of the concept of liminality?

On the surface, the use of the category of liminality itself adds little to the discussion about the "eclipse" beyond a mere change of labelling. The latter, it must be added, is rather obvious, since the term "eclipse" itself suggests an interpretation of this period as being something transitional. To make full use of the concept of liminality, one would need to examine more closely the role that liminal entities might play in a given structure. The problem with liminal entities lies primarily in their transgressive character, which arises from the fact that they are suspended between an old and a new state, and do not possess the properties of either of these. As Victor Turner noted, depending on the culture, liminality can either be

[16] See Ernst Mayr, **The Growth of Biological Thought: Diversity, Evolution, and Inheritance**, The Belknap Press of Harvard University Press, Cambridge — London 1982, pp. 517–519.

[17] See Ernst Mayr, **One Long Argument: Charles Darwin and the Genesis of Modern Evolutionary Thought**, Harvard University Press, Cambridge 1991, pp. 38–39.

[18] See Mayr, **The Growth of Biological Thought...**, pp. 516–517.

[19] See, e.g., Joe Cain, "Rethinking the Synthesis Period in Evolutionary Studies", *Journal of the History of Biology* 2009, Vol. 42, No. 4, p. 639 [621–648], https://doi.org/10.1007/s10739-009-9206-z.

[20] See, e.g., Peter J. Bowler, **The Non-Darwinian Revolution: Reinterpreting a Historical Myth**, The Johns Hopkins University Press, Baltimore — London 1988, pp. 196–198; Richard G. Delisle, "From Charles Darwin to the Evolutionary Synthesis: Weak and Diffused Connections Only", in: Richard G. Delisle (ed.), **The Darwinian Tradition in Context**, Springer, Cham 2017, p. 134 [133–167].

considered a state to which society must pay special attention, and which is to be treated as sacred, or the transgressive character of liminality can be seen as a threat to the social order, and because of that as something to be destroyed. [21] Turner, citing the work of Mary Douglas, explains that for those who want to maintain the social structure at all costs, liminal states must be excluded (i.e. hedged around with certain prescriptions, prohibitions and conditions) as elements that go beyond the established system of classification and so amount to some kind of destructive anarchism. [22] Douglas notes that exclusion of transgressive entities is a common practice, as their inclusion forces one to abandon an existing mode of classification and to create a new one, something which is a rare occurrence, due to the conservative nature of culture. [23] Thus, if historical periods can also be liminal, it is to be expected that they will meet with one of the two reactions Turner mentions: distinction or exclusion. Assuming that the structure here is a historiographical narrative, and that the individuals responding to such a liminal period are historians themselves, one can hypothesize that liminality is being eliminated by them in order to preserve a particular image of the history of science that they themselves subscribe to. Certainly, such an interpretation would be consistent with the relationship that the "Darwin industry" stands in to the "eclipse", where the liminality of the latter threatens the narrative promoting the privileged position of Darwinism and its contemporary supporters.

The exclusion of the "eclipse" takes place at the interpretative level, where historians are obliged to point out why it is an anomalous element that ought to be ignored in historical research. The historical works of Mayr, who is probably the most important representative of the "Darwin industry", can serve here as an example of this sort of practice. Mayr openly advocates an internalist interpretation of the development of science, but makes an exception when he writes about the "eclipse", which in his works is seen as the result of philosophical and ideological influences: i.e. it is interpreted externalistically. [24] The "eclipse" and the theo-

[21] See Victor Turner, **The Ritual Process: Structure and Anti-Structure**, Cornell University Press, New York 1991, pp. 48–50.

[22] See Turner, **The Ritual Process...**, pp. 108–109.

[23] See Mary Douglas, **Purity and Danger: An Analysis of Concepts of Pollution and Taboo**, Routledge, London — New York 1984, pp. 36–41.

[24] See Mayr, **The Growth of Biological Thought...**, pp. 3–6; Mayr, **One Long Argument...**, pp. 38–39.

ries developed during it are thus literally treated by him as something that exists outside of science, not fitting into its structure. Non-Darwinian theories of evolution become transgressive entities that on the one hand claim to be scientific, but on the other cannot be so, because their genesis is not a scientific one. By marginalizing non-Darwinian theories, Mayr attempts to maintain the narrative in which Darwinism and the modern synthesis are the only valid paths of scientific development on the one hand, and to justify his own beliefs about the rationality of science on the other. According to Mayr, science is producing better concepts that explain nature in ever more accurate ways, with faulty theories being eliminated by natural selection in the noosphere. [25] The very existence of non-Darwinian theories can be seen as undermining this cumulative vision of science, as after Darwin's discovery his research was not continued: instead, a number of concepts were developed that directly challenge the veracity of his theory. Non-Darwinian theories, therefore, not only undermine Mayr's vision of the evolution of science, but also challenge the revolutionary nature of Darwinism. Mayr thus recognizes the liminal character of the "eclipse", and behaves like Douglas's conservative who, faced with liminality, decides to disregard it as something threatening to the structure of science.

David Hull's historiography can serve as an another interesting example of the practice of marginalizing the "eclipse". As was mentioned earlier, Hull's ontological approach to historiography proposes interpreting theories as historical entities: that is, entities that change over time and, like species, form phylogenetic trees. Thus, if Hull wants to marginalize the "eclipse" because he sees it as a "liminal" period that disrupts his view of the history of biology (i.e. one in which the development of evolutionary biology began with Darwin and was directly continued by the modern synthesis), he must reflect this in his ontology. Therefore, in Hull's interpretation, non-Darwinian theories developed during the "eclipse" are treated as belonging to a phyletic lineage separate from the mainstream of biology that originated in Platonic idealism. [26] On this reading, the "eclipse" is eliminated from the historical narrative because the development of evolutionism is treated

[25] See Mayr, **One Long Argument...**, pp. 132–133; Ernst Mayr, **What Makes Biology Unique? Considerations on the Autonomy of a Scientific Discipline**, Cambridge University Press, Cambridge 2004, pp. 162–163; Ernst Mayr, "The Advance of Science and Scientific Revolutions", *Journal of the History of the Behavioral Sciences* 1994, Vol. 30, No. 4, pp. 331–332 [328–334], https://doi.org/10.1002/1520-6696(199410)30:4<328::AID-JHBS2300300402>3.0.CO;2-0.

[26] See Hull, **Science as a Process...**, pp. 41–46.

as synonymous with the "phylogeny" of Darwinism. Because of this, non-Darwinian theories are seen as "foreign bodies" that *de facto* do not belong to the history of biology.

The Problem of the Liminality of the "Eclipse" in Peter Bowler's Historiography

With the change in approach to the history of evolutionary biology that the statements of Churchill and Smoctovits signified, historiographical interpretations began to emerge that did not ignore the "eclipse of Darwinism" as the "Darwin industry" had done. In opposition to this approach, the "non-Darwinian industry" — as Peter Bowler put it [27] — began to form. It started to focus on the "eclipse", and on the naturalists working then. The need for such a historiographical initiative was partially generated by the development of Evo-Devo, and the resulting realization that many important discoveries in the field had been made during the previously overlooked "eclipse of Darwinism". These new interpretations were to show how the success of Darwin's theory was followed by a crisis and resurgence of non-Darwinian theories, and how the "eclipse" led to the emergence of the modern synthesis. The "non-Darwinian industry", with its emphasis on the study of the "eclipse", seems to present a very different part of the spectrum of responses to liminal entities, in that it sides with the devotional impulse where liminality is concerned. In practice, however, as will be shown below, its interpretative efforts reproduced many of the missteps committed by the historiography of the "Darwin industry" itself.

The two names most often mentioned in connection with non-Darwinocentric interpretations of the "eclipse" are the aforementioned Peter Bowler and Mark Largent. Bowler's books, such as **The Eclipse of Darwinism or The Non-Darwinian Revolution**, had a major impact on the modern historiography of nineteenth-century natural sciences, and many contemporary historians support his interpretative framework. [28] With his reinterpretation of the "eclipse of Darwin-

[27] See Peter J. Bowler, "Do We Need a Non-Darwinian Industry?", *Notes and Records of the Royal Society of London* 2009, Vol. 63, No. 4, pp. 393–395 [393–398], https://doi.org/10.1098/rsnr.2009.0008.

[28] See Peter J. Bowler, "Revisiting the Eclipse of Darwinism", *Journal of the History of Biology* 2005, Vol. 38, No. 1, pp. 23–24 [19–32], https://doi.org/10.1007/s10739-004-6507-0.

ism", Bowler created a historiography that provided a unique counterpoint to Mayr's. To distance himself from the legacy of previous historians, he focused on overturning the prevailing interpretation of the "eclipse of Darwinism" and demonstrating the true meaning of Darwin's theory in the context of Victorian biology. [29] He concluded that the nineteenth-century image of Darwin differed from modern interpretations of his persona. The Victorian Darwin had been a symbol of an evolutionist movement that, in itself, had little to do with his own ideas. [30] According to Bowler, the majority of scientists accepted evolution, but not in the form proposed by Darwin. [31] Darwin's theory proved too radical for its time, so most scientists returned to earlier, more easily understood evolutionary theories, such as Lamarckism. These were more consistent with their own research, which focused on reconstructing the history of life — the kind of studies Darwin was not particularly interested in. As Bowler concluded, they were working in a different paradigm than Darwin's, locating themselves within that of "developmental evolutionism". [32] According to this interpretation, Darwin was the "catalyst" who renewed interest in the idea of evolution. This elevated him to the position of a revolutionary, as even his contemporaries grasped how important he was for the popularization of evolutionism. [33] Nevertheless, the true significance of his theory was only recognized during the modern synthesis. In fact, according to Bowler, research done during the "eclipse" was essential to the emergence of the latter. As he states in his book **Life's Splendid Drama**, during the "eclipse" evolutionists conducted active research, especially in phylogenetics, leading to the development and transformation of this discipline. [34] Their research, although initially ignoring Darwin's work, gradually led to an acceptance of his theory. The arrival of the evolutionary synthesis and the recognition of the correctness of Darwin's theory were therefore natural consequences of the progress of science:

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[29] See Bowler, **The Non-Darwinian Revolution...**, p. 19.

[30] See Peter J. Bowler, **Charles Darwin: The Man and His Influence**, Basil Blackwell, Oxford 1990, pp. 14–16.

[31] See Bowler, **The Non-Darwinian Revolution...**, p. 47.

[32] See Peter J. Bowler, **Life's Splendid Drama: Evolutionary Biology and the Reconstruction of Life's Ancestry 1860–1940**, The University of Chicago Press, Chicago — London 1996, pp. 7–11.

[33] See Bowler, **The Non-Darwinian Revolution...**, pp. 4–5, 22.

[34] See Bowler, **Life's Splendid Drama...**, pp. 2–4.

> Modern Darwinism extends certain key ideas that were developed, either explicitly or implicitly, by Darwin himself, and which were ignored by many biologists of the immediately post-Darwinian era. Changing styles of phylogenetic research helped to articulate these more generally Darwinian insights quite independently of the rise of the new selection theory. Even those evolutionists who still accepted a role for non-selectionist mechanisms could thus participate in the formulation of a Darwinian world view. [35]

Thus, the biologists of the "eclipse" period were able, quite independently of Darwin, to arrive at conclusions similar to his. Here, however, the following question must be asked: if "developmental evolutionism" paved the way for a synthetic theory of evolution, could a synthesis have arisen entirely without Darwin's involvement? Bowler sought to answer this question in his counterfactual study **Darwin Deleted**. One of its theses was that if Darwin had not published his theory, the turn of the twentieth-century would have still looked the same as in a world with Darwinism, with one difference: biology would have been dominated by neo-Lamarckism and other non-Darwinian theories. [36] Bowler believed that even under such a scenario biologists would have worked out the theory of natural selection, and that the idea for this would have emerged from an "alliance" of geneticists and field naturalists: "Evolutionism would be seen as the product of the regular processes of scientific discovery, of normal rather than revolutionary science (to use T. S. Kuhn's terms) or at least of a continuous series of mini-revolutions rather than one big one". [37] However, this interpretation is problematic, especially if one analyzes it from the perspective of Kuhnian philosophy, as Bowler suggests doing in the above quote.

In his books Bowler is pretty open about his philosophical inspirations. In **The Eclipse of Darwinism**, [38] as well as in later works, [39] a crucial place in his historiography is occupied by the philosophy of Thomas Kuhn — especially the latter's

[35] Bowler, **Life's Splendid Drama...**, p. 442. See also Bowler, **Life's Splendid Drama...**, pp. 433–446.

[36] Peter J. Bowler, **Darwin Deleted: Imagining a World Without Darwin**, The University of Chicago Press, Chicago — London 2013, pp. 98–104.

[37] Bowler, **Darwin Deleted...**, p. 286. See also Bowler, **Darwin Deleted...**, pp. 284–286.

[38] See Peter J. Bowler, **The Eclipse of Darwinism: Anti-Darwinian Evolution Theories in the Decades Around 1900**, The John Hopkins University Press, Baltimore — London 1992, pp. 11–12.

[39] See Bowler, **The Non-Darwinian Revolution...**, pp. 1–2; Bowler, **Life's Splendid Drama**..., p. 15.

concept of scientific revolution. Although Bowler notes that Kuhn's theory of scientific change is too simplistic to be fully adapted to the history of evolutionism, [40] as the Darwinian revolution did not manifest itself as a singular shift in science, but rather as a slow process of integration of different approaches that ended in their unification during the modern synthesis, he still juxtaposes his own analysis of the Darwinian revolution with Kuhn's analysis of the Copernican one. While aiming to uncover differences between these [41] he also tries to find similarities: for example, by comparing the roles that Darwin and Robert Chambers played in the development of evolutionism with those of Copernicus, Kepler and Galileo in the development of heliocentrism. [42] This ultimately serves as a central argument for his main thesis to the effect that nineteenth-century Darwinism did not in fact have the status of a paradigmatic theory. [43] On this interpretation, Darwin was a visionary who forged ahead of his time but did not fit the prevailing paradigm of evolutionism. Even so, this interpretation represented a shift from one extreme — the marginalizing of the influence of non-Darwinians by the "Darwin industry" — to another: the marginalization of Darwin himself. Mayr, in particular, drew attention to this, stating that Bowler, wishing to faithfully present the influence of nineteenth-century biologists on the advancement of science, omitted the most important of them — Darwin. [44] Here one can refer to Kuhn, to show how his philosophy generates this problem. The Kuhnian model does not allow one to treat researchers operating outside of the dominant paradigm as fully-fledged scientists, because they are not participating in "normal science". [45] In this context, if Darwin's theory was not part of "developmental evolutionism" then he could not in fact have been contributing to science.

Recall that the liminality of the "eclipse" would be evidenced by the fact that there was a continuum in which (a) Darwin played an important role in the cre-

[40] See Bowler, **Life's Splendid Drama...**, pp. 17–18.

[41] See Peter J. Bowler, **Evolution: The History of an Idea**, University of California Press, Berkeley — Los Angeles — London 1989, p. 2.

[42] See Bowler, **The Eclipse of Darwinism...**, p. 12.

[43] See Bowler, **The Eclipse of Darwinism...**, p. 12, 28.

[44] See Ernst Mayr, "The Myth of the Non-Darwinian Revolution", *Biology and Philosophy* 1990, Vol. 5, No. 1, pp. 90–91 [85–92], https://doi.org/10.1007/BF02423835.

[45] See Thomas S. Kuhn, **The Structure of Scientific Revolutions**, The University of Chicago Press, Chicago 1996, pp. 18–19.

ation of evolutionary biology, (b) post-Darwinian evolutionists rejected his theories and created new non-Darwinian theories of evolution, and (c) the modern synthesis was a return to Darwin's ideas. Bowler eliminates this liminality by rejecting postulate (a) and adopting in its place the idea that before the synthesis there was a "developmental evolutionism" which led straight to point (c). By removing the transitionality of the "eclipse", Bowler fails to answer the question of why, after the publication of **On the Origin of Species**, a number of theories arose that stood in open opposition to Darwinism. The "eclipse" no longer has a liminal character, as Darwin is excluded from the realm of science. By marginalizing Darwin, Bowler presents the history of evolutionism as a process that consisted of a series of discoveries culminating in the triumph of the correct theory — i.e. the "modern synthesis". Therefore, when Bowler describes the history of "developmental evolutionism", he ultimately focuses on how its explanatory potential continued to weaken and how new discoveries have led to a resurgence of Darwinism. As a consequence, he focuses on the failed research programs undertaken by the proponents of neo-Lamarckism (*Entwicklungsmechanik*), [46] the connections between the orthogeneticists and idealist philosophy and essentialism, [47] and the prevalence of typological thinking. [48] All of these are identified as causes of the decline of non-Darwinian theorizing, and as obstacles to the acceptance of Darwinism. In the end, his interpretation boils down to a vision of scientific development as the process of "removing barriers" that Smocovitis wrote about. In part, Kuhn's philosophy itself promotes such a narrative. As noted by Hasok Chang, his philosophy assumes that each paradigm is subject to a "life cycle", where this means that from the moment of its first being accepted by the scientific community it is destined to undergo a depletion of its explanatory potential as it encounters new anomalies, and to always ultimately be displaced by another paradigm. [49] In this sense, a historian who studies past paradigms and attempts to fit them into the whole history of a given discipline will be compelled to focus on the crises that enabled new paradigms come to existence.

[46] See Bowler, **The Eclipse of Darwinism...**, pp. 76–77.

[47] See Bowler, **The Eclipse of Darwinism...**, p. 220.

[48] See Bowler, **The Non-Darwinian Revolution...**, p. 59.

[49] See Hasok Chang, **Is Water H_2O? Evidence, Realism and Pluralism**, Springer, Cambridge 2012, p. 258.

Of course, one may wonder at this point whether the liminal nature of the "eclipse" can be presented at all in the context of Kuhn's philosophy. The latter's model of scientific revolutions imposes exceptional limits on the interpretative possibilities of a historian wishing to demonstrate the transitionality of a given period. This is mainly due to the fact that Kuhn based his model on the assumption that the evolution of science takes place in a saltationist manner. Such a model does not allow for the existence of a transitional state in science, because paradigms are closed wholes that transition from one to another by evolutionary leaps. Using David Hull's terminology, it can be said that Kuhn's model assumed the existence of the essence of a paradigm. Essentialism, in turn, as Mayr wrote, [50] is incompatible with gradualism — let alone with the idea of transitionality — because it presupposes the existence of a static core that defines being. In Kuhn's philosophy, the closest thing to transitional moments are periods of crisis in science, which are located precisely between the old paradigm and the new one. One could argue that Kuhn's idea of a crisis is precisely a description of a liminal state, where scientists are at their most creative and innovative in searching for a new paradigmatic theory. This description can also be regarded as corresponding to what happened during the "eclipse". Bowler initially used the concept of crisis to interpret the "eclipse", before going on to explore fully the idea of "developmental evolutionism". In **The Eclipse of Darwinism** he wrote that the "eclipse" "seems to resemble the crisis state before the consolidation of a new paradigm". [51] But still, even with this similarity to liminality, scientific crises cannot be considered a part of the history of any discipline, as they do not count as a part of science. In Kuhn's philosophy, the state of crisis occurs when a paradigm in an established discipline collapses, which in turn triggers calls for a successor, or for an explanation of the anomalies causing the crisis. [52] During the crisis scientists, deprived of their paradigm, continue their research, which delves more into the realm of philosophy than of real science. [53] The problem here is that for Kuhn, the mere existence of a paradigm constitutes the main criterion of demarcation. So, as long as there is no established paradigm that dictates the rules and determines the conditions for solving scientific problems, any knowledge-creating activity pursued cannot be

[50] See Mayr, **The Growth of Biological Thought...**, p. 407.

[51] Bowler, **The Eclipse of Darwinism...**, p. 11.

[52] See Kuhn, **The Structure of Scientific Revolutions...**, pp. 82–84.

[53] See Kuhn, **The Structure of Scientific Revolutions...**, pp. 47–48.

considered fully scientific. [54] Thus, if one treats the "eclipse" as a period of crisis, then according to Kuhn's philosophy the theories proposed during that period should not be recognized as fully scientific, as they neither triggered a period of normal science nor were subsequently established as a paradigm. This provides grounds for recognizing such theories as irrational and irrelevant to the advancement of science, thus validating the conclusions of historians like Mayr and Hull. Referring to the "eclipse" as a period of crisis is tantamount to casting it beyond the realm of science, and liminality is therefore again excluded from the narrative.

Ultimately, Bowler, along with the historians of the "Darwin industry", eliminates liminality from his narrative. Depending on which interpretation one appeals to, he either portrays the "eclipse" as a moment of crisis which, according to the philosophical model on which he builds his interpretation, is not scientific, or undermines Darwin's influence on the development of nineteenth-century biology by making the "eclipse" not a moment of transition, but a period that needed to be overcome. Treating the "eclipse" as a period of crisis or of degeneration of the paradigm of "developmental evolutionism" justifies its omission from historical research because, in the last analysis, as a period during which erroneous theories were developed it is irrelevant to the history of evolutionism. What is interesting here is that Bowler himself recognized those problematic consequences of his historiography. As he wrote, [55] historians referring to his works often drew erroneous conclusions, stating that the theories from the "eclipse" period were completely unscientific, or that Darwin was not an important figure in the history of evolution and his work was derivative of the theories of Chambers or Ernst Haeckel. Bowler dissociated himself from both of these conclusions, emphasizing that they were not only incorrect, but also misinterpreted his intent. [56] Yet I would

[54] See Thomas S. Kuhn, "Logic of Discovery or Psychology of Research", in: Thomas S. Kuhn, **The Essential Tension: Selected Studies in Scientific Tradition and Change**, The University of Chicago Press, Chicago 1977, pp. 272-277 [266-292].

[55] See Bowler, "Revisiting the Eclipse of Darwinism…", pp. 24–28.

[56] Similarly, Bowler's work on the "eclipse" has also been used to criticize Darwinism and the modern synthesis as instances of unchallenged and unexamined dogma — something which also runs counter to his intentions (see Bowler, **The Eclipse of Darwinism…**, pp. 224–226). One such use of Bowler's works can be seen in Robert F. Shedinger's **The Mystery of Evolutionary Mechanisms**, in which he argues that the "resurgence" of Darwinism in the twentieth century occurred not for scientific but for philosophical reasons, and was pursued by scientists who wanted to separate biology from metaphysics and theology. See Robert F. Shedinger, **The Mystery of Evolutionary Mechanisms: Darwinian Biology's Grand Narrative of Triumph and the Subversion of Religion**, Cas-

argue that such "erroneous" conclusions were entirely justified, given the way in which he went about creating his historical narratives. Like the "Darwinian industry" before him, his historiography focuses on the exclusion of specific historical figures in order to construct a coherent narrative. Until historians manage to show how the transition from the Darwinian revolution to the creation of the synthesis via the "eclipse" happened without attempting to exclude any of these stages, no subsequent interpretation can be expected to capture the specificity of the "eclipse" as a moment of creation of a new scientific *status quo*.

The Interphase of Darwinism as a Pseudo-Liminal Period

It might seem that the solution proposed by Largent best captures the true meaning of the "eclipse", especially as he himself tries to address the problems facing other interpretations. According to him, the notion of the "eclipse of Darwinism" introduced into the history of biology a problematic discontinuity, which imposed on researchers an interpretative dichotomy with regard to this period: the "eclipse" was to be treated either as a period of marginalization of Darwinism in favor of other theories, or as one of complete rejection of Darwin's theory. However, both of these interpretations had a common conclusion: the continuity of the advancement of biology was restored with the emergence of the modern synthesis. This approach allowed for many of the scientists conducting research at the turn of the nineteenth- century to be dismissed as not contributing to the progress of science. [57] The "eclipse" metaphor should therefore be abandoned. Largent instead proposes that we talk about the "interphase of Darwinism". In biology, the interphase is the longest phase in the life of a cell, in which it prepares for mitosis or meiosis. For Largent, the period of the "eclipse" was of a similar nature: just as the interphase corresponds to a cell's preparation for mitosis, the interphase of Darwinism was supposed to be a period of preparation for the creation of the modern synthesis. [58]

On the surface, Largent's approach perfectly captures the liminal character of

cade Books, Eugene 2019, pp. 66–94.

[57] Mark A. Largent, "The So-Called Eclipse of Darwinism", in: Joe Cain and Michael Ruse (eds.), **Descended from Darwin: Insights into the History of Evolutionary Studies, 1900-1970**, American Philosophical Society, Philadelphia 2009, pp. 3–4 [3–21].

[58] See Largent, "The So-Called Eclipse of Darwinism...", pp. 17–18.

the "eclipse", as he treats the whole period as a preparatory step for the conceiving of the modern synthesis. Hence, the "interphase" is an interpretation focused on the synthesis and its arrival: one that places investigations into all of the changes and discoveries that occurred during the "eclipse" in a transitional perspective. Nevertheless, what is interesting here is that even in this interpretative scheme, where liminality is highlighted, Largent has still interpreted the history of the "eclipse" as a history of Darwinism only. Admittedly, he considered Darwinism a theory that had evolved and changed over time, but he still accepted that it was the prevailing scientific perspective. So, when Largent wrote about naturalists of the "eclipse" period, he meant not the scientists who opposed the theory of natural selection but the ones who interpreted it differently from how it is understood today. In the article "The So-called Eclipse of Darwinism", where he proposed his interpretation, he did not refer to the proponents of neo-Lamarckism or other non-Darwinian evolutionists; he focused on Vernon L. Kellogg, a Darwinist who actively fought against them. [59] Largent presented the "eclipse" as a period permanently dominated by Darwinism — with non-Darwinian theories marginalized, as he argued in his other work, [60] and their influence mostly confined to popular-scientific literature. [61]

This distinction between mainstream science and its more marginal popular-scientific counterpart splits scientific thought illegitimately into two disparate systems. It could even be said that by calling non-Darwinian theories "popular-scientific", Largent was trying to retain at any cost a single progressive line of development in respect of evolutionary biology, and in this way eliminate the liminal character of the "eclipse". He simply rejected the gap created by this period, doing so by dismissing the whole idea of an "eclipse", together with all of its competing theories. In deprecating non-Darwinian theories as merely "popular-scientific", he expelled them from the domain of science, such that they could be ignored in the context of considerations pertaining to the history of the development of biology. The question of why they emerged at all then remains open. As was mentioned

[59] See Largent, "The So-Called Eclipse of Darwinism…", pp. 7–8.

[60] See Mark A. Largent, "Darwinism in the United States, 1859–1930", in: Michael Ruse (ed.), **The Cambridge Encyclopedia of Darwin and Evolutionary Thought**, Cambridge University Press, Cambridge 2009, pp. 230–231 [226–234].

[61] See Christian C. Young and Mark A. Largent, **Evolution and Creation: A Documentary and Reference Guide**, Greenwood Press, Westport — London 2007, p. 110.

above, Mayr, Hull and Bowler used similar tactics when erecting a barrier between Darwinism and non-Darwinism in the form of ideological influences (Mayr, Hull) and paradigmatic differences (Bowler). In Largent's case, the distinction between mainstream science and "pop-science" suggests that discussions between Darwinists and non-Darwinists were not scientific as the views of the latter were not respected or even taken seriously by the former. The problem facing all of the aforementioned interpretations of the "eclipse of Darwinism" is that they cannot accept the possibility that science could have been shaped by more than one influence. Those interpretations presuppose that there is always some kind of barrier that does not allow scientists with opposing views to shape each other's worldviews. The liminal character of the "eclipse" thus proves too problematic to be fully included in the historiographical narrative.

Conclusions

The main problem that can be identified in existing interpretations of the "eclipse of Darwinism" is the impossibility of inscribing a time continuum in the development of science in which Darwin changes the trajectory of the development of biology, his theory is rejected in favor of non-Darwinian theories, and then a modern synthesis is established. The midway moment of this brief crisis of Darwinism, which I have termed liminal, poses the most problems, as it contradicts historians' presuppositions about how science should develop. However, despite this cognitive dissonance, it seems that this period can also teach us much about the current *status quo* in science. As representatives of the "non-Darwinian industry" have noted, it is in this period that we should look for the answers to questions about how the synthesis came about. However, in order to do so, it would be necessary to show that during the "eclipse" there was a rational, scientific discussion between Darwinists and non-Darwinists about the evolution of species. This is one thing that all of the aforementioned interpretations failed to show. The historiography of both the "Darwinian" and the "non-Darwinian industry" focused on disabling the liminal nature of the "eclipse". Thus, they attempted to construct a narrative in which there was always one main line of scientific development, in which there was no room for a period of indeterminacy — i.e. one in which science was not dominated by a single research perspective. The common denominator that unites all these interpretations and prevents them from achieving this is their assumption of a specific epistemological perspective: cogni-

tive monism. Hasok Chang has described it as follows: "Monism about scientific knowledge springs from the notion that science is the search for the truth about nature; since there is only one world, there is only one truth about it, and only one science that should seek it". [62] In Mayr's, Hull's and Largent's historiographies, this monism manifested itself in their discrediting of non-Darwinian theories and presentation of the history of evolutionary biology as the history of Darwinism. In the case of Kuhn's philosophy, and Bowler's historiography, monism took on a different form. As Chang has noted, in Kuhn's case monism manifested itself in his conviction that only one paradigm could be valid in each discipline during each period of normal science. [63] When Bowler argued that there was one dominant paradigm which contributed to the dismissal of Darwinism, he was adopting the same monism as Kuhn. As Bowler saw it, Darwinism was incompatible with "developmental evolutionism". Thus, the domination of the latter excluded all other alternatives. What all those interpretations have in common is the fact that they reject the pluralism characteristic of the "eclipse" period in favor of a monistic view of science in which there is no place for conflicting perspectives. [64]

Monism precludes the existence of liminality, because it does not allow one to explain the transition from one state to another. As in monistic ontology, no other state of things exists, and this means that in cognitive monism, likewise, only one view is valid and the rest should be disregarded. Hence, in the end, monist historians interpreting the "eclipse" are unable to show what the scientific basis for the rejection of Darwinism by non-Darwinists was, or how the research of non-Darwinists contributed to the development of biology. Translating this situation into Van Gannep's terminology, it can be said that monists are unable to capture the moment of separation and incorporation. At most, they may succeed in grasping one while omitting the other — as was the case with Bowler. In order to do proper justice to the specificity of the development of evolutionism during the "eclipse", one would have to create an interpretation sufficiently inclusive to allow for equal treatment of the different research perspectives that emerged during this period. However, it will not be possible to arrive at such an interpretation, as

[62] Chang, **Is Water H_2O...**, p. 259.

[63] See Chang, **Is Water H_2O...**, p. 224.

[64] For more detailed discussion, see Wagner, **Interpretacje rozwoju biologii ewolucyjnej...**, pp. 224–228.

long as the historiography of biology continues to be constructed on the basis of cognitive monism.

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