Transformations of Lamarckism: From Subtle Fluids to Molecular Biology

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In June 2009, the 23rd Annual International Workshop of the History and Philosophy of Science took place in Jerusalem to celebrate the 200th anniversary of the publication of Lamarck's *Philosophie Zoologique* (1809). The workshop resulted in a volume: Snait B Gissis and Eva Jablonka's *Transformations of Lamarckism*. More than just celebrating the 200th anniversary of the publication of *Philosophie Zoologique*, the main aim of this collective volume is to cast a light over the contemporary relevance of some of Lamarck's ideas—specifically, ideas about the generation of developmental variation and its role in the change of organisms—to recent advances in biology. The central message of the volume is that a Lamarckian perspective should be taken into account in biology in order to produce a new evolutionary synthesis that would describe and explain the biological world better than the classical theory of evolution (that is, the Modern Synthesis).

As conveyed by the title, Lamarckism includes very different perspectives, not all of which necessarily correspond to the historical Lamarck's ideas. That is why, in this volume, the term “Lamarckism” refers to a general stance about the way organisms change over time. More precisely, “Lamarckism” here is focused on the generation of developmental variation: the causal role of the environment in development is one of its main themes. “Darwinism” here is defined as a view attributing a central role to natural selection, thereby stressing the causal role of the environment in the selective process. As explicitly stated in the preface, no contributor means to oppose Lamarckism to Darwinism. There are advantages and disadvantages to this terminology, as I shall explain.

The volume is structured into five parts, preceded by two introductory essays dealing with the new perspectives opened by Lamarckian problematics (Gabriel Motzkin) and with Lamarck's life and way of thinking (Pietro Corsi) respectively. Each part explores the topic of the volume from a specific point of view expressed in its title: “History”, “The Modern Synthesis”, “Biology”, “Philosophy”, “Ramifications and future directions”. All these aspects are essential in order to understand the transformations of Lamarckism over time and its relevance with respect to the new developments in contemporary biology.

The first part—“History”—presents the historical transformations of Lamarckism, from the 1820s to the 1940s. It addresses in particular the diversity of Lamarckian ideas and their relation to Darwinism in different countries and over time (Sander Giliboff; Charlotte Weissman; Laurent Loison). It is worthwhile reading it for the following reasons. First, it gives the chance to have a fairly comprehensive image of the varieties of Lamarckism. In particular,
it shows that the common tendency to identify it with the inheritance of acquired characters is wrong-headed. Actually, the inheritance of acquired characters was a widespread and uncontroversial idea in the 19th century (Richard W Burkhardt Jr). Second, it explores the relationship between biology and other dimensions and disciplines, for instance, the impact of the political situation of a nation on the acceptance or the rejection of Lamarckism (Nils Roll-Hansen), and the way evolutionary (Lamarckian) ideas as a metanarrative had an influence on the emerging field of sociology during the second half of the 19th century (Snait B Gissis).

The second part—“The Modern Synthesis”—is about the classical theory of evolution, which emerged between the 1920s and the 1950s as the synthesis of Mendelian genetics and Darwin’s vision of evolution by natural selection. The volume rightly stresses the fact that the Modern Synthesis was constructed in opposition to Lamarckism: it relied on a Weismannian view of Darwinism and therefore centered on a rejection of the inheritance of acquired characters (supposed to be typically Lamarckian). More broadly, the Modern Synthesis represented a rejection of soft inheritance, defined as the gradual change of the hereditary material by use and disuse, by some internal progressive tendency, or by the direct effect of the environment (Marion J Lamb; Adam Wilkins). In so doing, biologists of the Modern Synthesis produced the split between development and heredity, which characterized biology until the 1980s (Scott Gilbert). This second part of the volume already conveys its central message: that it is now time to articulate the study of development and evolution in a broadly Lamarckian way in order to describe and explain the way the biological world changes over time more adequately.

The third part—“Biology”—is pretty technical. It deals with the nature, origins, construction, and inheritance of developmental variation, that is, phenomena that biologists often describe as Lamarckian. It is composed of a series of informative articles introducing new research advances in biology about the following topics: developmental and phenotypic plasticity (Stuart A Newman and Ramray Bahat, Erez Braun and Lior David, Sonia E Sultan, Marcello Buiatti), different forms of epigenetic inheritance (Eva Jablonka, Minoo Rassoulzadegan, Peter D Gluckman, Mark A Hanson and Tatjana Buklijas, Marcello Buiatti, Moshe Feldman and Avraham A Levy, Jan Sapp, Scott Gilbert), stress responses (Arkady L Markel and Lyudmila N Trut; Sivan Pearl, Amos Oppenheim and Nathalie Q Balaban). It exhaustively shows why, in the light of such new developments, biology needs a revival of a Lamarckian perspective, in particular the idea of soft inheritance reformulated in modern epigenetic terms. More precisely, it provides good evidence that the inheritance of non-genetic factors and, more broadly, development can play an explanatory role in biology.

The fourth part—“Philosophy”—contains some reflections on the possible integration of a Lamarckian perspective in contemporary biology and on its implications, both from a theoretical and a methodological point of view (Ayelet Shavit and James Griesemer, Paul E Griffiths, James Griesemer, Ehud Lamm, Evelyn Fox Keller). It addresses the urgent question of whether new discoveries on developmental variation can be integrated into current evolutionary models or are definitely incompatible with them. Like the “Biology” part, the fourth is pretty technical, discussing in detail how biologists should proceed in order to integrate such new developments into the traditional framework. Indeed, Gissis, Jablonka, and the contributors to this fourth part explicitly claim that there is no clear-cut distinction between philosophy of biology and theoretical biology.
The fifth and last part—“Ramifications and future directions”—is very short and deals with specific topics that have not been addressed before in the volume. A few short chapters discuss Lamarck’s take on the mind-body problem (Simona Ginsburg), the Lamarckian theme of progressive evolution (Francis Dov Por), epigenetic inheritance in prokaryotes (Luisa Hirschbein), and the implications of a return to a Lamarckian view for the societal role of modern biology (Raphael Falk, Alfred I Tauber). This final part ends with a critical discussion of the idea of epigenetic inheritance (Adam Wilkins), which, unfortunately, is not developed enough.

The best way to read *Transformations of Lamarckism* is to look first at the introductory essays, which provide an analytical presentation of the topic under discussion in each part and chapter, and to decide where to go from there. In fact, the volume is not particularly designed to be read from the beginning to the end, as one long argument; rather, readers are allowed, and even invited, to choose chapters guided by their own specific interests. A glossary that clarifies the notions repeatedly invoked through the entire volume will aid readers.

The main strength of the volume is that it indeed provides, as promised, an analysis of the relevant dimensions (historical, biological, and philosophical) of Lamarckism. This is meaningful because all these aspects should be taken into account in order to evaluate the contemporary relevance of Lamarckism with respect to the new developments in biology. The volume succeeds pretty well in addressing these three dimensions, in particular the historical and the biological. The “Philosophy” part could have been further developed in order to deal with some other central issues raised by the return of a Lamarckian perspective in biology (such as the role of chance in development and evolution). Additionally, by emphasizing that Lamarckism, as defined here, is not in opposition to Darwinism, the book acknowledges that Lamarck and Darwin had many points in common, in particular the 19th-century idea of the inheritance of acquired character, and helps the reader to appreciate that the Lamarckian and Darwinian visions can be complementary rather than mutually exclusive.

As to the weaknesses of the volume, I would like to underline two among them. First, while there are advantages to the broad sense given to “Lamarckism,” there are disadvantages, too. Although the contributors explicitly disclaim any necessary opposition between Lamarck and Darwin, the terminology is so entrenched that it is hard to avoid misunderstanding. Moreover, it is not clear what insight or understanding is to be gained from associating Lamarck’s name with some of the research described. Indeed, I consider that Lamarck’s ideas are not needed in order to characterize recent research advances in biology and to show their novelty with respect to the traditional evolutionary theory. Second, the question of the relative importance of epigenetic inheritance is not explored enough. The issue is raised in the last part by Wilkins, who plays the role of the devil’s advocate. Nevertheless, more critical remarks would have been welcome to make the central message of the volume more convincing.

In conclusion, *Transformations of Lamarckism* represents a complete overview of the spectrum of Lamarckisms and its diversity. It also provides an interesting discussion of the recent research advances in biology (about developmental and phenotypic plasticity, epigenetic inheritance, stress responses, niche construction, and so on) that should be in-
tegrated into the contemporary models in biology. This is the reason why it is an essential volume for any people interested in Lamarckism or in current developments in evolutionary theory. Last but not least, this volume provides an outstanding starting point for investigating further the implications of such changes in biology from a theoretical, a conceptual, and a methodological point of view.

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