



The Rise of the “Environment”: Lamarckian Environmentalism Between Life Sciences and Social Philosophy

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Abstract

It is common to designate Lamarck and Lamarckism as the main historical references for conceptualizing the relationship between organisms and the environment. The Lamarckian principle of the inheritance of acquired characters is often considered to be the central aspect of the “environmentalism” developed in this lineage, up to recent debates concerning the possible Lamarckian origins of epigenetics. Rather than focusing only on heredity, this article will explore the materialist aspect of the Lamarckian conception of the environment, seeking to highlight that the life-supporting function of physico-chemical milieus was its cornerstone. Indeed, compared to the Darwinian conception of the environment, which focuses on interindividual and interspecific relationships in a given habitat, Lamarck’s emphasis on the dependencies of organisms on physicochemical environments appears to have given rise to a very active philosophical environmentalism. Studying the environmental Lamarckism of 19th-century philosophers and social scientists in France, Great Britain, and the United States, such as Comte, Quatrefages, Spencer, and Ward, I propose to analyze their contribution to the conceptualization of the environment. The social, moral, or psychological conceptions of human environments that proliferated in the second half of the 19th century deviated from Lamarck’s more material approach, but they were still referencing Lamarck. Examining the scope of their “Lamarckism,” this article seeks to highlight the common context of life sciences and social philosophy, in which the environment emerged as a central issue in the 19th century.

Keywords History of ecology · Lamarck · Lamarckism · Organism–environment relationship

Introduction

The concepts of “milieu” and “environment” as singular entities, rather than being formulated by naturalists themselves, are results of philosophical interpretations of life sciences by “social thinkers” of the 19th century such as Auguste Comte or Herbert Spencer (for their contribution to biological theory, see Becquemont and Ottavi 2011; Petit 2016). Historically, it is remarkable to observe that environmental notions proposed by natural scientists (“*conditions d’existence*” by Georges Cuvier, “*milieux ambiants*” by Jean-Baptiste Lamarck, and later on, “conditions of life” or “circumstances” by Charles Darwin) are plural forms,

in contrast with the notion of *milieu* proposed in the singular by Comte (1830), translated later to English by Harriet Martineau (Comte 1853) as “environment,” before being popularized by Spencer (1855; see also Pearce 2010a, b). As a result, grasping the conceptualization of the environment in this period implies practicing a combined history of life sciences, philosophy, and emerging social sciences. Yet this complex history of the notion, and the multiplicity of its uses since the 19th century, complicates the determination of its meaning, as the concept of environment refers to quite different significations. Indeed, it remains unclear if “environment” refers to (1) a set of material (physicochemical) surroundings necessary to the survival and development of organisms (Lamarckian *milieux ambiants* or *circonstances*, to which species adjust themselves); (2) the function played in a given habitat by the rarity of resources or by the existence of predators, within the process of evolution (Darwinian “conditions of life,” with an indirect effect on heredity); (3) a combination of these significations, namely a set of

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physical, biological, and populational surrounding conditions to which living beings adapt; (4) an even broader set of all “external” factors interacting with a given organism, including social, psychological, or semiotic environments believed to be proper to human societies. This oscillation of the concept of environment between its Lamarckian, Darwinian, Lamarcko-Darwinian, and broader social acceptations seems to be a constant problem from the 19th century onwards, making ambiguous its use in the singular.

In this article, I will examine the scope of what might be called “environmental Lamarckism,” in order to identify its contribution to the conceptualization of the environment between biology and philosophy. Indeed, Lamarckism, social Lamarckism, or neo-Lamarckism are often used as designations of a scientific “environmentalism” ongoing throughout the 19th century, understood as a strong emphasis on environmental factors that affect evolutionary process and individual development of organisms, as well as the transformation of human societies (see Hofstadter 1944; Campbell and Livingstone 1982). Many Lamarck or life science scholars (for instance, Bowler 2015) have considered that the principle of the inheritance of acquired characters forms the cornerstone of Lamarckian environmentalism. According to this interpretation, the importance attached to the environment weakened gradually as this principle was criticized by more established scientists such as geologist Charles Lyell or, at the end of the century, biologist August Weismann. By pursuing another interpretation of environmental Lamarckism (Jordanova 1984; Burkhardt 2013), however, I will assert in this article that the survival and development functions of the organisms, which Lamarck attributes to their relationship with physicochemical environments, cannot be reduced to debates concerning the hereditary transmission of habits acquired in contact with this environment. I will argue that acceptance of the controversial principle of inheritance of acquired characteristics is not logically required to embrace the broader Lamarckian emphasis on the environment as a set of material surroundings necessary to the survival and development of organisms. Furthermore, the continuity and harmony that Lamarck presupposes between the organism and its physicochemical milieu seems to be the fundamental component of the “environmentalism” that referred back to Lamarck during the 19th century, which can be observed among thinkers who have rejected the inheritance of acquired characteristics, such as Comte.

By tracing the materialist aspect of Lamarckian environmentalism rather than focusing only on its component concerning heredity, I do not seek to take part in the current debate about the supposed revival of Lamarck and/or Lamarckism with the recent developments in epigenetics (see Deichmann 2016; Wang et al. 2017; for a critical approach, Loison 2018). The aim of this article is to contribute to the understanding of the historical emergence of the

environment as a philosophical and biological concept, by seeking to identify the role played by different acceptations of Lamarckian environmentalism. In the first part of the article, after a brief reminder of the 18th century’s legacies in natural history and medicine with regard to the interactions between the living and their surroundings, I propose to examine the specificity of Lamarck’s conception of milieu in two directions: on the one hand, the study of the relationships of living beings to physicochemical environments in the context of Lamarck’s materialism; and on the other hand, the role of the environment in the transformation of species and within the very principle of the inheritance of acquired characters. Comparing Lamarck’s milieu to the role of the environment in Darwin’s natural selection, I will seek to elucidate why Lamarckian environmentalism had a lasting impact on biological and philosophical conceptions of the environment throughout the 19th century, even after the publication of *On the Origin of Species* (1859). Having outlined the specificities of the Lamarckian approach to the environment in natural history, in the second part of the article I will turn to the analysis of the work of the philosophers and social scientists of the 19th century who refer to Lamarck when they elaborated both biological and philosophical syntheses concerning the environment. I will first discuss post-revolutionary French environmentalism, in which Lamarck’s work was received and philosophically elaborated by Comte. Second, by discussing the controversies that took place at the Anthropological Society of Paris between 1860 and 1880 within the context of environmentalism being challenged by the question of race formation, I will seek to explore resistance to Lamarckism, particularly among social scientists who supported the idea of social reform through the environment. In the last part of the article, I will focus on some aspects of the reception of Lamarckian environmentalism in Britain and the United States by the 1850s, especially by Spencer, who elaborated, in accordance with his social philosophy, a psychological and adaptive version of organism–environment relationship. Finally, I will briefly discuss the environmental component of neo-Lamarckism, which emerged in the United States around 1890 in the wake of Weismann’s criticism of the inheritance of acquired characteristics. While American sociologists such as Lester Frank Ward struggled to maintain the very idea of environmental social action, naturalists like Alpheus Packard referred to Lamarck to highlight the role of the physical environment in evolution.

Situating the environmental conceptions of Lamarck, Lamarckism, and neo-Lamarckism in France and the United States, especially in the second half of the 19th century when they were challenged by Darwin, Darwinism, and neo-Darwinism, I hope to provide some insight on how the concept of the environment emerges and stabilizes between the two lineages, when philosophy and social sciences embraced the

naturalists' debate on the relationship between living beings and their surroundings.

Situating Lamarck's Environmentalism in Natural History

The Environmental Heritage of the 18th century: Natural History and Medicine in France

Grasping the specificity of Lamarck's conception of the environment implicitly requires an evaluation of what Lamarck owes to 18th-century environmentalism, which was already well developed in natural sciences and philosophy. Indeed, it would be misleading to reduce the whole field of the study of environmental factors on living beings to a "Lamarckism" isolated from the natural history and physiology of the preceding century. In many respects, Lamarck synthesized disparate aspects of an extant interest in the environment across several fields of life sciences and physical sciences, generating a systematic and new conception of the role of milieux in the development of individuals and the transformation of species.

As Jordanova (1984) has made clear, Lamarck's interest in the environment, and its effects on life, was not unusual for his time: the study of the reactions of organisms to their surroundings, based on the idea that that organic beings were plastic and responsive, was a view common in 18th-century physiology, based on Albrecht von Haller's work on irritability and sensibility. In this framework, it is worth mentioning the medical elaborations of sensibility, especially by the Montpellier Medical School and physicians such as Théophile de Bordeu or Paul-Joseph Barthez (Williams 1994). Sensibility is the designation given by philosophical medicine to the human faculty at the interface of the living being with its surroundings, by which it receives an impression of the external object and can react to it. Thus, sensibility refers to a continuity between the physical and the moral, between external circumstances and human mind, according to the philosophical sensualism which holds that ideas are derived from bodily sensations (on the "discourse of sensibility," see Lloyd 2013). Lamarck was well aware of these physiological and medical ideas, as well as Locke's philosophy and Condillacian sensualism.

In the field of natural history, the most significant 18th-century reference for Lamarck, in terms of environmental factors affecting living beings, is George-Louis Buffon (1707–1788). Author of the highly influential *Natural History, General and Particular, with a Description of the King's Cabinet* (1750), Buffon is often identified with a static vision of nature because he thought that species were immutable. However, if for Buffon the species do not transform, nature is constantly being altered, and varieties within

a species are modified by the continuous action of *altering causes*, including disasters occurring in the physical environment. Contrary to a tendency of the historiography of biology of the 1960s and 1970s (Foucault 1966; Jacob 1970) to emphasize the immutability of species rather than the constant alteration of nature in Buffon, it is worth underlining that his work is a fundamental contribution to the historicization of nature (Zammito 2017). By connecting the alteration of living beings with geological revolutions of the Earth, Buffon (1778) opened a gap for the consideration of the correlative transformation of the physical environment and living beings, even if this occurs in a context where the species are immutable. As Schmitt (2007) puts it, such association leads "to examine precisely the relationships between living beings and their environment, to consider minerals, plants and animals, not only separately, but in their interaction with what we would today call their 'ecosystem.'" However, far from stimulating their evolution, the alterations in physical surroundings only cause degradation of species, compared to primary and better forms.

In the late 18th century, sharing Buffon's thinking that species are immutable, Cuvier (1769–1832), a contemporary of Lamarck at the Paris Museum, deepened this link between the physical environment and organisms by relating anatomy to geological transformations. Cuvier's comparative anatomy posits that an organized being implies harmony not only between its organs, but also between the structure of the organism and the external variables that must satisfy the functions of the organism. According to his principle of "*conditions d'existence*," "nothing can exist that does not bring together the conditions that make its existence possible" (Cuvier 1817). Revisiting Cuvier's principle, better understood as conditions *for* existence, Reiss (2009) termed it "conditional teleology," an explanation of the existence of an organism by the occurrence of the necessary conditions for that existence. An organism cannot exist unless it fully satisfies its conditions for existence, involving an alignment between its structure and environmental conditions, which is to be distinguished from the Darwinian framework—deployed in the second half of the 19th century—according to which a population adapts to environmental changes (see next section). Indeed, Cuvier's conception of an organism that exists in precise external conditions does not allow for any plasticity. As Appel (1987) has underlined, Cuvier "implicitly assumed that the Creator, having considered 'the conditions of existence', had created just those organs which were needed"—thus, there is no place for use or nonuse of organs in changing circumstances. Whereas Cuvier, in the frame of his non-evolutionary view of life, brings the internal organization of living beings together with their environmental conditions, Lamarck will consider the very genesis of life and the transformation of species in relation to the environment.

Two Aspects of Lamarckian Environmentalism

Regarding Lamarck (1744–1829), two conceptions of environment should be distinguished: the first concerns a physicochemical environment sustaining life, attesting to the very strong environmental component of Lamarckian materialism; the second relates to the conception of the environment that results from the principle of inheritance of acquired characteristics. The first aspect, which represents a significant contribution to the emergence of the environment as a biological concept, is being explored more and more in the Lamarckian literature (Jordanova 1984; Barsanti 1997; Burkhardt 2013) but remains barely visible as opposed to the second, which is generally considered as the main basis of Lamarckian environmentalism (Bowler 2015). I will argue in this section that the environmental component of Lamarckian materialism is an independent line of argument with regard to heredity, and to the principle of inheritance of acquired characteristics, and further, that it has an intrinsic interest.

- (1) Lamarck underlined the necessity to avoid all metaphysical speculations on the origin of life, establishing the continuity of physical laws with biological ones (Corsi 1988). His concept of *milieux ambiants* or *milieux environnants* refers to the environment as to a physicochemical set which allows vital organization. In his *Recherches sur l'organisation des corps vivants* (1802), Lamarck postulated that “organic movement could only occur if the surrounding *milieux* support it,” elaborating the idea of a physicochemical medium that made possible the genesis of organic life. Close to the Newtonian concept of medium (Canguilhem 2001), Lamarck presupposes a “subtle fluid” assuring the role of “vital principle,” which characterizes the very function of surrounding *milieux*. As Sloan (2019) points out, this approach may be called a theory of “vital materialism,” because “Lamarck’s appeal to the causal role of Newtonian aetherial fluids grounded his theory on a concept of active matter rather than on special superadded vital forces.”

This conception of environment as an active matter supporting life implies a form of continuity, called “harmony” by Lamarck, between the organism and its surroundings. On this issue, Lamarck’s main opponent is the French physiologist Xavier Bichat, who elaborated an antagonistic view of the organism–environment relationship, claiming that “everything that surrounds the living beings tends to destroy them” (Bichat 1802, p. 2). As a specialist of postmortem changes in the body caused by disease, Bichat (1802, p. 2) privileged harmony between the organs of the body, defining life as the “sum of all functions that resist death.”

Thus, Bichat’s conception implies a discontinuity between the body and its nonliving environment, with the organism—defined by its internal forces—resisting a hostile environment that constantly undermines it. By contrast, even though Lamarck agrees with Bichat’s methodological vitalism—the concept that biological organization is the ultimate principle that allows science to discriminate between living and nonliving—he argues that organic life itself could only appear within a physicochemical milieu that allows it. This opposition between a hostile environment destroying life on the one side, and a life-supportive environment as a condition of the possibility of organic life on the other, is crucial to understanding the importance of Lamarckism in the emergence of the environment as a positive concept.

As Barsanti (1997) points out, Lamarck was looking for a new form of materialism that would offer a third way between mechanism and animism. Indeed, rejecting both the assumption of an impalpable “vital principle” and the reduction of life to the laws of mechanics, Lamarck needed a new regime of continuity between the vital organization and the matter surrounding it. The life-generating and life-supporting function of *milieux* precisely ensures this continuity. If there is “no difference between the physical laws that act in organized beings and outside them” (Lamarck 1802), living beings are only distinguished from the nonliving environment by their organization, which is itself derived from the physical state of their local milieu. As Lamarck argues (1809, p. 367), “this cause that animates the bodies that are alive is found in the environments that surround these bodies, varies in its intensity according to the places, seasons and climates of the earth, and is not dependent on the bodies it animates.” The material continuity between living organisms and the physicochemical environment is the precondition of the harmony between the organism and its environment. The vital organization, still called “the vital principle” at the beginning of the 19th century, ceases in Lamarck’s writing to be a mysterious property of living beings themselves, and becomes a transformation within the physicochemical world, made possible with a specific composition of a local milieu; for instance, in the case of the simplest plants and animals, the vital cause is precisely in the fluids and physical forces in their surroundings.

Thus, Lamarck’s approach displaces the vital principle from the living being itself to its relationship with the nonliving matter, and aquatic milieux that can generate life are then charged with a causal quality. As shown by Tirard (2006), Lamarck (1802), in order to explain the generation of life, elaborates the con-

cept of “*orgasme vital*.” The vital “orgasm” allowing the general organization and acquisition of the simple functions results from the action of the subtle fluids surrounding the gelatinous matter. Lamarck elaborates a new materialistic metaphysics where the function of milieu is fundamental.

Therefore, Lamarckian materialism implies a positive and life-supportive conception of the environment, unfolding independently of continuing debates on heredity.

- (2) By implying that each generation inherits habits that the previous generation has acquired by adjusting itself to a changing environment, the Lamarckian hypothesis of inheritance of acquired characters also explains the importance given to the environment in this lineage. As Gayon (2006) explains, Lamarck did not use the term “heredity,” nor the “inheritance of acquired characters,” but rather writes of the transmission of “acquired faculties.” Acquisition of these faculties is based on the law of their use and disuse according to changing “circumstances.” The initial definitions of these “circumstances” by Lamarck are quite comprehensive: they are “somehow inexhaustible” and concern “the influence of climates, temperature variations in the atmosphere and all surrounding environments [*milieux environnans*], the diversity of places, habits, movements, actions, and finally the means of living, conserving, defending and reproducing” (Lamarck 1801). Such a comprehensive set of environmental factors appears close to the notion of “climate,” still being used in this sense in the first years of the 19th century (see Cabanis 1802), with reference to the Hippocratic tradition that was attentive to the particular characteristics of places and their inhabitants (on this Hippocratic lineage, see Glacken 1967). Lamarck’s main and most obvious contribution, clearly, is to consider these circumstances and their effects over long periods of time as the main factor in the transformation of species. A species can be modified by the “acquisition” or stabilization of new habits adopted by individuals in order to adapt themselves to new environmental circumstances. According to the “second law of nature” expounded in the *Philosophie zoologique* (1809), the production of a new organ in an animal body results from a new need, which itself depends on the changing circumstances.

When these two dimensions of Lamarckian environmentalism are considered together, it follows that inheritance of acquired characters (2) is not logically required to embrace the Lamarckian emphasis on the environment as a set of material (physicochemical) surroundings necessary to the very genesis, survival, and development of organisms (1). Even in the case that the habits acquired by adapting to the

environment are not transmitted to the next generations, Lamarckian vital materialism leads to a strong environmental emphasis. Thus, Lamarck’s conception of *milieux ambiants* as generating and sustaining organisms by the means of their physicochemical composition seems to be an underestimated source of the biological relevance of the environment. Despite the fact that the debate between neo-Lamarckism and neo-Darwinism, taking place at the end of the 19th century (Pfeifer 1965; Loison 2012), was focused mainly on the validity or non-validity of the Lamarckian principle of inheritance of acquired characteristics, I argue in the following section that previous elaborations of the environment as a biological and philosophical entity also rely on Lamarck’s concept of vital materialism. Indeed, regarding the new “environmental” elaborations, especially by Comte and Spencer, Lamarck’s emphasis on the *dependence* of organisms on their physical environment was more central than the direct or indirect action of the environment on heredity. Lamarckian terms such as “conditions of existence,” “*milieux ambiants*,” or “influencing circumstances,” later encapsulated in the concept of *milieu* by Comte, and translated to English as “environment,” were above all conceptual indicators of the fact that every organism depends on its material environment.

Lamarck and Darwin on the Environment

Compared to the Lamarckian *milieu*, Darwin’s conception of *conditions of life* considerably reduces the role of the physical environment, while increasing the role of other living organisms considered to be part of the environment. As a well-known passage of *On The Origin of Species* puts it, in order of priority, “as more individuals are produced than can possibly survive, there must in every case be a struggle for existence, either one individual with another of the same species, or with the individuals of distinct species, or with the physical conditions of life” (Darwin 1859, pp. 63–64). The struggle for existence thus implies the interdependence (solidarity and/or competitive relations) between one living being and another, or one species and another, *before* it implies the impact of the physical environment upon a single individual. Darwin’s conception of the problem of individual variability not in terms of a confrontation between a physical environment and an isolated individual representing its species, but in terms of large populations in which individuals compete for reproduction, leads him to take account of interactions between individuals and species while considering the “environment.” As Becquemont (1992, p. 94) asserts, “this transition from a thought centered on the individual essence to a thought centered on the populations implies a profound modification of the notion of environment. For Darwin, the environment in which a

species lives is composed of both species that share the same territory and the overall living conditions of that territory.”

Thus, rather than being a *milieu* surrounding the individual, the Darwinian environment is a *place* of coexistence, a given biogeographical habitat of interspecific and interindividual relations. As Pearce (2014) pointed out, such an extended conception of environment can be traced back through a line of naturalists including Augustin Pyramus de Candolle and Alexander von Humboldt, as well as Lyell, who had already stressed the multiplicity of relationships that must be taken into account while considering the circumstances affecting living beings: “The stations of different plants and animals depend on a great complication of circumstances—on an immense variety of relations in the state of the animate and inanimate worlds. Every plant requires a certain climate, soil, and other conditions, and often the aid of many animals, in order to maintain its ground” (Lyell 1832, p. 140).

Darwin, who was more familiar to these authors than French naturalists such as Buffon, Cuvier, and Lamarck, attached less importance to the direct action of the conditions of life on reproduction, and was unequivocally critical about the overestimation by naturalists of the impact of the physical environment upon organisms (Darwin 1859). He argued that if a plant does not multiply its population, the reason is not climatic conditions but the competition between species. Darwin agrees with Thomas Malthus that populations reproduce themselves within external limitations, including the existence of other species in the same habitat, thus transforming the environment into a place of competitive interaction. Whereas Lamarck argues that the physicochemical environment provides favorable circumstances to the genesis of life, for Darwin favorable environmental circumstances could only facilitate a population’s growth. In the latter case, the physical environment or

climate intervenes in the struggle of life, but only through an indirect influence on reproduction, for instance by the variation in food availability. Thus, for Darwin, the role of such environment is secondary, insofar as the fundamental threat to reproduction comes from other organisms, rather than inorganic surroundings.

Last but not least, whereas Lamarck presumes a direct action of the milieu on the organism, shaping new habits transmitted to next generations, Darwinian adaptation implies a natural selection of random variations. As Meloni (2017) argues, because Darwinian selectionism underlines the indirect effects of the environment and leads to a much less harmonious view of adaptation, it weakened the deep imbrication of organism and milieu posited by older environmentalist models such as Lamarck’s. Once again, the divergence between Lamarck’s analysis of the individual and a Darwinian analysis of the population is decisive. In the first case, the environment has the same effect on all individuals considered to be the same, while in the second case, only random variations in the reactions of several individuals to the environment are relevant. Darwin’s phylogenetic tree implies a differential reproductive success of heritable variations, referring not to an omnipotent milieu, but to the “infinite complexity of the relations of all the relations of all organic beings to each other and to their conditions of existence” (Darwin 1859). Even though Darwin recognizes, in his late writings (1875), a possible “direct action of the environment,” the physicochemical environment has a limited effect on variation. “The external conditions of life as climate and food, etc., seems to have induced some slight modifications” (Darwin 1859, p. 149).

Such a contrast between Lamarck and Darwin’s conceptions of the environment could be schematized as follows (Table 1).

Table 1 Lamarck’s and Darwin’s conceptions of the environment

	Lamarck (1744–1829)	Darwin (1809–1882)
Terms used	<i>Milieux ambiants</i> <i>Influential circumstances</i>	<i>Circumstances</i> <i>Conditions of life</i>
Function of the environment	Causal agent in the genesis of organic life; principle of the transformation of species (inheritance of the acquired characteristics)	Acts indirectly on reproduction (food & climate have effects on the competition between populations and species)
Composition of the environment	Physicochemical surroundings (<i>milieux</i>) acting upon the individual type	A place of interaction between populations
Type of knowledge about the environment	The normal type (individual) as it is influenced by the milieu	Individual varieties and statistical knowledge of populations
Relations of the organisms with the environment	Harmony	Conflicts and cooperation with other populations in the same environment
Effects of the environment on heredity	Direct action of the milieu on the individual: transmission of acquired characteristics	Darwin (1859): Indirect action of the environment: natural selection of random variations
Epistemological model of inspiration	Newtonian physics	Malthus’ political economy

As this quick overview illustrates, Lamarckian and Darwinian approaches to the environment differ on all points, and not only on the direct or indirect action of the environment on heredity. Although the first half of the 19th century was marked by the preeminence of the Lamarckian model, even beyond the French context, these two environmental conceptions promoted by naturalists, philosophers, or anthropologists began to collide with each other from the publication of *On the Origin of Species*. I will examine (see the section on “[Negotiating Between Race and Milieu](#)” below) this conflict from the point of view of French anthropologists between 1860 and 1880, when Darwinians criticize the importance given to the physical environment, whereas Lamarckian social scientists aim to maintain their hope for social reform by means of environmental action. However, in order to understand the emergence of Lamarckism and its philosophical significance, it is necessary to first turn to pre-Darwinian France.

Lamarckian Lineage and Environmental Reflections in France: From Auguste Comte to the Anthropological Society of Paris (1820–1880)

A Theory of Milieux Between Biology and Social Philosophy

Even before Lamarck formulated his hypotheses and Comte theorized them, early 19th-century French philosophers, physicians, and scholars embedded in the dual heritage of medicine and natural history (see the first section) strongly emphasized the idea that the physical and mental health of humans depended on what they still called “surrounding circumstances” (for instance, see Cabanis 1802). Groups of scholars such as *Ideologues* and *Les Observateurs de l’homme*, composed of doctors, anthropologists, linguists, or naturalists, played an active role in shaping the idea that social reform requires both physical and social environmental planning. Indeed, the environmentalism of the Enlightenment found in the French Revolution (at least at some points) not only a supporter, but also a public authority to charge of its ideas. Chappey and Vincent (2019, p. 109) argue that the Directory period during the French Revolution witnessed the rise of a “republican ecology”; it was “a time when reflection on the reciprocal relationship between human society and what was not yet termed ‘milieu’ or ‘environment’ occupied a central place.” *La science de l’homme* [science of mankind] actively supported by the young French Republic had an obvious environmental component, insofar as the new social policy incarnated the possibility of achieving the most audacious shaping of the environment defended by the philosophical sensualism of the Enlightenment.

The philosophical acknowledgement of Lamarck’s work took place in France in this context of already well-established environmental considerations. The particularity of Lamarckian citation in the first half of the 19th century stems specifically from the work of Comte (1798–1857), for whom Lamarck is “the true creator of the general theory of organic *milieux*” (Comte 1851). Comte is the first philosopher to use the singular term “milieu,” borrowed from Lamarck’s plural (Canguilhem 1968). Comte’s unique role in the conceptualization of the environment can be observed in two aspects. First, as witnessed by his *Course of Positive Philosophy* (1830–1842), Comte is an avid reader of the biology of his time, including Cuvier and Lamarck, and is particularly attentive to the originality of their work on the relationship between organisms and the environment. Second, his systematic project to unify the sciences was immediately political, because he believed that the political and social disorder of Europe following the French Revolution should be solved by a new social science that borrowed its positivity from natural sciences. Thus, the concept of milieu as a means of ensuring the continuity of biological and social laws appears to Comte as an appropriate instrument that operates in both the scientific and political fields. Indeed, as I will discuss in the conclusion, evoking a common context (Young 1969) between biology and political philosophy seems particularly relevant with regard to the philosophical conceptualization of the environment by Comte.

As far as the scope of biology is concerned, Comte’s interest focuses on Lamarck’s materialistic vitalism (see the previous section), rather than on the hypothesis of the inheritance of the acquired characteristics, which he rejects. According to Comte, biology acquires its positivity in the “almost contemporary era, when vital phenomena have finally been considered as subject to general laws, of which they present only simple modifications” (Comte 1830, p. 676). The material continuity between living organisms and the physicochemical environment is the key element in transferring the positivity of physics to a biology that accepts its laws, and Lamarck was the one to achieve this transition. For Comte, “this decisive revolution is now irrefutable” (1830, p. 676), and the last representative of vitalism, Bichat, is now supported only by “metaphysicians.” As a result, the new “Lamarckian” environmentalism arising in Comte’s work appears to be a form of biological materialism, in contrast to Bichat’s vitalism which posits an opposition between life and the physical environment. Whereas Bichat fantasizes life autonomous from its physical and chemical environment, Comte formulates a Lamarckian vision of the necessary dependence of organic beings on their environment.

It seems therefore clear that Comte’s interest in the organism–environment relationship does not depend on debates concerning heredity. Indeed, having promoted the “law of

harmony" between the organism and its environment that he attributes to Lamarck, Comte rejects the Lamarckian hypothesis of the inheritance of acquired characteristics, calling it the "boring hypothesis" (Comte 1830). As Gayon (2006) has clearly pointed out, Comte contests the unlimited character of environmental action on races, assuming rather Cuvier's principle of conditions for existence. According to Comte (1830, p. 683), "each determined organism is in necessary relationship with an equally determined system of external circumstances." The species are therefore "essentially static, through all external variations compatible with their existence," as Cuvier had shown. To consider the action of the environment as indefinite is for Comte a sign of the rudimentary stage of the Enlightenment's science, whereas true progress should be able to establish the precise limits of a phenomenon. Lamarck's insistence on the "absolute power of external circumstances" is, for Comte, an "exaggeration" symptomatic of the Enlightenment, reflecting Lamarck's "naivety" (Petit 1997). In this regard, Comte's theory of milieux, based on the idea that environmental action is determined and could therefore be predicted, implies a correction of the Lamarckian "exaggeration" consisting of an unlimited transformation of the living under the absolute power of external circumstances. Comte's second criticism of Lamarck is also in line with this correction, since by attributing decisive power to external circumstances, Lamarck neglects the agency of living beings, capable, according to Comte, of acting in return on their environment (on this point, see Braunstein 1997).

Secondly, it is relevant to consider the political interest of the concept of milieu for Comte. This aspect requires some clarification, because the Lamarckian milieux do not seem, in the first instance, to be close to the political concerns that are emerging in France after the Revolution. Nevertheless, for Comte, the connection between the lack of political and social harmony and what contemporary biology was discovering with the concept of milieu is obvious. On the one hand, the main issue of the era's political philosophy, which aimed to overcome the theoretical, scientific, and political chaos of the post-revolutionary period, is to establish social *harmony* based on the laws of nature. In accordance with its practical purpose of "regenerating Western Europe," the mission of positivism is to "generalize real science and systematize social art" (Comte 1851). On the other hand, within the framework of the philosophy of biology, "the harmony between the living being and the corresponding environment obviously characterizes the fundamental condition of life" (Comte 1830). If the harmony between organisms and their environment is a law of nature, social disorder constitutes a violation of this law, which could destroy living beings if it persists over time. Hence, restoring harmony between modern society and its ever-changing environment is an urgent task, which social science must guide. In this context, the

Lamarckian idea of a necessary harmony between organisms and their environment was raised by Comte to the status of a law of nature valid not only for biology, but also for the social science he was aiming to establish.

In this regard, the prestige of the concept of milieu is granted by its transversality between various sciences, namely physics, biology, and sociology. In the same way that Newton explained the remote action of physical objects by the *medium* in which they move, and that Lamarck pointed out the dependence of organisms on the physicochemical *milieu* that supports them, Comte's sociology seeks to transpose this positivity to the social field, through a theory of the relationships between societies and their *milieux*. The Newtonian revolution having been well established in physics, Comte's first task consists in making visible the importance of the organism–environment relationship in biology, before himself establishing, based on this relationship, the social science that he calls "sociology." In this framework, the relevance of Lamarck to Comte's project results from the fact that Lamarckian biology provides the laws of the organism–environment relationship, putting an end to the metaphysical speculations of the 18th century concerning "man in his circumstances."

If the effect of the environment (not on the formation of races, but on existing organisms including humans) is predictable, as is the range of response of organisms, the relationships between societies and environments may also become the object of a new social science. In the study of social milieux, one must proceed from the simple to the complex, starting from the physical environment, moving up to the living environment, and finally to the social environment; that is why "social philosophy must be prepared by natural philosophy itself, first inorganic, then organic" (Comte 1830, p. 771). Thus, the philosophical formulation of the biological laws resulting from Lamarck's and Cuvier's discoveries is a prerequisite for the establishment of a positive science of society, based on the predictability of organism–environment relationship, as well as on the action of the society on its own milieux.

Several decades before the so-called "neo-Lamarckism," Comte developed this "theory of milieux" in order to promote a project of full social regeneration relying on the conscious action of the society on its own environment. Comte's theory manifests a circular logic, insofar as environmental conditions were supposed to determine social behavior whereas society was able to modify conditions in order to modify itself. Such political and scientific motivations explain why Comte was willing to extend the meaning of the relatively peripheral concept of milieux he encountered in Lamarck. In fact, Comte (1830) understands by the concept of milieu "not only the fluid in which a body is immersed [which is its strictly Lamarckian definition], but, in general, the total set of external circumstances of any kind necessary

for the existence of each particular organism.” This extension produced the unified concept of *environment*, in both biology and sociology, through which the Comtian theory of the milieu has had a lasting and international effect.

Negotiating Between Race and Milieu: Anthropological Debates in Paris and the Survival of Lamarckian Environmentalism (1860–1880)

By the 1860s, the environmental–social theory propounded by Comte had encountered resistance from Darwinism, which had recently been introduced, as well as from the racial paradigm in biology and social sciences, especially in anthropology; both theories contested the explanatory virtues of milieu. In the same period, a group of French social scientists (Armand de Quatrefages, Louis-Adolphe Bertillon, and Joseph-Pierre Durand de Gros) continued to defend Lamarcko-Comtian environmentalism against its detractors. Indeed, between 1860 and 1880, eminent members of the Society of Anthropology of Paris (*Société d'Anthropologie de Paris*, founded 1859) were engaged in a very vivid controversy (Staum 2011), transposed in terms of a relation between race and milieu. This controversy is instructive in understanding the trajectory of the Lamarckian environmentalism promoted by Comte, after the complex process of the introduction of Darwinism in France after 1859 (see Conry 1974).

The main issue occupying anthropology in France by the 1850s is the need to determine the causes of human racial variation. Thus, the Lamarckian hypothesis of inheritance of acquired characteristics was thoroughly discussed, even when the anthropological context also leads social scientists to take into account his interpretation by Comte. If most of the members of the *Société d'Anthropologie* agree that the positivistic theme of the influence of milieu on human beings is still valid, anthropologists such as Paul Broca—one of the rare supporters of Darwinian thesis in this assembly (Blanckaert 2009)—question whether “environmental impact” could alter fundamental human characteristics during the process of evolution, such as the coloration of the skin. In general terms, the controversy opposes proponents of the action of milieux to defenders of the innate characteristics of races, distributing epistemological options between nature (*inné*, innate characters) and nurture (*acquis*, what is environmentally acquired). Within the debate on race formation, these racial and environmental options lead anthropologist members of the Society to choose between monogenism and polygenism. Monogenists stand for an environmental explanation of the variation of races from a single racial origin, whereas polygenists explain such variation through the inherent characteristics of multiple races appearing discretely in remote geographic areas.

From the polygenist point of view, race is the very paradigm of anthropology because it has its own explanatory principle: the inheritance of the innate, not of the acquired that Lamarck was defending. Thus, this “racial anthropology” was no longer interested in the conditions of existence of living beings, but aimed to study the fixed characteristics of the races, using the new technique of anthropometry (Blanckaert 2009). As a strategy to weaken the Lamarckian adversary, polygenists asked for proofs of the environmental influence on the formation of races. For Félix-Archimède Pouchet (1858, p. 123), “monogenistic theory was never experimental nor positive,” while he argued that anthropometry provides a verifiable empirical basis for racial anthropology. Broca (1868, p. 92) claims that the differences between two separate human collectivities cannot be explained by environmental influence, because racial differences remain constant even if climatic conditions and even *social milieux* differ.

Nevertheless, the very idea of the “action of milieux” was still defended by monogenist members of the Society, such as Quatrefages, an influential anthropologist. “It is impossible, according to Quatrefages (1863, p. 139), to not admit that the milieu has a modifying action upon humans, and new races are resulting from it.” Combining Darwin and Lamarck, Quatrefages thinks that the action of milieux causes individual modifications and thus consequences on races, through an extended temporality. However, such complex environmental action remains difficult to prove: “All living beings are subjected to modifying actions of the *milieu*, at a point we don’t yet know the limits [...]. These actions of the milieu are known by its effects and we can’t apprehend relations between such effects and their cause” (Quatrefages 1863, p. 139).

Thus, Quatrefages underlines a major difficulty, which is symptomatic of Lamarcko-Comtian environmentalism as a whole, namely the excessive complexity of environmental influences. While the signifier “milieu” allows for unifying a set of environmental modifiers, establishing evidence of causality is intricate, especially because the limits of the concept are highly vague. As Simonot puts it, the “study of *milieux* encounters a series of uncertainties and oppositions, and it is urgent to end them as soon as possible” (Simonot 1865, p. 787). Considerably exceeding the physicochemical character of the milieux described by Lamarck, the concept designates a set of various external influences including biological and social factors, hardly apprehensible in the limits of a single science. Indeed, Quatrefages deliberately extended the meaning of the concept of milieu, while proposing to “give to this word of *milieux* a larger acceptance than it is ordinarily done [...]. The milieu is not only the set of physical conditions, it includes also moral conditions” (1860, p. 336). Thus, the milieu became a general social modifier, a set of social, moral, and physical conditions acting upon

individuals and societies. Apparent in its effects but impossible to analyze in detail at a causal level, the Lamarcko-Comtian *milieu* is a powerful agent, unlike the Darwinian *conditions of life*, which do not acquire such status of moral and social *agent*, capable of modifying social relations.

This exhaustive character of the concept of milieu paradoxically functioned as a defensive argument against the criticisms expressed by polygenists of the Society of Anthropology of Paris. For instance, when Broca challenged the environmental framework by asking ironically if coloration of the skin could arise from “meteorological influences,” Franz Ignatz Pruner replied that milieu designates “a set of external modifications, and not this or that modifier” (Broca 1863, pp. 100–101). The generality of “milieu” as a modifier strengthens its defense as a whole paradigm, because no anthropologist could deny, in general, the existence of external influences on living beings. Such a strategy is clearly undertaken by Quatrefages, when he defines the milieu as “a set of *any* physical, intellectual or moral influences or conditions, which could act on organized beings” (Quatrefages 1868).

The main issue for Quatrefages concerns the flexibility of the human species under knowingly modified environmental conditions. He suggests that, rather than speculating on a supposedly known human nature, anthropology might find inspiration in zootechnics, precisely because the French lineage of Buffon, Lamarck, and Geoffroy St. Hilaire had proven that animals are modified by the influence of their milieu. Animal breeders

create from scratch new races and they do so by modifying the milieu [...]. How could it not be the same for man? If man escaped these actions, he would constitute an exception in the midst of organized beings. This is what I cannot admit for myself. (Quatrefages 1863, p. 141)

Thus, the transformation of animal species by artificial selection via acclimatization—also strongly emphasized by Darwin (1859)—seems to provide a strong argument for environmentalism, especially when one refuses to admit that the human race would be an exception to the rule of nature.

However, there is no doubt that, by 1862, such an argument requires taking a position on Darwinianism. Indeed, declaring that racial modifications occur by artificial selection as well as by natural selection, Quatrefages elaborates a specific way in which to associate Darwin with the action of milieux. Rejecting the transmutation of species, he only admits the transformation of races under the constant influence of milieu: the individual subjected to the action of a modified milieu has to adapt or perish (Quatrefages 1863, p. 197). These adaptations are maintained according to the Lamarckian idea of the inheritance of acquired characteristics. Quatrefages’ solution seems symptomatic

of a kind of Darwinism assimilated to Lamarckism, which accentuates substantially an environmental dimension in the selection process. Whereas for Darwin the struggle for life concerns mainly the competition between and within species, French naturalists and anthropologists like Quatrefages understood his theory as a further justification of Lamarckian environmentalism. Such a misinterpretation is underlined in Broca’s address to the assembly: “Darwin neglects the modifying effect of milieux as accessory; milieux do not intervene in his theory as direct agents of transformation, but only as a battlefield for struggle for life” (Broca 1870, p. 219). A polygenist, Broca defends the idea that the innate qualities of races determine their superiority or inferiority in the struggle for life, whereas he refuses the Lamarckian theory of milieux as obsolete after Darwin. Quatrefages opposes him with an active environmentalism, misinterpreting Darwinian adaptation by reducing it to an adjustment of the organism to its physical environment, in an overtly Lamarckian manner. Quatrefages’ attempt to assimilate Darwin into his environmental reformism could seem quite odd, unless one pays attention to the complex history of intersections between these two lineages. As Bowler (1983) puts it, before Weismann and until the 1880s, many naturalists and philosophers as notable as Spencer or Ernest Haeckel combined Lamarck and Darwin.

An “anthropological Lamarckism” (Staum 2011) arose in this period, reducing the extent of the comparative anatomy of races (Blanckaert 2009), and stressing the capital role of the milieu understood as a complex set of physical, chemical, social, and even moral entities. Indeed, according to Parisian anthropologists defending environmentalism, race should not have been the main topic of their discipline.

We should not seek to know, declares Simonot, if such or such milieu could transform a black man to a white or reciprocally. What we should seek to know are the needs and obligations different milieux impose to different human types, in order to keep the integrity of life in all kind of places. (Broca 1863, p. 789)

The aim of such a shift is precisely to disconnect the action of milieux from the race debate, in order to maintain the hope for social reform by means of environmental action. On April 2, 1868, during a plenary session of the Society dedicated to the “modifying action of *milieux* on man and animals,” Durand de Gros summarizes these political ambitions:

Indeed, gentleman, what is this all about? What is at stake is simply to know whether man must bow his head before the fatal laws of birth, or whether he

can stand up against them and struggle with some success, by using these forces of the ambient world that science teaches every day to master. (Durand de Gros 1868, p. 229)

The uselessness of the research program on race and heredity is dramatically opposed to the larger possibilities of social intervention allowed by a science of milieux. Whereas it is useless to speculate on the immutable *innate characteristics* of races, it seems crucial to Durand de Gros to take advantage of the modifying powers of the milieu. Social reformism could realize, around the human, a set of favorable environmental conditions in order to counteract the degenerative effects of a harmful social or physical milieu.

The focus of the Parisian anthropologists supports this article's argument that Lamarckian environmentalism evolved mainly through Lamarck's environmental materialism, rather than through his hypothesis of the inheritance of acquired characteristics. Their objective was to affirm the centrality of the environment to the well-being of individuals and society without engaging with the debate on heredity. This strategy of decoupling the environment from heredity is even more obvious in the way in which Bertillon, a positivist doctor, intended to found a Lamarcko-Comtian science of the environment, namely *mésologie* (see Braunstein 1997; Taylan 2018). Publicly defended by Bertillon (1873) during a plenary session of the Anthropological Society of Paris in 1873, *mésologie* was intended to systematize the science and technique of modifying milieux in order to modify corresponding organisms and societies. According to Bertillon, heredity and environment are the two main influences that shape organisms, and "if we can't do anything about the ancestor, we can do a lot about the environment" (Bertillon 1873, p. 212). The science of milieux promoted by Bertillon provides a means of action against harmful environmental influences, where heredity does not offer any possible reform.

The stabilization of the very concept of milieu in France in the wake of the influential Lamarcko-Comtian lineage remains inseparable from the ideal of social reform by means of environmental modification cultivated by positivist actors such as doctors, administrators, and social scientists. These actors relied on the variable prestige of the Lamarckian biology to affirm the extent of environmental effects on society. In this context, the extension of the concept of the environment from the biological field to the social field, already initiated by Comte before being pursued by scientists throughout the 19th century, led to the vague appellation of "social Lamarckism." In analogy with the physical environments mentioned by Lamarck, social or moral environments became objects of inquiry for these social scientists, who were not required to activate the hypothesis of inheritance of acquired characteristics. Last but not least, the

Lamarcko-Comtian model of harmony between the social organism and its milieu remained prevalent in France, often colliding with the Darwinian understanding of an environment populated by other living beings. Social Lamarckism, unlike social Darwinism which implies a random adaptation of individuals to a competitive environment, envisages that human society takes charge of its own modification. This seems to be the main reason of its adoption by reformist social thinkers, concerned to use environmental action for a planned transformation of society.

From *Milieu* to *Environment*: Lamarckian Heritage in English

At the beginning of the Victorian period, by contrast, British scientists generally had a critical attitude towards Lamarck's evolutionism (Secord 2000). Describing Lamarck's evolutionism as light fiction, Lyell contributed to a rather negative perception of the French biologist. However, Lamarckian environmentalism found support in London's radical subcultures, especially in utopian socialist thought. As Desmond pointed out, "the socialists taught an undiluted environmentalism in their schools and their leaders espoused Lamarck's theories" (1989, p. 74). In 1836, members of the British Medical Association adopted a "radical environmentalism" (Desmond 1989), stressing the need for a social policy that addressed the environmental conditions of urban life. Rather than being Lamarckian in the sense of references to Lamarck's texts, this kind of social environmentalism proffered a suitable framework for biologic-philosophical syntheses of the relationship between organisms and the environment.

However, the very concept of "environment" in the singular, equivalent to the French concept of the *milieu*, was introduced into English by Spencer, a leading thinker of liberalism. It is worth attending to how Spencer implemented a specific form of environmental Lamarckism into the English-speaking world by the 1850s, at the crossroads of biology and philosophy. This period (1860–1900) was characterized by the rise of Darwinism and the challenge it posed to the different ways of engaging Lamarckism to underscore the centrality of the environment either for the evolution of species or for the reform of human societies.

Psychology, Adaptation, and Lamarckism: The Mental Environmentalism of Herbert Spencer

British philosopher Herbert Spencer introduced both the term "environment" and the topic of the organism–environment relationship into the English-speaking world. As Pearce (2010a, b) has pointed out, Spencer was the central figure in the shift from the idea of a plurality of external

conditions to the singular environment, establishing the organism/environment interaction as a principle for biology. Whereas Pearce insists on the shift from “circumstances” to “environment,” showing how Spencer relies on the translation of Comte’s texts into English, this article aims to highlight the shift from *milieu* to environment. Although they are both singular forms, these concepts are differently shaped by Comte and Spencer, insofar as they had distinct political and philosophical projects orienting their interpretation of Lamarckian environmentalism. Despite the divergence of their respective projects, Spencer’s role is similar to that of Comte concerning the formation of the biologic-philosophical concept of the environment, in two ways. Firstly, like Comte, Spencer seeks to formulate a philosophical synthesis of the biology of his time, disseminating and popularizing a biological vocabulary he forged himself, including major concepts such as “evolution.” As Renwick (2015) puts it, “Spencer not only helped people understand what biology was, but also shaped its language and concepts.” Secondly, Spencer relies on the Lamarckian conception of the organism–environment relationship as support for his political and social philosophy, emphasizing the need for industrial societies to adapt to a constantly changing environment. Yet the two philosophical, scientific, and political projects of Comte and Spencer differ radically: not only does Spencer translate the Comtian concept of *milieu* to English, but he considerably modifies its philosophical and political meaning.

Although Spencer himself remains ambiguous about his readings of Comte, as Eisen (1967) points out, the circles he frequented in London in the early 1850s were well aware of Comte’s work, and his friends George Eliot and George Lewes circulated the content of the *Cours de philosophie positive*. According to Pearce (2010a, b, p. 247), “Spencer inherited the idea of organism–environment interaction directly from Comte,” reading Martineau’s abridged translation of Comte when it was published in 1853. However, a first break with Comte quickly arose on the epistemological level: Spencer’s disagreement with Comte’s classification of sciences is noticeable in the way he mentions the concept of environment for the first time in his *Principles of Psychology* (1855), a science to which Comte does not attach any particular weight. For Comte, the analysis of milieux is not conducted at the psychological or individual level, since the study of physical milieux is to be followed by those of chemical, biological, and social milieux. Where Comte passes from biology to sociology, Spencer introduces the psychological dimension as the very locus of the interaction between individuals and their environment, elaborating an alternative form of Lamarckism.

Spencer (1855) promotes a subjective psychology based on the biological model of the organism’s adjustment to the environment, although Lamarck is not mentioned in this work. Life is “the continuous adjustment of internal relations

to external relations,” involving modifications of the organism “in correspondence with the external sequences.” Firstly, this principle leads to an environmental explanation of organic evolution, insofar as all the cognitive faculties of the human species derive from adaptation to the environment: “Instinct, Reason, Perception, Conception, Memory, Imagination, etc., can be nothing more than [...] conventional groupings of the correspondences [between organism and the environment]” (Spencer 1855, p. 486). Secondly, this principle is activated at the level of the adaptation of modern individuals to their new industrial environment, as modern workers are inserted into what Spencer calls the “environmental sequences” of their lives (manufacturing, roads, etc.). Certainly, the Lamarckian belief that acquired habits are hereditarily transmitted reinforces the adaptation of the human species to its industrial environment. However, even as it engages in the long-term evolution of the species, Spencer’s analysis is also valid for the individual working in the present time, whose inability to adapt to the new environment raises a social problem. Francis (2014) has made this point clear, arguing that what could be called Spencer’s “mental environmentalism” does not concern the transmission of acquired characteristics within a species, because it is focused on single adult members of a species.

Thus, Spencer’s “philosophy of self-improvement driven by the market economy” (Bowler 2015) elaborates a general principle of adaptation to the environment, seen as a driving force for progress and a tool for social reform. Comte thought it was necessary to restore harmony between society and its environment; Spencer intends to accelerate the adaptation of individuals to the industrial environment of modern societies, insofar as evolution would require such adaptation. Life is only perfect when the correspondence between internal and external changes is accurate. Harmony between organisms and their environment, however, could only be the result of a struggle, the fittest being “chosen” according to their capacity to adapt themselves to changing environmental conditions. Such struggle leading to a better correspondence with the changing environment is the keystone of Spencer’s evolutionary theory (Francis 2014). In the same way that the adaptability of races to their changing environment would be a sign of civilization, the adaptation of the individual to a complex environment where they are in competition with other individuals would be proof of the being’s progress and superiority. For Spencer, the changing environment of modern societies and the challenges it poses to the human species drive evolution.

Remaining Lamarckian until the end of his life, all the while trying to make it compatible with Darwinism, Spencer developed a specific environmental synthesis, combining natural selection with the use-inheritance mechanism. Stressing that Spencer is Lamarckian mostly because he stands for the principle of the inheritance of acquired

characteristics, Bowler argues that “the belief that the future of the species can be shaped by the positive actions taken by organisms (including human beings) is attractive to a wide variety of thinkers” (2015, p. 438). Thus, for Bowler, biological improvement via a permanent transformation of the species, including the translation of learned habits into inherited instincts, is the reason why Spencer relied on Lamarck for his social philosophy. However, the social reform that Spencer wishes to achieve through the best adaptation of human societies to their environment not only concerns the evolution of the species, but also the social modification of present generations. Thus, his insistence on the individual-psychological level of environmental adaptation indicates that the environmentalism Spencer promotes does not logically imply adopting the inheritance of acquired characteristics, even though he was a strong advocate of this principle.

Whereas in France environmental reflections focus mainly on the social field, Spencer insists on the mental and competitive adaptations of individuals to perpetually changing social environments. Thus, Spencer’s psychological shift had clear consequences in the intellectual history of environmentalism. In the United States, Spencer’s psychological environmentalism was followed assiduously and often critically (Leslie 2006), leading to further developments of functionalist or pragmatist psychology. The word “environment” became a common term in psychology by the end of the 19th century (Pearce 2014). Critically debating with Spencer but moving the organism/environment correspondence forward, James (1890) defines psychology as the science of mental life and its environmental conditions, whereas Dewey (1903) believes that a moral standard or reasoning should be treated as an instrument for the adaptation to an environmental situation.

Still Lamarckian. Social Reform, Natural Sciences, and Environmentalism in the United States (1860–1900)

Nascent Darwinism had an undeniable effect, by the 1860s and outside Spencer’s work, on the understanding of the organism–environment relationship. This contributed to diminishing the importance of the physical environment and to prioritizing its competitive and populational conception. In the United States, even a Lamarckian as notable as Lester Frank Ward, pioneer of American sociology, embraced a Darwinian emphasis on populations, in order to criticize Lamarck’s understanding of the environment as being fundamentally inorganic. For a plant, he argues, adaptation should be seen not as a process of adjustment to an inorganic environment, but rather as including a set of organic surroundings such as competing vegetation (Ward 1876; see also Kingsland 2005, pp. 13 seq). According to Ward, the

physical environment is only a passive condition, incapable of having direct effects on living beings struggling actively for *places*. If territorial expansion is a matter of competition, geostrategic places become the very object of inter- and intra-specific conflicts, rather than the environment being an omnipotent agent, capable of transforming living beings.

However, coming much closer to Comte than to Spencer, Ward was a defender of social institutions for counterbalancing the competitive process of natural selection (Stocking 1962). For Ward, the relation between organism and environment is determining, but in its evolution the human species has managed to forge its own psychic and cultural environments in order to govern itself. Sociology must be, for Ward as for Comte, the science of the self-government of societies by the arrangement of the environments to which humans must adapt themselves. At this extent, the Lamarckian environmentalism is the warrant of progress and social reform, in opposition to neo-Darwinism which condemns all hope for environmental action. In France, as in the United States, by the 1880s, while Weismann’s ideas weakened Lamarckian emphasis on the environment, social scientists kept insisting on the crucial role of “environmental factors” on human society. Stocking (1962, p. 252) points out a fundamental dimension of the debate when he writes that, “social scientists were occupationally predisposed to resist the attacks on the Lamarckian doctrine precisely because it was so much more compatible with the general environmental orientation of the social sciences than the alternative proposed by Weismann.”

Social sciences are not, however, the only field in the United States affected by Lamarckian environmentalism. According to Packard (1901), after the appearance of Darwin’s *On the Origin of Species*, “there has arisen in the minds of many naturalists a conviction that natural selection, or Darwinism as such, is only one of other evolutionary factors.” For Packard—as for Spencer before him—Darwin carried his doctrine of natural selection to its extreme limits and pushed aside Lamarckian environmental factors entirely. These naturalists are convinced that Darwinian natural selection does not explain the origin of variations, which could only be explained by the actions of the “physical environments.” According to Packard, Spencer’s “survival of the fittest” had been misused to state the cause, when it simply expressed the result of “the action of a chain of causes which we may, with Spencer, call the ‘environment’ of the organism undergoing modification; and thus a form of Lamarckianism.” Such belief, writes Packard, is reinforced by the findings of paleontologist Hyatt (1874), who assigned the causes of the progressive changes in late forms to the “favorable nature of the physical characters.” In his earlier work on insects, Packard himself adopted Lamarckian factors when he attributed the origin of the metamorphoses of insects to change of habits or to the temperature of the

seasons and climates. Finding a solution for harmonizing Lamarck and Darwin, Packard attributed the initial stages of the origination of variations to the primary factors of evolution, and the final stages to the secondary factors: segregation and natural selection (1901). Thus, under the heading of "neo-Lamarckism," Packard mobilizes a set of environmental arguments elaborated by working naturalists in order not to deny but to complete Darwinian natural selection by the addition of such environmental causality of variations.

In general terms, by the 1890s what was called neo-Lamarckism was proving to be a joint effort by naturalists and social scientists to maintain the importance of environmental factors in the evolution of species, the development of individuals, and the reform of society, in a context where Darwinism and neo-Darwinism tended to weaken this environmentalism. As Campbell and Livingstone (1982) assert pointedly, "whereas Darwin regarded the 'relation of organism to organism the most important of all relations', neo-Lamarckism was quintessentially a physical environmental theory, which emphasizes direct environmental impress on the generality of local organic populations." In fact, not only "neo-Lamarckism," as a response to Weismann's attacks on the inheritance of acquired characteristics, but also the old-fashioned Lamarckian environmentalism promoted by Comte or Spencer, remained attractive at the end of the 19th century, as it permitted the reinforcement of what Campbell and Livingstone call "developmentalist social thought."

Conclusion: A Common Context. Lamarckian Environmentalism on the Edge of Biology and Social Philosophy

Underlining the specificities of Lamarckian environmentalism and its distance from the role of the environment in Darwin, as well as its multiple uses in philosophy and social sciences in the 19th century, this article presents a synthesis of a Lamarckian lineage. The analysis of the role that Lamarck attributes to physicochemical milieux in the genesis of organic life and in the development and survival of organisms, as well as the many mobilizations of this "vital environmental materialism" in philosophy and social sciences, leads to the conclusion that the idea of Lamarckian environmentalism should not be confined to the principle of inheritance of acquired characteristics. By affirming the necessary continuity and harmony between the organism and the physical environments surrounding it, Lamarck inaugurated a form of environmentalism that does not presuppose or require the inheritance of acquired characteristics. As evidenced by the fact that Comte, the most active theoretician in the era's philosophy, refused this principle of transmission, Lamarck's inspired environmentalism did not always depend on heredity. While it is true that the question

of environmental influence in race formation was a major concern for the social sciences in France in the second half of the 19th century, proponents of social reform through the environment continued to mobilize the materialist-vitalist aspect of Lamarckian environmentalism. Certainly, the Lamarckian idea that the habits contracted by a generation in its interaction with the environment are hereditarily transmitted played a major role in the biological and evolutionary debates of the 19th century, and in the way in which the very concept of the environment remained a vivid subject for debate. However, even among late advocates of this principle like Spencer, environmentalism was also driven by the central idea of a necessary correspondence between the organism's internal and external relationships.

Those that the history of science has named "Lamarckians" had different options: some favored the role of the physical environment in the evolution of species or the survival of individuals, according to Lamarck's ideas and against Darwin's conception of a relational environment; others proposed to think with Lamarck's ideas in social or psychological environments, as Comte or Spencer did respectively. These divergent strategies were often motivated by very distinct social philosophies, including hygienist republicanism and Comtian positivism in France, utopian socialism in Victorian Britain, Spencerian promotion of liberal self-improvement, or Ward's social reformism in the United States. Throughout the 19th century, in France as well as in Great Britain and the United States, the conceptualization of the environment was not confined to the strict field of biology, precisely because the issue of the necessary correspondence between human society and its environment was of interest across the whole of political and social life. Consequently, the invention of the "environment" as a unified concept is mainly the outcome of the work of the philosophers, sociologists, and anthropologists who referred to Lamarck to emphasize different kinds of environmental factors, forging a major concept that was, in return, widely used in biology by the beginning of the 20th century.

Thus, the conceptualization of the environment in the wake of the Lamarckian environmentalism appears to be an exemplary case of what Young (1969) has identified, concerning Malthus' influence in the evolutionary debate, as "the common context of biological and social theory." In the same way that Young made it clear how Malthus, Paley, Darwin, Lyell, Spencer, and Wallace were part of a common context, Lamarck, Comte, Spencer, and Darwin, and, at the end of the century, Ward or Packard, were part of a common debate about the environment, its definition, and its function in the evolution of species. Young's approach is particularly relevant in that, rather than considering the influence of Malthus outside biology, he indicates the ways in which Malthus' "theory and its assumptions about nature were at once pervasive in the

biological literature.” In the same way, far from excluding philosophers such as Comte and Spencer—who are better known for their work in social and political philosophy, but who also wrote important and influential texts on biology—from an anachronistically purified field of biology impermeable to their effects and confined to professional naturalists or biologists, a conceptual history of the environment should fully include them. In many regards, “the environment” is their invention.

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