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The Concept of Organism-Environment Relationship and the  
Emergence of a Unified Concept of Environments

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## ABSTRACT

Nowadays, the concept of environment is commonly used, both in scientific speech or in more mundane realms, such as in political or economic issues. However, this conceptualization of the environment, as something singular and abstract with which organisms continuously interact, was not known until the middle of the nineteenth century. This concept was coined and emphasized by Herbert Spencer, who primarily inherited the idea that organisms are constantly affected by their external circumstances firstly from Lamarck, and then Charles Lyell, Alexander von Humboldt, and especially Auguste Comte. From Lamarck, who was influenced by Cuvier and Buffon, Spencer received the idea of a physicochemical environment sustaining life. With Humboldt and Lyell, Spencer became progressively aware of the relevance of other living beings in defining a specific organism's environment. With Comte, Spencer encountered the idea of a correspondence between organism and environment, in which the latter was abstractly regarded. Consequently, Spencer would include physical, biological, and social circumstances under the umbrella of this abstraction. Darwin would also contribute to this perspective on environment while highlighting the idea of "struggle for existence", in which a new ecological stance, focused on the interdependence of organisms, was brought to the fore. My aim is to outline the history of the progressive concealment of elements of the external world surrounding an organism, which was involved in this continuous metaphysical abstraction of the concept of environment. Only then, I argue, did it become possible to construct a dichotomy between organism and environment, and conceptualize their interaction, crucial aspects in the history of ecology.

**Keywords:** ecology, environment, Herbert Spencer, philosophy of ecology, history of ecology

## ARTICLE

### 1. Introduction

Today, and largely due to the growing awareness of environmental issues, the idea that an organism has an environment is commonplace. However, in the mid-nineteenth century, the idea of a singular, abstract entity – the *organism* – interacting with another singular, abstract entity – the *environment* – was virtually unknown. The relevant issue is thus to understand how a myriad of causal factors that compose the environment, such as sunlight, water, soil, climate, air, and other organisms came to be treated as a single and unified entity, i.e., how a plurality of external conditions or circumstances was replaced by an idea of a singular environment.

This conceptualization is especially due to Herbert Spencer (1855), at least in the Anglo-American tradition. It is important to highlight the initial adoption of the term “environment” by Spencer and the concomitant appearance of the idea of organism-environment interaction (PEARCE 2010b; TAYLAN 2020). Before the word “environment” was coined, the English language only possessed plural words like “circumstances” or “conditions”. Therefore, the singular term “environment”, the ensuing dichotomy, and the application of the idea to intellectual and social domains as well as to the life sciences, led to the popularization of Spencer’s account of organism-environment interaction. This shift from circumstances to environment, which was also important for Darwin, moreover, accentuates the unificatory metaphysical work performed by the environment concept (PEARCE 2010b; WALSH 2022).

Spencer inherited the idea that organisms are constantly affected by their external circumstances firstly from Jean-Baptiste de Lamarck, and then Charles Lyell, Alexander von Humboldt, Auguste Comte, and Robert Chambers, the then-anonymous author of the *Vestiges of the natural history of creation*, published in 1844 (PEARCE 2010b). It is therefore helpful in understanding the influence of Lamarck’s environmentalism on Spencer to situate Lamarck’s position within the Natural History of the eighteenth century, somehow shaped by Georges-Louis Buffon and Georges Cuvier. Lamarckism was not isolated from the Natural History and physiology of its century (TAYLAN 2020). In fact, Lamarck synthesized diverse intellectual developments stemming from a growing interest in the environment across several fields of science, generating a systematic and new conception of the role of the “*milieux*” in the development of individuals and the transformation of species.

However, before delving into these aspects of Natural History and Lamarckism, it is crucial to point out where this idea of “*milieux*” comes from. Indeed, it was Newton who developed the notion of *fluid*, trying to solve the problem of accounting for the action at a distance between two distinct bodies (CANGUILHEM 1965; HENRY 2019). The fluid was thus the vehicle of action at a distance, being in the middle of the two bodies: it was their medium. The notion of medium was relative to the two bodies,

becoming completely separated from them. Ultimately, the medium would be something between two centers of forces, losing its relative meaning and becoming a reality in itself. This mechanic notion of medium appeared in *L'Encyclopédie* (1750-1772), by Denis Diderot and Jean le Rond d'Alembert, in the entry "*milieu*", with some examples of "*milieux*" in the utmost mechanic sense, according to the framework of Newtonian physics. These concepts of fluid and medium would be imported from mechanics to biology (CANGUILHEM 1965), and will be crucial for Lamarck, especially for his materialist ideas about the dependence of the organisms on their surroundings, although Lamarck refers to them in the plural: "*milieux*".

## **2. Natural History and the "conditions of existence" of the organism**

Buffon was one of the most significant references for Lamarck in the field of eighteenth-century Natural History, particularly insofar as the analysis of environmental factors affecting living beings is concerned. Although for Buffon species do not transform, nature is constantly being altered, and varieties within a species are modified by the continuous action of altering causes. He deemed the geographical distribution of living beings to result from the history of nature, already arguing that the distribution of living beings could not be explained by climatic variables alone (BUFFON 1736). Buffon thus considered the correlative transformation of the physical environment and living beings, even if this occurs in a context where the species are immutable. However, in his perspective, far from stimulating their evolution, the alterations in the physical surroundings only caused the degradation of species (CAPONI 2020). Accordingly, climate and food were the agents that produced degeneration, delimiting the regions in which species could survive without degenerating. Buffon's Natural History therefore gave crucial importance to the environment because it was a major determinant in the distribution of species. Nevertheless, the environmental perspective of Buffon was very strict, because *only the inanimate surroundings were considered*. It is this understanding of the environment that Darwin, especially influenced by Lyell, would be compelled to contest in 1859.

Cuvier, another prominent figure of the Natural History of the eighteenth century, who shared the fixism of Buffon, deepened the link between the physical environment and the organism by relating anatomy to geological transformations (TAYLAN 2022). He claimed 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 could exist that does not bring together the conditions that make its existence possible" (CUVIER 1812). However, parsimony should be used when interpreting the concept of "conditions of existence" in Cuvier because the environment here was only conceptualized as inanimate surroundings. That is, as a "molecular medium" (FOUCAULT 1970), the relationship between the living being and its environment was similar to a molecular exchange – a purely physiological phenomenon (CAPONI

2020). Cuvier thought that for an organism to be able to respond to the demands of the environment, it should be an organizationally coherent structure (CUVIER 1812). Therefore, in consonance with Cuvier's perspective, the organismal internal requirements were preeminent over the exigencies of the environment, which were thought out in a very generic way. Life and its embedment in the environment were determined by organismal organization; they were not fully a response to a challenge of the environment. In fact, Cuvier was very concerned with the general organization of living beings: the ecological functions were not as important as the physiological ones (PEARCE 2010b). It is this *internalist* posture that Lamarck, Lyell, and Darwin would successively dispute.

### **3. Lamarck: the material continuity between organism and environment**

Lamarck advocated the existence of a physicochemical environment sustaining life, which can be considered as the strong environmental component of Lamarckian materialism. His concepts of "*milieux ambiants*" or "*milieux environnants*" (LAMARCK 1809) refer to the environment as "a physicochemical set which allows vital organization" (TAYLAN 2022). These concepts are thus closely related to the Newtonian concept of "medium" because Lamarck presupposes a "subtle fluid" assuring the role of "vital principle", which characterizes the very function of the surrounding "*milieux*". This conception of environment as an active matter supporting life implied a form of continuity – called "*harmonie*" by Lamarck – between the organism and its surroundings. This stance completely opposed the internalist view of Bichat, a French naturalist who elaborated an antagonist view of the organism-environment relationship, privileging the harmony between the organs of the body – which implies a discontinuity between the body and its non-living environment. Accordingly, the organism was defined by its internal forces, which resists a hostile environment that constantly undermines it: "Life is the totality of those set of functions which resist death" (BICHAT 1800). Interestingly, at this juncture a strong opposition can be highlighted between two clear-cut ideas, defining, respectively, the *internalist* and the *externalist* postures: on one side, a hostile environment destroying life; on the other side, a life-supportive environment as a condition of the possibility of organic life.

Lamarck was looking for a new form of materialism that could offer a third way between mechanism and animism (TAYLAN 2022). He fully rejected both the assumption of an impalpable "vital principle" and the reduction of life to a strict mechanism. 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 ensured this continuity. In the Lamarckian perspective, the material continuity between living organisms and the physicochemical environment was therefore the pre-condition of the harmony between the organism and its environment. Lamarck then transferred the "vital principle" from the living being to the organism-environment relationship. The posterior elaborations of the environment as a biological and philosophical entity, namely by Comte and Spencer,

relied on Lamarck's concept of "vital materialism", while Lamarck's emphasis on the dependence of organisms on their physical environment became crucial for the forthcoming assessments (PEARCE 2010b). Lamarckian terms such as "*conditions d'existence*", "*milieux ambiants*", later encapsulated by Comte in the concept of "*milieu*" and conveyed to the English term "environment" by Spencer, were above all conceptual indicators of the fact that every organism crucially *depends* on its material environment.

#### **4. Humboldt and Lyell: the relevance of biotic environment**

Another influence for Spencer was the work of A. von Humboldt, the great German traveler and naturalist of the nineteenth century (WULF 2016). He can also be regarded an *externalist*, in opposition to Cuvier or Bichat. The idea of an *exclusive abiotic environment* was present in Humboldt's theorizations, since the environment, understood just as climate, was thought to be the determinant of the distribution of living beings on the surface of the Earth. The living being was always considered in contrast with something that was not alive, and never, or almost never, in contrast with other living beings. He argued that the type of vegetation that could be found in different regions of the globe depended on physical variables such as "atmospheric pressure, temperature, humidity, and electrical tension" (HUMBOLDT 1805). He asserted that animals also "follow, although certainly less than the plants, that identity of forms in places that are far from each other, but that enjoy an analogous climate" (HUMBOLDT 1811).

With Lyell occurs a relevant development concerning the notion of environment. According to him, the possibility of the existence of a certain species in a given locality, or of its thriving, was determined not merely by temperature, humidity, soil, elevation, and other circumstances of the same kind, i.e., *abiotic factors*, but *also* by the existence or non-existence, and the respective abundance, of a particular assemblage of other plants and animals in that same region, i.e., *biotic factors* (LYELL 1832). Lyell was influenced by Candolle's ideas (1820) of "war between species" and "struggle for life": this war or struggle was decided by the better or worse fit to the abiotic environment (CAPONI 2020). As Candolle asserted, organismal features were related to the variables of the abiotic environment rather than the living beings with which they share the living space. Lyell's analysis took a crucial turn, probably due to Malthus's (1798) influence, in which the environmental variables, which define success or defeat in the war between species, were *not only abiotic but also biotic*. The relevant circumstances of an organism were determined by its "immense variety of relations" (LYELL 1832) with its surroundings – a variety which included the *presence and the relative abundance of other organisms*.

#### **5. Comte: the singular "*milieu*"**

Another very important influence on Spencer for the conceptualization of the environment was Auguste Comte, the French philosopher, mathematician, and writer who formulated the doctrine of

positivism. Spencer encountered Comte's work in 1851, finding a new conception of life centered on the *correspondence* between organism and environment – Spencer would inherit the idea of organism-environment interaction directly from Comte (PEARCE 2010b). For Comte, Lamarck was the true creator of the general theory of organic "*milieux*". However, whereas Lamarck used "*milieux*" only in the plural, to refer to the surrounding fluids (e.g., water and air), Comte was the first to use "*milieu*" in the singular, to mean an organism's external circumstances more generally, coming close to a *dialectical conception* of the relations between the organism and the "*milieu*". For Comte, "*milieu*" is a new expression that he used to designate "the whole of the surrounding circumstances necessary to the existence of organisms" (COMTE 1838). Consequently, neither the organism nor the environment was more important, for "the idea of life supposes the mutual relation of two indispensable elements – an organism, and a suitable medium or environment" (COMTE 1838). In fact, Comte recommends the pursuit of a general theory of organic media, and of their action upon the organism, *abstractly regarded* (COMTE 1838). This would seem to be the advantage of a singular term: the "*milieu*" (and by analogy the environment) is a whole variety of circumstances, but abstractly appraised. Thus, Comte focused on Lamarck's vital materialism, in the sense that the material continuity between the organism and the physicochemical environment was the key element in transferring the positivity of physics to a biology that accepts its laws. Lamarck was, according to Comte, the one who opened a path to achieving this transition. Where internalism, as Bichat advocated, imagines life autonomous from its physical and chemical environment, Comte formulates a Lamarckian vision of the *necessary dependence of organic beings on their environment*. Comte understood by "*milieu*" not only the fluid in which a body is immersed, as did Lamarck, but rather, more generally, the total set of circumstances of any kind necessary for the existence of each particular organism (COMTE 1830).

It is important to contextualize the political interest of the concept of "*milieu*" for Comte, in order to understand its posterior influence on Spencer. In the first half of the nineteenth century, the main concern of political philosophy, seeking to overcome the theoretical, political, and philosophical chaos of the post-revolutionary period, was to vindicate some form of social harmony on the basis of natural laws. For Comte, there was, within the framework of the philosophy of biology, a harmony between living beings and the corresponding environment that characterized the fundamental conditions of life (COMTE 1830). If this harmony between organisms and their environments was a law of nature, social disorder resulting from revolutionary upheavals would constitute a violation of this law. Hence, it was an urgent task, in Comte's view, to restore the harmony between modern society and its ever-changing environment. This task should be guided by social science. Comte fully believed that the purpose of the new scientific analysis of society should be ameliorative and that the ultimate outcome of all innovation and systematization in the new science should be the guidance of social planning. It is in this context that 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 that he was aiming to found: sociology (TAYLAN 2020). The relevance and prestige of the concept of “*milieu*” was somehow granted by its transversal character throughout various sciences, such as physics, biology, and sociology. Newton explained the action at a distance of physical objects by the medium in which they move. Lamarck pointed out the dependence of organisms on the physicochemical “*milieux*” supporting them. Comte, through sociology, sought to transpose this positivity to the social domain, by the construal of a theory of the relationships between societies and their “*milieu*”.

In this framework, the importance of Lamarck for Comte results from the fact that Lamarck’s thought provided the laws of the organism-environment relationship, putting an end to some metaphysical considerations of the eighteenth century concerning “the man and its circumstances” – namely that the potential applications of scientific methods to the study and improvement of society could not be possible (COMTE 1830). The outstanding idea was that if it was possible to predict the effect of the environment on organisms, the relationships between societies and their respective environments could also become the object of a new and robust social science. The philosophical formulation of biological laws resulting from Lamarck’s and Cuvier’s discoveries was, in a way, a requirement for the establishment of a positive science of society, namely sociology, grounded on the predictability of organism-environment relationships, as well as on the action of societies upon their own “*milieux*” (TAYLAN 2020). Thus, Comte was willing to expand the meaning of the relatively peripheral concept of “*milieux*” found in Lamarck. It is this extension that produced the *unified concept of environment* in both biology and sociology, and through which the Comtian theory of the “*milieu*” had a lasting effect, particularly on Spencer (PEARCE 2010b).

## **6. Spencer: the individuated organism embedded in an abstract environment**

In short, through Lamarck, Humboldt, Lyell, and Robert Chambers (the author of *The vestiges of the natural history of creation*), Spencer was exposed to the idea of the force of circumstances, i.e., that organisms *accommodate themselves to variation in external circumstances*. But Spencer stretched the term “circumstances”, emphasizing the importance of physical, biological, and social circumstances, in order to include human society (PEARCE 2010b). Thus if Lyell had extended Lamarck’s conception of circumstances by including both inanimate and animate conditions, Spencer took a further step, adding human social circumstances into the mix – for him, the force of the circumstances operated in a similar way *regardless of whether these were physical, biological, or social*. He concluded that organisms, species, and human beings could be understood as transforming over time in response to dynamically changing conditions.

Two other influences were important for Spencer. First, the radical circle around the famous bookseller John Chapman between 1849 and 1852, which contended that drastic changes in physical

conditions were accompanied by corresponding changes in species exposed to these conditions. Second, Coleridge's (1848) notion of life as a tendency to individuation. Imbued with these ideas, Spencer, in his work *Social Statics* (1851), developed a theory of morality and progress that depends on the concept of harmony between organisms and their circumstances – physical, biological, and social. For Spencer, the entire animal series could be read as a chart of *increasing individuation* of both organisms and their parts. The main argument was built around the fundamental law that “every man may claim the fullest liberty to exercise his faculties compatible with the possession of like liberty by every other man” (SPENCER 1851). This was the moral law under which individuation becomes perfect. The relevant circumstances for modern humans were not only physical or biological, but also social: this is why Spencer compared society to an organism, equating the ultimate man in the perfect social state with the highest expression of Coleridge's tendency to individuation (TAYLOR 2007).

Spencer thus integrated all these aspects, inheriting the idea of organism-environment interaction directly from Comte. Some aspects of Comte's account struck him: an explicit consideration of the *organism's circumstances*; the relation between the organism and its environment, characterized as a *correspondence* and as *the fundamental condition of life*; and the employment of the singular term “*milieu*” (medium), *abstractly regarded*, rather than the plural terms “circumstances” and “conditions”.

However, although Comte and Spencer used singular forms, respectively “*milieu*” and “environment”, these terms were somewhat differently conceptualized, insofar as they had distinct underlying political and philosophical projects orienting their interpretation of Lamarckian environmentalism (PEARCE 2010b; TAYLAN 2020). Spencer somehow modified the political and philosophical meaning of “environment” in relation to Comte's “*milieu*”. While it is true that the Spencerian idea of organism-environment interaction has Comtian roots, there is a kind of epistemological break because Spencer disagreed with the fact that Comte did not attach too much value to psychology (TAYLAN 2020). For Comte, the appreciation of “*milieu*” needed not to be conducted at the psychological or individual level, since the study could be done in terms of groups. Where Comte passes from biology to sociology, Spencer introduces the psychological dimension as the most important locus of interaction between individuals and their environment, elaborating an alternative form of Lamarckism (GODFREY-SMITH 1996). Focusing on human societies, Spencer promoted subjective psychology, a kind of “mental environmentalism”, an adaptation of modern individuals to the newly arising industrial environment of that era, which did not concern the transmission of acquired characteristics within a species, because it was focused on single adult members of a species. In this sense, Spencer's philosophy of self-improvement (1855), driven by the emergent liberal market economy of the second half of the nineteenth century, elaborated a general principle of adaptation to the environment, which was therefore seen as a powerful driving force for progress and as a tool of social reform.

Comte (1830) thought that it was necessary to restore harmony between society and its “*milieu*”. Spencer (1855) intended to accelerate the adaptation of individuals to the industrial environment of modern societies, insofar as evolution would require such an adaptation. Accordingly, life could only be perfect when the *correspondence* between internal and external changes was more accurate. However, the harmony between organisms and their environment could only be the result of a fierce struggle, the fittest being “chosen” according to their own capacity to adapt to continuously changing environmental conditions. Such struggle leading to a better correspondence with the changing environment is the keystone of Spencerian evolutionary thought. In the same manner that the adaptability of human races to their changing environment would be a sign of civilization, the adaptation of an individual to a complex environment, where there is rampant competition with other individuals, would be proof of progress and superiority. Therefore, for Spencer, the changing environment of modern societies and the challenges posed to the human species drove its own evolution (TAYLAN 2020).

Spencer’s *Principles of Psychology* (1855) would then be dominated by *the general and abstract dichotomy of a sharply individuated organism and an abstractly regarded environment*. Spencer says in that work that “the changes or processes displayed by a living body are especially related to the changes or processes in the environment”, and introduces the term *correspondence*, the word that most adequately comprehends “all forms of this relation between the organism and its medium”. Spencer therefore offers a broad and complete definition of life as “the continuous adjustment of internal relations to outer relations”, in the sense *that external conditions are continuously tracked by internal states*. Spencer’s approach was thus purely externalist because it explained the properties of the organism by appealing to the properties of their environments (GODFREY-SMITH 1996).

## **7. Darwin: new interpretations on the organism-environment relationship**

The Darwinian perspective is also very important for the conceptualization of the environment (PEARCE 2010a; CAPONI 2020). The famous notion of “struggle for existence” is present in *On the Origin of Species* (1859). Although Lyell has already vindicated this perspective, as mentioned above, it is indeed with Darwin that the influence of the living surroundings began to be considered as having decisive importance. Accordingly, the relationship between the living being and other living beings became preeminent over the relationship between the living being and the environment understood as a set of physical forces. The “struggle for existence” in Darwinian terms thus chiefly implied the interdependence between one living being and another or one species and another, before it implied the impact of the physical environment upon a single individual (TAYLAN 2020). Darwin conceptualized 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 individual organisms compete for resources and mates for reproduction. This stance led him to take account of the

interactions between individual organisms, and also species, while considering the “environment”. This transition from essentialism to population thinking implied a profound modification to the notion of environment, especially for the then-incipient evolutionary biology and ecology of the second part of nineteenth century. Rather than being a “*milieu*” surrounding the individual organism, the Darwinian environment was a place of competitive coexistence, a given biogeographical habitat of interindividual and interspecific relations (EGERTON 2011). Thus, for Darwin, the role of physical environment was somehow “trivialized” to the extent that the fundamental threat to reproduction and garnering resources came from other organisms, rather than the inorganic surroundings (CAPONI 2020; TAYLAN 2020).

Of course, Darwin did not deny that physical factors played an important role: he was just pointing out that this role was played indirectly, always *mediated by biological relationships*, which conditioned the geographical distribution of species more immediately than physical factors. This aspect was also related with the notion of “economy of nature”, which refers only to living beings, alluding to a *permanent struggle* to conquer and preserve a place that always can be lost (PEARCE 2010a; CAPONI 2020). That is the reason why biotic relations are so important to defining the conditions of existence of each living being. Darwin argued that the scrutiny imposed by natural selection could not be limited to the requirements of the inanimate surroundings. According to him, that was not sufficient to explain the observable diversity. Thus, the process of natural selection should be driven by the biological relationships in which the drama of the struggle for existence was posed – this was the important aspect of the *interrelatedness* of life (CAPONI 2020). For the concept of the “struggle for existence” to have the explanatory power that was required by the theory of natural selection, Darwin needed to modify not only the way of thinking about the relationship between the living being and its environment, but also the *very notion of environment*. Accordingly, biological variables would have to play a *decisive* role that they never had in the pre-Darwinian period. Therefore, as a requirement for the advent of evolutionary theory, a new ecological perspective, more focused on the biotic factors, and already anticipated by Lyell, began to take shape, and ended up imposing itself as if it had been something obvious. Lyell could see it as no one before, but Darwin was the one who really showed its theoretical relevance. Whereas Lamarck presumed a direct action of the “*milieux*” on the organism, by shaping new habits transmitted to the next generation, Darwinian adaptation implied a selection of random variations within a population.

Although Spencer and others often treated words like “environment” and “circumstances” as synonyms, it is relevant to ask what the conceptual implications of this linguistic adjustment were and have been. It is also crucial to appreciate the *metaphysical and methodological implications* of the shift from a plural to a singular term. When a progressive conceptualization is construed from individuated

particular factors (e.g., temperature) to a general plural term (e.g., circumstances), and then to a general singular term (e.g., environment), putatively there is “a *progressive concealment* of the different elements that constitute the world outside the organism and the relations between these elements. This concealment, perhaps misleadingly, implies that the abstracted environment can be taken to be a *single, unified cause*” (PEARCE 2010b: 249, emphasis mine) – as Darwin uses it, for example, when he speaks of “direct action of the environment” (DARWIN 1875). However, using the singular term “environment”, like “organism”, was an important heuristic device for biologists and ecologists because it allowed them “to talk about general causes *without exploring the details of micro-level complexity*” (PEARCE 2010b: 249, emphasis mine) – hence, the word “environment” plays a metaphysical work (WALSH 2022). The external environment of an individual organism was therefore a *construct*. It can be considered an idealization, or a simplifying approximation, which was devised from the complex constellation of causal relations that each individual organism encounters. There was a commitment to abstract away from the causal complexities associated with the individual environmental factors to find a *larger component of the causal structure of the phenomena*. In this sense, the “environment” became a device for making the complexity of biological reality more tractable. Certainly, there was also a methodological implication of the shift from “circumstances” to “environment”: the introduction of a singular term allowed *the opposition of two unified and abstract entities* – the organism and the environment. This abstraction made the dichotomy more comprehensible because the environment could be seen as a *cause*, according to an externalist perspective.

### **Final discussion**

Understanding the issue of how a myriad of causal factors making up the environment came to be treated as a single and unified entity becomes crucial to comprehending the formalization of ecology as a science. The intellectual trajectory of Spencer can therefore provide a picture of the rise of the idea of organism-environment interaction in the mid-nineteenth century – he effectively introduced the term “environment”, and its conceptualization, and the subsequent concept of interaction. The concept of *organism-environment interaction* is an important part of the “pre-history of ecology”, along with the idea of an “economy of nature” (EGERTON 1973; McINTOSH 1985). After all, Haeckel coined the word “*Oekologie*” referring to the science of “the relation of the organisms to the external world (*Aussenwelt*), and of the place that each organism takes up in the natural economy (*Naturhaushalte*) (HAECKEL 1866; EGERTON 2013).

Lamarck, Lyell and Humboldt disagreed about the details of which conditions affected organisms. However, to some extent, they all believed that there was a *causal relationship between external conditions and organic form*. From Comte, Spencer inherited the definition of life as a *correspondence between the organism and the “milieu”*: this definition became the center of Spencer’s system, the

*organism-environment interaction*, in which Spencer abstracted away from specific conditions to construct the generalized idea of this interaction.

Thus, the idea of environment has its own history, and its omnipresence today conceals the implicit work of metaphysical abstraction that produced it. The concept of environment, considered as a singular entity, and the concomitant concept of organism-environment interaction, rather than being exclusively formulated by naturalists themselves, such as Lamarck, Lyell, or Darwin, were also the result of philosophical interpretations of the life sciences by prominent “social thinkers” of the nineteenth century, such as Comte and, especially, Spencer.

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