

# THE PHILOSOPHICAL FOUNDATIONS OF LIFE

## Morphology, ecology, and chorology in Ernst Haeckel's thought

Roberta Ranieri

rranieri25@phd.uniba.it

1. Introduction
2. Chorology as a Comprehensive Science: Haeckel's Programmatic Vision
3. Life-Space and the Limits of Geography
4. Integrating the Local and Global: Two Complementary Scales
5. The Platonic Legacy in Haeckel's Thought
6. Haeckel's Chóra: Form, Organism, and Region
7. The Morphogenetic Dimension of Space
8. The Semantics of Space and the Genealogy of Species
9. Stereometry and Morphogenesis: A Geometric Principle of Nature
10. Conclusions

**ABSTRACT: THE PHILOSOPHICAL FOUNDATIONS OF LIFE: MORPHOLOGY, ECOLOGY, AND CHOROLOGY IN ERNST HAECKEL'S THOUGHT**

*Ernst E. Haeckel, renowned as the father of ecology, revolutionized the life sciences with his *Generelle Morphologie der Organismen* (1866), a work aimed to address the philosophical foundations of life. Among his contributions, Haeckel's philosophical inquiry into chorology—the comprehensive science of the spatial distribution of organisms—has remained unexplored. This article investigates the interconnectedness of life and space as explained by Haeckel through his synthesis of morphology, ecology, and chorology. Influenced by Goethe's concepts of morphology and metamorphosis and Lamarck's transformism, Haeckel identified in Darwin's theory of natural selection the efficient cause of the becoming of organisms' forms. However, what allowed organisms and species to acquire their first form and come into existence remained unknown. Haeckel found this in the Platonic concept of *chóra*—the generative space that pre-existed all living forms. Since every organism must possess both a form and a place in order to exist, *chóra* represented, for Haeckel, the ultimate cause of all living things. At the same time, Haeckel transformed the Plato's *chóra* by introducing a morphogenetic dimension: space was no longer a passive receptacle but a dynamic, living, and relational field. By integrating morphology, ecology, and chorology, Haeckel laid the groundwork for an interconnected understanding of life and its evolution across Earth's ever-changing regions. For this reason, I argue that what we owe to Haeckel is not merely ecology but the establishment of the philosophical foundations of life.*

**KEYWORDS:** Chorology, Ernst Haeckel, History and Philosophy of Biology, Plato, Space.

---

\* Dottoranda in Storia e Filosofia della scienza presso l'Università degli Studi di Bari Aldo Moro.

## 1. Introduction

When we think of Ernst Haeckel, we inevitably also think of the word *ecology*—a science, both descriptive and predictive, that studies the dynamic and variable interrelationships between living beings and their biotic and abiotic environments. Haeckel coined this term in *Generelle Morphologie der Organismen* (1866) and further developed in his lectures at the University of Jena and in *Die Lebenswunder* (1904). His philosophical contribution to *chorology*, however, is far less well known.

In *Generelle Morphologie*, Haeckel defined chorology as:

the comprehensive science of the spatial distribution of organisms, of their geographical and topographical extension over the Earth's surface. This discipline does not consider the extent of the sites and boundaries of the distribution areas only horizontally, but also vertically, by monitoring the diffusion of organisms above and below the sea level, their descent into the depths of the ocean, their ascent up the heights of the mountains<sup>1</sup>.

Although in *Generelle Morphologie* the paragraphs devoted to ecology and chorology are almost the same<sup>2</sup>—and although Haeckel conceived of these two disciplines as interrelated even in later works such as *Natürliche Schöpfungsgeschichte* (1868)—it seems that chorology has largely been forgotten. This neglect may be due, at least in part, to the fact that Haeckel never devoted an entire monograph to this science.

At first glance, reading Haeckel's definition, one might think that the questions guiding this discipline concerned how and why organisms tend to distribute themselves in particular ways across the Earth's surface. Yet, as many historians and philosophers of science know, these questions had already been addressed by Darwin through his theories of the origin and evolution of species and of sexual selection. One might therefore regard Haeckel's proposal as a mere reiteration of Darwinian theses. After all,

---

<sup>1</sup> E. Haeckel, *Generelle Morphologie der Organismen* (1866), Walter de Gruyter, Berlin 1982, vol. II, p. 287.

<sup>2</sup> *Ibid.*, vol. II, pp. 236, 286-289, 294.

*Generelle Morphologie* has often been considered merely a panegyric of Darwin.

However, *Generelle Morphologie* did not aim solely to support Darwinian theses, but also (a) to develop a comprehensive understanding of the «complex phenomena of organic nature»<sup>3</sup> and the «efficient causes of appearances»<sup>4</sup>, and (b) to address the «neglect of indispensable philosophical foundations»<sup>5</sup> that, according to Haeckel, afflicted 19<sup>th</sup>-century science.

This paper proposes to examine Ernst Haeckel's thought from a new perspective. From an early age, his interests ranged from natural sciences to history, geography, and philosophy. Both an artist and a scientist, he dreamed of undertaking a great journey—as von Humboldt and Darwin had done—in the hope of tracing the philosophical foundations of the living world, which he ultimately synthesized in the concepts of *morphology*, *ecology*, and *chorology*. In particular, this article seeks to break the long-standing silence in scientific and philosophical discussions of Haeckel's chorology and to bring attention back to the central question that guided this discipline: why and how space influences (a) the form of organisms as they appear to the senses, (b) the patterns of distribution of species and communities, and (c) the identity and behaviour of individual organisms and species.

To address this question, a shift in perspective is required. The focus here will not be on Haeckel as the German Darwin, nor as an enthusiastic reader of von Humboldt's *Kosmos*, nor as the father of ecology<sup>6</sup>. Rather, this study uses the history of science to develop a thesis in the philosophy of nature, suggesting that—although there are no explicit references in *Generelle Morphologie* or in his later works—the Platonic *Dialogues* were essential to Haeckel's intellectual formation, for only they could have guided him toward the knowledge of truth in the sacred temple of Nature.

---

<sup>3</sup> *Ibid.*, vol. II, p. 294.

<sup>4</sup> *Ibid.*, vol. I, p. XIII.

<sup>5</sup> *Ibid.*, vol. I, p. XXII.

<sup>6</sup> These interpretive frameworks have dominated the historiography of Haeckel's thought since the early 20<sup>th</sup> century.

## 2. Chorology as a Comprehensive Science: Haeckel's Programmatic Vision

Haeckel defined *chorology* as a «comprehensive science» [*die gesammte Wissenschaft*]. The phrase is not a simple lexical qualification but a programmatic statement of ontological, methodological, and ethical import. As a *Wissenschaft*, it must represent a body of knowledge both organic and systematic, aimed at identifying, time after time, the objective structures underlying the functioning of the living world. Haeckel wrote that chorology:

must be able to present a certain wealth of general results and laws; it must strive for the understanding of phenomena and for the knowledge of their causes; it must never content itself with the mere acquaintance with individual facts<sup>7</sup>.

With this claim, Haeckel established a clear distinction between what he saw as the mere description of natural phenomena and what he considered *true science*—a distinction also reflected in his opposition between phytogeography and natural history.

Founded by Alexander von Humboldt and widely disseminated throughout 19<sup>th</sup>-century Germany, phytogeography emerged, on the one hand, from a cognitive and cosmographic revolution—the discovery of America—and, on the other, from a methodological innovation: the consolidation of Linnaeus's taxonomic system, combined with a phytocentric interpretation of the natural world. The collapse of the Aristotelian-Ptolemaic cosmos produced a profusion of new botanical (and also zoological, anthropological, and ethnographic) data that needed to be collected and compared. Through Linnaeus's standardized binomial nomenclature—which required uniform criteria of classification—explorers and naturalists could distinguish and catalogue plant forms according to their number, type, and geographical distribution.

---

<sup>7</sup> Id., *Ueber Entwicklungsgang und Aufgabe der Zoologie (Vortrag, gehalten beim Eintritt in die philosophische Facultät zu Jena, am 12. Januar 1869)*, in Id., *Gesammelte populäre Vorträge aus dem Gebiete der Entwicklungslehre*, Emil Strauss, Bonn 1879, vol. II, chap. 1, p. 7.

Yet this discipline, for Haeckel, represented a merely quantitative, analytical, and descriptive idea of science—one that limited itself to enumerating the phenomena of the plant world. «Such a purely descriptive natural history», he wrote, «can never be a science. For the concept of a purely descriptive science is an internal contradiction—a *contradictio in adjecto*»<sup>8</sup>. It was therefore necessary, in his view, to return to that universal and comprehensive, synthetic, and comparative conception of natural history—one inherited from Aristotle—and thus to seek a genuine causal understanding of the single, universal substance: Nature itself.

This material substrate—composed largely of carbon<sup>9</sup>—linked the inorganic and the organic realms, differing only in degree and complexity. Building on his studies of radiolarians and crystals<sup>10</sup>, Haeckel revived the classical idea of a connection between microcosm and macrocosm and postulated that organic matter could spontaneously arise from inorganic matter. In this way, the simplest and lowest living forms were thought to evolve into higher and more complex ones through a long process known as *Entwicklungsgeschichte*. Energetic, active, and thinking, this substrate thus permeated life in all its forms, preserving it over time<sup>11</sup>.

By overcoming the dilemma between materialism and spiritualism<sup>12</sup> through an ontological monism inspired by Giordano Bruno and Spinoza<sup>13</sup>,

---

<sup>8</sup> *Ibidem*.

<sup>9</sup> E. Canadelli, *Icone organiche, Estetica della natura in Karl Blossfeldt ed Ernst Haeckel*. Mimesis, Milano-Udine 2006, pp. 45-47; Id., *Tra evoluzione e morfologia. Ernst Haeckel e le forme artistiche della natura*, in «Elephant & Castle», III, 2011, p. 14.

<sup>10</sup> N. Heie, *Ernst Haeckel and the Redemption of Nature*, ProQuest Dissertations & Theses, Queen's University, Kingston 2008, pp. 122-123.

<sup>11</sup> The term “thinking” should not be understood as individual consciousness or as an attempt to anthropomorphize nature, but rather as a diffuse and immanent force inherent in nature itself.

<sup>12</sup> In *Natürliche Schöpfungsgeschichte*, Haeckel observed that materialism conceived of the universe as composed solely of “dead” matter, whereas his monism was centred on matter that was always “alive” and made no distinction between animated and inanimate bodies. N. Heie, *op. cit.*, p. 132.

<sup>13</sup> Haeckel's monism has often been described in existing scholarship as pantheistic or pansychist. In fact, Haeckel himself defined it as such in a letter to Frida dated 22 February 1898: «It was only when I had penetrated farther and farther into the mysteries of life and its

Haeckel sought to transcend Kant's dualism between the phenomenal and the noumenal world, thereby restoring the totality of nature to the realm of immanence<sup>14</sup>.

The inner and external worlds were consubstantial and therefore governed by the same laws. These laws shaped nature by mechanically regulating the processes of generation, distribution, and decay of individual organisms and species within a framework of «uninterrupted evolution»<sup>15</sup>. The universality of these laws made it possible to construct a unified, comprehensive, and all-encompassing description of reality<sup>16</sup>. Haeckel's ontological and metaphysical monism thus became a genuine research program within the natural sciences, whose system of truth was supported by

---

evolution, when as a practicing physician I grew thoroughly familiar with all the misery of mankind, and as a student with all the grandeur of "godless" nature, that I became after the most desperate spiritual conflicts a freethinker and a pantheist», F. N. Egerton, *History of Ecological Sciences, Part 47: Ernst Haeckel's Ecology*, in «Bulletin of the Ecological Society of America», XCIV, 3, 2013, pp. 238-239. However, the pantheism to which the zoologist alludes here is primarily religious rather than metaphysical—a pantheism he would later describe, quoting Schopenhauer, as «a polite form of atheism», K. Peden, *Alkaline Recapitulation: Haeckel's Hypothesis and the Afterlife of a Concept*, in «Republics of Letters», IV, 1, 2014, pp. 3-13. What concerns me here, however, is the specifically metaphysical, epistemological, and gnoseological dimension underlying Haeckel's choice of this attribute. For this reason, I argue that it is more accurate to speak of monotheism, following Carus's definition: «the eternal norm which determines the destiny of the world as a whole and also in its parts. It is the intrinsic consistency which exists in and by itself and would exist even if nature did not exist», P. Carus, *The Monism of "The Monist," Compared with Professor Haeckel's Monism*, in «The Monist», XXIII, 3, 1913, pp. 435-439.

<sup>14</sup> Within such a framework, there was no room for the transcendent Christian God, for the idea of *creatio ex nihilo*, for the fixity of species, and even less for the survival of the soul after bodily death. In place of the «gaseous vertebrate», Haeckel posited the eternal existence of a primordial, formless unity of matter and energy in ceaseless becoming. From a unified knowledge of nature, he also defined his monism as a form of "practical materialism," which, on the one hand, uprooted any metaphysical possibility of the supernatural, and on the other, proposed an ethics oriented toward the pursuit of goodness and the creation of beauty. E. Canadelli, *Icone organiche*, cit., pp. 45-47; K. Peden, *op. cit.*, pp. 3-13; S. Forrester, *Ernst Haeckel's 'Kant Problem': Metaphysics, Science, and Art*, in «Biology & Philosophy», XXVII, 2020, pp. 3-4.

<sup>15</sup> B. Dayrat, *The Roots of Phylogeny: How Did Haeckel Build His Trees?*, in «Systematic Biology», LII, 4, 2003, p. 523.

<sup>16</sup> F. N. Egerton, *op. cit.*, pp. 238-239.

the univocity and coherence between the object of inquiry—nature—and its scientific description—natural history<sup>17</sup>.

However, a fully scientific understanding of the laws governing the natural world could be achieved only if botanists and zoologists embraced the reform of the *Descendenz-Theorie* initiated by Charles Darwin through his theory of the evolution of species—of which Haeckel was one of the most ardent supporters throughout Prussia<sup>18</sup>. Haeckel read Darwin's *On the Origin of Species* (1859) in the German translation by Heinrich G. Bronn, published only a few months after the English edition<sup>19</sup>. He believed that Darwin's theses were not only entirely convincing but also represented «the only possible way to approach an understanding of the great law of development that determines the phenomena of the organic world, their origin, and ultimately their transformation»<sup>20</sup>. Darwin's theory combined empirical knowledge with the theoretical foundations of *Naturphilosophie*, providing a causal explanation for organic evolution<sup>21</sup>.

To support and elaborate upon this framework, Haeckel introduced his *Biogenetic Law*—what he defined as the fundamental law of organic evolution. First expressed in *Generelle Morphologie* and later developed in *Die Kalkschwämme* (1872) and *Anthropogenie* (1874), the law stated that during

---

<sup>17</sup> S. Forrester, *op. cit.*, pp. 3-4; E. Watts, U. Hoßfeld, G.S. Levit, *Ernst Haeckel's "Genetica" (1922)–Reprint and a Short Commentary*, in «Folia Mendeliana», LV, 2, 2019, pp. 6-8; G.S. Levit, U. Hoßfeld, *Natural Selection in Ernst Haeckel's Legacy*, in R.G. Delisle (ed.), *Natural Selection. Evolutionary Biology – New Perspectives on Its Development*, Springer, Cham 2021, vol. III, p. 116.

<sup>18</sup> More than forty letters were exchanged between January 1864 and July 1881, about one year before Darwin's death in April 1882. See: *Darwin Correspondence Project*, <https://www.darwinproject.ac.uk/> (last accessed: 10/01/2026).

<sup>19</sup> O. Breidbach, *Visions of Nature: The Art and Science of Ernst Haeckel*, Prestel, Munich 2006, pp. 99-100; R. J. Richards, *The Tragic Sense of Life: Ernst Haeckel and the Struggle over Evolutionary Thought*, University of Chicago Press, Chicago 2008, pp. 68-72.

<sup>20</sup> V. Maggiore, *L'estetica biologica di Ernst Haeckel tra evolucionismo darwiniano e morfologia goethiana*, in A. Mecarocci, V. Rasini (eds.), *A proposito di organismi, evoluzione e conoscenza*, Meltemi, Milano 2023, p. 103.

<sup>21</sup> «All true natural science is philosophy, and all true philosophy is natural science. All true science, however, is natural philosophy», E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. II, p. 447.

embryological development (*ontogeny*), an embryo recapitulates the morphological stages of the evolutionary history of its species (*phylogeny*). This process, always in flux, was mechanically governed by the physiological functions of heredity and adaptation to external circumstances, continuing until the individual reached the fully mature form determined by its species<sup>22</sup>.

The *Biogenetic Law* presupposed that organisms belonging to the same species exhibited precise morphological or transcriptomic homologies inherited from their ancestors. It allowed for the study of the history and diversification of life on Earth<sup>23</sup>. To corroborate his theory, Haeckel used his artistic skills to illustrate embryos of vertebrates that were not phylogenetically related. Executed in a serial and comparative manner, these drawings highlighted how embryos displayed significant phenotypic similarities in early stages, which gradually decreased as the embryos acquired greater complexity. In this way, he demonstrated that the emergence of very different species depended on the morphological transformations of embryonic forms<sup>24</sup>.

However, although this progressive differentiation indeed occurs, Haeckel's drawings contained what might be called an "exaggeration of truth." In his attempt to make them serve as scientific evidence for a form of embryological knowledge not only considered valid but, above all, true, Haeckel introduced several graphical inaccuracies, as well as imprecisions and omissions concerning the scientific names, stages, and sources of the specimens he examined<sup>25</sup>. As a result, the original value of those drawings was compromised, along with Haeckel's credibility, as he was accused by many

---

<sup>22</sup> E. Canadelli, *Icone organiche*, cit., pp. 44; K. Peden, *op. cit.*, pp. 3-13; G.S. Levit, U. Hoßfeld, *Natural Selection in Ernst Haeckel's Legacy*, cit., p. 121.

<sup>23</sup> K.J. Niklas, E.D. Cobb, U. Kutschera, *Haeckel's Biogenetic Law and the Land Plant Phylotypic Stage*, in «BioScience», LXVI, 6, 2016, pp. 510-512.

<sup>24</sup> V. Maggiore, *Ernst Haeckel e il "rompicapo" dello sviluppo embrionale tra arte e scienza*, in «Scienza&Filosofia», XX, 2018, pp. 261-270; F. N. Egerton, *op. cit.*, p. 239.

<sup>25</sup> M.K. Richardson, J. Hanken, M.L. Gooneratne, C. Pieau, A. Raynaud, L. Selwood, G.M. Wright, *There Is No Highly Conserved Embryonic Stage in the Vertebrates, Implications for Current Theories of Evolution and Development*, in «Anatomy and Embryology», CXCVI, 1997, pp. 91-106; F.N. Egerton, *op. cit.*, p. 239.

contemporaries—including the British biologist Michael K. Richardson—of «intentional untruth, deceit, and scientific falsification»<sup>26</sup>.

The charge of falsification, however, stemmed from a misunderstanding of the gap between the “truth of nature” and “mechanical objectivity”—i.e., between the claimed correspondence of the natural world and its description, on the one hand, and the representational means through which Haeckel sought to make this correspondence visible, on the other. As Valeria Maggiore observes, Haeckel did not use the term *exakt*, but rather *ganz genau*, indicating that his aim was not «to reproduce exactly the particular embryo [...] but rather to make it an emblem, a symbol», in the Kantian sense<sup>27</sup>.

In the second half of the 19<sup>th</sup> century, studies of the living world increasingly adopted the positivist ideal of *scientific non-intervention*: scientists were expected to let nature emerge as it was, offering a bare, objective, fact-oriented description of biological phenomena. By contrast, Haeckel defended a subjective idea of the truth of nature. This did not mean that he endorsed relativism; rather, he considered the ideal of a nature entirely free from human interference to be impossible. Observation and measurement were, in his view, interactive acts that placed the researcher and the object of investigation under conditions of proximity and anisotropy. Consequently, they formed an intimate connection and engaged in both poietic (directed toward the other) and autopoietic (directed toward the self) actions that were mutual and simultaneous<sup>28</sup>.

Knowledge production was therefore possible only through a participatory, empathic, and delicate method, borrowed from art and religion—one that the Romantics sought to transfer into the natural sciences,

---

<sup>26</sup> V. Maggiore, *Ernst Haeckel e il “rompicapo” dello sviluppo embrionale tra arte e scienza*, cit., pp. 266-267; L. Dibattista, *I “falsi” di Ernst Haeckel. Plancton, meduse, embrioni e la perdita oggettività della scienza*, in F. Morgese, V. Vinci (eds.), *Performascienza. Laboratori teatrali di storia della scienza a scuola*, FrancoAngeli, Milano 2010, pp. 77-98.

<sup>27</sup> V. Maggiore, *Ernst Haeckel e il “rompicapo” dello sviluppo embrionale tra arte e scienza*, cit., p. 270.

<sup>28</sup> In scientific inquiry, it was «precisely the act of immersing oneself in the object of research that transmitted certainty», in C. G. Carus, D. Kuhn (ed.), *Briefe über Landschaftsmalerei* (1835), Lambert & Schneider, Heidelberg 1972, p. 136.

especially medicine and biology<sup>29</sup>. Just as an artist inevitably interacts with his work, so too did the scientist's subjectivity inevitably intervene in his observation and measurement of biological phenomena. Through his descriptions, Haeckel developed a genuine aesthetic construction of nature. Hence, it was only through this "exaggeration of truth", characteristic of his galleries of ancestors, that it became possible to convey to his audience that species and individuals were historical phenomena—i.e., produced and transformed over time by the universal laws underlying ontogenetic and phylogenetic development<sup>30</sup>.

### 3. *Life-Space and the Limits of Geography*

The discovery of America opened entirely new horizons for Europeans. It spurred geographical explorations, accelerated the conquest and colonization of other continents, generated new commercial, cultural, and biotic exchanges, and reshaped the trajectories of major migratory movements. It also transformed the Earth's surface into a unified space: although continents remained separated by vast oceans or imposing mountain ranges, these no longer constituted insurmountable barriers<sup>31</sup>. The French Revolution and Napoleonic expansion further natural and political boundaries, dismantling the *Ancien Régime's* system of states and creating a homogeneous, isotropic, and readily traversable territorial continuum<sup>32</sup>. The Jacobin conception of

---

<sup>29</sup> K. Köchy, *Das Ganze der Natur. Alexander von Humboldt und das romantische Forschungsprogramm*, in «HiN – Alexander Von Humboldt Im Netz. Internationale Zeitschrift für Humboldt-Studien», III, 5, 2002, p. 7.

<sup>30</sup> Known as the "St. George of science," Haeckel became in the first half of the 20<sup>th</sup> century an «allegorical representation of the inner conflict [...] between the demand for rigor imposed by scientific research and the artistic ideals of Romantic culture», V. Maggiore, *L'estetica biologica di Ernst Haeckel tra evolucionismo darwiniano e morfologia goethiana*, in A. Mecarocci, V. Rasini (eds.), *op. cit.*, p. 100.

<sup>31</sup> I. Consolati, *Geografia del movimento storico. Spazio e politica in Carl Ritter*, in E. Boria, M. Marconi (eds.), *Geopolitica dal pensiero all'azione. Spazio e politica in età contemporanea*, Argos Sprea Editori, Cernusco sul Naviglio 2022, p. 194.

<sup>32</sup> F. Farinelli, *Blinding Polyphemus: Geography and the Models of the World*, Seagull Books, London 2018.

space reduced the world to «sheer externality»—i.e., absolute, abstract, immobile, boundless, and internally undifferentiated<sup>33</sup>.

Territories could no longer be delineated by prerogatives, the authority of local jurisdictions, or natural elements, whose selection was arbitrary and whose stability transient, nor according to the Enlightenment ideal of cosmopolitanism<sup>34</sup>. A new set of criteria for spatial organization was therefore required, alongside a radical rethinking of the very notion of boundaries. Carl Ritter's *Erdkunde* (1817–1818), the foundational work of modern geography, sought to articulate this post-revolutionary order. The geopolitical and social events surrounding the Congress of Vienna demonstrated that intra- and extra-European regions were interconnected, even if not always contiguous, and were shaped over time by human activity. Crucially, the organization of these regions also depended on the active involvement of organisms with the places they inhabited. Thus, any description of continents and terrestrial regions had to account for human presence, which could transform and re-signify the natural environment.

Ritter defined geography as a “doctrine of relationships” not merely because he regarded the Earth's surface as an organism—or as a whole composed of interdependent parts, following Kant's *Physische Geographie* (1802) and von Humboldt's *Ideen zu einer Geographie der Pflanzen* (1807) and *Ansichten der Natur* (1808)—but primarily because he identified the interrelation between a people's national identity and the territory it occupied as the guiding principle for redrawing geographical and geopolitical maps in the 19<sup>th</sup> and 20<sup>th</sup> centuries<sup>35</sup>. In this framework, space [*Raum*] became the central concept of German geographical and geopolitical thought, conceived not as “sheer externality” relative to life, but as a container within which life unfolds in its genotypic and phenotypic diversity.

---

<sup>33</sup> D.W. Bond, *Hegel's Geographical Thought*, in «Environment and Planning D: Society and Space», XXXII, 1, 2014, p. 186.

<sup>34</sup> M.G. Bevilacqua, *Limiti della conoscenza e metafore spaziali in Kant: Grenze, Schranke, Feld, Boden, Karte des Landes*, in «Areté», VIII, 2023, pp. 411–414.

<sup>35</sup> D.W. Bond, *op. cit.*, pp. 189–194; W.J. Cahnman, *The Concept of Raum and the Theory of Regionalism*, in «American Sociological Review», IX, 5, 1944, pp. 455–459.

Thus, departing from Kant's notion of space as an "a priori form of sensibility"<sup>36</sup>, space came to be conceptualized as "Life-space" [*Lebensraum*]<sup>37</sup>—a field of physical, biological, and sociological forces. Although later associated with social Darwinism and racial or climatic theories, the conceptual foundations of *Lebensraum* were rooted in the phytogeography of von Humboldt, Schouw, and Grisebach, as well as in the zoogeography of Berghaus, von Schmarda, and Wallace—disciplines that particularly captured the interest of Friedrich Ratzel from an early age. From these studies, several principles emerged: (a) the Earth's surface was a vast space inhabited in every part by living beings, regardless of extent, latitude, or geomorphological differentiation<sup>37</sup>; (b) it consisted of interrelated sub-regions, each delimited by the species that inhabited them; (c) geomorphological and climatic characteristics could be inferred by studying the geographical distribution of species; and (d) the study of species' distribution could not ignore the geomorphological and climatic changes that shaped these regions in past epochs.

The notion of "spatial determinism"—i.e., space conditioned the existence of organisms, shaping their biological, cultural, and spiritual differences, and conversely being shaped by them<sup>38</sup>—initially pertained to the life sciences, but was later extended to geopolitical, sociological, and anthropological studies. In particular, it became an interpretative framework for explaining or legitimizing major historical processes of the 19<sup>th</sup> century:

---

<sup>36</sup> I. Kant, *Critique of Pure Reason* (1781-1787), eng. tr. MacMillan & Co., London 1929, vol. I, pt. I, section 1, §2, pp. 67-74.

<sup>37</sup> «This science, as vast as its object, paints with a broad brush the immense space occupied by plants, from the regions of perpetual snows to the bottom of the ocean, and into the very interior of the earth», A. von Humboldt, A. Bonpland, S. T. Jackson (ed.), *Essay on the Geography of Plants*, University of Chicago Press, Chicago-London 2009, p. 64.

<sup>38</sup> A. Daum, *Alexander von Humboldt, die Natur als „Kosmos“ und die Suche nach Einheit. Zur Geschichte von Wissen und seiner Wirkung als Raumgeschichte*, in «Berichte zur Wissenschaftsgeschichte», XXIII, 2000, pp. 246-249.

the organological model of the nation-state<sup>39</sup>, the conquest of extra-European continents, European migrations, and racial classification and comparison.

Although Haeckel did not engage in explicitly geopolitical theorization, these issues—including those discussed in this chapter, from geographical exploration to spatial determinism—resonate throughout his works<sup>40</sup>. Indeed, the object of chorology was «the spatial distribution of organisms [...] over the Earth’s surface». The wording is deliberate: it references Chapters 12 and 13 of *On the Origin of Species*<sup>41</sup>, linking Haeckel’s *Generelle Morphologie* with Darwin’s work. At the same time, Haeckel’s phrasing—*räumlichen Verbreitung* rather than a literal translation of Darwin’s «geographical distribution»—represents a syncretic gesture typical of his thought, reconciling physical geography, phytogeography, and zoogeography with Darwin’s theories of migration, dispersal, and spatial differentiation of species.

What is particularly curious, however, is that the science dealing with “the spatial distribution of organisms” is called *chorology*, not *geography*. Haeckel himself explains this in the *Generelle Morphologie*: geography was merely «a collection and [...] an orderly presentation of the chorological facts, without seeking their causes»<sup>42</sup>—that is, it limited itself to recording, cataloguing, and describing the state of the physical world. Certainly, it had

---

<sup>39</sup> The organism becomes a model for interpreting all complex unities within multiplicity—whether poetic, philosophical, economic, political, or natural forms. See: K. Köchy, *op. cit.*, pp. 5-13.

<sup>40</sup> In the second half of the 20<sup>th</sup> century, some historians argued that Haeckel’s studies had provided the Nazis with the intellectual foundations for their racial programs, thus consigning him to oblivion. Certainly, like other nineteenth-century scientists, including Darwin, Haeckel argued for a division between “savage” and “civilized” races based on morphometric data derived from biometrics, osteometry, craniometry, and anthropometry. However, these historical claims are inconsistent—both in content, since Haeckel was not anti-Semitic and classified Jews among the Caucasians, and in chronology, since he died in 1919, more than a decade before Hitler’s rise to power in January 1933. See: A. Wulf, *The Invention of Nature: Alexander von Humboldt’s New World*, Knopf–John Murray, New York–London 2015, chap. 22; P. Govoni, G. Belcastro, A. Bonoli, G. Guerzoni, *Ripensare l’Antropocene. Oltre natura e cultura*, Carocci, Roma 2024, p. 55.

<sup>41</sup> C. Darwin, *On the Origin of Species*, P. F. Collier & Son, New York 1909.

<sup>42</sup> E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. II, p. 288.

the merit of encouraging a rethinking of scientific inquiry and the concept of science, whereby many discoveries resulted from the curiosity, sense of beauty, and care of naturalists and explorers, rather than from cold, Galilean measurements<sup>43</sup>. Nevertheless, geography remained a purely descriptive discipline and, according to Haeckel, inadequate for narrating the becoming of the Earth and of living beings.

Moreover, geography entirely neglected the search for true, primary, and immediate causes. Haeckel considered it a gangrenous science, afflicted by the plague of «the neglect of philosophical foundations»<sup>44</sup>. Naturalists believed they could advance science without relying on the systematicity and organic nature of Western philosophical thought. Consequently, there was no mutual permeation between empirical natural science and speculative philosophy. This led to conceptual confusion, dualistic interpretations of life, the cult of the individual and thoughtless specialization, and entangled scientific descriptions in a technical language Haeckel called «Babylonian»<sup>45</sup>.

Haeckel's position was certainly radical and, in light of the effects of Positivism, valid, though not without critical issues. In *Physische Geographie*, Kant defined *physical geography* (or natural history, the description of the physical world) as an empirical science [*empirische Wissenschaft*] capable of producing genuine erudition concerning phenomena that occur simultaneously in space<sup>46</sup>. By describing the objects of experience through the senses as they appear in space next to one another within the same interval of time, it allowed for the production of *a posteriori* knowledge about the physical world. Yet, precisely because it was empirical, it lacked the necessity and universality characteristic of the rational sciences [*rational Wissenschaft*]<sup>47</sup>.

---

<sup>43</sup> A. Wulf, *op. cit.*

<sup>44</sup> E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. I, p. XXII.

<sup>45</sup> *Ibid.*, vol. I, p. XXII.

<sup>46</sup> I. Kant, *Physische Geographie*, Gottfried Vollmer, Mainz und Hamburg 1802, vol. I, pp. 3-4; M. Costantini, *How Much Geography in Kant's Critical Project?*, in «Journal for the Philosophy of Language, Mind, and the Arts», V, 1, 2024, p. 64.

<sup>47</sup> I. Kant, *Critique of Pure Reason*, cit., vol. I, pt. II. 2, book 2, chap. 2, sec. 4, p. 433.

This might seem to fully confirm Haeckel's theses, if it were not for the systematic character that Kant also attributed to physical geography. Since the planet is an interrelated whole, with every part intelligible only in relation to the whole, physical geography could only be a systematic knowledge of the external world.

The knowledge of the world must be a system. [...] In a system the whole precedes the parts, whereas in an aggregate the parts precede the whole. [...] All world or Earth description, insofar as it is to be a system, must begin from the globe, as the idea of the whole, and must maintain reference to it. [...] Physical geography rather gives us an idea of the whole, with respect to space—the globe—and in the description of its parts it follows the laws and the order of nature<sup>48</sup>.

What physical geography aspired to was to give the sensibility, the perception involved in the experience of the world the form of a wholeness. For this reason, there had to be coherence between the systemic character of the object [*die Erde*] and the systematicity of its description [*die Erdbeschreibung*]. This implied that both Kant's physical geography and his critical philosophy were centred on the «representation of the whole»<sup>49</sup>. Moreover, the philosopher from Königsberg explicitly distanced himself from Linnaeus's *Systema Naturae*, which aimed at a knowledge of nature that Kant defined as particular [*besondere*]: it studied living beings as individual, isolated entities, independent and self-sufficient<sup>50</sup>. By contrast, Kant sought to preserve the complexity of the «blade of grass» [*Grashalm*]<sup>51</sup> even in the description of the Earth's surface, conceiving the world as a mosaic in which each local phenomenon acquired meaning only within a broader context.

A similar situation is evident in von Humboldt's *Ideen zu einer Geographie der Pflanzen* (1807). Opposed to the synthetic, intuitive, and poetic principles of the Romantics, von Humboldt transformed

---

<sup>48</sup> Id., *Physische Geographie*, cit., vol. I, pp. 10-11.

<sup>49</sup> M. Costantini, *op. cit.*, pp. 62-63.

<sup>50</sup> I. Kant, *Physische Geographie*, cit., vol. I, p. 9; K. Köchy, *op. cit.*, p. 6.

<sup>51</sup> I. Kant, *Kritik der Urteilskraft* (1790), Felix Meiner, Leipzig 1922, pt. II, sec. 2, § 75, p. 265.

phytogeography into an analytical, deductive, and empirical discipline, aligned with the Galilean–Newtonian sciences. It was to be «an essential part of general physics»<sup>52</sup> and therefore relied on quantitative measurement and experimental methods—observation, experimentation, and data collection—to uncover the universal laws of nature. Although mathematics was indispensable, the affinity with *physica generalis* placed phytogeography closer to mathematics than to the philosophy of nature<sup>53</sup>.

Nevertheless, reducing Humboldt’s project to a mere micrological transcription of individual plant diversity underestimates its unifying, integrated, comparative, and interpretative scope, which aligned with the philosophical tradition of systems. The goal of his physical description of the world was «the recognition and explanation of unity in multiplicity, the exploration of what is common, of the inner connection»<sup>54</sup> among entities. Defined as a systematic science, phytogeography surpassed classificatory botany to demonstrate that (a) the planet is not a dead aggregate but a living, complex, interconnected, self-organizing, and evolving system; (b) natural phenomena vary systematically and interdependently across the Earth’s surface; and (c) within individual entities, it is possible to recognize the universal principles that organize the empirical, thus aspiring to knowledge of the truth of nature.

Thus, both Kant’s physical geography and von Humboldt’s phytogeography laid the groundwork for a broader understanding of nature: simultaneously holistic and systematic, unified and dynamic, oriented toward both empirical collection and the search for general connections. Although Haeckel often criticized them, he nonetheless grasped a real limitation: the absence of a causal theory explaining the historical development of organic forms.

In Kant’s case, this limitation stemmed from the dependence of physical geography on empirical data. Although it privileged the holistic dimension

---

<sup>52</sup> A. von Humboldt, A. Bonpland, S.T. Jackson (ed.), *op. cit.*, p. 64.

<sup>53</sup> I. Kant, *Critique of Pure Reason*, cit., vol. II, chap. 3, p. 663.

<sup>54</sup> K. Köchy, *op. cit.*, p. 8.

over the *chorographic* one typical of traditional geography—which was fragmentary, local, and episodic—and although this approach was consistent with Kant’s cosmopolitan vision of the world, physical geography remained entirely devoid of its own laws. It organized natural phenomena according to the places and times in which they occurred and, consequently, remained bound to the empirical and concrete reality of phenomena, with little room for abstraction or for the search for the necessary and universal causes underlying their occurrence<sup>55</sup>.

Furthermore, Kant proposed a teleologically oriented reading of the organic world. Contrary to what he had argued in the *Allgemeine Natur-Geschichte und Theorie des Himmels* (1755)—where he explained the origin of the cosmos according to purely mechanical, Newtonian principles—in the *Kritik der Urtheilskraft* (1790) he established the necessary subordination of the principle of mechanism (*causae efficientes*) to that of teleology (*causae finales*) in the life sciences<sup>56</sup>. This led to contradictions and ambivalent, dualistic conclusions, which were ultimately irreconcilable not only with Haeckel’s monistic vision, but also with certain theses he embraced concerning the composition of universal matter—such as Johann G. Vogt’s *pyknotic theory of substance*, according to which the substance filling the universe consisted of atoms moving through space under the influence of mechanical forces<sup>57</sup>. Indeed, Haeckel wrote:

We now know that all vital phenomena of animals, as well as of man, occur with absolute necessity according to great mechanical laws of nature; that they are not brought about by final causes (*causae finales*), but by mechanical causes (*causae efficientes*); and that, in the last resort, they rest upon physical-chemical processes, upon

---

<sup>55</sup> A similar, though more moderate, critique can be found in the section “Kant and Geography” of M. Tanca’s *History of Geography and History of Philosophy. Convergences, Affinities, and Loans*, in T. Tambassi, M. Tanca (eds.), *The Philosophy of Geography*, Springer, Cham 2021, pt. I, chap. 1, pp. 8-10. See also: M. Tanca, *Geografia e filosofia. Materiali di lavoro*, FrancoAngeli, Milano 2012, pp. 15-48.

<sup>56</sup> E. Haeckel, *Ueber Entwicklungsgang und Aufgabe der Zoologie*, cit., p. 19; Id., *Natürliche Schöpfungsgeschichte* (1878), Georg Reimer, Berlin 1889, chap. 5, pp. 89-92.

<sup>57</sup> N. Heie, *op. cit.*, pp. 133-135.

infinitely subtle and intricate motions of the smallest particles which compose the body<sup>58</sup>.

Unlike Kant, Humboldt neither adopted an exclusively holistic method nor endorsed a teleological conception of nature. In continuity with the *chorographic* tradition, he identified distinct, non-contiguous regions of the Earth's surface and studied the distribution of plant species on a global scale, assessing which environmental factors—such as altitude, latitude, climate, and atmospheric pressure—might have mechanically determined their generation and preservation over time. Yet, although his measurements, *tableaux*, and maps amounted to an encyclopaedic enterprise, they were insufficient for achieving a full understanding of evolutionary mechanisms. Humboldt himself was well aware of this:

Humboldt proceeds from the assumption that even the mere compilation of large and seemingly intricate observational results into a structured and harmonious overall view promotes insight into causal connections. [...] However [...] Humboldt is also fully aware that, given the abundance of data and the magnitude of the enterprise, his approach represents only an imperfect beginning, and that the transition from a description of the world to an explanation of the world, and thus to the grasp of the causal nexus being sought, is still incomplete, ultimately even becoming a striving toward the infinite<sup>59</sup>.

Humboldt admitted the possibility of evolution—or, more precisely, of the plasticity of the forms of organisms and species—and recognized in it the obedience to an initial impulse to be sought through reasoning, proceeding Aristotelically from cause to cause, until the recognition of that cosmic force that moves everything<sup>60</sup>. He also acknowledged that both history and geology were indispensable for explaining the distribution of plants across the Earth's

---

<sup>58</sup> E. Haeckel, *Ueber Entwicklungsgang und Aufgabe der Zoologie*, cit., p. 19.

<sup>59</sup> K. Köchy, *op. cit.*, p. 8.

<sup>60</sup> A. von Humboldt, A. Bonpland, S.T. Jackson (eds.), *Essay on the Geography of Plants*, cit., pp. 20, 67-68; A. von Humboldt, *Kosmos. Entwurf einer physischen Weltbeschreibung*, Cotta, Stuttgart-Tübingen 1845, p. 52.

surface, the migrations of species, and geological transformations. However, the theories proposed at the time had not yet been adequately verified and presented critical issues, as in the case of Lamarckian transformism. Consequently, Humboldt maintained a cautious attitude toward these hypotheses, which he considered destined for perpetual *aporia*, and in his phytogeography preferred to adopt a synchronic framework—focused on the description of current biotic and abiotic relations—rather than a diachronic one, which would have reconstructed their evolution from past to present. The fact that he died only a few months before the publication of *On the Origin of Species*, which might have resolved his hesitations, ultimately consigned phytogeography to a state of permanent incompleteness<sup>61</sup>.

This incompleteness was further compounded by its separation from zoogeography. As Haeckel's definition of chorology reveals, he used the term *organism* [*der Organismus*] rather than *plants*, a substitution fully consistent with his research program. He argued that it was precisely the neglect of philosophical foundations and the excessive specialization of scientific disciplines that (a) prevented the recognition of the interdependence between plants and animals—including humans—, (b) caused descriptions to diverge from the principles governing the living world, and (c) perpetuated the division between botany and zoology. According to Haeckel, there was a «mutual complementarity between botany and zoology», and that «their intimate interaction was necessary»<sup>62</sup>, both ontologically and epistemologically. Thus, the *geography of plants* of von Humboldt and Schouw, and the *geography of animals* of Berghaus and Schmarda<sup>63</sup>, had to be reconciled into a single science, which would take as its object not the individual kingdoms of plants or animals but the totality of life itself.

Unable, therefore, to elevate either physical geography or phytogeography to the rank of a true science, and considering them inadequate and incomplete for narrating the becoming of the Earth and living

---

<sup>61</sup> A. von Humboldt, A. Bonpland, S.T. Jackson (eds.), *op. cit.*, pp. 2-46.

<sup>62</sup> E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. I, p. XXI.

<sup>63</sup> *Ibid.*, vol. II, p. 288.

beings, Haeckel felt compelled to reject geography and replace it with chorology.

#### 4. Integrating the Local and Global: Two Complementary Scales

Theories of migration, dispersal, and spatial differentiation of species emerged in response to the recognition of striking morphological similarities among organisms inhabiting different, and often non-contiguous, regions of the planet. Haeckel identified Christian Leopold von Buch's *Physikalische Beschreibung der Kanarischen Inseln* (1825) as the first work to formulate observations on the movement of organisms across the Earth's surface—observations that would later form the basis of the concept of geographic speciation. Von Buch argued that individuals of a given species could disperse from their centre of origin and reach other regions of the globe, where they might eventually establish themselves. Yet the presence of natural barriers—such as forests, bodies of water, or mountain ranges—could, on the one hand, bring members of a population into closer contact within a given area, while on the other, further separate them from neighbouring groups. Isolation, together with differences in habitat, food, and soil, thus contributed to progressive modifications in the organisms inhabiting these regions, leading to the emergence of varieties that, once stabilized over time, became new species incapable of interbreeding with their ancestors<sup>64</sup>.

Von Buch's thesis gained significant credibility in the ensuing decades, laying the groundwork for a redefinition of the Earth's surface in light of the historical, geological, and ecological factors that had influenced—and continued to influence—the evolution of species. In line with the principles of spatial determinism that shaped 19<sup>th</sup>-century geography and geopolitics, many naturalists and explorers proposed dividing the planet not according to strictly physical boundaries, but through ideal or imaginary lines that nonetheless effectively illustrated patterns of species distribution. Among the

---

<sup>64</sup> L. von Buch, *Physikalische Beschreibung der Kanarischen Inseln*, Königlichen Akademie der Wissenschaft, Berlin 1825, chap. 4, p. 133.

most renowned of these was Wallace's Line<sup>65</sup>, which separated the faunas of Southeast Asia from those of Australia and New Guinea. Crossing between Bali and Lombok, and between Borneo and Sulawesi, the line accounted for the fact that the depth of the sea floor had hindered the movement of numerous terrestrial species, such as marsupials. Yet even before Wallace, in 1858, Philip L. Sclater had proposed a global division of the planet into six major zoogeographical regions<sup>66</sup>, based primarily on the distribution of animal species—especially birds—and their phenotypic similarities<sup>67</sup>.

However, von Buch's thesis was not without limitations. First, as Darwin later argued in Chapters 12 and 13 of *On the Origin of Species*, the migration and distribution of species depended not only on the current environmental or geomorphological conditions of a given region, but more fundamentally on the capacity of organisms to move across the Earth's surface throughout history. Natural barriers did not merely isolate and spatially differentiate populations, as von Buch had maintained, but also determined their potential for dispersal. This, Darwin explained, accounted both for the stark differences between the faunas of the Old and New Worlds—separated by the Atlantic Ocean—and for the morphological similarities among species inhabiting the northern regions of Europe, Asia, America, and the Arctic, where contiguous landmasses had historically enabled migration and gene flow.

---

<sup>65</sup> E. Haeckel, *Natürliche Schöpfungsgeschichte*, cit., chap. 14, p. 328; A.R. Wallace, *On the Physical Geography of the Malay Archipelago*, in «The Journal of the Royal Geographical Society of London», XXXIII, 1863, pp. 217–234.

<sup>66</sup> In 1864, the zoologist hypothesized the former existence of a now-vanished continent, *Lemuria*—a theory that, though fascinating for its resemblance to Plato's legend of Atlantis, soon lost relevance with the advent of plate tectonics.

<sup>67</sup> Scholars maintain that the observations of Buch, Scatler, and Wallace marked the first crucial stages in the history of biogeography, the discipline concerned with the distribution of organisms across the Earth's surface and the deep interconnections between geography, geology, and biology. Its object of study did not differ from that of chorology. Nevertheless, originating from phytogeography and zoogeography, it remained a purely descriptive science, unable to identify the efficient causes governing the living world. According to Haeckel, his chorology, by contrast, could explain why organisms and species appear and are distributed in space as they are, since it embraced the «perfectly satisfactory mechanical-causal justification» provided by Darwin's theory of natural selection. E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. II, p. 294.

Second, the similarity between certain regions of the planet in their abiotic components or geomorphological structures did not necessarily imply morphological similarity among their inhabitants. In asserting this, Darwin explicitly challenged the transformist explanations advanced by many naturalists of his time. In *Versuch die Metamorphose der Pflanzen zu erklären* (1790), Goethe had argued that the complexity of living beings' morphology depended on variations in environmental conditions<sup>68</sup>. This idea—that local environmental conditions could influence the form and organization of organisms—became central to Lamarck's transformism. In his *Philosophie zoologique* (1809), Lamarck sought to demonstrate that environmental circumstances (e.g., light, heat, humidity) and animals' behaviours directly shaped their morphology and physiology<sup>69</sup>. In other words, both the environment and *ethos* constituted the initial causes that either promoted or hindered the development of organisms' organs<sup>70</sup>.

By that time, Humboldt had already observed that climatically and geomorphologically similar areas could be found on different continents—what he termed “vegetation zones.” Yet, according to Darwin, competition for basic necessities had a far greater influence on the lives, behaviours, and structures of living beings, since it concerned not merely the local inorganic

---

<sup>68</sup> For instance, terrestrial plants exhibit a more complex morphology and physiology than aquatic ones because, according to Goethe, they require not only water but also light and air to survive. See: J. W. von Goethe, *The Metamorphosis of Plants*, The MIT Press, Cambridge-London 2009, p. 19.

<sup>69</sup> The Goethean-Lamarckian theory severed all ties with fixism and thus represented a breakthrough for its time. However, it failed to identify the cause of the becoming of living beings. For this reason, scholars did not abandon fixism, creationist and catastrophist interpretations of the Earth, or stewardship beliefs. See: R. Attfield, *Stewardship*, in H. ten Have (ed.), *Encyclopedia of Global Bioethics*, Springer, Pittsburg 2016, pp. 2696-2705; M. Ciardi, *Terra. Storia di un'idea*, Laterza, Roma-Bari 2013, pp. 53-85; A. Iannace, *Storia della Terra*, Laterza, Roma-Bari 2023, pp. 71-78; J. Passmore, *Man's Responsibility for Nature*, Duckworth, London 1974; G. Pellegrino, M. Di Paola, *Nell'Antropocene. Etica e politica alla fine del mondo*, DeriveApprodi, Roma 2018, pp. 111-117; L. White, *The Historical Roots of Our Ecologic Crisis*, in «Science», CLV, 3767, 1967, pp. 1203-1207.

<sup>70</sup> «Je montrerai l'influence des circonstances et des habitudes sur les organes des animaux, comme étant la source des causes qui favorisent ou arrêtent leurs développemens», J.-B. de Lamarck, *Philosophie zoologique*, Dentu-l'Auteur, Paris 1809, vol. I, pp. 14-15.

conditions but the intricate web of interdependencies among organisms sharing the same habitat. Therefore, the distribution of organisms could not be explained solely by reference to climate or physicochemical factors; it required consideration of the fundamental law governing the living world: the *struggle for life*. This struggle was not a physical battle, but rather a dynamic ensemble of strategies—physiological, morphological, or behavioural—devised and continually adjusted by organisms to ensure survival and reproduction. «The relation of organism to organism is the most important of all relations»<sup>71</sup>, Darwin wrote, since each living being depends on many others that may prove beneficial, indifferent, or detrimental to its existence.

Third, organisms inhabiting similar regions, though belonging to distinct species, often displayed physiological or behavioural affinities. Darwin noted that the relations established between organisms and their external environment—both biotic and abiotic—defined their function within the broader economy and history of nature. Thus, it was possible for climatically or geomorphologically analogous areas to host organisms performing comparable ecological roles while belonging to different evolutionary lineages. This was particularly evident, for Darwin, in the class of birds: moving across latitude or longitude, one could often encounter species with strikingly similar songs, nests, or eggs, as if each region possessed its own local variation of a common archetype. The evolutionary implication of this observation was descent from a shared ancestor, followed by migrations—perhaps facilitated by major geological and climatic changes. In short, the spatial differentiation of species resulted not from abiotic conditions alone, but from the phylogenetic history of entire groups of organisms.

The issues raised by Darwin were taken up and further developed not only in the sections explicitly devoted to chorology, but more broadly throughout Haeckel's entire body of thought: from the theory of single centres of creation to the processes of overpopulation and radiation; from the distinction between passive and active means of transport to the influence of

---

<sup>71</sup> C. Darwin, *op. cit.*, p. 516.

geological, hydrological, and climatic changes; from geographic speciation through isolation to phylogenetic studies. However, as we have already seen, Haeckel's interest did not lie in *geographical* distribution, but in *spatial* distribution [*räumlichen Verbreitung*]*—i.e., in a mechanical-causal explanation of how organisms are positioned and move within specific regions of the Earth. The only way to achieve such an explanation was to re-examine the method employed by geographers.*

Up to that time, the only method that could properly be called *scientific**—because it made systematic use of instruments, measurements, graphic representations, and the conceptualization of relationships among physical and chemical phenomena (air, temperature, wind, geomagnetism)—was the one developed within the Humboldtian program. It encompassed:*

- (1) precise and accurate measurements of physical and chemical properties and geographic location, (2) dispersed spatial arrays of simultaneous measurements, ranging from floristic inventory to temperature and geomagnetism, (3) graphical displays of quantitative and qualitative information, including iso-maps and geographic profiles, (4) search for general theoretical and conceptual frameworks to explain the particulars within a field of knowledge (e.g., average air temperature), and (5) pursuit of formal conceptual relationships among diverse phenomena (e.g., how latitude, temperature, physiography, humidity, wind direction, snowfall, and proximity to the ocean influence the lower limit of permanent snow across the globe)<sup>72</sup>.

The set of these techniques and methodologies enabled Humboldt not only to identify and address various issues concerning the lithosphere, atmosphere, and asthenosphere—closely linked to phytogeography—but also to produce an empirical, comparative, holistic, and aesthetically participatory description of the Earth's surface.

Reading Haeckel's definition of chorology, one cannot help but notice both methodological and conceptual resonances. He wrote that his chorology

---

<sup>72</sup> A. von Humboldt, A. Bonpland, S.T. Jackson (eds.), *op. cit.*, pp. 36-37.

aimed to comprehend the reasons for the «geographical and topographical extension [of organisms] over the Earth’s surface» and their distribution not only «horizontally, but also vertically, by monitoring the diffusion of organisms above and below the sea level, their descent into the depths of the ocean, their ascent up the heights of the mountains»<sup>73</sup>. More than mere resonances, it seems plausible to argue that Haeckel was directly paraphrasing Humboldt, as becomes evident from the following passage of *Ideen zu einer Geographie der Pflanzen*: «This science [... paints] the immense space occupied by plants, from the regions of perpetual snows to the bottom of the ocean, and into the very interior of the Earth»<sup>74</sup>.

According to existing scholarship, Haeckel is remembered both as Darwin’s bulldog<sup>75</sup> and as the continuer and perfecter of the Humboldtian program. It is therefore not only possible, but indeed highly probable, that he drew direct inspiration from the phytogeographical method, which he ultimately considered suitable for explaining the causes of chorological phenomena. Yet, the scientific character of Humboldt’s method—rooted in the capacity to apprehend nature «as unity in diversity, as the connection of what is different in form and composition, as the epitome of natural things and forces, as a living whole»<sup>76</sup>—inevitably tended to absorb and conceal the local within the global. This ambition was already implicit in the very etymology of the term *geography*, derived from the Greek *gê*, meaning “Earth” and referring to the idea of totality.

---

<sup>73</sup> E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. II, p. 287.

<sup>74</sup> A. von Humboldt, A. Bonpland, S.T. Jackson (eds.), *op. cit.*, p. 64. Haeckel’s text also recalls the following passage from Darwin’s *On the Origin of Species*: «the existence of the same species on the summits of distant mountain ranges, and at distant points in the arctic and antarctic regions; and secondly (in the following chapter), the wide distribution of fresh-water productions; and thirdly, the occurrence of the same terrestrial species on islands and on the nearest mainland, though separated by hundreds of miles of open sea», C. Darwin, *op. cit.*, pp. 401-402.

<sup>75</sup> N. Rupke, *The break-up between Darwin and Haeckel*, in «Theory in Biosciences», CXXXVIII, 2019, p. 113.

<sup>76</sup> K. Köchy, *op. cit.*, p. 10.

Recently, this position has earned Humboldt criticism from the social anthropologist Margarita Serje, who accused him of appropriating concepts and techniques developed within the *criollo* system of scientific production in his descriptions of the Andean landscape. According to Serje, Humboldt “stole” from Francisco José de Caldas (1768–1816)—a *criollo* naturalist, geographer, and cartographer from New Granada (present-day Colombia)—the very notions and methods that later became central to his phytogeography, without explicitly acknowledging their origin<sup>77</sup>. By doing so, Serje argues, Humboldt committed two forms of epistemic injustice. On the one hand, by incorporating Caldas’s lexicon and technical innovations while obscuring his authorship, he deprived him of international recognition, thereby perpetuating within science the same colonial asymmetries that prevailed in political and juridical domains. On the other hand, by uprooting Andean landscapes and *criollo* peoples from their local historical-geographical context, he subsumed them into the framework of modern Western natural history, theories of climate and race, and the European religious and eschatological tradition<sup>78</sup>.

Although Serje’s interpretation has been regarded as controversial—partly due to certain historical inaccuracies—Humboldt’s marginalization, however unintentional, of subaltern and non-European forms of knowledge remains undeniable. Yet, while Serje’s critique stems from a decolonial and postcolonial standpoint, Haeckel’s objection—though formulated within the European scientific tradition—was primarily of a methodological nature.

---

<sup>77</sup> The friendship between Humboldt and Caldas is remembered in the history of science as symbolically marking the encounter between modern European science and the colonial scientific cultures of Latin America. Their relationship was one of scientific exchange and collaboration: Caldas was deeply impressed by Humboldt’s investigative and representational method (*Naturgemälde*) and his instruments (barometer, thermometer, etc.), while Humboldt benefited from Caldas’s studies of Andean geography, his altitude measurements, and his techniques for mapping the relationships among plants, climate, and the geography of the Andes.

<sup>78</sup> M. Serje, *The National Imagination in New Granada*, in R. Erickson, M.A. Font, B. Schwartz (eds.), *Alexander von Humboldt: From the Americas to the Cosmos*, Bildner Center for Western Hemisphere Studies, New York 2005, pp. 83-88.

In Haeckel's view, «no organism can live anywhere on Earth [... since] they are all limited to a portion of the Earth's surface, and most species to a very small portion of it»<sup>79</sup>, depending on the living conditions of their habitat. Resuming the initial conciliation attempted by Kant in the *Physische Geographie*, Haeckel sought to preserve the value of the local without severing it from the global. As Hegel would later remark, the large-scale divisions between continents and their vast subregions were both necessary [*nothwendig*] and essential [*wesentlich*] to the understanding of life on Earth<sup>80</sup>. Haeckel thus envisioned a science devoted to studying the processes of generation, growth, migration, and decay of organisms in space, articulated across two distinct yet complementary scales—derived respectively from Aristotle and Humboldt: the topographical (local, situated, particular) and the geographical (global, contextual, general). In this way, he integrated the local within the global, affirming regional and local differences and their interrelations with the whole not as obstacles but as necessary conditions for the production of true scientific knowledge.

### 5. The Platonic Legacy in Haeckel's Thought

The reduction of geography to a mere question of scale had precise epistemological implications—among them, the rupture with the phytogeographical tradition. Yet the substitution of *chorology* for *geography* was not a simple terminological adjustment. It represented, rather, a profound conceptual transformation in the way space was conceived within the life sciences of the 19<sup>th</sup> century. As we have already seen, space—once regarded as sheer externality—was redefined as a generative and hospitable medium for life, one that shaped the biological, cultural, and spiritual differences among organisms.

Haeckel, however, went further in developing his *chorology*. He (a) made space the principal variable through which the distributional patterns of organisms and species had to be investigated; (b) endowed it with

---

<sup>79</sup> E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. II, p. 234.

<sup>80</sup> D.W. Bond, *op. cit.*, p. 188.

philosophical foundations that he believed modern science had lost, drawing on the ancient philosophical tradition, particularly the Platonic one; (c) structured it mereologically, embedding the local within the global and establishing a dynamic relation between the two; (d) attributed to it the characteristics of universality and necessity; and (e) brought it into dialogue with the conception of space found in classical mechanics, stereochemistry, and Darwin's theory of the centres of creation of species.

To accomplish this, Haeckel first needed to change the prefix of his new science from *gê* to *chóra*. Translated into English as “land,” “region,” or “country,” *chóra* was for the Ancients a polysemic term, rich in technical connotations. In medical terminology, it referred to the cavity of the body housing an organ; in the military lexicon, it denoted the territory or battlefield chosen for combat; in architecture, it designated the delimited interior of a building; and in metrics, it indicated the position of the foot within a verse. Taken together, these meanings reveal a term that resists precise definition—at once obscure and ambiguous.

This semantic ambiguity was already evident in classical sources and later reconstructed by Hjalmar Frisk in his *Griechisches Etymologisches Wörterbuch* (1960) and by Pierre Chantraine in his *Dictionnaire étymologique de la langue grecque* (1968), both based on texts and fragments from Homer, Herodotus, Pindar, Thucydides, Hippocrates, Aristotle, Zeno of Citium, Polybius, and Galen. Frisk argued that *chóra* denoted a bounded but empty space—its root being probably *khéra* (“widow”) or *khêtos* (“void,” “lacking”). Chantraine, by contrast, maintained that *chóra* was indeed a delimited space, but a full one: a space capable of containing, or already filled by, something. It was, in his words, a space suitable for use, function, and activity, and thus distinct from both *kenón* [void] and *tópos* [place]<sup>81</sup>.

Chantraine's reconstruction is the most convincing, as it accords with the logical, metaphysical, and physical meanings the term *chóra* acquired in Antiquity. In classical logic, *chóra* was not the empty space or void [*kenón*]

---

<sup>81</sup> P. Chantraine, *Dictionnaire étymologique de la langue grecque. Histoire des mots*, Klincksieck, Paris 1968, pp. 1281-1282.

discussed by the atomists. Rather, it may be modelled—metaphorically, for explanatory purposes—as a *full set* which, by definition, could not contain *kenón*, since it could not admit the existence of an empty subset within itself. Yet *chóra* and *kenón* were logically similar because of their uniqueness, grounded in the principle of identity: both were self-identical wholes, since each contained (or, in the case of *kenón*, did not contain) the same elements. This also implied that no other sets could exist outside them.

From this followed three key conclusions. The first was logical: *chóra* was a whole that occupied no place but itself, for outside it there was no other *chóra*. The second was metaphysical: everything that exists must occur within *chóra*, which thus functioned as both the origin and the limit of the possibilities of being. It was the space that had to exist before the generation of beings. The third was physical: *chóra* was the very condition for the appearance of the cosmos, which later assumed the form of an ordered and finite mass. It precedes the cosmos and makes possible both its spatial extension and the bodies within it—bodies that must possess matter, form, and a determinate place (the Aristotelian *tópos*) in order to exist.

It was Plato who gave the term this logical, metaphysical, and physical depth, making it the object of systematic reflection in the *Timaeus*<sup>82</sup>. Considered his most influential dialogue, the *Timaeus* was the principal ancient source through which the term *chóra* traversed the centuries, reaching the 19<sup>th</sup> and 20<sup>th</sup> centuries and inspiring, among others, Jacques Derrida's *Khōra* (1995). The French philosopher, however, bracketed some of the central questions raised in the *Timaeus*—such as the genesis of the cosmos, the emergence of living beings, and their material structure—in order to concentrate on the ineffability of the Platonic *chóra*<sup>83</sup>. In particular,

---

<sup>82</sup> Chantraine focused exclusively on the Platonic conception of *chōra* as both figure and geometric surface, neglecting its logical, metaphysical, physical, and political dimensions.

<sup>83</sup> According to Derrida, the ineffability of *chōra*—its unnameability, already recognized by Plato («one cannot even say of it that it is neither this nor that or that it is both this and that. [...] At times *khōra* appears to be neither this nor that, at times both this and that») —was due to its transcendence of the logic of noncontradiction (or binarity), alternating the logic of exclusion with that of participation. See: J. Derrida, *Khōra*, in T. Dutoit (ed.). *On the name*, Stanford University Press, Stanford 1995, p. 89.

focused on two of its key definitions: that it constitutes a *third kind*, distinct from and exceeding both being and becoming; and that it is the *formless receptacle* in which, and from which, all things are generated—a sort of feminine or maternal principle<sup>84</sup>.

Derrida, however, overlooked the fact that the term *chóra* also appears in other Platonic dialogues, where it bears allusions and meanings distinct from, though interrelated with, those of the *Timaeus*. In the *Laws*, for instance, Plato describes *chóra* as a wild, rugged, and geomorphologically varied terrain—neither flat nor homogeneous. Despite its asperities, it was highly fertile, and, when subjected to proper agricultural cultivation, capable of great abundance<sup>85</sup>. This association with the agrarian dimension—which Chantraine also noted—had both social and political implications. The *Laws* describe how the *chóra* surrounded and was distinct from the *pólis*<sup>86</sup>, while simultaneously encompassing and exceeding it<sup>87</sup>. Similar depictions recur in the *Republic* and the *Statesman*<sup>88</sup>. *Chóra* coincided with the *dēmos*—the people inhabiting a given territory, whose genetic, cultural, religious, and linguistic identity was defined by their Panhellenic belonging<sup>89</sup>—rather than by possession of citizenship. At times, it was also described as a place of exile<sup>90</sup>, or as an area within the *pólis* designated for commercial exchange governed by reciprocity and justice<sup>91</sup>.

---

<sup>84</sup> Plato, *Timaeus*, 48e-52b.

<sup>85</sup> Id., *Laws*, 625c-d, 695a, 740a, 745d, 833b.

<sup>86</sup> *Ibid.*, 704c, 759b, 763c, 817a, 823e, 830e. For abbreviations of Greek authors, cfr. H. G. Liddell, R. Scott, H. S. Jones, *A Greek-English Lexicon*, Clarendon, Oxford 1996.

<sup>87</sup> Plato, *Ls.*, 847c, 871d, 874b, 945d, 950d.

<sup>88</sup> Id., *Republic*, 388a; Id., *Statesman*, 259a.

<sup>89</sup> Id., *Ls.*, 920e. In this regard, recall Herodotus' definition of *Greekness* [*to Hellēnikón*]: «αὔτις δὲ τὸ Ἑλληνικὸν ἐὸν ὄμαιμόν τε καὶ ὁμόγλωσσον καὶ θεῶν ἰδρύματά τε κοινὰ καὶ θυσίαι ἡθεᾶ τε ὁμότροπα» (tr. "and next the kinship of all Greeks in blood and speech, and the shrines of gods and the sacrifices that we have in common, and the likeness of our way of life"), Herodotus, *Histories*, W. Heinemann Ltd., London 1922, Book 8, §144, pp. 152-153. See also: Id., A.M. Bowie (ed.), *Histories*, Cambridge University Press, Cambridge 2007, pp. 236-237.

<sup>90</sup> Plato, *Ls.*, 864e.

<sup>91</sup> *Ibid.*, 915d.

The picture that emerges is intrinsically ambiguous and antithetical. *Chóra* embodied pairs of opposites such as centre and periphery, urban and rural, ordered and wild, self-sufficiency and community. It lay outside the *pólis* yet simultaneously surrounded, nourished, and sustained it. It was a space to be regulated, yet also one of generation, production, and exchange. It was, in short, a living and lived space—at once an organic extension of the *pólis* and the territory within which the *éthne* gathered and coexisted, eventually giving rise to the *póleis* themselves.

This same inner contradiction appears in the more overtly metaphysical passages of the *Republic*. There, *chóra* is portrayed as the dwelling and abode of the souls of the best—those who have ascended to the vision of the Ideas. *Chóra* is thus also the space of the divine and of philosophy. In the *Sophist*, it is the land endowed with the luminous clarity proper to Being, standing in contrast to the darkness of Non-Being<sup>92</sup>. Yet, as the *Republic* again notes, *chóra* may also host unworthy souls—namely the sophists—when those capable of rising higher fail to do so, leaving their place to the corrupted<sup>93</sup>. *Chóra*, therefore, receives and safeguards Being, allowing entities to come into being, to transform, and to move. It behaves like the bed of a river in constant flow<sup>94</sup>—yet ensures that nothing overflows beyond itself, containing and hosting all that is subject to generation and decay, of both body and soul<sup>95</sup>. It was a «region of regions [...] the “in which” on which things (qualities, powers,

---

<sup>92</sup> Id., *Sophist*, 254a–b.

<sup>93</sup> Id., *R.*, 495b–c.

<sup>94</sup> «pánta khōréi kai oudèn ménei» (tr. “everything flows and nothing remains”), Id., *Cratylus*, 402a. Both Frisk and Chantraine define the verb *khōréō* as a derivative of *chōra* meaning “to give place, to make room, to depart, to move from one’s place, to proceed forward, to spread, to expand, to comprehend, to contain, to receive, to conceive.”

<sup>95</sup> Sallis insightfully observes that the verb “occupy” [*katéchon*] has a double meaning: «it can also mean restraining or holding back. The beings that occupy the *chóra* would, then, also be held back, withheld from it. As the figures are withheld from the gold in which they are molded», J. Sallis, *Chorology. On Beginning in Plato’s Timaeus*, Indiana University Press, Bloomington 1999, chap. 3, p. 120.

motions: ultimately perceptible things) come to appearance, exchange positions, and gain their place»<sup>96</sup>.

It is plausible that Haeckel derived the term *chóra* from Kant's *chorography*<sup>97</sup>, but it is equally probable that he drew directly from the Platonic dialogues—although, as Robert J. Richards's 2008 biography shows<sup>98</sup>, there is no explicit evidence of this. He certainly did not adopt it for merely linguistic reasons, but for programmatic ones: to refound the life sciences by providing them with the philosophical foundations they had long lacked. Moreover, profound resonances undeniably exist between Haeckel's thought and Platonic cosmogony, though with significant differences.

As is well known, for Plato the world was not created *ex nihilo*, but generated through the union of necessity (*anáńkē*, identified with *chóra*) and intelligence (*nous*, or the Demiurge), in imitation of ideal and transcendent models. Haeckel, by contrast—whose monism explicitly rejected any transcendent, personal, or teleological principle while retaining the notion of a generated cosmos—could not conceive of the universe as the product of a plan conceived by a separate intelligence, nor as the image of something ontologically other<sup>99</sup>. For him, the laws of nature were immanent to nature itself, and were none other than evolutionary and morphogenetic laws governed by the principle of natural selection.

Yet it would be inaccurate to claim that Haeckel entirely excluded *nous*. It is more precise to say that he inverted the Platonic hierarchy between *nous* and *anáńkē*, establishing an identity where previously there had been persuasion<sup>100</sup>. In other words, formal and efficient causes now emanated directly from the material cause—from bodies composed of matter and

---

<sup>96</sup> E. Casey, *The Fate of Place. A Philosophical History*, University of California Press, Berkeley–Los Angeles 1997, pt. I, chap. 2, p. 36.

<sup>97</sup> According to Kant, chorography was the discipline concerned with depicting «the physiognomy of a region, giving a picture of it, its beauties, blemishes, advantages, shortcomings», I. Kant, *Physische Geographie*, cit., vol. I, p. 16.

<sup>98</sup> R.J. Richards, *op. cit.*

<sup>99</sup> Plato, *Ti.*, 29a–b, 30c, 39e, 41a–d, 48a–49a.

<sup>100</sup> *Ibid.*, 56c.

energy<sup>101</sup>. There was no longer a Demiurge delegating to generated gods the task of fashioning mortal beings through a descending process of mixtures extending from humans to plants and animals<sup>102</sup>. On the contrary, the *first form*—“first” both chronologically and ontologically—of organisms and species arose necessarily, not accidentally, *from below*, through that ascending and expanding impulse Haeckel inherited from Goethe.

For a long time, the concept of *form*—understood as the appearance of inorganic or living matter, that is, its mode of existing and of manifesting itself to the senses<sup>103</sup>— had been reduced to a mere epistemological instrument for grasping the essence of things. Goethe was among the first to restore form to its ontological dignity. Beginning in 1776, he devoted himself to the study of botany and to what he called the «natural shaping activities»<sup>104</sup> of living beings; in the following years he elaborated his *morphology of organic nature*, the doctrine of the forms of all things as they manifest themselves in and through their own becoming. A clear definition is found in fragment *LA II I, 128*:

Morphology. It is based on the conviction that everything must suggest itself and appear. We apply this principle from the first physical and chemical elements to the spiritual manifestation of man. We immediately become something that has form. The inorganic, the vegetative, the animal, and the human, all these suggest themselves and appear for what they are to our inner and external senses. The form is something which moves, becomes, and

---

<sup>101</sup> In his later writings (*Die Welträtsel*, 1899; *Der Monismus als Band zwischen Religion und Wissenschaft*, 1892), Haeckel proposed the triad Matter–Energy–Psyche, which can be seen as a scientific and immanent reinterpretation of the Christian Trinity: The Father as the principle from which all derives corresponds to matter; the Son to energy; and the Holy Spirit to psyche (or *psychom*), a kind of cosmic consciousness or vital principle.

<sup>102</sup> Plato, *Ti.*, 44d–45a, 77a–b, 91d–92c.

<sup>103</sup> J. Steigerwald, *Goethe's Morphology: Urphänomene and Aesthetic Appraisal*, in «Journal of the History of Biology», XXXV, 2, 2002, pp. 291–328.

<sup>104</sup> J.W. von Goethe, *Gli Scritti Scientifici. Morfologia I: Botanica*, Il Capitello del Sole, Milano 1996, p. 337.

perish. The doctrine of form is the doctrine of transformation. The doctrine of metamorphosis is the secret of all the signs of nature<sup>105</sup>.

Goethe's attention to the study of forms stemmed from his conviction that everything must acquire form—as well as a place and a space—in order to exist, and that no being ever appears as identical to itself over time, but continually transforms, now in one way, now in another. Observation of phenomena reveals that things are never rigid, unitary, or stationary. As he wrote, no living being will ever possess «a configuration so stable that it can be clearly defined and separated from other surrounding beings (transitions in space), or from the development stages immediately preceding or following it [...] (transitions in time)»<sup>106</sup>.

In *Metamorphosis of Plants* (1790), Goethe thus described how a primordial, creative, and immanent law governs the progressive transformation of the cotyledons into leaves, then into calyx, corolla, and so on—according to a universal ascending and expanding impulse<sup>107</sup>. Through this process, all living beings—not only plants—are capable of producing their like both within themselves (as in the flower) and from themselves (as in the fruit containing the seed within).

### 6. Haeckel's *Chóra*: Form, Organism, and Region

From Goethe's morphology, Haeckel inherited two essential elements. The first is the mereological organization of both the cosmos and living bodies<sup>108</sup>, in which the parts are always in relation with the whole, and vice versa. According to Goethe, forms divide the whole into parts that are not distinct,

---

<sup>105</sup> Id., *Die Schriften zur Naturwissenschaft*, Hermann Böhlau Nachfolger, Weimar 1964, X, fr. LA II I, p. 128.

<sup>106</sup> Id., *Gli Scritti Scientifici*, cit., p. 331.

<sup>107</sup> Id., *The Metamorphosis of Plants*, cit.

<sup>108</sup> In the title and subtitle of Haeckel's *Generelle Morphologie der Organismen*, not only does Darwin's name appear, but also those of Goethe and Lamarck. Indeed, *general morphology* was the discipline introduced into natural history by Goethe less than a century earlier, devoted to the study of organic forms in their becoming; whereas the *descendance theory* reformed by Darwin was the Lamarckian transformism.

isolated, or independent, such as cells, tissues, and organs. The material envelope of a body—its epidermis, cortex, and other membranes—acts as a permeable physical and spatial boundary between individual units. «A plant is not a unit, but a creature made up of several units»<sup>109</sup>, and the totality of the living being is embedded in each of them.

A similar structure can also be discerned in Plato. The Platonic cosmos is a single visible living being that contains within itself all other living beings of the same kind—connected by invisible yet dissoluble bonds<sup>110</sup>. Beings are called “living” because they are all permeated by the soul of the world. Following the model of the four elements, they are born from one another, transmit generation reciprocally, transform into one another, and eventually dissolve<sup>111</sup>. The bodies of living beings are internally articulated into organs with specific functions, and the health of the whole depends on the proper functioning of its parts<sup>112</sup>. Likewise, even political and institutional structures—such as the *póleis* that emerged from *synoecism* and the evolution of the *ethne*<sup>113</sup>—depended on the communities inhabiting them and on the territories they occupied.

What thus emerges is a framework of profound affinities, interrelations, and interdependencies between parts, and between parts and whole alike. This reflects both the dissolution of unity into multiplicity and the blending of multiplicity into unity<sup>114</sup>: a unity encompassing the totality of things and leaving nothing outside itself. Yet this analytical act, compensated by a synthetic mediation both vertical and horizontal<sup>115</sup>, was in Plato performed by the Demiurge, who imparted order to a *chóra* that was irregular,

---

<sup>109</sup> Id., *Gli Scritti Scientifici*, cit., p. 356.

<sup>110</sup> Plato, *Ti.*, 31a–33b, 43a–b.

<sup>111</sup> *Ibid.*, 49c–d, 50a, 53e.

<sup>112</sup> *Ibid.*, 82a.

<sup>113</sup> F. Lefèvre, *Histoire du monde grec antique*, Le Livre de Poche, Paris 2007, chap. 8.

<sup>114</sup> Plato, *Ti.*, 68d.

<sup>115</sup> «The three forms of the Indivisible and the Divisible indicate the plane of the suprasensible and the sensible [...]. The composition, moreover, of Being, the Identical, and the Different [...] indicates horizontal mixture», Id., *Timeo*, it. tr. Bompiani, Milano 2017, p. 21 (My translation).

purposeless, and lacking any inherent tendency toward the good, yet still capable of receiving reason and thereby generating what is real.

Haeckel, too, preserved these intimate affinities, interrelations, and interdependencies. This is evident above all in his drawings of embryonic development: as in Goethe, each stage represents a part of a potential whole but also contains within itself the characteristic forms of its species; and, as in Plato, the parts do not pre-exist the whole but come to be through it, acquiring meaning only in relation to it. The same principle governs his genealogical trees: each organism is a member of a species, each species a part of a genus, each genus a part of a family, and ultimately every branch belongs to that universal trunk that is life itself. The appearance or disappearance of a species (as of an organ) must therefore be understood as a transformation and reorganization of the relations between parts and whole.

This issue also reverberates in Haeckel's chorology. In his attempt to preserve the value of the local without dissolving it into the global—by conceiving topography and geography as two interrelated scales of analysis—he was, in effect, redefining the “part-whole” relationship within space. Yet this redefinition had to take into account, in his view, the correlation between the different regions of the planet and the specific variations that arose within them.

As both von Humboldt and Darwin had observed<sup>116</sup>, the distribution of species and organisms across the different areas of the Earth's surface was far from homogeneous. Haeckel—who, in truth, stood closer to Lamarckian transformism than to Darwinian theory<sup>117</sup>, since he included the interrelation

---

<sup>116</sup> For example, the strange yet marvellous case of the bird species inhabiting the Galápagos Islands.

<sup>117</sup> In 2019, on the centenary of his death, Haeckel was “rediscovered” in contemporary debate. This revival was no coincidence: In the early 2000s, the expanded and extended evolutionary synthesis had emerged, and between 2010 and 2020 a new ecological and relational paradigm began to challenge the divide between human and non-human, organism and environment—with thinkers such as Latour, Morton, Braidotti, and Weber at its forefront. These developments renewed interest in epigenetic inheritance, morphogenesis, and the evolution of complex systems, themes explored by figures once marginalized like Lamarck and culturally ambiguous like Haeckel. Yet most studies have treated Haeckel mainly as a bridge between biology and

between each being and the external world among the organic conditions (or causes) determining the appearance of things—maintained that the emergence of heterogeneous forms of life was made possible by the prior existence of highly dissimilar portions of the Earth’s surface. These portions constituted heterogeneous and concrete *chórai*, whose specific qualities allowed the appearance of particular forms of life that could not have arisen in other, qualitatively distinct *chórai*.

This conception carried precise epistemological consequences. First, Haeckel dialectically overcame the “topography–geography” dichotomy by placing them in reciprocal relation, thereby proposing a “third” cartographic genre suited to the hermeneutic investigation of the cosmos. Second, his conception remained continuous with the Platonic triad of being–space–becoming, insofar as the Haeckelian *chóra* was likewise the “in which” of manifestation and generation—though now understood as the mechanical effect of natural selection<sup>118</sup>. Third, it established an “organism–region” binomial<sup>119</sup>, according to which a living being and the land it inhabits are bound by an invisible relation of interdependence—perhaps, again, of Platonic derivation<sup>120</sup>.

However, unlike the Platonic argument—according to which *chóra* was eternal and exempt from becoming<sup>121</sup>—Haeckel’s “organism–region” relationship was bidirectional, as shown by his use of the term

---

aesthetics, and as closer to Lamarckian transformism than to Darwinism. See: F. N. Egerton, *op. cit.*; K.J. Niklas, *op. cit.*; K. Peden, *op. cit.*; L. Kováč, *Lamarck and Darwin revisited*, in «EMBO Reports», XX, 4, 2019, pp. 1-2; G. S. Levit, U. Hoßfeld, *Ernst Haeckel in the History of Biology*, in «Current Biology», XXIX, 2019, pp. 1276–1284; N. Rupke, *op. cit.*; E. Watts, U. Hoßfeld, G. S. Levit, Ernst Haeckel’s “Genetica”, *cit.*; G. S. Levit, U. Hoßfeld, *Natural Selection in Ernst Haeckel’s Legacy*, *cit.*

<sup>118</sup> Plato, *Ti.*, 50c–d.

<sup>119</sup> I propose this expression following Elena Casetta’s notion of the “organism–environment binomial”. See E. Casetta, *Philosophy of the Environment. An Introduction*, Routledge, London 2025.

<sup>120</sup> Plato, *Ti.*, 24c–d.

<sup>121</sup> *Ibid.*, 52a–b.

*interrelationships* [*Beziehungen, Beziehungs-Verrichtungen*]<sup>122</sup>. More precisely, an interrelationship denoted the totality of habitual activities shared by at least two beings. Under conditions of proximity and anisotropy, these beings formed an intimate connection, engaging in *poietic* (directed toward the other) and *autopoietic* (directed toward the self) actions that were mutual and simultaneous. Consequently, just as *chórai* governed the generation and development of organisms, so too did organisms, through their very existence and activity, shape the *chórai*. In short, both were subject to transformation.

The idea that organisms do not merely inhabit spaces but actively produce and modify them over time is a Romantic legacy—more precisely, an echo of the concept of *Lebensraum*. Unlike the Platonic *chóra*, Haeckel's *chóra* coincided with the Earth's surface, entirely occupied by living beings. It was therefore composed of interrelated subregions, each subject to geomorphological and climatic change. It is no coincidence that Haeckel insisted that the study of the present and past distribution of organisms and species required consideration of the evolution of terrestrial morphology over time.

Chorology thus had to attend both to *intra-regional interrelationships*—concerning the interactions among living beings, their habitats, and their

---

<sup>122</sup> According to Haeckel, metabolic processes such as nutrition and reproduction were necessary but not sufficient causes for the preservation of organisms and species. What is essential is the nourishment derived from the interrelations that each organism establishes with the surrounding biotic and abiotic world. Haeckel called these *oecologischen Erscheinungen*, i.e., evident phenomena resulting from the vital activity of organisms. Life, in Haeckel's view, consists of two activities—one conservative and the other relational— which evolve over time and drive the transmutation of organisms (and species). He defined the interrelations established by an organism with the portion of space that hosts it as *chorological* [*chorologischen*], while those formed with other organisms and the environment as *ecological* [*oecologischen*]. More precisely, chorological interrelations described the spatial distribution and spread of organisms in both an extensive and orographic sense, whereas ecological ones emphasized the dependence of organisms on their living conditions. These vital functions (a) outlined the existence of a *Relations-Physiologie* [*physiology of relationships* or *relational physiology*]; (b) were far more complex than those regulating nerves, sensory organs, or muscles; and (c) were interdependent. E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. II, p. 236.

conservative or relational activities—and *inter-regional interrelationships*, involving the connections among neighbouring regions. These interactions contributed to changes in the configuration of the lithosphere through the extremely slow, ancient, and continuous processes of elevation and subsidence—consistent with Charles Lyell’s theory of uniformitarianism and deep time—thereby producing mountain ranges, valleys, and depressions<sup>123</sup>. Like living beings, portions of the Earth’s surface could not be conceived as isolated and individual entities, but as members of a larger community.

The strong resonance between Haeckel’s *chóra* and the concept of *Lebensraum* thus introduced a decisive innovation with respect to the Platonic model: although it retained the receptivity and necessity described in the *Timaeus*, the Haeckelian *chóra*—or space—was dynamic, living, historical, active, and relational.

### 7. The Morphogenetic Dimension of Space

The Haeckelian *chóra* introduced a *morphogenetic dimension of space*: it did not merely receive forms, but also generated and transformed them. It was not an efficient cause, as natural selection was, but simultaneously a material and formal one, determining both how and where life could assume form. Indeed, as stated in the *Generelle Morphologie*—perhaps echoing Plato’s claim in the *Timaeus*<sup>124</sup>—organisms had to possess both a form and a place in order to exist. In this sense, Haeckel imposed a chronological and ontological precedence of the Aristotelian categories of place and relation over that of substance. In other words, he turned space into the sole constitutive principle of life and the first cause of all existing things.

But how could *chóra* materially constitute the bodies of beings, endow them with form, assign them a place of birth, and influence the distribution patterns and behaviours of communities and species? According to Haeckel, the answer lay in the microcosm, specifically in the nature of atoms and their relation to the ether.

---

<sup>123</sup> Id., *Natürliche Schöpfungsgeschichte*, cit., chaps. 6, pp. 112-114; 14, pp. 326-327.

<sup>124</sup> Plato, *Ti.*, 52b.

In line with Schlesinger's theories<sup>125</sup>, which opposed Kant's conception of space as an a priori form of sensibility, Haeckel's monism affirmed that space was active, continuous, and self-sufficient. Contrary to anti-Democritean and pro-Platonic theses denying empty space and action at a distance, he maintained that space generated the ether: a universal, continuous, homogeneous, fluctuating, and massless substance that filled every part of space, moving through vibration, oscillation, or vortical motion, much like a fluid. From these kinetic modes of the ether emerged specific configurations corresponding first to the primitive atoms of heavy mass and later to the modern atoms identified by chemists such as Mendeleev and Lothar Meyer—carbon, oxygen, nitrogen, sulfur, and so forth. These discrete entities, endowed with inertia, were moved, separated, or combined by the action of multiple forces: the shaking force of space itself, the immanent attractive force, and the repulsive force inherent to the ether. Through these interactions, atoms formed molecules and subsequently bodies, both organic and inorganic<sup>126</sup>.

This cosmogonic description, which exalted the primordial and active role of space in the generation of matter and the universe, resonates strongly with the Platonic *chóra*. Like its ancient counterpart, it acted as a shaking instrument, oscillating and stirring the elements, separating, transporting, and condensing them—some in one place, others in another—according to their similarity or dissimilarity and their proper location<sup>127</sup>.

Moreover, it reveals Haeckel's dual ambition: on the one hand, to solve Kant's insoluble problem—namely, to discover a «Newton of the blade of grass»<sup>128</sup>—and, on the other, to establish a mechanical foundation for the sciences he created, including chorology. In this way, he sought to integrate

---

<sup>125</sup> J. Schlesinger, *Thatsachen und Folgerungen aus dem Wirken des allgemeinen Raumes*, in «Mittheilungen aus dem Osterlande», V, 1892, pp. 419-475.

<sup>126</sup> E. Haeckel, *Monism as Connecting Religion and Science. The Confession of Faith of a Man of Science*, A. and C. Black, London 1895, pp. 19-30; Id., *Natürliche Schöpfungsgeschichte*, cit., chap. 15, pp. 351-352.

<sup>127</sup> Plato, *Ti.*, 52d-53a, 57a-58c, 81b.

<sup>128</sup> E. Haeckel, *Natürliche Schöpfungsgeschichte*, cit., chap. 5, pp. 94-95.

them into a Newtonian model of science, aimed at uncovering universal, necessary, and mathematically and geometrically verifiable laws.

From these two observations, it becomes possible to understand the correlations Haeckel established (a) between his chorology and the Darwinian theory of species' centres of creation, and (b) between his promorphology, stereochemical theories, and the second element inherited from Goethe—namely, the idea of the existence of archetypes.

### 8. *The Semantics of Space and the Genealogy of Species*

Like the terms *ecology*, *phylogeny*, or *ontogeny*, *chorology* was a neologism coined by Haeckel in the *Generelle Morphologie*<sup>129</sup>. In two footnotes, he explicitly states that the term derives from the Ancient Greek *chóra*, translating it into German with the nouns *der Wohnort* and *der Verbreitungsbezirk*—in English, respectively, “the place of residence” and “the distribution area”<sup>130</sup>.

Although it is plausible that Haeckel had read the Platonic dialogues, there is no concrete evidence of this, and neither the edition nor the translation he may have used is known. What is certain, however, is that in more recent German editions of the *Timaeus*, the word *chóra* is rendered as *Raum*<sup>131</sup>, not as *Wohnort*. It is possible that Haeckel encountered such translations in the works of contemporary philologists. Yet, consulting Ancient Greek–German dictionaries contemporary with or prior to Haeckel's time, as well as more modern ones, there is no record of *Wohnort* being used to translate *chóra*<sup>132</sup>.

---

<sup>129</sup> B. Dayrat, *op. cit.*, p. 515; F.N. Egerton, *op. cit.*, p. 226; G.S. Levit, U. Hoßfeld, *Ernst Haeckel in the History of Biology*, cit., p. 1277. It can be assumed that these neologisms also resulted from Haeckel's reading of von Humboldt's remarks on the use of ancient languages in coining scientific terms. See: A. von Humboldt, *Kosmos*, cit., pp. 51-52.

<sup>130</sup> E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. II, pp. 236, 286.

<sup>131</sup> Plato, *Timaios*, CreateSpace Independent Publishing Platform, 2013 (the edition follows F. Susemihl's 1856 translation); Id., *Timaios*, Felix Meiner, Hamburg 2017.

<sup>132</sup> Typically, dictionaries present terms such as “space, interval”; “land, region, territory”; “soil, agricultural field”; “place, locality, village, city, state”; “homeland, countryside, territory, landscape”; or “position, site”. These largely preserve the original meanings identified by Frisk

Haeckel's choice is therefore particularly noteworthy. It becomes even more interesting when considering that in German both *Wohnort* and *Aufenthalt* were used to indicate a place of residence. From the second half of the 18<sup>th</sup> century, although related, the two terms referred to distinct realities, especially in legal and administrative contexts. *Wohnort* indicated the original and stable residence, i.e., the habitual dwelling in which an individual concentrated their vital centre<sup>133</sup>. In the case of humans, it also coincided with the centre of private, family, and civic life, and legally defined the political authority to which a person was subject, establishing their right to citizenship. By contrast, *Aufenthalt* indicated a temporary stay in a place that offered comfort, hospitality, or refuge, distinguishing those who were merely passing through from those who officially resided there<sup>134</sup>.

Between the two, *Wohnort* was undoubtedly the more suitable term to convey the idea that every individual or species inhabited a specific place within physical and biological space. It is highly likely that this semantic precision guided Haeckel's choice. Furthermore, it justified some of his studies, including his *biogenetic law* and his *phylogenetic charts* (or trees), which were consistent with the notion that each species could be understood «only through its evolutionary history»<sup>135</sup> from its initial appearance on Earth. This thesis, in 18<sup>th</sup>- and 19<sup>th</sup>-century biological thought, was elaborated through four distinct theoretical frameworks, proposed respectively by Goethe, Lamarck, Darwin, and Haeckel.

---

and Chantraine. See: W. Pape, *Handwörterbuch der griechischen Sprache. Wörterbuch der griechischen Eigennamen nebst einer Uebersicht über die Bildung der Personennamen*, Vierweg und Sohn, Braunschweig 1842, vol. III, p. 1387; F. Passow, *Handwörterbuch der griechischen Sprache nebst einem Anhang*, F. C. W. Vogel, Leipzig 1857, vol. III, pp. 2545-2547; W. Gemoll, *Griechisch-deutsches Schul- und Handwörterbuch*, G. Freytag-F. Tempsky, Wien-Leipzig 1908, p. 811. Only Montanari offers a metonymic translation as “resident, inhabitant” (*Bewohner*), but there is no evidence of such usage in 19<sup>th</sup>-century dictionaries. See: F. Montanari, *Wörterbuch Altgriechisch-Deutsch*, De Gruyter, Berlin 2023, p. 2250.

<sup>133</sup> J. & W. Grimm, *Deutsches Wörterbuch*, Lfg. 8 (1950), vol. XIV, pt. II (1960), col. 1224, line 50. A similar term used as a translation of *chóra* is “homeland” [*Heimatland*], though it carried a cultural and identity-related sense inappropriate for biological studies.

<sup>134</sup> Id., *Deutsches Wörterbuch*, Lfg. 3 (1852), vol. I (1854), col. 637, line 57.

<sup>135</sup> E. Haeckel, *Ueber Entwicklungsgang und Aufgabe der Zoologie*, cit., p. 3.

According to Goethe, every living being is subject to deformation and deviation over time due to both an inner, primordial force—the so-called *Urform*— governs the relationship between the whole and its parts, and an external force, which encompasses relationships with what lies beyond the form itself, namely the environment and other individuals. Things are constantly in a state of becoming, both qualitatively and quantitatively. They gradually pass from a previous form (the *product*) to a new, more perfect, and more complex one (the *production*). By alternating phases of relative stability with periods of transmutation<sup>136</sup>, things evolve, abandoning their previous forms and manifesting emerging ones, which remain only virtual possibilities until realized. For this reason, Goethe preferred the term *Bildung* over *Gestalt*, emphasizing the process of formation and development rather than static shape<sup>137</sup>.

---

<sup>136</sup> In 19<sup>th</sup>-century German works on botany and zoology, the term *transmutation* still carried the meaning originally given to it by alchemy. It referred not only to phase transitions between states of matter but also to the transformation of matter itself—matter that, while acquiring a new form, retained the same essence. For example, Goethe demonstrated that the becoming of substance followed that of form, applying the concept of transmutation to the living world. Transmutation—or *metamorphosis*—was the principle that allowed the slow and almost imperceptible process of transformation of living beings into something that was only apparently different from itself, and the emergence of a world characterized by «wonderful plasticity and fluidity [...] extraordinary variability and adaptability», E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. I, p. XVII. This creative and transformative activity never ends but is always ongoing: it is a succession of forms, because «the various external parts [...] develop one after another and [...] one from the other», J. W. von Goethe, *Gli Scritti Scientifici*, cit., p. 27. The idea that Goethe's work echoes the alchemical tradition was proposed by Paul Bishop, who even describes *Faust* as “an alchemical drama” focused on processes of formation, transformation, and the rebirth of the archetype. Ronald D. Gray also explores how alchemy opened a path toward Neoplatonism and influenced the symbols Goethe used not only in his literary works but also, and above all, in his scientific writings. P. Bishop, *The Superman as Salamander: Symbols of Transformation or Transformational Symbols?*, in «International Journal of Jungian Studies», III, 1, 2011, pp. 4–20; R.D. Gray, *Goethe the Alchemist. A Study of Alchemical Symbolism in Goethe's Literary and Scientific Works*, Cambridge University Press, Cambridge 2010.

<sup>137</sup> «Gestalt [...] abstracts from becoming and assumes that a whole must be defined, closed, and immutable in its characteristics. However, if we consider all forms, especially the organic ones, we find that they are not defined, closed, and immutable, and that everything swings in a continuous becoming. For this reason, our language uses [...] the term *Bildung* to refer both to the product and the production», J.W. von Goethe, *Gli Scritti Scientifici*, cit., pp. 7-8.

For Lamarck, evolution was a linear and ascending process traversing the entire scale of living beings: from the simplest to the most complex, from protozoa to humans. According to him, nature possesses an internal force that drives every organism toward increasingly complex and perfected forms, while the environment modulates this tendency through the use and disuse of organs. Life, in Lamarck's view, unfolds along a single, continuous, and ascending line.

Darwin, by contrast, radically transformed this perspective. While he too posited that all organisms descend from a common ancestor, descent is no longer linear but branched. Species progressively differentiate through the emergence of ever-new forms. There is no universal, teleological scale; rather, multiple evolutionary lines follow their own paths of adaptation, determined mechanically and contingently by natural selection, without predetermined goals or directions.

Although conceptually distinct, these three theses share a monophyletic vision of evolution. By "monophyletic," reference is made to the term *phylum*, coined by Haeckel, which proposed dividing living beings into groups based on the fundamental morphological type from which they derived. The prefix *mono* indicates that all organisms descend from a single common ancestor. This vision was further developed by Darwin with Lyell's *theory of individual centres of creation* [*Schöpfungsmittelpunkt*]: the origin of a species had to be located not only in time but also in space<sup>138</sup>. Consequently, as the tree of life branched further and further, giving rise to new species, each species was thought to have arisen only once in the course of time and in a single geographic location on Earth.

Considered the three founding fathers of a new science of life—unbound by the static and reductionist claims of Linnaean taxonomy and focused on the search for the causes underlying the appearance of organisms in both phenotype and number—Haeckel built a theoretical bridge between Goethe, Lamarck, and Darwin. He integrated Darwinian common descent and natural selection, while also retaining the Goethean-Lamarckian idea of a

---

<sup>138</sup> E. Haeckel, *Natürliche Schöpfungsgeschichte*, cit., chap. 14, p. 319.

natural scale of perfection. Accordingly, he too proposed the concept of monophyletic evolution, arguing that both organic and inorganic forms derived from a single principle of material organization.

However, unlike his predecessors, Haeckel maintained that only certain evolutionary lines developed increasing perfection and complexity—e.g., the Chordata and Arthropoda—while others remained stalled at the earliest stages of organic evolution, such as the monera, algae, or protists.

This thesis was later revised by Haeckel, particularly following his anthropological studies, and increasingly assumed the characteristics of polyphyletic evolution. On one hand, in attempting to reconstruct human phylogeny and the migration of ancient humans, Haeckel drew on suggestions from numerous philologists regarding the transition from speechless, ape-like men to fully human beings, proposing that several human species—he identified twelve species, subdivided into thirty-six races—coexisted simultaneously on Earth. On the other hand, he asserted that lower and simpler organisms could have had a polychronous origin in different regions of the Earth through spontaneous generation from matter. This process, he proposed, occurred when carbon atoms—ubiquitous across the planet—condensed and combined with hydrogen and oxygen (i.e., water) to form moist or semi-liquid protein compounds, which Haeckel regarded as the «first and most indispensable substrate of all vital phenomena»<sup>139</sup>.

### 9. *Stereometry and Morphogenesis: A Geometric Principle of Nature*

At the origin of life in particular, and of the cosmos in general, there was, according to Haeckel, a tendency of matter to self-organize through combinations, mixtures, and transformations, determined by the affinity—or lack thereof—between certain elements. This mechanism, immanent to matter, began at the atomic level and, in a romantically inspired manner, extended to the macroscopic world, as Goethe had observed in his novel *Elective Affinities*. By combining with one another, atoms acquired specific

---

<sup>139</sup> Id., *Natürliche Schöpfungsgeschichte*, cit., chap. 15, p. 353.

spatial configurations that influenced the properties of molecules and, consequently, of bodies. These properties—later called *stereochemical*—explained how space actively shaped life: not only providing a material substrate, but also determining form, behaviour in relation to surrounding matter, and, crucially, distribution and orientation within space.

With August Kekulé's 1862 discovery of the *tetrahedral carbon atom*, motivated by the structural problem of benzene (C<sub>6</sub>H<sub>6</sub>)<sup>140</sup>—coinciding with the publication of Haeckel's *Die Radiolarien*—it became clear that matter was oriented, extended, and moved along all three Cartesian spatial coordinates, consistent with both empirical data and with the kinematic and dynamic frameworks of classical mechanics. Thus, when studying chemical bonds or macroscopic bodies, these had to be modelled as *solids*, rather than plane figures, oriented along the  $\vec{x}$ ,  $\vec{y}$ , and  $\vec{z}$  axes. However, this presupposed the existence of an ordered and measurable geometric structure—a system of positions, figures, movements, and proportions. In short, space itself had to be rethought in terms of Euclidean *stereometry*.

In the Def. XI.14 of *Elements*, devoted to stereometry, Euclid describes solids [*sôma*]<sup>141</sup> as bodies possessing three necessary extensions: *length*, *width*, and *depth* [*mēkos, platos, bathos*]. These extensions distinguish the solid from the point, line, and surface, while including them: points give rise to lines, lines to surfaces, and surfaces to bodies. Points, although dimensionless, are regarded as the principle of all extension. The three dimensions articulate space<sup>142</sup>: length indicates direction, width indicates

---

<sup>140</sup> Stereochemistry was a discipline in vogue in the 19<sup>th</sup> century, whose main exponents were Jacobus van't Hoff and Joseph Le Bel—students, along with Dewar, Körner, and Paternò, of August Kekulé. See: G. Montaudo, *La scoperta del carbonio tetraedrico. Il contributo di Paternò e Cannizzaro*, in «Rich-Mac Magazine», LXXXIV, 2002, pp. 66-70.

<sup>141</sup> It should be noted that in Ancient Greek, the term *sôma* referred both to the geometric solid body and to the biological body of living beings.

<sup>142</sup> In Euclid, what we moderns would call “space” did not exist in itself, neither as a physical entity nor as a metaphysical principle. Indeed, it would be improper to define it as such, since Euclid never used this word nor devoted any section of his *Elements* to that concept. Nonetheless, something analogous was already implicit in his geometry: a logical-mathematical framework that allowed for the emergence of extension and, consequently, of solid bodies and their properties. Solids therefore existed by virtue of this abstract structure,

coexistence, and depth indicates presence. They serve not merely to measure or construct bodies mathematically, but also to define their identity and describe their *stereometric properties*—i.e., intrinsic qualities, relations connections with other geometric entities, and behavioural capacities (the ways they manifest, react, and preserve themselves)<sup>143</sup>.

The three-dimensionality of bodies, which in Euclid was purely geometric, constituted in Plato and Aristotle the natural and ontological condition of the cosmos. In the *Timaeus*, Plato affirms that every body must possess three dimensions to exist. By embracing differences and varieties of form according to proportion and measure, the Platonic *chóra* becomes the locus of three-dimensionality and sensible extension. Furthermore, in Plato, the bodies of the cosmos assume regular geometric configurations: fire, air, water, and earth correspond respectively to the tetrahedron, octahedron, icosahedron, and cube, while the dodecahedron represents the form of the whole<sup>144</sup>. These perfect figures, constructed from elementary triangles, demonstrate the intimate relationship between geometry and nature, showing that cosmic order derives from a mathematical and rational principle. Aristotle, too, identified three-dimensionality as the very nature of the natural body, as he writes in *De Caelo*:

Hence continuous is that which is divisible into ever divisible parts, body is that which is divisible in every way. Of magnitude, that which is extended in one dimension is a line, that which is extended in two is a surface and that which is extended in three dimensions is a body. There is no other magnitude beyond these, since the three is all and the thrice is in every way<sup>145</sup>.

---

which Euclid conceived as a set of necessary rules and relations for understanding the operation and construction of geometry, without resorting to metaphysical explanations.

<sup>143</sup> For example, a cube is defined as a solid with six faces, twelve edges, and eight vertices—all congruent and orthogonal—capable of being inscribed within a sphere or resting on a plane and maintaining its geometric identity under translation or rotation around an axis.

<sup>144</sup> Plato, *Ti*, 55a–55c.

<sup>145</sup> Aristotle, *De Caelo*, I, 1, 268a 6–10; G. Betegh, F. Pedriali, C. Pfeiffer, *The Perfection of Bodies: Aristotle's De Caelo I.1*, in «Rhizomata», I, 1, 2013, pp. 35–44.

The idea that length, width, and depth were not merely geometric coordinates but actively conditioned the appearance of bodies—endowed with both form and matter—and their arrangement in space constituted another central element in Haeckel's thought. It connected two of his disciplines that might otherwise appear separate: promorphology on the one hand, and chorology on the other.

As we have seen, according to Haeckel, physicochemical properties are the true cause of vital phenomena. In the centres of creation, atoms condense and aggregate, giving rise to the first and simplest forms of life. In this process, chemical composition plays a central role: carbon, for example, is recognized in Haeckel's *Generelle Morphologie* as the fundamental element without which organic matter could not emerge. Yet, chemical composition alone is necessary but not sufficient. The stereometric configuration assumed by atoms, as well as the forces and movements in which they participate, are equally indispensable for understanding both vital and non-vital phenomena.

Unlike Goethe's morphology, which sought to study and describe the forms of living beings to uncover the common principles underlying their transformation, Haeckel aimed to identify the first forms acquired by bodies. From his observations, he noted that crystals, protists, and radiolarians are bounded by flat surfaces that meet along straight lines at geometrically measurable angles, whereas animals and plants, though apparently indeterminate, are delimited by curved surfaces and lines intersecting at variable angles. Yet all these forms could be traced, as Haeckel explained in his *promorphology*, to a limited number of ideal stereometric configurations [*Grundformen*]<sup>146</sup>.

Here we can discern the second element inherited from Goethe: the idea of an *Urbild*, or archetype—the primordial form from which all others derive through metamorphosis<sup>147</sup>. Haeckel maintained that underlying both organic

---

<sup>146</sup> E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. I, p. 48; See also: V. Maggiore, *Ernst Haeckel tra Estetica e Morfologia. Un pensiero che prende forma*, QuiEdit, Verona 2020, pp. 155-156, 259, 263.

<sup>147</sup> On the esoteric principle of the Goethean archetype and Haeckel's promorphological form see R. Riedl, *The role of morphology in the theory of evolution*, in M. Grene (ed.), *Dimensions of*

and inorganic bodies were universal, real, and immanent formal schemata, given *a priori* in nature and apprehended *a posteriori* by scientists. What was novel in Haeckel's approach, however, was his attempt to construct a kind of taxonomy of forms grounded in the stereometric and stereochemical properties of matter—a project reflecting both the mineralogical and crystallographic studies of his time, while also recalling the geometric, symmetrical, and rational structure of the Platonic cosmos.

Crucially, tracing entities back to original geometric forms did not reduce them to such forms. Haeckelian nature contained stable formal patterns, akin to Plato's fixed Ideas, yet it retained margins of autopoietic freedom<sup>148</sup>, governed by natural selection, which rendered organisms dynamic and historical products.

This dynamism stems from the movements underlying the development of both organic and inorganic beings. Formal structures grow and transform through the interplay of internal (endogenous) and external (environmental) forces, and through processes of growth by apposition or intussusception, i.e., the addition or penetration of particles into the formal pattern. These forces underlie not only morphogenetic processes but also vital phenomena, with nutrition and reproduction as their first expressions.

In fact, migratory processes are an extension of this same dynamic: species are not fixed entities but systems in motion, adapting and redistributing themselves in space according to conditions of equilibrium or disequilibrium determined by geological-climatic conformation or local resource availability. Their movements mirror those of crystals and cells, extending tridimensionally. Organisms and species expand not only along the horizontal plane of the Earth's surface (latitude and longitude) but also along the vertical dimension of altitude and depth.

---

*Darwinism: Themes and Counterthemes in Twentieth-Century Evolutionary Theory*, Cambridge University Press, Cambridge–London 1985, pt. III, chap. 8, p. 209.

<sup>148</sup> This notion must not be confused with the Darwinian idea of chance, which Haeckel entirely rejected.

Thus, the scientist's task through chorology is to monitor both horizontally and vertically «the diffusion of organisms above and below the sea level, their descent into the depths of the ocean, their ascent up the heights of the mountains»<sup>149</sup>.

## 10. Conclusions

Although almost entirely forgotten today, Haeckel's chorology holds a unique place in the history and philosophy of the life sciences. The long silence that has surrounded it is striking, given both the programmatic ambition with which Haeckel conceived this discipline and the philosophical depth that sustained his project.

In this article, the concept of chorology has been examined in detail: its definition as a science (Chapter 2), its object of inquiry (Chapter 3), its methodological basis (Chapters 4–5), and its aims (Chapters 6–9). Through this analysis, chorology emerges as one of the three foundational sciences—together with morphology and ecology—that Haeckel saw as essential to rebuilding the philosophical foundations of life and to promoting a genuine understanding of the living world.

The study also reveals a decisive moment of rupture with previous philosophical traditions. By focusing on the spatial distribution of organisms, their relationships with the regions they inhabit, and the generative role of space itself, Haeckel moved beyond the classical view that linked body and motion<sup>150</sup>. He proposed instead a radical shift: assigning chronological and ontological priority to place and relation over substance. In this way, he redefined space as the fundamental principle of life.

Haeckel pursued this project through his ontological, metaphysical, and epistemological monism, aimed at achieving a genuinely causal

---

<sup>149</sup> E. Haeckel, *Generelle Morphologie der Organismen*, cit., vol. II, p. 287.

<sup>150</sup> «Every movement requires a body, since movement cannot exist without one, just as no body is completely motionless. Each movement corresponds to a body: simple motion to a simple body, and complex motion to a complex body», Aristotle, *De Caelo*, it. tr. Sansoni, Firenze 1961, p. XIII.

understanding of natural phenomena. He advanced this goal by rejecting the classificatory sterility of Linnaean taxonomy and the empiricist reductionism of positivism, as well as the traditional dualisms separating the living from the non-living, matter from form, and space from organism. These positions aligned him with Goethe's Romanticism and with the systematic philosophies of German Idealism.

At the same time, Haeckel challenged the prevailing 19<sup>th</sup>-century conception of space as mere externality or as a neutral container of relations, such as that proposed by Ritter. Instead, he developed his concept of *chóra* as a dynamic field in which physical, biological, chemical, and even sociological forces continuously interact and co-evolve.

From this perspective, he also redefined the very task of the naturalist. The naturalist, according to Haeckel, should not limit himself to descriptive observation, as a simple cartographer of appearances, nor should he interpret nature as teleologically oriented toward a predetermined goal. Rather, his task is to offer a mechanistic and causal explanation of how and why organisms are located, move, and transform within specific regions of the Earth's surface. For this reason, Haeckel sought to reconcile Kant's *Physische Geographie*, German phytogeography and zoogeography, and Darwin's theories of migration, dispersal, and differentiation, in order to uncover the true, primary, and immediate causes of natural phenomena.

Haeckel thus positioned himself as both the continuator and the perfecter of the Humboldtian and Darwinian programs, while at the same time emerging as a radical innovator. He achieved this by (a) making space the principal variable through which the distributional patterns of organisms and species were to be investigated; (b) grounding this conception within a rigorous philosophical framework; (c) structuring it mereologically, embedding the local within the global; (d) attributing to it the characteristics of universality and necessity; and (e) bringing it into dialogue with the conceptions of space developed in classical mechanics, stereochemistry, and the monophyletic theories of species evolution.

As stated from the outset of this study, although no direct citation can be found, the influence of the Platonic *Dialogues* emerges unmistakably from the structure and content of Haeckel's thought. The *Timaeus*, in particular, may have offered him both the lexicon and the metaphysical framework necessary to conceive his chorology. Through the *Dialogues*, Haeckel seems to have undertaken a "second voyage"<sup>151</sup>, leading him beyond the empirical observation of the physical world toward the knowledge of the true causes of what exists.

All these elements of continuity and rupture with the preceding philosophical and scientific traditions underscore the paradoxical neglect that chorology has suffered—even in recent scholarship published on the centenary of Haeckel's death. The persistent focus on Haeckelian ecology alone provides only a partial and reductive understanding, not merely of the zoologist himself but of ecology as a discipline. As this study has shown, morphology, ecology, and chorology together constitute the three philosophical foundations of life. Indeed, as stated in *Generelle Morphologie*, organisms must possess both a form and a place in order to exist—and, consequently, to live.

Finally, the study of chorology can open the way for an integrated historical, philosophical, and scientific inquiry into migratory flows and the spatial dynamics of life—topics that have become increasingly relevant in contemporary academic debate. Haeckel's chorology offers a perspective for interpreting human and non-human migrations as potentially natural, evolutionary, and relational phenomena, rather than solely contingent or political events. Anticipating some present-day reflections on the Anthropocene, revisiting chorology may help to highlight the epistemic roots of current theories on the distribution and mobility of life, as well as to explore how migratory flows—human and otherwise—can contribute to the diversification and resilience of ecosystems. In this sense, chorology could be considered a valuable discipline for supporting biodiversity and enhancing geodiversity, within a framework that spans both local and global scales.

---

<sup>151</sup> Plato, *Phaedo*, 99c-d.