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VITALISM AND MODERN GEOGRAPHICAL THOUGHT

O VITALISMO E O PENSAMENTO GEOGRÁFICO MODERNO

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VITALISME ET PENSÉE GÉOGRAPHIQUE MODERNE

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ABSTRACT

Geographic thinking was at the center of philosophical and scientific formulations between the mid-18th century and the beginning of the 20th century. This period also represented a great influence of vitalist thinking. In this work we present elements to understand the relationship and mutual influence between vitalism and geographical thinking in this period of modern thought.
KEYWORDS: Geographical Thought, Vitalism, History of Thought.

RESUMO

O *pensamento geográfico* esteve no centro das formulações filosóficas e científicas entre meados do século XVIII e início do século XX. Este período também representou uma grande influência do *pensamento vitalista*. Neste trabalho apresentamos elementos para compreender a relação e mútua influência entre o *vitalismo* e o *pensamento geográfico* neste período do pensamento moderno.
PALAVRAS-CHAVE: Pensamento Geográfico, Vitalismo, História do Pensamento.

RESUMEN

El pensamiento geográfico estuvo en el centro de las formulaciones filosóficas y científicas entre mediados del siglo XVIII y principios del siglo XX. Este período también representó una gran influencia del pensamiento vitalista. En este trabajo presentamos elementos para comprender la relación e influencia mutua entre el vitalismo y el pensamiento geográfico en este período del pensamiento moderno.
PALABRAS-CLAVES: pensamiento geográfico, vitalismo, historia del pensamiento.

RÉSUMÉ

La pensée géographique était au centre des formulations philosophiques et scientifiques entre le milieu du 18e siècle et le début du 20e siècle. Cette période a eu, également, une grande influence de la pensée vitaliste. Dans cet article, nous présentons

quelques éléments pour comprendre la relation réciproque entre vitalisme et pensée géographique tout au long de cette période de la pensée moderne.
MOTS CLÉS: Pensée géographique, Vitalisme, Histoire de la pensée.

INTRODUCTION

How important the Vitalist thought is to modern geographical thinking needs to be addressed. This text, aiming to assist some reflection on this matter, strives to examine Vitalist thought itself. But due to its large scope, with its further back origins, and drawing on a great deal of renovation and reinterpretation, defining it is risky work. In our opinion, this would require pointing up how this Vitalist thought was at the time of geographic thinking renewal, from the 18th century onwards. Its importance is related to the limits, obstacles, displacements, problems, and paradoxes of the physical-mathematical thought of the time, namely the Mechanicism, unable to "*sufficiently explain, for example, the phenomena associated to life itself, drawing some attention of philosophers interested in the matter*" (Duarte, 1993, p.37).

Its limits are manifest when it was necessary to address the core of the organism. This mechanicism-vitalism dualism was seen over much of the scientific-philosophical debate, at least ranging from Immanuel Kant (1724-1804) to Ernst Haeckel (1834-1919). But would mechanicism be useless when applied to life? This problem concerns the birth of several ideas within the scopes of natural history and philosophy of nature, along with geology, anatomy, physiology, biology, and geography. More than this, at least since Baruch Espinosa (1632-1677) a shift towards immanence has been trying to explain the world for itself.

The geology field experience major changes in the late eighteenth-century, hence different conceptions beyond its original intellectual sphere. In other words, the progressive transformation of the earth's surface evokes the transformation of all its living conditions, taking us to the species variability problem that concerns major changes and adaptations in organisms. Physicists, bringing up new studies on mechanical heat and energy, place the eternal flow of matter as a principle. Chemists bridge the gap between the inorganic and organic realms. To this, one can add the ongoing researches of paleontology, anatomy and compared physiology, in the microscope usage, and the discovery of cells. Details were better compared within this new background, both in the laboratory or when investigations led to the actual conditions of the earth's different landscapes, also of the plants and animals, which resulted in the biological thought to emer-

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ge. And by the comparative physical geography method, these contributions encompass each particular organism within its concrete situation, including those that defied any sort of classification, since they could not be definable either as animals or vegetables.

These notions weakened the fixed idea and the parallelism between the history of the organic and inorganic world and each organism in particular. Noting that CasparWolf (1733-1794), in his Theoria Generationis (1759), starts from Aristotle (384a.c – 322a.c), Willian Harvey (1578–1657), and the theory of epigenesis to get into question the species invariability, anticipating the works of Lorens Oken (1779-1851), Jean-Baptiste Lamarck (1744-1829), Karl Baer (1792–1876), and Charles Darwin (1809–1882). That is, contributing to the events of 1859. It was not an isolated thought, as one can see. Back in the early 1880s, Friedrich Engels (1820-1895) had already acknowledged this in his Dialectics of Nature: "*the first breach in this petrified outlook on nature was made not by a natural scientist but by a philosopher". In 1755 appeared Kant's General Natural History and Theory of the Heavens. The world appeared as something that had come into being in the course of time*" (Engels, 1979, p.19). This question is of great importance since it is palpable that *geographic thinking* had a profound influence on the debate about the *system of nature* since Kant's ideas.

Was there a second revolution or a displacement of the Copernican revolution? (Lebrun, 1993, p.323). If that is the case, we will try to think of it in dialogue with geographical thought. For Lebrun, in this "revolution inside a revolution", there would be a "dissolution of the technical purpose" (Lebrun, 1993, p.329). But here is the point: how to understand an organized body? Lebrun also states that Kant exposes twin obstacles to conceptualize organism, one that leads to the very concept of matter and its relations with the driving forces, and another that differentiates body and matter, as in the perspective of discontinuity of life and matter. (Lebrun, 1993, p.331). Then the question "*what is life?*" naturally arises at this point.

WHAT IS LIFE?

Kant comments that Herman Boerhaave (1668-1738) "*says somewhere: the animal is a plant which has its root in the stomach. And one could say that the converse is also true, without being blamed: the plant is an animal which has its stomach in its root*" (Lebrun, 1993, p.330). Kant, to this point, adds another question: *where can we detach the living and nonliving entities*? In Lebrun's account, we came to understand from Kant that "*an organized being is not just a machine*" (Lebrun, 1993, p.340). In turn, after reading Kant, Johann Blumenbach (1752-1840) attributes natural ends to the organism: such

as *growth, reproduction, self--preservation* (Lebrun, 1993, p.340). And considering these natural ends, we came to *self--organization*. Are we looking at the world from a different angle? This "new" perspective has now a powerful word before it: life. Would it be a semantic whim to be close to "organic creation"?

Bensaude-Vicent & Stengers (1992, p. 87) highlight the importance of Georg Ernst Stahl (1660-1734) and the vitalist theory, "*which refuses to assimilate living beings to machines in a physical and chemical terms*". Life, they note, demands its own principles, far beyond those offered by mechanicist theory. The same issue can be traced back to Baruch Spinoza (1632-1677) and David Hume (1711-1776), for whom the art of anatomy can be found in the limit of physics. The same for the interweaved relationship among reasoning, observation, and experimentation (Pimenta, 2018, p.30). And the distinction between vitality and causality.

It is interesting and illustrative to ponder on these limits. Denis Diderot (1713-1784) and Jean d'Alembert (1717-1784) in their 36-volumes *Encyclopedia*, published between 1751 and 1772, with contributions from Rousseau, François--MarieVoltaire (1694-1778), Anne Turgot (1727-1781), Jean-François Marmotel (1723-1799), Charles Montesquieu (1689-1755), François Quesnay (1694-1774), Paul Holbach (1723-1789), at one point ask themselves: *What is an animal?* After further reflection and demonstration, they conclude: "*the only general quality of animals is that one shared with the plants, that is the faculty of reproduction*". (Diderot and d'Alembert, 2015, pg.143). There are "*passages*", no "*lines of separation*", and organized beings "*who are neither a living being nor something else*", Diderot said. Or "*minerals less dead than others*". Still, for Diderot, out of Georges-Louis Buffon (1707-1788), it is worth thinking about "*relations*". It is about replacing Newtonian physics with an organicist view and a system of nature.

The problem so far can be presented as follows: *how to expand the application of the experimental method to encompass bodies, matter, substance, living beings, animals, and humans? Is this important shift somewhat helpful to think about the "soul" and its correlates*? Immanence here is like a glance: a deep look inside that can reveal the body itself in a given space and time, as if was a system of physiological relations and stable anatomical proportions (Pimenta, 2017, p.16.) Physiology, comparative anatomy, and experimental medicine became safe havens to discuss organized bodies. The importance then of reading the body out of effects, signs, and symptoms makes physiology elevated to a philosophical principle. Are we facing philosophical physiology or a physiological philosophy? Diderot found this *common thread* in chemistry.

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Precisely the *threshold between one realm and another*. And between its borders, one can find feelings and nourishment.

The question "what is the animal?" refers to its physiological dimension, to the definition of *life* itself. As natural beings, and according to the laws of nature, there are vital (breathing), natural (digestion) and animal (movement) functions. At this point, one can also find similarities and differences between physics and chemistry.

In the "*chemistry*" entry of the Encyclopedia (Venel, 2015, p.313-348), Gabriel François Venel (1723-1775), dialoguing with sundry theories of physics and chemistry, also with Hermann Boerhaave (1668-1738) but chiefly with Johann Joachim Becher's (1635-1682) work *Physica Subterraneae*, make us reflect on these similarities and differences between the mechanistic tradition physics and organicist chemistry. For him, *chemistry pierces into certain bodies while physics could only learn them superficially*. It would be necessary, however, to overcome those isolated explanations of chemical inquiry. By the influence of phlogiston and vitalism, Venel was expecting to be a new Philippus Paracelsus (1493-1541). Actually, he sought to replace physics with chemistry, drawing the *attention of philosophers* to this intellectual field. He heralded general philosophical chemistry. Whilst physics sought to know bodies by their external qualities, it would be up to an essentially different science to study the organization, composition, organic, and living bodies' movements.

One can find in this context debates about distinctions between aggregate and corpuscle, external properties and internal qualities, and between physical forces and chemical affinities. But also particular qualities, what integrates and what depends upon the other. Unearthing bodies internal qualities would be the announced chemistry program. And these movements or actions would rely more on corpuscles' internal qualities than on jolts out from external bodies and forces. Drawing back to Baruch Espinosa (1632-1677), there would be variations between different forms of conditions.

In this context, scrutinizing internal movements (digestion) are needful. These movements, in turn, do not act in a sensitive way (instantaneous), obeying the laws of affinities and not mechanical principles. The major concern is with relationships between bodies and their principles, that is, their properties, chemical qualities, combinations, modifications, and correlations.

This *secret* physics, which that latest chemistry had announced, would account for observing natural phenomena (maturation, formation, change, generation, and inflammation), monopolizing the debate along with animal economics, physical botany, and mineral studies. Supported by experimental studies on artificial and laboratory phenomena, chemistry *knows this body*, it is the *small-bodies* science; it is an art (Venel, 2015,

p. 317-333). Did chemical art really take it a step further?

This is the affinity point of view, which allows aggregate and mixture discrimination. It demands to mull over those chemical bonding responsible to create bodies from other bodies. For the chemistry inquiry of the 18th to the 19th century, "*intimacy of matters*" is of concern. (Bensaude-Vincent & Stengers, 1992, p. 94). This chemistry of affinities is vital to fathom Antoine-Laurent de Lavoisier's *Traité Élémentaire de Chimie* of 1789. Since it is linked to transformations in inorganic and organic matter, the idea of *chemical affinity* was fundamental. It is also vital to grasp Alexander Humboldt's work, in his magistral *Cosmos* (Humboldt, 1859, pg.10-11). This topic of discussion gives us a glimpse of chemistry's place in natural philosophy thought in those days. Composed by corpuscles and cannot be reduced to mechanical properties, the understanding of matter is the thought underlying *chemical* studies from that moment on. Similar to *geographical thought.*

WHAT IS *MILIEU*?

The notion of *milieu* emerges from the *chemical thought* aforesaid. It seeks to study the phenomena of organic compounds and to move beyond the organic chemistry field, as part of physiology. Therefore, the milieu describes the "*living bodies' composition and the arising chemical processes*" (Bensaude-Vicent& Stengers, 1992, p. 184).

The preserved enigma once said by Walter Benjamin (1892-1940), "*that of what is alive*", exposes Johann Wolfgang Von Goethe's (1749-1832) uneasiness. Goethe's phenomenology is a critical link to this *chemical thought* acting as a *geographical thought*. And the notion of *milieu* can be seen throughout the entire Elective *Affinities' work*. Goethe shared with Johann Kaspar Lavater (1741-1801) a commonplace about physiognomy, also with Johann Gottfried Herder (1744-1803) when dealing with anatomy, sharing a similar historical conception. Still, for Goethe anatomy was a method, a perspective that has influenced Johann Friedrich Blumenbach (1752-1840) when writing his 1805's *A Manual of Comparative Anatomy*. These dialogues formed the basis of type theory.

A shared goal of several systems of thought is the study of organic natures and their metamorphoses, the appearance of types provided by physical-chemical bonds and interaction, all following the same starting methods of compared physiognomy.

This physico-chemical understanding of the *environment* dialogues with *geographical thought*. Alexander Humboldt himself held intense intellectual relations with Blumenbach and contributed to extending the elements of physiognomy to vegetation. Carl Ritter's *Comparative*

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Geography was also influenced by physiology and anatomy studies of Blumenbach, also debating with Carl Linné (1707-1778), Georges-Louis Buffon (1707-1788), and Georges Cuvier (1769-1832) theoretical works.

Humboldt's Cosmos, for instance, demonstrates that *descriptions* of nature scenes are not incompatible with the *lively painting of scenes* (Humboldt, 1859, pg.10-25). The physical portrayal of the earth becomes a physiological description of the world. And this required a Kantian plan, drawn up meticulously by Humboldt the time before his long journeys. He studied natural history at Gottinguem with Blumenbach, carried out geological studies at Academia de Minas, deepened his anatomy and physics research in Vienna, discussed so-called vital force with Friedrich Schiller (1757-1805), animal electricity with Luigi Galvani (1737- 1798), and on metamorphoses with Goethe. Botany (and zoology), geology (and volcanism), chemistry (and vitalism), physics (and astronomy), and instrumental techniques (and terrestrial magnetism) took part in Humboldt's readiness. From these science fields, he learns to grasp the *phenomena' deeper meaning*, in its complex *mutual influence*, letting be guided by the sequence of things that feed each other.

Observe and acknowledge the connectivity present in the forces of nature illustrates the intimate feeling of their mutual dependence. This approach continues natural philosophy tradition and of that deep sense of harmony of nature, now merged with a rational, watchful, and experimenting vision. Furthermore, celestial and terrestrial phenomena can be accounted for with descriptive descriptions, from distant phenomena to a better understanding of organic and cellular scales, both grasped by physics and by chemistry, respectively. But this extends beyond: more than just looking in the vastness of the cosmos and to the diversity of all forms and organisms, this attitude must consider the primordial mysteries of life, their transformations, and metamorphoses, as well as the astral bodies and distribution of terrestrial organisms. It is in nature's calmness the elements to see each organism as part of a whole; they are no isolated forms, but linked to the chain of beings, *including extinct ones* (Humboldt, 1859, pg.23-25.

At some point in *Erdkunde*, Karl Ritter (1779-1859) explicitly states that he employed the word "comparative" in the same sense it used to be applied to other major branches of science, as comparative anatomy, for example. Like Johann Georg Adam Forster (1754-1794), Goethe and Humboldt established a relationship with botanist Georg Franz Hoffmann (1760-1826). And it is worth mentio-

ning the connection between Johann Heinrich Pestalozzi (1746-1827) and Ritter, and the problem of instincts and natural methods. Still, Ritter understood the different parts of the world as living organisms, which had some influence on George Wilhelm Friedrich Hegel's metaphorical idea (1770-1831) that continents are individuals.

These latter, in turn, were influenced by Johann Gottfried Herder (1744-1803) regarding the relationship between genius and space as a revelation. Herder was Kant's student at Konigsberg and bore direct influence on Friedrich Wilhelm Joseph Schelling's *Naturphilosophie* (1775-1854). It is an in-change confluence of thoughts. Humboldt and Aimé Bonpland (1773-1858) yet expand the idea of vital force for the whole of nature, by interweaving physical, geological, chemical, biological, and cultural spheres. This *naturgemälde* actually dialogues with Schelling's *naturphilosophie*.

Through Lavoisier, Michael Faraday (1791-1867), and Justus Von Libieg (1803-1873), among other thinking figures from the late eighteen-century, chemistry made known the power of transmutation, a legacy of alchemy. Thus the *chemical thought* reassesses vitalism. But how? Think of those kingdoms of Linné and its correlation of permanence in Buffon; in its fixed and teleological program; and ponder about the balance and harmony of forces

This *chemical thinking* enabled us to reflect on the continuity of things, processes, and elements (the movement from inorganic to organic, for instance), and about transformation and transmutation (from quantity to quality as another example). And what is the changing relation of forces that produces modes?

The problem now is with atomism, substance, corporium, the particles, and elements. This mechanicism--vitalism debate is central. It makes the body and its organs be considered as living-body, given it an organism status. And the human? This must be resolved since the body besides its extensiveness is a living thing (a living being, living organism, living environment...). Furthermore, it is a thinking living being, the one who lives and knows this. Chemistry and nascent biology rescue this idea of living creatures capable of reasoning, giving more attention to the relationship between the inner and external environment of a being. Even the prominent theme of immanence, called now metabolism, was reinstated.

Comparative anatomy, physiology, and chemistry become the illustration of experimental sciences with their own equally experimental arts. Would experimental physics be (or could it have been?) the bridge that links the most

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abstract and the most concrete approach? "*And what the experimental-method philosopher have to grasp is a picture of nature. The image of the world is considerably more complex than that unwavering ground in which Newtonians work*" (Pimenta, 2018, p.176)

For Diderot, the distinction between observation and interpretation of nature is the starting point. The former applies experimental methods that concern laboratory experimentation, experiment, and experience. And conjectural is the latter, insofar it deals with an epistemological realm and acts as a *guiding principia* to natural sciences. It concerns subject-object relation, utility-outcome, and sense-reflection-sense epistemological circle: "*there is a natural metaphysics, conceived in the immediate contact between man and his surrounding world*". All recognized human senses, those of sight, hearing, touch, taste, smell, and also the reflecting attribute "*only allow us to perceive nature when [the elements can be] linked, forming a circuit in which pieces are connected by the thread of sensitivity or nervous system: an organic unit that anticipates and mirrors that of organized beings outside of humankind.*" (Pimenta, 2018, p.181). It was left to Marie Bichart (1771-1802), "*as a good 'vitalist', to formulate the fundamental axiom of physiology science, rather than experimental or comparative: 'vie est l'ensemble dês fonctions that resistent à mort". This 'well-known aphorism' would be at the basis of Claude Bernard's later formulations, whose theory yet allowed structural morphology to decipher changes in the shape of different species that inhabit the same environments as 'physiological differences'. These variations are determinant for the enforcing demands of the inhabited environment*" (Pimenta, 2018, p.241). The distinction between internal and external environment lies, once again, at the threshold. There is a hypothesis of a space where life exists. "What does it mean to discuss a body as if it had a center and a circumference and as if it were a geometric shape?" (Pimenta, 2018, p.244). In this sense, isolating the body's internal environment from other bodies, to study it, turns into a premise. Then the distinction between the living and his environment can be grasped, and where vital forces, that guarantee the connection or unity of the parts, are opposed to the destructive and external forces. One original language must arise for this. However, insofar as it can be defined by those existing analogies of mechanical science, this is physiology's challenge. And "*what do they mean by life, when this word is pronounced? And what does it mean to reduce life to what is indeed a support, that is, as an organism?*" (Pimenta, 2018, p.245)

Georges Canguilhem (1904-1995) reminds us that Claude Bernard (1813-1878) claims that an organism is just "*a living being living like any*

other", that is, living as a *whole* (Canguilhem, 1965, p.19). The expansion of experimental science to the whole of life would be hindered by some important issues: the specificity of living forms, diversity of individuals, organism's totality, and irreversibility of vital phenomena. But these are stimulating obstacles. The complexity of life phenomena must lead to experimentation in physics, chemistry, biology, and medicine. Does this also apply to geography? If one content escapes others' reach, it is possible to extend its content as secondary as well. We can reckon, in this sense, Carl von Linné as the *fixism* advocate, even if throughout his life he distrusted this *thesis*. Actually, we can place this naturalist as one of the founding fathers of transformism. What can the eye see of the world through the microscope's lenses? The living compound of a cell. And what information can we glean with naked eyes? The same living compound of the biosphere.

It is, actually, the extension of sight and thought. Cells are not just a part, and living beings are not a sum of these tiny little parts we know as cells. They actually represent the only component of all living things, something usually named the biosphere. In truth, understanding that cells originate from other ones and not from an outside world entails a position-changing flow. Indeed, this launches cell theory. But ideas often take different paths. There are many possible analogies for this: honeycombs, a small monastery room, the idea of work, affinity, affection, grain, seed, organization, composition, decomposition, something deposited, or immanence. Let us remember Friedrich Ratzel's (1844-1904) query, back in 1901: "*We could not say that spatial tackling [Raumbewältigung] is a general phenomenon of life and a mark of life?*" (Ratzel, 2019, pg. 112).

Coeval writers Lineé, Buffon, Haller and Pierre Maupertuis, authors of Systema Naturae (1735), *Histoire générale des animaux of* (1749), Elementa Psysiologiae (1757), and Venus Physique (1745), respectively, will introduce major questions in this eighteenth-century debate. For Haller "The fiber *is to the physiologist what the line is to the geometer*" (Canguilhem, 1965, p.49). Upon his understanding of the living being as a system, Buffon builds his theory. And Maupertuis states that "*behind affinity, it is necessary to discern attraction*". And backing to Buffon, nutrition, development, and reproduction of living beings are consequences of laws other than ordinary mechanics, making us questioning about penetrating and active forces in bodies masses and weights, in magnetic attractions, and chemical attractions. Why not to admit it? In his *Leçons d'anatomie comparée of 1805*, *George Cuvier's* (1769-1832) get close to the answer when highlighting that the idea of life is a general one and sets before us "by cer-

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tain sequences of phenomena, which one can see in succession, at a constant order, held together by mutual relations. Even though we do not grasp the nature of what unites them, this link must exist". For him, our body seems to "resist for a certain period to the laws governing *bruts* bodies, and even acts completely at odds upon these same laws external to them, life and vital force designate these exceptions to general laws" (Cuvier, 1805, pg. 1, 2).

Buffon, questioning the penetrating forces and the inner form, puts himself somewhere between Aristotle's *formal cause* and Claude Bernard's *inner or psychological environment*. He starts with mathematical calculation (mechanical principles), discusses physical sciences (penetrating forces, weight etc.), and attain natural sciences reflecting about those *penetrating forces* in organized bodies. The attraction, to Buffon, extends to all phenomena of living matter, thereby stretching to living beings, organic molecules, fire, light, heat, and to "*all matter that seems to be active by itself*" (Canguilhem, 1965, p.54).

Wherever the name one might use, be it system, principle, ensemble, or vital force, there is an affinity between the cellular, molecular, and atomic theory with the notion of vitality. This discussion was present in Lorenz Oken's (1779-1851) work, as well it bridged the romantic school of Friedrich Schelling (1775-1854) to doctors and biologists practices. It was also present at the University of Iena with Theodor Scheleiden (1810-1882), who investigated plant cells and phytogenesee, and with Theodor Scwann (1810-1882), who led the theory of all living beings to a more general level. Thus, Paul-Joseph Barthez's cell theory and vitalism and the eighteenth-century European taste for natural history are coetaneous. And the amount of descriptions increases. Also natural history offices and collections, science academies, royal societies, gardens, and exhibitions. It was, in short, the surrounding context that influenced Étienne Saint-Hilaire's *Principles of Zoological Philosophy* (1830) and the debate with Georges Cuvier.

WHAT IS A *DESCRIPTION*?

In Louis Daubenton's (1716-1799) account "*to describe nature's different productions is to draw its portrait, it is to compose a representation picture of both inside and outside environment under different aspects and states*" (Daubenton, 2015, pg .185)

The extension of the object of *natural history to be described is the real matter. But how to describe the whole universe*?

> "Indeed, the description of nature's productions underpins its history, and it is the only path to recognize the particularities and explain each arrangement with a fair idea [...] And through such changes, one can compare an object with another ... If a naturalist considers an object, it is only to

compare it to another" (Daldenton, 2015, pg.219-220).

Anatomy enables us to contemplate each thing-in-itself starting from the particular. Comparing being and its parts, one becomes familiar with observable particularities and general *nature mechanics*. For Daubenton, this would then be the object of comparative anatomy. And because the human being is an animal, the medical field would be a natural history branch. Hence comparative medicine and comparative surgery would be based on compared anatomy. *Separating* correspond to *naming* in this method. To the eighteenth-century botany as well, whose purpose was to grasp the qualities of plants through a "*detailed scrutiny of the parts*" (Daubenton, 2015, p.223), would have in its essence a *kind of anatomy*.

In practice, deepening anatomy studies have shed light on relations between genera, species, and families. For Daubenton, in the "*natural history*" entry, one can "*compare the sap of plants to the blood of animals or even to the no-blood animals with a particular kind of liquid. Plants absorb nutrients through suction carried out by roots and leaves, as well as animals by mouth or sucking. Digestion, secretion, evacuation can be found in plants*" (Daubenton, 2015, pg.224). And among mineral, vegetable, animal *realms* there are *countless other relationships*.

While a *naturalist* researches productions of nature, he also observes and even touches these results. Delicately, he strives to not deform them. This is a whole unique situation regarding chemists. They long to decompose these productions of nature, like artists, until reaching the small: particles, molecules, elements, principles, and to the first. Still with Daubenton, chemistry "starts where natural history ends" (*Daubenton, 2015, p.224*).

It is crystal clear eighteenth-century European taste for descriptions, observations, and to conceptually build systems of nature. "*Who would go throughout the surface of the Earth to see attest the output of every climate in every country*? The naturalists. Gardens, collections, and offices represented the idea of a *summary* of whole nature. With everything arranged in a given order before the observer's eyes. It was in the office's environment where *first notions* of this science and method were learned: "*after having considered them in their offices, it is convenient to read a well-chosen work about their description and history, before moving on to observe an object within nature*". For Daubenton, the natural history facts are established by *relations* (between things and natural beings) and it is up to the *naturalist* to make comparisons. Actually, those possible *combinations* are the *meditation objects* of naturalists (Daubenton, 2015, p.227-229).

As the division of different

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productions of nature should be methodical (Diderot & D'Alembert, 2015, pg.233), mostly because of the number of objects, with their inner structures, qualities, their properties, naturalists have had to compare the parts and grasp their relations, further exposing nature's order both in particular and general scale. Until then, they were dedicated and satisfied to categorize and describe the parts, organs, and differences. This shift represented a transition from an external to an internal view of objects. Nevertheless, it represented an additional problem, an obstacle, and an epistemological boundary.

One can see Holbach, in the entry "minerals", saying that this "*external knowledge of bodies is sterile and fruitless; and as natural history must have in mind its usefulness to society, it is necessary to be aware of internal qualities of mineral substances to know when and where they can be employed, something that can only be provided by chemistry* "(Holbach, 2015, p. 241) Thus, physiology bequeathed its foundational elements of chemistry that, in turn, help us grasp the connection between animate and inanimate world. Still, it was up to this science bridges natural history and physics.

AND WHAT IS VITAL?

The definition of *life* conveyed paradoxes: it is an effect, a form, a sign, and a systematic articulation. It is an impulse such as Blumenbach's *bildungstrieb*. But what is a form, if not the effect of a forming *force* or an *impulse*? And what is *life*, if not the effect of a *vital force*? For Holbach, it is an *activity* that of fulfilling vital needs, a steady movement from internal to external. We are dealing with the *immanent formation idea*, very similar to Blumenbach's *bildungstrieb*, and with transcendent formation one, as proposed by the Kantian *bildungskraft* notion. Rather distinct senses in regard to formation.

This discussion can lead us to dialogue with Jean Baptiste Lamarck's conception portrayed in his *1809 Philosophie Zoologique*, which seeks the stimulating causes of excitations. But it is in another vitalistic vocabulary that Lamark found elements to reflect on these causes, in the term of irritability, as an inherent property of animated bodies, used by Pierre-Jean Cabanis (1757-1804) representing the Montpelliere school. Following the footsteps of Cabanis, Antoine Destrt de Tracy (1754-1836) and Étienne Condillac (1714-1780) elevate the sense of touch as regard as the primary source of ideas. Hence a physiological theory of sensitivity is born. But why not a philosophy?

This latter question is present in Arthur Schopenhauer's ideas, made known especially with *The World as Will and Representation* (1818) and with *On the Will in Nature* (1836), two of his treatises. In the same direction, we have Friedrich Nietzsche holding a

fraternal and Dionysian dialogue within his work On the Genealogy of Morality (1887), where he meditates that "*man would rather will nothingness than not will*" (Nietzsche, 1998, pg.149. And Lamarck regards that when the realm of biology integrates that of physics, a physiological theory of sensitivity is formulated in a philosophical language. Thus Lamarck, Cuvier, and Claude Bernard have shared several traits: "*as a result of a process, life happens in the inner environment, which maintains sometimes conflicting sometimes harmonious relations with surrounding or external environment; and the more complex an organism is more interdependent it is in relation to itself*" (Pimenta, 2018, p.258).

There is a principle, as with *energy*, that acts differently from gravitational attraction: this is the *vital force*. There are geometric shapes, but there is a distinction between spaces (interior and exterior). There is geometry as a general rule and there is an abstract and neutral space but populated by private, active, living, and organic bodies.

Now, the idea of *position* comes up. Hence the importance of location and cartography. For Paul Vidal de La Blache (1845-1918), however, recognize this *topographical trait* (Olinto Marinelli, in La Blache, 1901, 2012 p.114), that often indicates "*where*", is not enough. And he adds " *from where?*" And the "*why*"? (La Blache 1901, 2012 p.114). In turn, Ratzel's Anthropogeography already had presented the "*how?*" question. Dragged into this, geographic thought has thought about relationships, types, and compositions.

There is a scheme. There is a kind of architecture, as we find in Kant. But would his *Critique of Pure Reason* be a small treatise for naturalists to use? There is a bond between general figurations and peculiar and particular elements, also with forms and modes. In Pimenta's account, Humboldt takes advantage of Goethe and Geoffroy Saint-Hilaire's same intuition: "*the standpoint that an organism interacting with the environment contributes to shaping it whilst catering for physiological needs. It does not properly suppress the idea of conflict between living beings and conditions of existence, this view actually establishes a dynamic relationship between poles that tend to be opposed.*" (Pimenta, 2018, p.259). And here lies a fundamental question on the description act: "*when one describes a being, it is necessary to observe the relationships between their and other beings within nature*" (Daubenton, 2015, pg.185).

IS GEOGRAPHY A KIND OF ANATOMY?

Between beings and between realms, there is an analogy. According to Pimenta (2018, p.176), Buffon taught us "*to see bodies in motion not only in animal's semen but also in the seeds of plants*". Or still be-

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tween *body* and *milieu*. Pierre Tarin (1725-1761) once stated "*this analogy presents nothing that surprises doctors, since animal blood differ from that of vegetables sap by only one degree, and ours are not different from those of animals*" (regarding Boerhaave). Besides, Tarin splits the human body into segmented plans, "*to avoid confusion*": "*anatomy is a kind of geography and precision is indispensable*"... "*the body thus was divided into several regions, just as with the Earth*". (Tarin, 2017, p.131-132). It is a dialogue between anatomy *boards* and geographic *descriptions* of different regions and their *cartographies*.

Abundant empirical analogies with the *human body*, out of physics (levers, ropes, tubes, machines etc.) and chemistry (filters, stills, containers, streamers etc.), approximate us from this debate. To this thought, the *whole* of life has an objective and subjective reality, and the organic *matter* is seen as a being. This was certainly a Kantian influence founded on his idea of the unity of Earth's surface and nature. This very notion of a living unity of nature led to acknowledge the works of nature. Kant, introducing his *physiche erdbeschreibung* (physical description of the Earth), says that this is the propaedeutic first step towards the knowledge of the world. Anticipation, a solid idea, a preliminary concept of everything, and a plan are required for this. It takes more than just see. We need to know "*it all*", in a systematic manner. The whole is actually actually the whole world, and its description is of paramount importance. And for describing we need a previous ordering, concepts need to be classified - one can search for the meaning of logic in Linné, for instance -, the same way that the limits of time and space need to be specified.

The geographical description (*physische Erdbeschreibung*) must conform to the places that the concepts occupy on Earth. In Kant, geography deals with *phenomena* in a *given space* happening in a *given time*. It refers to side-by-side events scattered in space. For Kant, the history of nature contains the *diversity of geography*. If we expose the events of all nature throughout time, if we also consider the ongoing transformation of animals, plants, and other *compared things*, as well as those resulting from *areal differentiation*(*verschiedenheit des landes*), we can grasp the foundation of natural history. One can conclude, therefore, that events can only be materialized when there is a relationship *between things* and here, we add, in a relation *between places*.

For this natural geography, this geography of living beings, relations and their general laws shall form a land-based harmony and a coherent whole, as with a body, crossing mineral, animal, and vegetable realms as a single common thread of thought. These com-

parable evidence enabled an analogy with the comparative anatomy method. This geography then can reflect the living picture of nature, as if it were a unit and as a whole. Constituted and animated by natural forces, the *whole* of nature would be a physical body, as if were a diversified system of phenomena that respects individualities.

WHAT CAN A LIVING BEING ACCOMPLISH?

The 1755 Lisbon earthquake incident shook the foundations of fixist thinking and ignited in Kant a keen interest. For him, these tectonic activities spotlight the concept of time, as well the pure reason capacity to deal with practice and ethics. Is it possible to see time in the future? In other words: what can a body do in face of cosmic, geological, natural forces, since these constitute complex force fields? This inexorable tectonism is systematized by Charles Lyell (1797-1875) in his *Principles of Geology* of 1830-1833.

The questions of Earth's reciprocal influences and its inhabitants, the relations among inorganic, organic, and human sphere, as well as the influence of mechanics in the whole of life, was already sowed in scientific thinking of those days about nature. It is therefore the passage, it concerns the relations between inorganic and organic. And this eighteenth-century stream is tributary to the debate on geology (neptunism and tectonism) and biology (mechanism and Vitalism).

What was once asked by Spinoza, the "*what can a body do*" question can now be reformulated: how does a living being relate to its milieu (body and thinking thing), is it determined by it, and what can they do? The forces affect the body, but what is next? The body seeks energy, what then? Interchanged ideas coming from the answers to these questions resulted in another possible response derived from *geographical thinking*. However, there were some epistemological issues to this field, there were limits. Indeed, it has already been said that we would be facing a second Copernican *revolution*. If the former gives life to the universal system idea, the latter brings to the body a system-in-itself, highly complex, status. It places the debate on the relationships between centralities and spatialities: the whole, the sun, the Earth, the body, and the mind. It is the milieu, as we have seen. It is Humboldt's concern: plants and all vital beings, in their existence and experiences, have chemical, physical and biological determinations (temperature, humidity etc.). Hence the physiographic method and the derived considerations on distributions and relationships between living beings.

Furthering Kant, Goethe, Lavater, Lavoisier, and Blumenbach's propositions, Humboldt will extrapolate the experimental method to nature,

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changing how it is directly presented, in its form and modes, to in-field experience. As though it were a kind of anatomy that penetrates nature to later make comparisons and from intellectual intuition come up with the idea of one *harmonic whole*, the idea of *Cosmos*.

There is a clear intersection between the old climate debate, carried out by Maupertuis and Buffon, and the geography of plants and animals, made from Humboldt by Hewett Cottrell Watson (1804-1881), Alphonse de Candolle (1806-1893), Alfred Russel Wallace (1823-1913) and Philip Lutley Sclafer (1829-1913). Recalling that the limit of this approach will be of scale due to microbial perspective from Martius Beijerinck (1851-1931) and Lourens Baas Becking (1895-1963). These technological and theoretical changes of the micro molecular level, give rise to some issues to landscape morphology reading. In other words, why did geography not search for its object of study under the microscope?

SOME *CONCLUDING* REMARKS FOR GEOGRAPHICAL THOUGHT

All this construction of *environment* notion within the scope of life notion has influenced a number of ideas, a debate that also influenced the *trickiest chapter of human geography*, that is, the well-known problem of *influences* and physiological changes: *"Man does not escape the influence of his local environment (milieu), nor in its physical and moral constitution. There is nothing more generalized and older to be admitted than the fact that the fruits of their works contract a particular mark coming from the soil, climate, and from the surrounding living beings. Such an area (contrée), such men, is said"* (La Blache, 2012, p.117-118).

This is, however, a more comprehensive and geographical view of the whole. Not a simplistic one, Ratzel would say. For La Blache (1901), it is a question of knowing "*the living nature that links us in multiple relationships. From the world of beings that surrounds us, the role of the infinitely small beings barely begin to be imagined* "(La Blache, 2012, pg.122).

Geography has a fundamental role, both via Kant and via Humboldt, in advancing the experimental method when applied to nature, furthering the cause-and-effect notion. In the physical description of the world, *physis* means the displacement of Isaac Newton's physical-mathematical mechanicism and its torsion by the chemistry present in Lavoisier. The "*risk*" of applying the experimental method in the context of physics and mathematics, and within the Newtonian framework to deal with life, had become increasingly clear. This risk is nothing less than understand life as a mechanical thing, and by analogy as an inert thing or just a

thinking machine.

Geographical thought made its presence felt in these major debates on natural science, but once called *natural philosophy*. And Humboldt contributed to this effervescent discussion around the so-called animal electricity. Luigi Galvani, in turn, brings to the surface the relations among anatomy, physics, and chemistry, enriching the philosophical debate of nature.

Humboldt deeply foresaw this issue and performed thousands of experiments on animals, including himself. These experiments highlighted the ideas about *vital force*. This was a central problem to *natural philosophy* and lies at the heart of that debate concerning the inorganic and organic, the discussion around the matter, strength, and activities. These are the limitations of mechanicism to underscore the living matter, living beings, life itself. This controversy brings to the fore the ideas of Spinoza and Hume on the limits of human experience and reason, leading to Kant. And falls within this context brought by Goethe, that same question: what can a body do?

These experiments on animal electricity, the animal-machine hypothesis, debates on animate and inanimate matter, on the relationship between force and body, and about life animated many intellectual, scientific, philosophical, and artistic centers. And it was all of major importance to medicine, as they were drawing on a new conception of life. Further, Blumenbach advanced the thesis that living organisms fave internal forces, with *bildungstrieb*, the *formation impulse* or the formation force, being the foremost of these forces. The impulse to create life.

Highlighting the internal forces of the Earth and their causal relationships, geology represented an important paradigm in this context, attracting Goethe, Kant, and Humboldt's attention. According to this science, time unfolds into other dimensions, giving rise to the concept of long-term, which becomes a key ingredient for the notion of succession.

By internal forces and by following the land-body analogy, bodies transform themselves and also transform others. It is like Spinoza once said, nature is a game of forces. In the 29 proposition, present in the first part of his Ethics, Spinoza even claims that no volition can really exist, nor be it determined to operate except for another cause, and this for another and so on, up to the infinite. Hence the importance of his *Naturam Naturatam (substances)* and *Naturam Naturantem (modes)* to be pondered.

In the late eighteenth-century, Goethe wrote his The *Metamorphosis of Plants* defending that plants are actually forms, variations, a primordial and primitive *urform* (*archetypal form*). Goethe sought the relationship between this internal force called *urform* and *milieu*, the letter repre-

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senting the external forces and space where the organism is shaped. This is the crossroad where Goethe and Humboldt meet each other. Indeed, Humboldt was moved by Goethe's ideas about comparative anatomy and later together they elaborated ideas about *life* within living beings, and the affinities with Blumembach's ideas about *vital forces*, the *Bildungstrieb, are evident*.

These ideas keep on expanding: from *Naturam Naturantem, Bildungstrieb* and *Urform* to *physiche erdbeschreibung* (*physical description of the world*), *verschiedenheit des Landes* (areal comparison) to *Kosmos* (living world). And undoubtedly Humboldt was instrumental in this expansion. A novel way to understand nature coming from this ongoing debate, which moves from the forces to the organism and from this to the *organic whole*, linked by forces in moments of interactions, is founded. The concept of system in Kant's *physische geographie* (*physical geography*) classes sparked great interest in Humboldt. Nature needed to be interpreted.

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