The European Origins of Scientific Ecology, 1800-1901

Edited by Pascal Acot

Over the last few decades, historians of scientific ecology have brought to light the role of the European scientists who laid the basic cornerstones of modern ecology between the end of the eighteenth century and the beginning of the twentieth century. The foundations of geobotany were laid by Alexander von Humboldt (1769-1859), Augustin-Pyramus de Candolle (1778-1841), Adolphe Jules Dureau de la Malle (1777-1857), Gaston Bonnier (1853-1922) and Charles Flahault (1852-1935); biocenotics, by Erasmus Darwin (1731-1802), Charles Lyell (1797-1875), Pierre-François Verhulst (1804-1849), Charles Darwin (1809-1882), Karl Mœbius (1825-1908), Charles-Valentine Riley (1843-1895) and François-Alphonse Forel (1841-1912); agrochemistry and microbiology by Justus von Liebig (1803-1873), Jean-Baptiste Boussingault (1802-1887) and Stanislas Winogradski (1856-1953); the taxonomy of communities by August Heinrich Grisebach (1813-1879), Anton Kerner von Marilaün (1831-1898), Alphonse de Candolle (1806-1893) and Charles Flahault; and anthropogeography by Karl Ritter (1779-1859), Elisée Reclus (1830-1905) and Friederich Ratzel (1844-1904). Together, they created the conditions that, with Eugenius Warming (1841-1924), gave birth to the autonomous discipline of scientific ecology, thirty years after the German biologist Ernst Haeckel (1834-1919) had christened this new branch of biology.

Up to now, the writings of these scientists have been scattered in various publications that were often not so accessible, which made a comparative study almost impossible. There was thus a need to bring together the primary sources in their original form and pagination. They are gathered here in two volumes, in an analytical framework that aids in understanding their relevant historical context and significance.

Pascal Acot was born in 1942. Having obtained his doctorate in philosophy, he is today a historian of science at the Centre National de la Recherche Scientifique (CNRS). He has studied the history of scientific ecology since 1971, and has published several general works in this field as well as many specialist articles. In this book, in order to deal with the complex multi-disciplinary roots of the history of ecology he has brought together a group of historians with authoritative knowledge of the field's various sub-branches, without ever losing sight of ecology's relationship to the broader history of biology and the environmental sciences.

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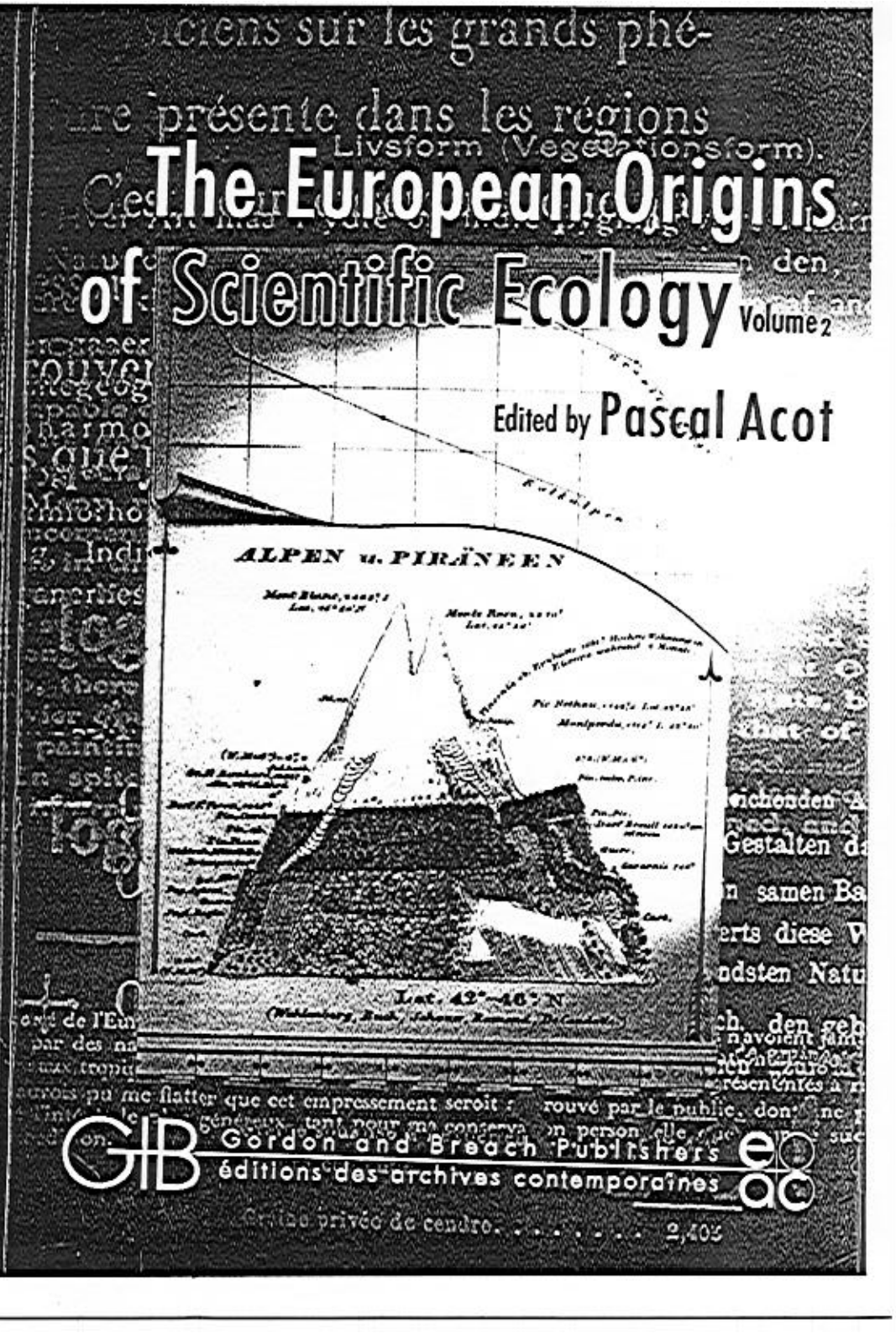

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THE EUROPEAN ORIGINS OF SCIENTIFIC ECOLOGY (1800-1901)

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THE HISTORY OF SCIENCE, TECHNOLOGY AND MEDICINE

éditions des archives contemporaines

In the last twenty years, the history of contemporary science has undergone profound changes. Previously dominated by epistemological and philosophical approaches, the history of contemporary science focused on the birth of concepts and discursive transformations and emphasized the study of particular disciplines. Under the influence of other fields in the social sciences — general history, sociology, anthropology — the new approaches that will be promoted in this series call into question this kind of approach to research. They share a common focus on the study of scholarly communities at work and will examine actual scientific practice in such diverse areas as the university, industry, hospitals, government, or in the field. In addition, they will take a look at the interrelationship of scientific practice with broader social life and politics.

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Patrick Matagne, Centre de Culture Scientifique, Technique et Industrielle Poitiers (France)

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Donato Bergandi, Muséum National d'Histoire Naturelle, Grande Galerie de l'Évolution

FOREWORD

Pascal ACOT
Editor

The history of scientific ecology is a very recent field in the history of science. Even today, less than twenty books on this subject have appeared worldwide, most of them since 1985. Currently, study is most advanced in the United States as well as in France, where doctoral theses were presented in 1984 (Jean-Marc Drouin) and 1985 (Pascal Acot) and where several general works have been published.[1] The field is expanding rapidly today in Europe and the United States, most likely because unearthing the history of ecology – a multi-disciplinary field – sheds new light on the history of biology itself.

The founding texts of ecology, a great majority of which are European, are generally little known or known only through secondary sources.[2] For example, the works of the Brussels mathematician Pierre-François Verhulst (1804-1849), the inventor of the "logistic" curve for population growth (also known as the "S" curve), are often cited, but usually upon the basis of what was written about them by the ecologist George Evelyn Hutchinson or the historian of science Sharon Kingsland, and almost never based on the direct texts. The reason is that it is rather difficult to find them. This state of affairs had to be changed. In correlation with this, a solid critical framework was needed to accompany the reappearance of these primary sources.

The six sections of this book cover the fields that came to make up twentieth-century scientific ecology. This does not mean that ideological factors are not treated in this work or that they will be considered separately from the scientific discussion. On the contrary, only vague environmentalism, ephemeral trends and "political" ecology *stricto sensu* have been left out.

Despite their enormous importance for Natural History, the three classical writers who are questionable precursors of scientific ecology have not

1. Acot, P. (1988), *Histoire de l'écologie*, preface by Michel Godron. Paris: Presses Universitaires de France, 285 p.; Drouin, J.-M. (1991), *Réinventer la nature, l'écologie et son histoire*, Preface by Michel Serres, Paris: Desclée de Brouwer, 208 p. (republished in 1993 under the title: *L'écologie et son histoire*, Paris: Flammarion, 218 p.); Deléage, J.-P. (1991), *Histoire de l'écologie, une science de l'homme et de la nature*. Paris: La Découverte, 330 p.; Acot, P. (1994), *Histoire de l'écologie*, Paris: PUF, 128 p. See also in the bibliography: Bowler, P. J. (1992); Carpenter, J. R. (1962); Cittadino, E. (1990); Crowcroft, P. (1991); Golley, F. B. (1993); Kingsland, S. E. (1985); Kormondy, E. J. (1965); Kwa, C. (1989); Maienschen, J., Collins, J. P. and Beatty J., eds. (1986); McIntosh, R. P. (1985); Mitman, G. (1992); Real, L. A. & Brown, J. H., eds. (1991); Tobey, R. C. (1981); Worster, D. (1985).
2. Occasionally they are ignored: *Foundations of Ecology, Classic Papers with Commentaries*, edited by L. A. Real and J. H. Brown in 1991, does not contain a single European text from before 1926.

Part Five

THE GEOGRAPHY OF HUMAN SOCIETIES

Donato BERGANDI
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The nineteenth century, at the crossroads of the currents of romantic idealism and positivism, was a decisive period for determining the structure and definition of the theories, models, subjects and methods of geography as well as ecology. The history of geography and ecology overlap and intermingle to such an extent that very often it is difficult to determine the boundaries or specific features of one or the other. It was with Alexander von Humboldt (1769-1869) that their continuous evolution bore its full fruit. Humboldt, along with Karl Ritter (1779-1859), can be considered to be the founders of modern geography.[1] Nonetheless, while with Humboldt geography turned towards the natural sciences, with Ritter it looked instead to the historical sciences.[2]

Karl Ritter and the impact of nature on people

The first part of Ritter's higher education took place in the institute founded by the educator Salzmann in Schnepfenthal, Germany. Under the supervision of Gutsmuths, the author of a manual on geography published in 1810, Ritter began the study of geography, obtaining excellent results. In 1807, having attended university in Halle and Frankfurt, he went to Iferten in Switzerland to the institute headed by the well-known educator Henry Pestalozzi (1746-1827), who was a great influence on him. Pestalozzi sought a more lively approach to teaching by focusing on the close connection between nature and the historical and civil development of society. Other influences on Ritter's work include both Johann Gottfried Herder (1744-1803) and Friedrich Wilhelm Joseph von Schelling (1775-1854). Ritter's interest in history and philosophy (he also studied ancient Greek philosophy) led him to write an essay on

1. As concerns Humboldt, cf. Part One, Botanical Geography.
2. In this regards, cf. Numa Broc (1977), "La géographie française face à la science allemande (1870-1914)", *Annales de Géographie* 86: 71-94.

Herodotus (484-425 BC).[3] Ritter was one of the first modern geographers to grant history a special role in the interpretation of geographical facts. Giving geography a historical dimension opened up new paths for research, in particular the analysis of human factors in the "construction" of geographical reality.

Between 1817 and 1818, Ritter published *Erdkunde im Verhältniss zur Natur und zur Geschichte des Menschen*. The second edition of this text, which appeared between 1822 and 1859 in 21 volumes, became the standard geographical work of the nineteenth century[4] **[Facsimile texts 5.1a-b]**. With its encyclopedic ambitions, it could even be compared to the *Geography* of Strabo (58-[21-25] BC).

To gain a clear understanding of Ritter's work and its place in the development of European scientific ecology, it is necessary to examine his philosophical background. One decisive influence in Ritter's intellectual development was Herder, who viewed human history as the result of the interaction between human nature and the surrounding physical environment. Precursors of this view include Plato (428-348 BC) and Aristotle (384-322 BC). Basing himself on theories by geographers like Hecates of Abdera (540-480 BC), historians like Herodotus, and physicians like Hippocrates (460-377 BC), Plato was one of the first to propose a sort of "psychology of peoples", which was the fruit of an analysis incorporating both geographical and historical factors.[5] Aristotle in turn described the "natural character of citizens" and proposed a "political hierarchy" of peoples, resulting from the correlation between the presence or absence of certain characteristics of peoples and their geographical and climatic environment:

> ...we will proceed to speak of what should be the character [of the citizens]... Those who live in a cold climate and in [northern] Europe are full of spirit, but wanting in intelligence and skill; and therefore they keep their freedom, but have no political organization, and are incapable of ruling over others. Whereas the natives of Asia are intelligent and inventive, but they are wanting in spirit, and therefore they are always in a state of subjection and slavery. But the Hellenic race, which is situated between them, is likewise intermediate in character, being high-spirited and also intelligent. Hence it continues free, and is the best governed of any nation, and, if it could be formed into one state, would be able to rule the world.[6]

3. K. Ritter (1820), *Die Vorhalle europäischer Völkergeschichten vor Herodotus um den Kaukasus und an den Gestaden des Pontus, eine Abhandlung zur Alterthumskunde*, Berlin: G. Reimer.
4. The first edition of *Erdkunde* (1817-1818), 2 Bde., Berlin: G. Reimer, was followed by a second edition (1822-1859): *Erdkunde im Verhältniss zur Natur und zur Geschichte des Menschen, oder allgemeine vergleichende Geographie, als sichere Grundlage des Studiums und Unterrichts in physikalischen und historischen Wissenschaften*, 2. stark vermehrte u. verbess. Aufl., Berlin: G. Reimer; French trans.: *Géographie générale comparée ou Étude de la terre dans ses rapports avec la nature et avec l'histoire de l'homme, pour servir de base à l'étude et à l'enseignement des sciences physiques et historiques*, trans. – of the Introduction and the Africa section – by E. Buret and E. Desor (1836), Paris: Paulin, 3 vol.; this second edition was incomplete (global regions covered: Africa, western Asia, East Asia, Asia Minor, and the Sinai Peninsula). The Introduction to the *Erdkunde* (*Introduction à la géographie générale comparée*) was partially translated as well, by D. Nicolas-Obadia (1974), Paris: Les Belles Lettres, pp. 41-102.
5. Plato, *Laws*, V (747 d-e).
6. Aristotle, *Politics*, VII, 7 (1327 b), trans. Benjamin Jowett, Oxford at the Clarendon Press, 1905, Book VII, 7, pp. 270-1.

In *Meteorology*[7], Aristotle presented his own version of the well-known formula of Hecates and Herodotus (*History*, II, 5): "Egypt, gift of the Nile". Thus, Herder's view that the differences between civilizations depended on the different geographical conditions affecting a people's history followed in the steps of an ancient tradition:

> Egypt had no pasture land – he states – so its inhabitant was forced to master agriculture; this difficult apprenticeship was facilitated immensely by the fertile Nile. Egypt had no wood: he thus had to learn to build using stone; there were enough stone quarries, and the Nile offered a means to transport them – to what heights this art rose! How it drove forward other fields of endeavour! The Nile overflowed: surveys were needed, and by-passes and dikes, canals, cities, villages – in how many ways were men thus bound to the land![8]

"Naturphilosophie": Herder and Schelling

According to Herder, climatic-geographical conditions were also decisive for Greece, "a genuinely transitional country for civilization", with its wonderful climate,[9] and for the Nordic peoples, with their autonomous, more primitive societies. Men were hardened by a way of life where the climate made agriculture difficult, if not impossible.[10] Thus, "...everything humans develop is pushed forward by the epoch, the climate, necessity, the world, destiny...";[11] furthermore, man "...can be changed in thousands of ways and, given the structure of our earth, almost certainly shall be changed..."[12]

Ritter adopted this type of determinism and, merging it with Schelling's *Naturphilosophie*, developed a powerful tool for geographical research. Nonetheless, without wishing to deny the importance of determinism in Ritter's work (and as we shall see later, in Friedrich Ratzel's work as well), it would seem that a more balanced perspective is needed. The soil, the climate and other geographical factors undoubtedly do represent a "matrix" which forms an integral part of the framework for the development of human civilization. However, there is a mutual interaction between this matrix and man. One cannot be understood without the other. In this regard, Ritter delineated a

7. Aristotle, *Meteorology*, I, 14 (315 b 25-35).
8. J. G. von Herder (1774), *Une autre philosophie de l'histoire* (orig. title: *Auch eine Philosophie der Geschichte zur Bildung der Menschheit, Beytrag zu vielen Beyträgen des Jahrhunderts*), translated from the German by Max Rouché (1964), Paris: Aubier, Section One, p. 141; p. 489 from Volume V of the Suphan edition (*Herders sämmtliche Werke*, hrsg. von Bernhard Suphan [1877-1913], Berlin: Weidmann. 33 vol.).
9. Ibid., Section One, p. 155; p. 496 of Volume V of the Suphan edition.
10. Ibid., Section Two, p. 196; p. 514 of Volume V of the Suphan edition. In this respect, Montesquieu (1689-1755) held this same viewpoint, that "the sterility of the earth makes man industrious, sober, and hardened to work, courageous, and fit for war" (*L'esprit des lois*, 1748, XVIII, Chap. 4; cited by Numa Broc (1969), "Peut-on parler de géographie humaine au XVIII[e] siècle en France?" *Annales de Géographie* 78: 57-75, p. 61).
11. Ibid., Section One, p. 175; p. 505 of Volume V of the Suphan edition.
12. Ibid., Section Three, p. 301; p. 558 of Volume V of the Suphan edition.

sort of "geographical determinism gradient". The pressure of geographical determinism would be all the greater when people "are still close to a state of unconsciousness"(!):

> This is the result we get from the deep connection between the history of people and living nature. First, it can be seen in a fatal dependence on nature, a dependence which is all the greater when man is near a state of savagery and people live in hordes; second, it is seen in the progressive trend for peoples to free themselves, and, to the degree that they gain this freedom, the influence of their natural environment declines to that same extent.[13]

Schelling's contributions were also pivotal to Ritter's thinking. His *Naturphilosophie* was a form of monistic idealism that rejected the conventional categories of subject and object, ego and non-ego, and man and nature. According to this romantic viewpoint, the soul of the world, the spirit of life, animates everything, all natural reality. In particular, organic beings, because of their internal structure, cannot all be reduced to their mechanical features:

> Every organic product carries the reason of its existence in *itself*, for it is cause and effect of itself. No single part could *arise* except in this whole, and this whole itself consists only in the *interaction* of the parts... Only in organized beings are they *real*; they exist without my participation, because there is an objective relationship between them and the whole.[14]

Schelling clearly recognizes the organic relationship that exists between the whole and the parts ("the parts cannot exist without the whole, nor the whole without the parts").[15] Nonetheless, for basically theological reasons, he holds that the Whole/Nature/Divinity, as a constellation of mutually supportive parts, must inevitably exist prior to the parts themselves.[16]

The "systemic", "organic" spirit of Schelling's philosophy of nature would be internalized by Ritter to such an extent that in his approach to the study of a given region of the planet (a continent), he treats it not as an isolated entity, but as a (geographical) "individual" in a relation of interdependence with the other components of the same living organism (the earth).[17] In this same spirit, he interprets the forces (of nature and society) that shape the globe, using a "hierarchical" perspective that provides a framework to give conceptual coherence to diverse historical and geographical phenomena:

13. K. Ritter, *Géographie générale comparée*, op. cit., pp. 26-7.
14. F. W. J. von Schelling (1797), *Ideas for a Philosophy of Nature, as Introduction to the Study of This Science*, 1797 (orig. title: *Ideen zur einer Philosophie der Natur. Als Einleitung in das Studium dieser Wissenschaft*), trans. Errol E. Harris and Peter Heath (1988), Cambridge: Cambridge Univ. Press, p. 31.
15. Ibid., p. 85.
16. F. W. J. Schelling (1799), *Introduction à la première esquisse d'un système de la philosophie de la nature* (orig. title: *Einleitung zu dem Entwurf eines Systems der Naturphilosophie*), translated from the German by S. Jankélévitch, in *Schelling. Essais*, p. 369.
17. K. Ritter, *Géographie générale comparée*, op. cit., p. 15.

> Every time we want to study man or nature, we proceed perforce from the individual to its relationship with the whole, from fortuitous and apparent phenomena to the general law of being. An understanding of the whole does not arise from the study of the individual, if the whole is not also understood. Just as the part is formed by the whole, similarly it is only because of this general law that a particular phenomenon can be separated from the whole and considered as *one*, as an *individual*.[18]

Ritter, like Humboldt before him and Ratzel after him, set out on a search for unity amidst the diversity of geographical and historical phenomena.[19] His analytical approach is based, on the one hand, on an inductive perspective in the tradition of Bacon[20] and, on the other hand, on a rejection of the Kantian idea that human reason can bestow the authority of law on certain natural phenomena.[21]

Erkunde undoubtedly lies at the cutting edge of several disciplines. It transformed the traditional approach to geography by introducing the political dimension of human history. Even though it is accepted that it was Friedrich Ratzel (1844-1904) who advanced the study of geography by taking into account political factors, it was actually Ritter who showed early signs of this epistemological approach:

> If analytically the human race cannot be separated from the planet earth, similarly, an individual, or a people even less independent of the earth than an individual, or likewise a state that is closely linked to the nature of a territory, cannot achieve self-understanding without understanding the land they occupy and their relationship with it. In other words, it is the relationship between a people and their native land, between a people's position in respect to nature and in respect to human society, that is, the relationship between the physical and the political, which, in the history of the world, always underlies and promotes the progress of peoples and states.[22]

Élisée Reclus, geographer and anarchist

Among Ritter's disciples, whose number included Arnold Guyot (1807-1884), Élisée Reclus (1830-1905) stands apart. In his youth, Reclus studied geography with Karl Ritter and translated one of his papers.[23] He could be

18. Ibid., p. 13.
19. Ibid., p. 10.
20. Ibid. According to Ritter: "the basic rule to ensure the truth is to advance step by step, from observation to observation, and never from an opinion or a hypothesis to the observation" (p. 33).
21. Ibid. "The earth is independent of man – he states – before him and without him it was the scene of natural revolutions. Thus the laws of its creations do not derive from him" (p. 8). It should be recalled that, according to Ritter (and Herder), a providential order reigns both in nature and in human history.
22. Ibid., p. 12.
23. K. Ritter (1850), *Über räumliche Anordnungen auf der Aussenseite des Erdballs, und ihre Functionen im Entwicklungsgange der Geschichten*, Berlin: F. Dümmler; French trans. (1859), "De la configuration des continents sur la surface du globe, et de leurs fonctions dans l'histoire", *Revue germanique* 8, 11: 241-67; republished in D. Nicolas-Obadia (1974), *Introduction à la Géographie générale comparée*, op. cit., pp. 217-41.

considered to be the forgotten, or sometimes consciously ignored, father of French human geography. Because of his dual commitment to both politics – he was an anarchist – and science, his star did not shine more brightly in the firmament of French geographers, but abroad his work had a resounding success. He was exiled twice because of his political beliefs. The first time, from 1852 to 1857, followed the coup d'etat of Napoleon III. Reclus was exiled again from 1872 to 1882, when he was deported to New Caledonia for having participated in the Paris Commune in 1871. His sentence was commuted to 10 years in exile due to an international petition by scientists from all over the world, including, it seems, Darwin and Wallace.[24]

Because of his political choices, and because he did not belong to the French academic community – he was self-taught – Reclus did not manage to leave a school of followers capable of contributing actively to the development of theories, subjects and research methods for modern French geography.[25] It was instead Vidal de la Blache (1845-1918) and his followers[26] who founded and popularized the discipline of human geography in France.

In addition to his political writings, one of the key focuses in Reclus' voluminous bibliography is the merging of traditional Humboldtian physical geography with Ritter's interest in the history of human society. This fusion represented a sort of permanent legacy of what Reclus himself, in a letter to the Hachette publishing house in 1895, called his "trilogy". The core of this was the impressive geographical encyclopedia entitled *Nouvelle géographie universelle* (1876-1894).[27] *La Terre* (1868-1869)[28] focused on the physical dimension of geography, without neglecting the socio-historic dimension **[Facsimile texts 5.2]**, whereas *L'Homme et la Terre* (1905-1908)[29] **[Facsimile**

24. Cf. P. Geddes (1905), "A Great Geographer: Élisée Reclus, 1830-1905", *Scottish Geographical Magazine* 21: 490-6, 548-55. In contrast, G. S. Dunbar considers that there is no basis to the idea that Darwin signed this petition (G. S. Dunbar [1978)], *Élisée Reclus. Historian of Nature*, Hamden, Connecticut: Archon Books, p. 67). Also see P. Reclus (1964), *Les frères Élie et Élisée Reclus*, Paris: Les amis d'Élisée Reclus, p. 82.
25. Even so, Reclus gave geography courses at the Université Nouvelle in Brussels (1894-1905), which was founded following the departure of a certain number of professors from the Université Libre of Brussels, due to a divergence in political views.
26. Principally, Emmanuel de Martonne (1873-1955) and Maximilien Sorre (1880-1962) – the latter theoretically linked human geography to scientific ecology (see: Max. Sorre [1843], *Les fondements Biologiques de la Géographie Humaine, Essai d'une écologie de l'Homme*, Paris: Librairie Armand Colin). See also R. E. Dickinson (1969), *The makers of modern geography*, London: Routledge & Kegan Paul; M.-C. Robic (1976), "La conception de la géographie humaine chez Vidal de la Blache d'après les principes de géographie humaine", *Les cahiers de Fontenay, Géographie* 4: 1-76; M.-C. Robic (1992), "Géographie et écologie végétale: le tournant de la Belle Époque", in: *Du milieu à l'environnement*, M.-C. Robic, ed. Paris: Economica, pp. 125-65.
27. É. Reclus (1876-1894), *Nouvelle géographie universelle. La Terre et les hommes*, 19 vol. Paris: Hachette. This encyclopedic work was written entirely by Reclus.
28. É. Reclus (1868-1869), *La Terre, description des phénomènes de la vie du globe*, 2 vol. Paris: Hachette; English translation: (1871-1873), *The Earth*, 4 vol., London: Chapman and Hall.
29. É. Reclus (1905-1908), *L'homme et la Terre*, 6 vol., Paris: Librairie Universelle.

text 5.3] was decidedly a *social geography*, which sought to "...follow over time each period in the life of a people in relationship to changes in the environment, so as to observe the joint action of Nature and of Man himself, reacting back on the earth that formed him".[30] The *Nouvelle géographie universelle* follows the model set by Ritter's *Erdkunde*, which was never completed, and stands alongside that other great attempt at systematizing geographical thought, the *Précis de géographie universelle* by Konrad Malte-Brun (1775-1826).[31]

The themes Reclus takes up in his work make him a precursor not only of ecology (general and human), but also of a new approach to nature. In the Hegelian – then Ritterian[32] – assertion that "Man is Nature becoming conscious of itself", it is Nature that prevails. Man as a separate entity, limited and unconscious, disappears to make way for a new richer, more exalted entity – Man/Nature.

Reclus undoubtedly had clearly grasped some of the basic theoretical points that would come to characterize ecology as a scientific discipline. Indeed, he understood the importance of the energy and trophic cycles in natural economy. For example, solar radiation is accumulated by plants.[33] The existence of a species depends on the complex of relationships existing in the community (animal and vegetable), i.e., the entire set of influences of the organisms on each other. If environmental conditions change, for example, following an excessive form of predation, the trophic cycle will be disturbed; this would lead to the multiplication and ultimately the disappearance of certain species:

> The butchery year after year of the birds which feed upon insects has resulted in a formidable increase of the numerous tribes of ants, termites, locusts, caterpillars, &c, and in the same way the cetaceae and fish which have disappeared are replaced by myriads of *medusae* and *infusoria*.[34]

Furthermore, based on a form of organicism that was secularized and stripped of teleological features, Reclus came to understand the importance of the water cycle as an ecological factor **[Facsimile text 5.4]**. He vividly and poetically describes the process of run-off, infiltration, evaporation and precipitation that makes it possible for life to exist on our planet. This "great

30. Ibid., Preface, p. II. See also *La Terre*, op. cit., vol. II, pp. 622-3.
31. The model of the geographic encyclopedia dealing with both the physical environment and human society would be introduced in Italy by Giovanni Marinelli (1846-1900): *La Terra, trattato popolare di geografia universale*, 8 vol, Milan: F. Vallardi., 1883-1901.
32. É. Reclus (1864), "De l'action humaine sur la géographie physique. L'Homme et La Nature", *Revue des Deux Mondes* 34, 54, p. 762 (account by G. P. Marsh [1864], *Man and Nature, or physical geography as modified by human action*, London: S. Low); *L'homme et la Terre*, op. cit., vol. I, p. 623.
33. É. Reclus, *The Earth*, op. cit., Section II: The Ocean, Atmosphere and Life, p. 286.
34. *Ibid.*, p. 288.

water circuit", the giver of life, would itself become a symbol of the life of nature and human society:

> Peoples mix with other peoples like streams with streams and rivers with rivers; sooner or later, they will form but a single nation, just as all the waters from a single basin wind up flowing together inseparably in a single river.[35]

However, the study of nature is not an end in itself, it is the precursor of action. Reclus was influenced by Spinoza's philosophy and admired Buddhist philosophy. In his analysis of the book by George Perkins Marsh (1801-1882), *Man and Nature* (1864),[36] as well as in the third part of the second volume of *La Terre*,[37] he sounds a warning about man's destruction of animal and plant species, although this is tempered by the optimism that flows from his evolutionary ideal of humanity's inevitable progress. The destruction he warns of also includes human populations that are incapable of standing up to the military-economic expansionary force of technologically advanced civilizations.[38] All the animal and plant species – and today we would say the specific wealth inherent to the planet, or its "biodiversity" – must be studied, but above all preserved. The conservation of nature, and any "embellishment" thereof, has become for man a right and a responsibility which he cannot fail to exercise, under penalty of losing his own humanity, even as species disappear.

Whatever the subject of his intellectual endeavour, whether it be politics, geography or the laws on which life is based, the world-view of Reclus is characterized by a profound coherence. He accepted the idea of natural selection. According to this, any variation favourable to an individual enables it to survive the selective pressures of the environment. This variation would be preserved by the species. In contrast, any variation harmful to the individual would lead to its disappearance.[39] Nonetheless, Reclus rejected the Malthusian postulate upon which the principle of natural selection is based, as well as its application to human societies. This is for two basic reasons. First, because "...the earth is vast enough to hold all of us in its bosom, it is rich enough so that we can live in ease". Whether or not man suffered hunger and alienation depended on his political-economic choices.[40] Second, because Darwinian natural selection, filtered through the evolutionist views of Spencer (1820-1903) ("survival of the fittest"), was transformed into a vision of one-sided natural evolution. It was perceived quite simply as a permanent struggle for existence, without envisaging in any way the other aspect of the evolutionary process, that of mutual aid. Reclus countered the vision of life interpreted as a bloody struggle with the concept of mutual aid, making use of Kropotkin (1842-1921)[41] and Darwin (1809-1882) himself.[42] Neither animals nor man can survive in a state of perpetual warfare. Thus, Reclus gives us a more subtle, balanced and all-sided vision of natural and sociological processes.

35. É. Reclus (1869), *Histoire d'un ruisseau*, Paris: Hachette, p. 316-17.
36. G. P. Marsh, *Man and Nature*, op. cit. The book had a certain impact on Reclus. In this regards see: G. S. Dunbar, *Élisée Reclus, Historian of Nature*, op. cit., p. 44. M.-C. Robic, "Géographie et écologie végétale: le tournant de la Belle Époque", op. cit., p. 131.
37. *La Terre*, op. cit., vol. II, pp. 748-9, et passim.
38. Ibid., pp. 743-4.
39. Cf. C. Darwin (1859), *On the Origin of Species*, London: John Murray.
40. É. Reclus (1979), *L'évolution, la révolution et l'idéal anarchique* (1st ed. 1898), Paris: Stock, pp. 97-8.

The anthropogeography of Friedrich Ratzel

At the end of the nineteenth century, the rise of positivism in the natural and social sciences had the direct result of temporarily overshadowing the traditional idealist philosophies. Hence, even though Ritter's thought was a basic reference point in the gestation of human geography, it did not give rise to a school. Its obsolescence was reflected in the obscure style of his language, the presence of the concept of ultimate causes, and a certain lack of pragmatism.

Ratzel (1844-1904), who trained as a naturalist (he studied geology, zoology and comparative anatomy), succeeded in meeting the challenge of reviving Ritter's work. Although Ratzel, like Reclus, was associated with Ritter's ideas, he criticized Ritter from numerous angles. Ratzel found his views too ephemeral and too distant from practical reality. Indeed, Ritter's style was more that of an artist than a scientist.[43]

In the development of Ratzel's thought, which was marked by a very great number of articles and papers,[44] the theory of the migration of organisms developed by Moritz Wagner (1813-1887) played a very special role. This theory was offered as an alternative to Darwinian natural selection. Wagner posited that the basic cause of the transformation of organisms was the migration and isolation of individuals of a species.[45] In an effort to systematize the relationships between geographical and historical phenomena, Ratzel applied this theory to the life of people. For him, the Darwinian struggle for existence took the form of a struggle for space.[46]

41. P. A. Kropotkin (1902), *Mutual Aid, a factor of evolution*, New York: McClure, Phillips & Co.
42. *L'homme et la Terre*, op. cit. vol. I, pp. 140-48.
43. F. Ratzel (1914), *Geografia dell'uomo*, 2 vol. Torino: Fratelli Bocca Editori., vol. I, p. 23 (orig. title: Ratzel, F. [1882], *Anthropo-geographie oder Grundzüge der Anwendung der Erdkunde auf die Geschichte*. Stuttgart: J. Engelhom).
44. For an exhaustive bibliography of the works of Ratzel, see H. Wanklyn (1961), *Friedrich Ratzel. A bibliographical memoir and bibliography*, Cambridge: Cambridge University Press. For an in-depth commentary on his work, see G. H. Müller (1996), *Friedrich Ratzel (1844-1904): Naturwissenschaftler, Geograph, Gelehrter*. Stuttgart: Verlag für Geschichte der Naturwissenschaften und der Technik.
45. See *Geografia dell'uomo*, op. cit., vol. I, p. 47.
46. O. Marinelli (1905), "Federico Ratzel e la sua opera geografica", *Rivista geografica italiana* 12: 8-18, 102-126, pp. 12-13, 105 and 118.

In 1882, Ratzel published the first volume of the *Anthropo-geographie*, in which he identified the geographical factors which have had the greatest influence on the development of human society. Even though he has gone down in history as a champion of geographic determinism, this judgement should be tempered.[47] First, Ratzel's view of these influences is not one-sided. Humanity is the product both of its own history and the history of the earth.[48] The state and society are "organisms" linked to the soil. They are influenced by the land, but they in turn also influence it.[49] Second, the temporal factor is decisive in analyzing the influence of the natural environment on people. The cultural traits of a people cannot be understood simplistically, without understanding the history of its movements.[50] Third, Ratzel effectively countered the belief, also held by Ritter, that people become ever more independent from the natural environment as they reach "higher" levels of civilization. On the contrary, technical progress gives rise to new, previously non-existent ties. For example, coal-based industrialization led to a more intense exploitation of natural resources and to more numerous, tighter and more varied links between land and society; at the same time, the domination of nature became less onerous. According to Ratzel, a primitive people does not have a more intimate relationship with nature; rather, it lives under nature's domination.[51]

Before the publication of the second volume of the *Anthropogeographie* in 1891,[52] Ratzel published the *Völkerkunde* (1885, 1886, 1888),[53] which was a geographically based ethnography **[Facsimile texts 5.5a-b]**. By continuing to use Wagner's theory of the geographical propagation of organisms as an epistemological basis, he opposed the polygenic theory of cultural features.[54]

47. In this regards, see R. E. Dickinson, *The makers of modern geography*, op. cit., pp. 65, 71 and 72. H. Wanklyn, *Friedrich Ratzel*, op. cit., p. 24. In the Anglo-Saxon world, the thought of Ratzel, as "filtered" by Ellen Churchill Semple (1863-1932), became the paradigm for environmental determinism.
48. *Geografia dell'uomo*, op. cit., vol. I, p. 6.
49. Ibid., vol. I, p. 65; see also: F. Ratzel, *Géographie politique*, C. Hussy, ed. (1988), Paris: Economica, pp. 13-15, 35-6 (orig. title: F. Ratzel [1897], *Politische Geographie*, R. Oldenbourg: Leipzig); O. Marinelli (1903), "La geografia politica di Federico Ratzel", *Rivista geografica italiana* 10: 272-7.
50. *Geografia dell'uomo*, op. cit., vol. I, p. 56.
51. Ibid., pp. 61-2.
52. The second volume of *Anthropo-geographie*, published in 1891, was entitled *Anthropogeographie. Die geographische Verbreitung der Menschen*, Stuttgart: J. Engelhorn. The first volume was republished in 1899 in a revised version.
53. F. Ratzel (1885, 1886, 1888), *Völkerkunde*, 3 vol., Leipzig: Bibliographisches Institut; English translation: *The history of Mankind*, translated in three volumes from the second German edition, modified and condensed to two volumes [1894-1895], London: Macmillan, 1896-1898; Italian translation: *Le razze umane*, translated from the first German edition, UTET, Torino, 1891, 1896, 1896).
54. In this regards, see E. B. Tylor (1876-1878), *Civilisation primitive*, Paris: C. Reinwald et Cie, Libraires-éditeurs, p. 10 (orig. title: [1871] *Primitive culture*, 2 vols., London: Murray).

Instead, he supported the idea of the dissemination of cultural features from a unique source (monogenism):

> When we find all races in Africa, from Moors to Hottentots, producing and working iron after one and the same method, it is far more probable that this art reached them all from a common source than that it was independently discovered in all parts alike... But may not [the] Indian, who got his maize from Mexico, have learnt from the same quarter the art of his delicate stone-work? Such introduction, together with its consequence of the widest possible propagation, must seem to us more natural than the independent invention of one and the same utensil, or one and the same touch of art in a dozen different places.[55]

By taking the unique origin of cultural characteristics (ideas, traditions, instruments) as a general rule and presupposition of research, Ratzel considers the main task of ethnography to be the spatial and temporal determination of their expansion. The underlying idea, according to which all peoples, independent of the level of civilization, are part of the same evolutionary process, cut to some extent against the prevailing "ethnocentric" viewpoint of the epoch.

With his *Politische Geographie* (1897), Ratzel developed and expanded in a variety of ways on theories he had already touched on in *Anthropogeographie*. He obviously intended to try out anthropogeographical principles by applying them to political geography, a discipline that clearly suffered from an inadequate scientific basis, as compared with physical geography. *Politische Geographie* represented an attempt to elucidate the laws governing the forms of development of peoples and states, particularly their territorial expansion.

Ratzel opposed sociological theories that ignored the geographical situation of a state. Based on an epistemological approach to research that incorporated an organicist conception of the state, Ratzel affirmed that, as for all animal and plant organisms, the land is the underlying basis for the state's existence. Furthermore, as an organism, the state is characterized by the mutual relationships of its constituents (families, clans, guilds, associations, etc.). However, unlike physical organisms, which have a high degree of material correlation, the state is composed of autonomous, independent individuals, and maintains itself by educating a community in shared values.[56]

In pursuing this analogy, which of course did not imply that all features of the entitites compared were identical, Ratzel used a reference system in

55. F. Ratzel, *The history of Mankind*, op. cit., vol. I, p. 81. Also see pp. 40-1.
56. F. Ratzel, *Géographie politique*, C. Hussy, ed. (1988), op. cit., pp. 19-24. As for the "possible influence" of Ratzel's thought on national socialism, see: H. Wanklin, *Friedrich Ratzel*, op. cit; A. L. Sanguin (1975), "L'évolution et le renouveau de la géographie politique", *Annales de géographie* 463, pp. 275-96; Friedrich Ratzel, *La géographie politique*, Foreword by M. Korinman, Fayard, Paris, 1987; Britta Rupp-Eisenreich (1996), "Ratzel Friedrich", in: *Dictionnaire du darwinisme et de l'évolution*, Patrick Tort, ed., Paris: Presses Universitaires de France, pp. 3627-30.

order to identify certain morphological and functional "laws" of the state. For example, the "borders" of the state, its peripheral organs, are not static but dynamic. They are directly related to changes in a people's "sense of space" (section 6). A state's geographical "position" helps determine its historic development (section 4), whereas the relationship between its "expanse" and the density of its population will be the measure of the state's capacity to preserve itself and advance (section 5).

The organicist analogy thus plays a key role in the way Karl Ritter, Élisée Reclus and Friederich Ratzel approach the study of geography. This philosophical perspective, which strongly reflects the influence of Herder, Hegelian idealism, and in particular Schelling's *Naturphilosophie*, will later, once stripped of its teleological dimension, become a cornerstone of the newly emerging ecology.[57]

There are basically two variations of the organicist-type epistemological approach. The first tends to focus on certain "phenomenological" characteristics of a given organism. For example, every organism is born, matures, reproduces and dies. The second variation tends instead to abstract from these characteristics to extract what is said to represent "the ontology", the basic conceptual kernel: the concept of a "system", in other words, or the "holistic" dimension. Both of these can of course be found in the same author. And both have as their theoretical basis the two axioms, "the whole is greater than the sum of its parts", and "*tout est en tout*, nothing exists in isolation".

The "integrative", "systemic" dimension of organicism underlies Haeckel's definition of ecology as the "science of the relationship of the organism with the environment".[58]

In the pre-energetics plant ecology of Clements (1916),[59] on the other hand, organicism is presented in phenomenological terms. The "climax" represents the basic unit of the vegetation, towards which the different stages in the evolution of the plant association are moving. Simultaneously, Phillips (1931) and Shelford (1931) apply the phenomenological version of organicism to the "biome", or "biotic community" complex. For Shelford, in particular, the "biome" is an "amoeboid" organism.[60]

57. For an analysis of the philosophical roots of the organicist vision of the world, see D. Pepper (1984), *The Roots of Modern Environmentalism*, London: Croom Helm; A. Buttimer, *Geography and the Human Spirit* (1993), Baltimore: John Hopkins University Press.
58. Cf. P. Acot (1988), *Histoire de l'écologie*, Préface de Michel Godron, Paris: Presses Universitaires de France, p. 44; P. Acot (1994), *Histoire de l'écologie*, Paris: Presses Universitaires de France (Que sais-je?), pp. 5-7.
59. F. E. Clements (1916), *Plant Succession: An Analysis of the Development of Vegetation*, Washington, D.C.: Carnegie Institution Publ. 242, pp. 124-5; also see J. M. Drouin (1990), *Réinventer la nature*, Paris: Desclée de Brouwer, pp. 138-41.
60. V. E. Shelford (1931), "The biotic community", *Journal of Ecology* 19, pp. 4-5, 19-20; V. E. Shelford (1931), "Some concepts of bio-ecology", *Ecology* 12, p. 456.

Even the "ecosystem" concept of Tansley (1935), who formally opposed Clements' organicist perspective, has this integrative dimension. Indeed, as what he calls a "quasi-organism", the "ecosystem" is defined in relationship to organicism.[61]

In the ecosystem ecology of Odum (1953, 1959, 1971, 1993),[62] the organicist analogy is no longer used directly, but the basic semantic concept of a "system" is retained. Nonetheless, independently of the ontological approach, Odumian "holism", structured around the concept of "emergence", is expressed in a contradictory way as an atomist-analytico-reductionist methodology.[63] More recently, landscape ecology has been presented as a more complex version of the Odumian approach, and as its truly direct descendant.[64]

Today, in that fanciful way in which history repeats itself, a Ritterian matrix organicism is once again on the rise, in the form of an expressive, and perhaps meaningful, metaphor. What could be called the "new wave" of ecology, "global ecology", considers the controversial "Gaïa hypothesis" of Lovelock (1979, 1988, 1991) one of its most systematic expressions.[65] It is characterized by the analysis of global changes at the planetary level. The analogies between Ritter and Lovelock are indeed striking: for Lovelock, as for Ritter, the earth *is* a living organism. Furthermore, both of them refer to "physiology" as the ideal approach to the study of the earth.[66]

Finally, even though Lovelock's cybernetic approach is still far from meeting the requirements of a truly "emergentist" analysis,[67] it recalls the Ratzelian proposal for a "hologeic" analytical perspective (treating the earth in its totality),[68] and, by heightening our awareness of the network of relationships that underlie the life of the planet, puts us in touch again with that dream of a re-born humanity evoked by Élisée Reclus, the poet-scientist.

61. A. G. Tansley (1935), "The use and abuse of vegetational concepts and terms", *Ecology* 16, pp. 289-92.
62. E. P. Odum (1953), *Fundamentals of Ecology*, Philadelphia: W. B. Saunders Company; revised and re-edited in 1959, 1971; E. P. Odum (1993), *Ecology and Our Endangered Life-Support Systems*, Massachusetts: Sinauer Associates, Inc. Publishers. Cf. also D. Bergandi (1995), "An oxymoron or a philosophical chimera of E. P. Odum's systems ecology?" *Ludus Vitalis* 3, pp. 145-80.
63. The concept of "emergence" implies that the characteristics that define a (systemic) totality cannot be foreseen or explained from its components. Cf. J. K. Feibleman (1954), "Theory of Integrative Levels", *The British Journal for the Philosophy of Science* 5, pp. 59-66. See also D. Bergandi (1995), *Limites et possibilités de l'approche holiste dans la théorie des systèmes écologiques*, Doctoral thesis, Paris: Muséum National d'Histoire Naturelle.
64. Z. Naveh and A. S. Lieberman (1984), *Landscape Ecology. Theory and Application*, New York: Springer Verlag; I. S. Zonneveld (1990), *Changing Landscapes: An Ecological Perspective*, New York: Springer Verlag.
65. J. Lovelock (1979), *Gaia, a New Look at Life on Earth*, Oxford: Oxford University Press; J. Lovelock (1988), *The Ages of Gaia*, Oxford: Oxford University Press, 1988; J. Lovelock (1991), *Gaia, The Practical Science of Planetary Medicine*, London: Gaia Books Limited.
66. K. Ritter, *Géographie générale comparée*, op. cit., p. 42; J. Lovelock, *The Ages of Gaïa*, op. cit., p. 43.
67. Cf. J. P. Deléage (1991), *Histoire de l'écologie*, Paris, La découverte, Paris, p. 244.
68. F. Ratzel, *Anthropogeographie*, op. cit, vol. II, Introduction.

5.1a
Karl Ritter (1822)

Erdkunde, Volume 1, Berlin, 1822.
pp. 1-19.
pp. 1032-1036.

5.1b (1836)

Géographie générale comparée, Volumes 1 and 3, Paris, Éd. Paulin, 1836.
Vol. 1: pp. 1-26.
Vol. 3: pp. 361-367.

Summary

The purpose of this work is to understand man's relationship with his surroundings. Individuals, like peoples, must develop their potential. It is necessary to study the relationship of people with their government and with the locus of their activity: the earth. Nature must be investigated by classifying, describing and measuring natural phenomena. The goal is to understand the laws and "the mutual interaction of nature and history".

There is order to the parts of the planet. There is an equilibrium between forces of attraction and repulsion. The North and the South and the East and the West form a unity constituted by the tension between these forces. This is reflected in the languages, philosophies and histories of the parts of the planet. The solid forms of the earth (plateaus, lowlands, plains) are individualized, whereas the fluid forms (water, air, fire, heat) unite the earth's surface with the heavens and the depths. Human life results from the correlation between the three kingdoms of nature (mineral, vegetable, animal). As human civilization progresses, it liberates itself from the "fatal influence of nature." (...)

In the lowlands of Africa, man has adapted to the extreme conditions of the Sahara desert, that ocean of sand. He is guided by the stars and the flight of the birds. The population of Tobbos is nomadic. The Touaregs inhabit the oases that link the centre of Africa with the north, and which serve as commercial markets. The Moors live as wandering hordes, pillaging the fertile lands of Senegal and Niger.

atroces, demandent avec larmes qu'on leur épargne le supplice continu ou les douleurs fulgurantes, et que cependant, sous prétexte d'amour filial ou conjugal, on les laisse lamentablement gémir pendant des semaines, des mois ou des années?

La forme communautaire de la propriété, qui prévalut dans presque tous les pays du monde et qui se maintient ça et là, même dans les contrées le plus complètement accaparées par des propriétaires individuels, permet de constater combien l'entr'aide fut l'idéal et la règle chez les peuples agricoles arrivés à un degré de civilisation déjà très avancé. Là aussi le souci d'un chacun dut être la prospérité de tous, ainsi qu'en témoignent les mots mêmes qui servent à désigner la collectivité des villageois associés. Ce sont les « universités » des Basques, les « mir » russes ou petits « univers », les zadrughi ou « amitiés » des Serbes, les « fraternités » des Buriates.

Le terme de « commune » que l'usage du latin et des langues qui en sont dérivées a généralisé dans le monde, s'applique à tous les hommes « qui prennent part aux charges », c'est-à-dire à tous ceux qui s'entr'aident. Et de la commune naît la communion, c'est-à-dire le partage du festin et l'échange des pensées intimes. Car « l'homme ne vit pas de pain seulement » et l'entr'aide n'a cessé de se produire par la communication des idées, l'enseignement, la propagande. Il n'est pas un homme, pas même un égoïste, qui ne s'évertue à faire pénétrer sa façon de concevoir les choses dans l'intelligence d'autrui. Car plus la société progresse et plus l'individu isolé apprend, même inconsciemment, à voir des semblables dans ceux qui l'entourent. La vie, qui fut simplement végétative chez les types inférieurs de l'animalité, de même que pour les hommes vivant dans la brutalité première, prend un caractère tout autre et bien plus ample chez ceux dont l'intelligence et le cœur se sont agrandis. Ayant acquis la conscience de vivre, ils ajoutent un nouveau but au but premier, qui se bornait à l'entretien de l'existence : le cercle infiniment développé embrasse désormais le bien-être de l'humanité entière[1].

Mais il y a des retours, et terribles parfois, dans la marche du progrès humain. L'entr'aide, qui a tant fait pour développer d'homme à

1. Auguste Comte : *Philosophie positive*, 1869, p. 494.

5.4
Élisée Reclus (1869)

Histoire d'un ruisseau, Paris, Hachette, 1869.
pp. 309-317.

Summary

Rivers running from all parts of the planet flow into the ocean. A droplet of water passes through diverse transformations and the most varied climates as it traverses the planet and the fauna that populates it. It is absorbed by plants and animals. It rises into the air and becomes vapour. After it condenses in the clouds, rain falls on the oceans, from whence it comes, or on the mountains, hills, and plateaus of terra firma. It penetrates into the earth and into its caves only to finally spring up yet again in the form of rivers and streams. The "circuit of water" is the very symbol of life. Like water, all organisms incessantly change. It is the same for human society. One generation succeeds another. Human history reflects an inherent tendency towards progress. The day will come when the peoples unite, as streams join with other streams. Then humanity, finally intelligent, like a single river, will lose itself in the ocean…