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Alexander von Humboldt was a Francophile. Humboldt's Francophilia was induced by the French Revolution. It promised a new historical era and the young German aristocrat was swayed by the prospect of a leap in the quality of life for mankind.

His affection for France cannot be dissociated from his having been nurtured, culturally speaking, in the values of eighteenth-century Enlightenment. Humboldt was very much part in the continuity of the group of intellectuals who wrote the *Encyclopédie*. His own biography, his widespread interests, his skill at writing all make him a kindred spirit to Denis Diderot's.

Moreover, Humboldt was familiar with France. He lived for a number of years in Paris. Actually, that is an understatement: Humboldt lived in Paris for several decades. We tend to forget it, associating a German with Germany. However, Humboldt first arrived in Paris in 1797 at the age of 28. There, he met Aimé Bonpland and together they left for South America in 1799. Returning to Europe in 1804, he settled again in Paris. This is where he wrote his *Voyage aux régions équinoxiales du nouveau Continent* (publication, begun in 1805, would take a full 20 years). In 1828, Humboldt left for his exploration trip of Russia and Central Asia. Only in 1847, a full half-century after his arrival in Paris, did Humboldt leave the capital of France for his native Berlin. He continued to find Paris an irresistible attraction, and he continued to split his time between the two cities.

In Paris Humboldt was fully integrated within the local intelligentsia. He had numerous French friends. Among many other stories, one may recall that in 1808, when François Arago was released from captivity in Algiers (he had been arrested by the Spaniards as a spy, and the subsequent events are from a picaresque novel), he was greeted in Marseilles by Humboldt who had rushed to meet his friend after he was liberated from his ordeal.

I shall offer here a commentary on a brief text which Humboldt wrote in French, the *Essai sur la géographie des plantes*. It originated with a presentation Humboldt made to the Institut de France on January 7th, 1805 (*17 Nivôse de l'an 13*). It was not printed before 1806 and probably not published until 1807. Only 38 pages long, this printed lecture has all the charm of Humboldt's writings, but it suffers from his inability to frame his thoughts in an organized, Cartesian manner, which Arago pointed out to him: "Tu ne sais pas construire; tes livres sont comme des tableaux sans cadre." ("You don't know how to build; your books are like unframed pictures").

What does the *Essai* consist of? The explicit intent, expressed by the title is a disquisition on the geographic distribution of diverse plant species. More interesting yet, are the actual contents. They consist of an attempt at an encyclopædic excursion through the whole of knowledge.

Typical of educated Europeans in his generation, Alexander von Humboldt was nurtured on the *Encyclopédie*. Its volumes had a precious feature, subversive of authorities, primarily of the Church. This was the presence of the numerous cross-references—*renvois*, in French.

One might initially have looked-up some notion, a word perhaps. This was a mere hook. One might have been induced, in the process of reading that entry, to look-up another. The editors thus had built a network of intended connections.

I will submit here that Humboldt acquired his *Wanderlust* in part from reading the *Encyclopédie*. Cross-referencing gave him an ease at crisscrossing existing knowledge. From there, to seek connections between geographic areas, to visit faraway populations and to observe biological organisms over the whole planet, are but logical outcomes of such wide-ranging curiosity.

The *Essai' sur la géographie des plantes* embodies an isomorphism, from the printed page, to the landscape traversed on horseback, or on foot. To Humboldt, to write about his South American travels is restitution. He gives back his personal exhilaration, being privileged to witness so many exotic scenes. His is the appetite for the life of the nomad. There is no intrinsic difference between the personal observations he made in natural history, and institutionalized knowledge, in its various branches. It is all a matter of writing and of reading.

Critical analysis of such an encyclopedic romp can do no better, I submit, than use as its tool a more or less contemporary attempt at organizing the whole of human knowledge. Thus, it should come as no surprise if my looking glass, in this examination of the *Essai*, is provided by André-Marie Ampère's classification of the sciences. Even though it appeared in print almost four decades after the appearance of Humboldt's *Essai*, it helps the modern reader to recapture what Humboldt and Ampère had in mind, when

they independently envisaged the totality of knowledge, with a view to both organize it along its lines of forces and to circumscribe it.

The Essai: Summary of its Contents

The Preface to the *Essai* is all the more interesting that, given the small size of the *Essai*, it is of disproportionate length. The Preface is almost eight pages long, as against a little over 21 pages for the *Essai*. It starts with the rhetoric of modesty: the author, who might have instead published a narrative of his travels and thus drawn attention to himself, pales in comparison to the importance of his topic. He wished to present an overall picture of the planet. A sentence in the Preface makes it clear, both that Humboldt carried the project of writing such an essay for many years, and that George Förster, an associate of Captain Cook's, had encouraged him to do so.

In the very first sentence of the *Essai* proper, Humboldt dissociates himself from botanists: as a group, their research is too specialized, he writes: "Researches by botanists are generally directed towards objects which comprise a very small part of their science." Accordingly, the *Essai* turns out to offer a plea for the equivalent, at the beginning of the nineteenth century, of pluridisciplinarity.

How does Humboldt achieve it? By transposing to the library the experience of the explorer. Instead of physical travel through varied territory, encompassing mountains, deserts, cultivated land, forests, rivers and lakes, the scientist will hop from specialty to specialty. As an Ariadne's thread, he will have his chosen theme, the geography of plants in this case. Hence, Humboldt evokes in succession, systematic botany, historical botany, and the historical sciences, general physics, (the word "physics" under his pen demands however, an explanation), agronomy, paleontology, astronomy, anthropology, imitation arts including painting, poetry, psychology and chemistry. Thus, the *Essai* could also be described as a rambling walk through the sciences.

General Physics in the Essai

That we are on the right track in using Ampère's text to read Humboldt's *Essai* becomes obvious as soon as one looks up the expression *physique générale*. When Humboldt wrote his lecture, geology was still in its prehistory. As writes Ampère, "the distinction between general physics and geology is sufficiently determined in that the former considers bodies in general, while the latter studies them only to the extent they belong to the terrestrial globe." (1.97). Such a meaning of general physics was current in Humboldt's time. It is fleshed out by Ampère who, in his comments (1.98) refers to a

number of phenomena belonging with general physics, not with geology: alignment of the compass needle with the magnetic pole – lifting of a column of mercury by the atmospheric pressure – water evaporation and rain – presence of layers in the soil. Meteorology, for Ampère, belongs with such general physics.

General physics, in other words, had a very different meaning from today's. To Humboldt, as well as to Ampère, it referred to inanimate natural history, to the physical phenomena in nature. To us, general physics has become almost exclusively laboratory physics. It is interesting that the expression still retained its meaning from Early Modern times at the beginning of the nineteenth century, even though experimental science was already a couple of centuries-old.

Indeed, laboratory science is totally excluded from the *Essai*, which reads like a lyrical ode to natural history. Moreover, Humboldt and Bonpland engaged on their trip to Latin America right at the time of the first triumphs of the Industrial revolution in Europe. Their travels can be interpreted as a symbolic gesture. When European society was undergoing a qualitative mutation, the two friends were seeking a passeist retreat into the nomadic existence of hunters-gatherers among the American Indians of South America. It is paradoxical, when European factories became transformed qualitatively and quantitatively by steam power, for the *Essai* to have mechanical philosophy as its blind spot.

Descriptive Botany in the Essai

Humboldt starts the *Essai* with an attack on the myopia of botanists. "They occupy themselves near exclusively," he writes, "with the discovery of new plant species, study of their external structure, of their distinguishing characteristics, and of the analogies which group them into classes and families." He goes on to define the main axes of plant geography, a science which would study plants in terms of their local associations in the different climates. Clearly, Humboldt has our discipline of ecology in mind.

Even though Humboldt pours scorn on descriptive botany, he resorts to it repeatedly. He gives plants their accepted Latin linnean names, and these keep recurring, litany-like, throughout the text of the *Essai*.

The influence of Goethe is obvious. Humboldt seeks among plants the *Ur-Pflanzen*, the primitive form from which all such organisms ultimately derive. He writes (p. 31) that "In the variety of plants which cover the general framework of our planet, one easily recognizes a few general forms to which most of the others reduce themselves," and he goes on enumerating 15 such groups. Earlier on (p. 20), in a paragraph which interrupts the narrative and

descriptive flow, Humboldt wrote: “It is this science [he means plant geography] which examines whether one can recognize a few primitive forms among the immense variety of plant forms; and which examines whether the diversity of species should be considered as the effect of a degeneration which has rendered constant, with the passing of time, species which had appeared accidentally.”

When Ampère gets to botany, he distinguishes the four branches of phytophany, plant anatomy, phytonomy and plant physiology. The first identifies with Humboldt’s *géographie des plantes*: “From immediate observation of plants,” wrote Ampère, “results knowledge of their external characteristics, of the nature of the soils they exist in, of the climates they inhabit and of the elevations above the sea level where they are found “ (1.104).

Geology in the Essai

On reading p. 19 of the *Essai*, with the sentence “geology bases itself on the analogous structure in coastlines, in the bottom of the Ocean and on the identity of animals inhabiting them,” the reader rubs his eyes. Not only is the word “geology” used, much before Lyell had published his masterpiece and thus started that science, one also has the eerie feeling of a preview of Alfred Wegener’s work which more than a century later would establish the reality of continental drift. Indeed, a couple of sentences later, Humboldt writes of the “separation between Africa and South America (having) occurred before development of organized beings.”

To return to the word *géologie*, it was introduced in volume 1 of the *Encyclopédie*, in 1751, in its *Explication du système des connaissances humaines (Discours préliminaire)*. This was a forerunner to both Humboldt’s and Ampère’s efforts at an overview of the sciences as a whole.

Geology provides the *Essai* with some of its most incisive insights, some of its most daring and ultimately very successful generalizations. There is the vision (p. 23) of the accretion of the planet: “If the most impressive phenomena of geology tell us that the whole mantle of the planet was yesteryear in a liquid state” he writes, and then goes on with, “if stratification and the differences between rocks show us that mountain formation and the crystallization of vast masses around a joint core did not occur simultaneously over the whole surface of the globe.” And he then speculates that the attendant heat release as the earth cooled, might have determined the local climate.

But geology also provides Humboldt’s pen with some of its best-chosen particulars, as in the sentence where he refers to (p. 17) “the great catastrophe which opened the Gibraltar Straits and dug the bed of the Mediterranean.”

Agronomy in the Essai

In writing about agriculture, Humboldt uses an archeological perspective. He goes from man in the state of nature to the agriculturalist, from the nomad to the settled cultivator. He watched the former, the Indian who in-between the valleys of the Orinoco and the Amazon (p. 24) depends on a few plants, very few plants, for his survival (p. 24).

He then enumerates plants essential to mankind which have been acclimated to all parts of the planet. These are predominantly cereals and fruit trees. In so doing, man replaces biodiversity, Humboldt writes (p. 28), with a monotonic uniformity. He earlier penned an impassioned paragraph about the hegemony of heather, responsible for turning much of northern Germany into a wasteland comparable to the desert in Lybia (p. 17). Now, he comes up with a parallel indictment of cultivated plants which also stifle competition and replace diversity with uniformity.

When Ampère writes on agriculture (1. 120), he emphasizes that he considers it in its wider meaning; distancing himself from other authors who restrict agriculture to cultivation of cereals (1. 121). However, Ampère defines another four related sciences. He names *geoponics* (1. 108) the art of the gardener, looking after plants, whether in the wild or in the garden. He terms agricultural *cerdoristics* what we would now call agro-industrial management (1. 109), while to him (as to us) *agronomy* concerns the means by which to agricultural goods and yields are improved. Finally, in this chapter, *plant physiology* is for Ampère the set of causal explanations for all the empirical knowledge about plant cultivation.

Paleontology in the Essai

“To solve the great problem of plant migration,” writes Humboldt (p. 22) “plant geography goes inside the globe. There, it consults antique monuments which nature has left behind in the petrifications, in the fossil woods and the layers of coal, tombs for the first vegetation on our planet.” Humboldt goes on to mention animal remains also; before he raises again the question of the changes in the climate which account for such observations.

Ampère is clearly at a loss as to where to put such a science. He names *oryxionomy* the science of digging the earth and he relates it primarily to metallurgy, i.e., to the extraction of metals from their ores. When writing this part of his treatise (1. 94), Ampère was clearly forgetting that soil does not consist exclusively of minerals, it also contains organic remains.

Astronomy in the Essai

To Humboldt, the geography of plants beckons astronomical knowledge. The link is climactic change. However, he cannot put his finger on it. Could there have been a change, in the distant geological past, in the axis of rotation of the Earth? Could there have been a modified configuration of celestial bodies? Has there occurred a great change in the intensity of light from the sun? As he writes on p. 23, “the present state of our astronomical knowledge” does not allow a choice between these various hypotheses.

Most interestingly, Ampère identifies four sciences having to do with the cosmos. There is *uranography*, i.e., “all what the view of the sky offers to immediate observation.” (1. 57). Basically, this is the map of the sky with the fixed stars. Humboldt refers explicitly to such a sight and, in doing so, is guilty of prejudice. He makes a mistake from lack of imagination, surprising on his part. He writes of the (p. 34), “earth unfolding to his eyes a show as varied as the azure canopy of the sky, *which does not hide from him any of its constellations.*” By equating the visible with the existing constellations, Humboldt is guilty of a definite lapse in imagination. To Ampère, returning to his classification of the sciences, *heliostatics* (1. 58) corresponds closely to the conjectures of Humboldt’s. This is the planetary science concerning itself, in Ampère’s words, with “real motion of the earth about its axis, of the Earth and of the planets around the Sun, while assuming the latter motionless in the center of the planetary system.” *Astronomy* deals with Kepler’s laws of motion and with similar empirical laws, induced from observations. (1. 58) Celestial mechanics deals with theory of motion, as devised by Newton. (1. 59)

History in the Essai

At its core, history is a constant presence in the *Essai*. Humboldt presents himself as the spokesman for a collective anamnesis on the part of Europeans: we should recall, he writes (p. 26) that we owe walnuts and peaches to Persia, apricots to Armenia, cherries and horse chestnuts to Asia Minor, half-a-dozen other fruit trees to Syria. He refers to Hesiod and Homer for testimony to the ancient colonization by olive trees in Greece. Conversely, in the time of Cato, Romans were still ignorant of cherries, peaches and blackberries. He sketches a history of the vine: born on the shores of the Caspian, it came first to Greece, afterwards to Sicily. The populations in the area of Marseilles brought vines to southern France, Romans implanted them along the Rhine river. In another agricultural history, the Roman dictator Lucullus brought back, as part of his public triumph, a single cherry tree, after his vic-

tory over Mithridates. Less than a century later, cherry trees were common in France, Germany and England (p. 27).

To Humboldt, history as it unfolds is not only a narrative of migrations. It is also an equally astounding report on invariants and permanences. Is it not so that the potato flower is identically the same in the Andes as it is in Siberian plains (p. 27)? Barley which fed the horses of Achilles is the same cereal feeding us today. The ibis found in Egyptian catacombs, contemporary with the building of the pyramids, is the same bird still to be found on the banks of the Nile (p. 27).

This won't come as a surprise, Humboldt follows the thought of Jean-Jacques Rousseau in his *Discours sur l'origine de l'inégalité*. To both writers, mankind went from the nomadic state to the agricultural state. Primitive man was a hunter-gatherer (p. 24). One can infer from the paragraphs on p. 25 *et seq.* that human history begins with gardening and agriculture. A latter reference to history emphasizes strife and war. Their causes, for Humboldt, are the fight for valuable plants and their resources. Quinquina, the source of quinine, is an example of a useful medicinal plant.

Here, to help us understand Humboldt's thought, I have to quote Ampère at some length:

It has often been said that societies are like individuals. They are born, they slowly develop. They have neighborhood interactions, they live at peace or at war with the neighboring societies. They are impelled by the feelings and the passions of individuals, which become the feelings and the passions of the crowd. Societies get old, and they die. In order to study such societal lives, one has to start by observing the facts. Indeed, the mere narrative or the simple exposition of facts concerning the life of societies is the science (...) which I term *chronography*.

Imitation Arts in the Essai

Humboldt refers to painting in particular. Images brought back from the tropics will be treasured by Europeans, he explains, for their depiction of plant forms more awesome, more admirable, bigger and more colorful, far more diverse than anything that can be seen in Europe. Nature, near the equator, is more profuse, more inventive, more awesome. It is the province of the artist to convey those impressions.

Ampère terms *terpography* the science based on the study of art masterpieces. Besides immediate observation of an artifact, one ought to study as well the intentions of the artist, compared with the actual production; which is the purpose of what Ampère terms *terpnognosy*. *Technesthetics*, of which *terpography* and *terpnognosy* are but two parts, denotes the whole sphere of

human perception of art; as Ampère writes, it refers to “everything which in the arts has to do with feeling.”

To come back to Humboldt’s piece, let us give some attention to the occurrence of the word *painter* in his text. After noting the identity of the oak species crowning the heights of the Tenochtitlan valley with those found along the 45th parallel, Humboldt asserts that (p. 17) “the painter who would travel through those parts of the countries located under the tropics for studying the character of the flora, would not encounter the beauty and the variety of forms displayed by equinoctial plants.” Clearly, he himself identifies with the painter in this sentence. Why does he refer to the painter, when elsewhere he mentions the traveller, as on p. 21 (*d’autres voyageurs*)? Why does he refer to the painter, when elsewhere as on p. 27 he mentions the observer (*l’observateur*)? Why does he refer to the painter when elsewhere (p. 28) he identifies himself with the botanist in his excursions (*le botaniste dans ses excursions*)? The answer is from aesthetics, as noted on p. 30: “a person sensitive to the beauties of nature” (*l’homme sensible aux beautés de la nature*). A few sentences down, he writes that “the mere aspect of nature, the sight of fields and of forests, are causes for enjoyment” (*Le simple aspect de la nature, la vue des champs et des bois, causent une jouissance*). Note in passing that here, Humboldt identifies nature with nature humanized through cultivation.

Psychology in the Essai

Here and there, Humboldt uses adjectives to characterize human types. They partake of a jaundiced view of man, in the tradition of Jean-Jacques Rousseau. Man may have been good originally in the state of nature, but civilization has corrupted him. The *Essai sur la géographie des plantes* reads as a forerunner to *Tristes Tropiques* by Claude Lévi-Strauss.

There is the traveller, as exemplified by Humboldt and by his companion Bonpland. He is termed *l’homme inquiet et laborieux* (p. 27), which might be rendered as the worried and hard-working man. Such a pessimistic note is reiterated toward the end of the book, where Humboldt refers to the European, “a man isolated on an aridic shore.” (p. 34) There is (p. 29) the Amerindian, dwelling on the shores of Rio-Negro or Cassiquiare, who is termed *aussi mélancolique que méfiant*: as melancholy as he is distrustful.

Humboldt’s deep sadness whenever he mentions the human animal contrasts with his enthusiastic depiction of the world of plants, in their majesty, beauty and empire over the whole of the natural world.

Circulators

But how does Humboldt contrive to move from one science to another in his *Essai*? Does he use a single rhetorical tool or a set of devices to effect such textual switches? A scrutiny is worthwhile.

Consider fossils, as the entry point for paleontology. The switch occurs on p. 22 of the *Essai*. Humboldt has just denounced “the error from those geologists who reconstruct the entire globe on the model of the hills nearest to them.” The next paragraph asserts, in a non sequitur, that the solution to the problem of plant migration is to be sought inside the Earth. The circulator, in this case, is the return to the nagging question of plant migration. Humboldt the traveller has observed that plants also travel. Why do they do so? At this point, Humboldt concludes from the evidence of fossilized plants, that marked changes in climate have taken place during what we now term the geological past. He then conjectures astronomical changes, maybe another configuration in the stars, maybe the tumbling of the rotation axis of the Earth.

Another transition is needed, when the *Essai* changes its focus from geology to agriculture. Humboldt accomplishes it in three segments. First, he characterizes geology as a fictional medium, as (I quote) something which “offers to the imagination of man a field as rich as it is worth cultivating.” (p. 24). Next, he contrasts plants and animals in that the latter, not the former, are capable of motion. Hence, and this is the third part of his switch, how come plants are endowed with an apparent mobility?

Enumeration of factors such as winds, currents and birds precedes mention of the main actor, man, responsible for the dispersion of plants. Humboldt, then and only then, deftly changes the topic to plant cultivation.

To return to changes in climate and to their cause, astronomical or terrestrial, who is to decide whether such a perturbation indeed occurred? *L'imagination de l'homme*, he answers (p. 24). This re-centers on man his meditation. Has not man been, Humboldt writes on p. 24, the prevailing cause of plant migration. This is the circulator ushering in agriculture (p. 25). After a couple of pages devoted to examples of cultivated plants and to classical authors documenting their ancient dwellings, Humboldt recapitulates this whole section on p. 27 with the mention of “a sequence of events having spread the human race on the whole surface of the globe,” in other words, to a history of human migrations.

In order to connect agriculture to political history, Humboldt uses psychology as a link. “The influence of food, (which can be) more or less of a stimulant, on the type and on the intensity of passions, the history of voyages and of wars waged for disputing productions from the world of plants: those

are topics which connect the geography of plants to political and moral history of mankind” (pp. 29-30). Humboldt then goes on to relate the aspect of plants on taste and the imagination, which circulator serves to introduce descriptive poetry and imitative arts, such as painting and sculpture (p. 30). A few pages later, the author returns to such arts as the resource by which Europeans can experience the splendid view of plants from the Equator, from the “equinoctial regions” which Humboldt has explored and which has left him with such indelible impressions.

Conclusion

The *Essai sur la géographie des plantes* belongs in a class of texts, belletrist essays written by scientists with a talent for literature, which also include, just to quote a few which followed and which might have been influenced by Humboldt’s. Some of the writings by Humphry Davy not to mention novels of ideas such as Adelbert von Chamisso’s *Peter Schlemihl* (1814), and of course Mary Shelley’s *Frankenstein* (1818). A common thread running through these texts is the pre-Romantic notion of the lonely individual roaming the wilderness in bewilderment. If scientific curiosity and the urge to observe the wonders of natural history draw the scholar in an endless exploration of the planet, they also remove him from the society of his fellow human beings. The geography of plants bestows not only admiration for biodiversity, it also brings with it the desolation of removal and exile.

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