

Michel Serres

Leibniz's Filters

Knowledge: the combinatorial filter and algebraic deciphering

(Translated by Martijn Boven, 2025)*

Abstract: This chapter from Michel Serres's comprehensive study on Leibniz—*The System of Leibniz and its Mathematical Models* [*Le système de Leibniz et ses modèles mathématiques*]*—examines Leibniz's epistemological framework. This framework, which Leibniz developed for a large part in his "Meditations on Knowledge, Truth, and Ideas* [*Meditationes de cognitione, veritate et ideis*]" (1999, 585-592), is pitched against Descartes's *Meditations on First Philosophy* [*Meditationes de Prima Philosophia*] and the method of systematic doubt developed therein. While Descartes rejects any knowledge with the slightest possibility of falsehood, Leibniz accepts knowledge with even a minimal degree of truth. Leibniz's approach involves a progressive genesis of truth through a series of filters, each further refining knowledge. This process is intrinsically linked to infinitism and combinatorics, allowing for a gradual differentiation of the distinct from the indistinct. The filters are applied sequentially, with each filter proceeding through its own oppositions, resulting in a spectrum of knowledge ranging from obscure to clear, confused to distinct, inadequate to adequate, and symbolic to intuitive. This framework facilitates pluralism within rationalism that proceeds through evolving or regional truths. The filters overlap, and only the final stage of knowledge is devoid of mixture. Leibniz's epistemology is non-Cartesian, as it relativizes truth and falsehood at each stage of the filtering process. It also accounts for the limitations of sensory perception, attributing them to the imperfection of the human mind in its current state.

* Original text: "Connaître: le filtre combinatoire et le déchiffrement algébrique [Knowledge: the combinatorial filter and algebraic deciphering]", in Serres, 1968, 117-127.

Separating truth from falsehood within their mixture—as Descartes retorts to Pierre Bourdin—sorting the good apples from the bad ones,⁵⁴ that is the first question. The technique of doubt entails discarding any content for which there exists a reason to suspect impurity. Notably, this concerns a specific argument about *the greatest and the smallest amount* in radical and hyperbolic doubt: “doubt all things where we find the *slightest* suspicion of *uncertainty*” (Descartes 1904, 25: *Les principes de la philosophie*, I, 1), “consider as false all those where we can imagine the *slightest* doubt” (ibid., I, 2; Descartes, 1902, *Discours de la méthode*, IV). This implies that we have to pass from the minimum of suspicion, the minimum of impurity, to the maximum of rejection, to the hyperbole of refusal.

However small the amount of falsehood that I suspect is mixed in with the truth—in terms of the quantity of falsehoods, but also in terms of the quality: probable, insecure, etc.—and no matter how precious the truth in which it is mixed, I reject all the knowledge in question, I repudiate it as false and impure. Hence the parable of the apples: if there are *many* pieces of fruit in the basket, it is impossible for me to know which ones are spoiled, and therefore I must *empty* the basket to *sort* them one by one. Above all, this demands a finitist philosophy. However numerous the apples may be, in order to empty the basket (i.e., to doubt), there must be a finite number of them; in order to examine them one by one, I must hope to be able to complete the count.⁵⁵ This highlights the profound connection between the method of doubt and finitism, between the radicalism of exclusion and the demand for computation.

For a great number of reasons, Leibniz takes here the opposite approach to the Cartesian method: in particular, he turns the argument of *the maximum and the minimum* on its head, element for element. Far from excluding or rejecting as false all knowledge [*tout savoir*] that has even the smallest degree of falsehood mixed in, he allows within the encyclopedia any content, however obscure, in which he would have some reason to suspect clarity. The Leibnizian mixture [*le mélange leibnizien*]*—the slightest truth diffused within a false set [le moindre vrai diffus dans un ensemble faux]*—is, strictly speaking, an inversion of the Cartesian mixture—*the slightest falsehood diffused within a true set [le moindre faux diffus dans un ensemble vrai]*. And the decision follows the same inversion: Leibniz *accepts all* of the former; Descartes’s *refuses all* of the latter. From this stems a generous hospitality that opposes the Cartesian rejections and welcomes those who have been dismissed; there are veins of gold in the barren rocks of Scholasticism; there is something to be taken from all philosophers, even the most distant or contradictory,⁵⁶ as well as from poets, novelists, historians,

⁵⁴ In his “Réponses aux Septièmes Objections [Seventh Set of Objections with the Author’s Replies]” Descartes writes: “Suppose he [Pierre Bourdin] had a basket full of apples and, being worried that some of the apples were rotten, wanted to take out the rotten ones to prevent the rot spreading. How would he proceed? Would he not begin by tipping the whole lot out of the basket? And would not the next step be to cast his eye over each apple in turn, and pick up and put back in the basket only those he saw to be sound, leaving the others?” (1985, 324). Already, in the *Regulae ad directionem ingenii* [*Rules for the Direction of the Mind*], particularly in Rule III, Descartes uses the terms *admiscendas* [to mix together], *permiscentes* [to join together through mixing] (1998, 78-79).

⁵⁵ The parable of the apples [*la parabole des pommes*] contains an idea that adds to finitism, and it is a pessimistic one: rotten fruits spread decay around themselves. Thus, error mixes easier than truth, and evil easier than good. This explains the distrust and the maximum rejection. The Evil Genius [*Malin Génie*] is not far from this. We are aware that the parable of the Demon [*Démon*] was rediscovered in modern physics through an analysis of the notion of mixture; we will address this question in a separate study.

⁵⁶ Leibniz’s *Nouveaux essais sur l’entendement humain* [*New Essays on Human Understanding*] (1990, first published in 1765), are misleading in their dialogical presentation. There is no dialectical confrontation within them, and Leibniz does not, as has been believed, oppose his rationalism to empiricism or nominalism, and so on. They are, in fact, an enterprise of integration: they seek to filter Locke’s work, keeping all the elements that a flexible rationalism can accommodate; they seek to define the greatest possible portion of Locke’s *Essays on Human Understanding* as a special case of Leibnizianism. They are written to accept, not to reject.

grammarians, craftsmen, and so on. The more curious narratives I hear or the more extravagances I read, the more I will be a true scholar. The Cartesian ideal is clarity and the distinct idea “contains only what is clear”, it is clarity without any mixture whatsoever; the Leibnizian ideal is progressive distinction against a background of obscurity and confusion.⁵⁷ From this new inversions follow: from a Cartesian perspective, intuitive knowledge is *the starting point*, since, through doubt, I have already expelled all mixture; from a Leibnizian perspective, it is *the end point*, since I transform the preliminary and radical doubt [of Descartes] into a work of continuous and progressive filtering. Within the Cartesian approach, knowledge solely develops through clarity, or even distinction, so there is no progressive genesis of truth, which is assigned in its entirety to the preliminary parentheses of doubt. In the Leibnizian approach, knowledge develops against an enveloping background, whereby the distinct gradually detaches itself from the indistinct and creates a *progressive genesis of the criteria for truth and falsehood*. There is a trajectory towards the truth that defines its own conditions while unfolding: this is the fundamental lesson of Leibniz’s *Meditations*. Indeed, just as the suspiciousness of doubt in Descartes is tied to *finitism*, the optimism of welcoming falsehood in Leibniz is tied to *infinitism*: how could I empty the basket and count the fruits one by one if it contains an infinity of apples?

In a sense, the Cartesian *Meditations* employ a single filter as their starting point and as their maximum point: within the ordering, there is no need to go back to the conditions of evidence and clarity that precede the first determination. The Leibnizian *Meditations* by contrast, distribute the conditions for the emergence of truth within the ordering itself, using filter upon filter,⁵⁸ the second more refined than the first, the third more refined than the second, and so on. The classification of knowledge that they propose is therefore genetic *in terms of its content and in terms of its norms*. Given that norms and content are generated at the same time, it is easy to conceive that some of the knowledge that was accepted and marked as true by the first filter, will be rejected and marked as partly false by the second filter, and so on. In short, it’s easy to conceive of a pluralism within rationalism. “Therefore, knowledge is either obscure or clear; and the clear is either confused or distinct; and the distinct is either inadequate or adequate; furthermore, it is either symbolic or intuitive: and indeed, if it is at the same time adequate and intuitive, it is most perfect. [*Est ergo cognitio vel obscura, vel clara; et clara rursus vel confusa vel distincta, et destituta, vel inadæquata, vel adæquata; item vel symbolica, vel intuitiva: et quidem si simul adæquata, et intuitiva sit, perfectissima est*]” (Leibniz 1999, 586). The crude filter that only proceeds through a true-false opposition is now replaced with a sequence of four filters, each of which proceeds through its own oppositions.

⁵⁷ Thus, for Descartes, distinction is the absolute absence of mixture, whereas for Leibniz, it is a certain relationship that truth maintains with falsehood.

⁵⁸ Cf. G.W. Leibniz, “Plan de la Science Générale”. The structure of the *Meditationes* is revisited there and treated as a succession of *discrimina* (filters). [Translator’s note. Leibniz writes here: “This provides us with the following chapters: [1] On the filter [*discrimine*] that distinguishes between obscure and clear concepts, where it must be shown that we often have only *blind* concepts of things [*nos conceptus tantum cæcos de rebus*], understood through analogy and symbols, or requiring explanation by the ingenuity and authority of others. [2] On the filter [*discrimine*] that distinguishes between confused and distinct concepts, where explanations by demonstration and by definition are discussed, as well as those explanations where definitions are not to be sought. [3] On the filter [*discrimine*] that distinguishes between inadequate and adequate concepts, or between nominal and real definitions, where we must address Hobbes’s difficulty regarding arbitrary truth and Descartes’ difficulty concerning the ideas of the things we speak about. [4] On the filter [*discrimine*] that distinguishes between imperfect and perfect concepts, where we deal with Pascal’s difficulty concerning continuous resolution, showing that perfect demonstrations of truths do not require perfect concepts of things.” Leibniz 1903, 220.]

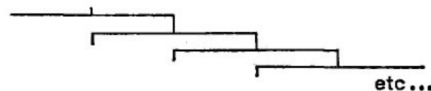
This is, let it be said in passing, a series of dichotomies in the purest tradition of the *Sophist* or the *Statesman*.

However, it has not been sufficiently observed that, in Plato, a continuous dichotomy also constitutes a filter, that is, the iteration of a division [*d'un partage*] according to a fixed law applied to a given set, such as a segment, from which you cannot deviate during the process.⁵⁹

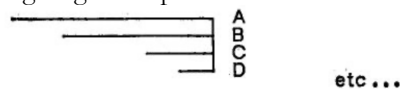
And indeed, it is through the segmentation of a line according to a fixed law (where the left segment is the image, and the right segment is the object of this image) that the end of book VI of the *Republic* presents the *scala entium et intellectus* [*scale of beings and intellect*], which has remained famous. When, in the opening lines of the subsequent book, Plato stages the elements of this classification in the Cave allegory, he concretizes the general object/image law into hierarchized figures of shadow and light. We will have ample opportunity to emphasize that the theory of shadows in Leibnizian scenography plays an important role in completing the Platonic heritage; here, the theory of knowledge is organized around recognizable legacies: a series of dichotomies, a combination of the scale of beings with the gradations of knowledge, and the ongoing emergence of light and shadow models.⁶⁰ Despite the close alignment between the Platonic meditation and the mathematical model, Leibniz applies a superior level of rigor to his entire corpus, drawing its main features from a host of mathematical disciplines, algebra, geometry, perspective, gnomonics, and so on. From Plato to Leibniz, the model shifts from a geometric inspiration to a more broadly mathematical one.

Let us return to our dichotomies. Descartes can do without this graduation of filters as he rejects any kind of mixture, without first concerning himself with the composition of this mixture. Leibniz, by contrast, is specifically interested in this composition: and we know well enough that

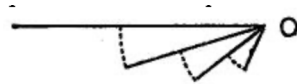
⁵⁹ In a forthcoming publication, *Le modèle mathématique du Politique* [*The Mathematical Model of the Political*], we attempt to show that the traditional analysis of the dichotomic technique is partly misled by the tree-like diagram that is commonly used to represent it. This diagram generally looks like this:



This tree structure suggests an amplifying search to the right and prevents one from seeing that the n^{th} dichotomy merely divides elements contained in the previous division, and so on, moving down—so that we never leave the original set. The following diagram expresses the method more accurately:



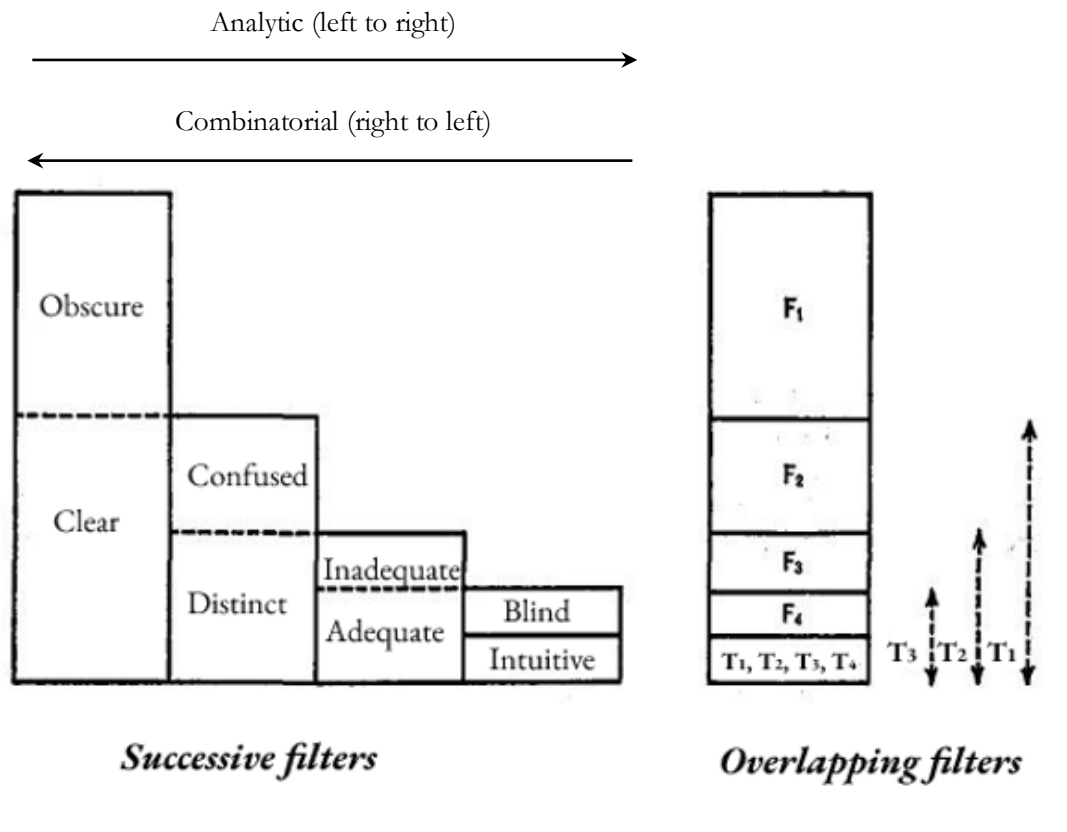
But since, in the end, the last term is defined by retrieving all determinations specified on the right and uniting them into a single statement, the best graph is ultimately the following, which reunites at point O the points A, B, C, and D.



As it turns out, this diagram corresponds exactly to a geometry problem set out in Plato's *Statesman*, 266a-b. The study of this problem brings us back to the dichotomous schema on one side, and, since this schema is made up of rotations, to the internal logic of the cyclical world theme; moreover, it allows us to account for the paradigm of the weaver and to explain why the dichotomies in *The Sophist* stop at a given number. We demonstrate these results in detail in the work mentioned.

⁶⁰ Leibniz also provides a metaphor of the Cave in his “On the Ultimate Origination of Things (23 November 1697) [De Rerum Originatione Radicali]”: “...like people born and raised in prison or, if you prefer, in the subterranean saltmines of the Sarmatians, people who think that there is no light in the world but the dim light of their torches, light scarcely sufficient to guide their steps.” (1989, 153) This text immediately precedes a precise allusion to perspective geometry. We know that Leibniz was the director of the Harz Mines.

for him composition is always combinatorial in nature. Consequently, applying a sequence of filters to the initial obscurity serves to decompose, to “decombine” the original mixture:⁶¹ this is an analytical process, *reversing* the combinatorial process.



The combinatorial process can easily be re-obtained by moving from right to left [see figure 1]. For example, when the distinct [*le distinct*] merges into the confused [*le confus*], we will see that the clear [*le clair*] is formed; when the intuitive [*l'intuitif*] merges into the blind [*l'aveugle*], the adequate [*l'adéquat*] is formed, and so on. Conversely, [following the analytical process, moving from left to right], the clear, as a mixture of the confused and the distinct [*le clair, mélange de confus et de distinct*], requires well-formed criteria to be separated into confused and distinct [*confus et distinct*]. The laws of mixture are the laws of combinatorics (moving from right to left), while the laws of analysis are the criteria or indicators that constitute the successive filters (moving from left to right), to be examined later. In a certain way, Leibniz's *Meditations* proposes a trajectory opposite to the one taken in his *Dissertation on Combinatorial Art* [*Dissertatio de Arte Combinatoria*].

This accounts for a progression of truthfulness and the—anti-Cartesian—idea of an evolving truth or of regional truths, an idea that turns pluralism into a theory of knowledge. Indeed, in within the falsehood of the obscure, the clear appears as a degree of truth, with the obscure acting as its regional opposite. The totality of knowledge it thus split into the obscure (F₁) and the clear (T₁). It is within this first region of truth that the confused appears as a degree of falsehood (F₂), whereas the truth of that region emerges as its opposite: the distinct (T₂). Within this second region of truth, inadequacy appears as its falsehood (F₃), while its local truth expresses its opposite: the

⁶¹ Yvon Belaval (1960, 167, note 1) uses combinatorics to form the series itself, from left to right: for example, *obscure-clear = confused*. We use it in the reverse order, from right to left: *confused-distinct = clear*.

adequate (T₃). Finally, within this third region of truth, it is the blind that emerges as falsehood (F₄), while the intuitive expresses its opposing truth (T₄). Once the filtering process is complete, the clear-distinct-adequate-intuitive (T₁ T₂ T₃ T₄) counts as “completely perfect knowledge,” leaving behind the gradual residues (F₄ F₂ F₃ F₄) that resemble the gradient hues of a shadow that becomes more and more (or, conversely, less and less) dark: a filtering process that, at the same time, constitutes a spectrum, so to speak. On the other hand, it is important to recognize that the filters overlap. To take just one example, the inadequate is, in fact, clear-distinct-inadequate (T₁ T₂ F₃), having gone through two filters while remaining a residue of the third one; similarly, the blind is clear-distinct-adequate-blind (T₁ T₂ T₃ F₄), having gone through to three filters, it ends up as the residue of the fourth one. Ultimately, it is only the last stage of knowledge that is no longer a mixture, and not the first stage, as in Descartes’s works. All of this shows how far ahead of his time Leibniz was: what better image of the indefinite progress of enlightenment could the 18th century wish for than this gradual elimination of shadows? It prefigures the contemporary conception of knowledge as a work of continuous rectification,⁶² while the full and perfect truth serves as its ultimate horizon: an endpoint that can be reached, albeit only in exceptional cases.⁶³ Just as the ‘complete concept [*notio plena*]’ was akin to the integration of one (or several) infinite series, the ‘perfect concept [*notio perfecta*]’ is like the ultimate result of a filtering process, it is perfect in the sense of a finished work.

All these aspects exemplify a non-Cartesian epistemology; and Leibniz’s rejection of Descartes takes its full force in the idea of *indexed truths* we have just encountered. Any given notion or form of knowledge is *true in its own category* and plays out, within its own region, the *relative opposition between a local falsehood and a local truth*, presenting competing points of view on the same region. How, indeed, could the sorting process be repeated if truth and falsehood were not relativized at each stage of the process? Each stage of approximation has its own truth.⁶⁴ As a result, here, there, or elsewhere, I come across specific objects that resist certain filtering procedures, admitting only the first or the first two filters, either due to their inherent nature or to my own limitations. This applies to colors, smells, flavors, and even artistic taste, ultimately leading me back to an inexplicable feeling. Limited as I am by my own inherent constraints, I sometimes do not manage to go beyond these regions, even though I am aware there must be underlying causes or reasons. At this point, I must stop, of course, but I am able to do so, and I can accept a relative truth: I am unable to explain this or that to others, except by bringing them in proximity, except by exposing them to a

⁶² In an undated letter to the Scottish lawyer Thomas Burnett, written in 1699, Leibniz summarizes the “Meditations on Knowledge, Truth, and Ideas” and speaks of them in terms of the rectification of ideas. [Translator’s note. The letter states: “...I have noticed how one can fail in following one’s ideas, when they are false and chimerical. For here one cannot rely on whether they are agreeable or disagreeable, because chimerical and impossible ideas involve contradictions, and they can be both agreeable and disagreeable at the same time. This shows that it was necessary to provide a proper mark to distinguish true ideas from false ones, which is what I did in the “Meditations” referred to above, following what I had learned from the geometers. Here is how I explained it: the mark of a true and real idea is when one can demonstrate its possibility, either a priori by providing its prerequisites, or a posteriori through experience, for what actually exists cannot fail to be possible. Thus, those who rely on their ideas without being able to verify them through reason or experience are much like Enthusiasts who do not listen to reason because they rely on their visions. Assuming therefore this rectification of ideas, I believe that for the rest M. de Worcester and M. Lock could agree with each other and with me regarding the way to use them.” (1887, 257-8)]

⁶³ Intuitive knowledge is rare.

⁶⁴ Just as a relative falsehood is a truth in its own way, the unnoticed [*l’ina-perçu*] is a perception in its own way. Thus, the entire scale of Leibniz’s *Meditations* rests on the noticed-unnoticed [*aperçu-ina-perçu*] distinction. If an obscure notion, for example, is a memory [*souvenir*], then the unnoticed is lower than the obscure, as if forgotten

pure manifestation. In this way, Leibniz saves ‘the appearances’—raw experiences, picturesque sensations, the art of the unexpected, and the vagueness of critique—all of which are clear without being distinct, that is, true within their own category. Here, we rediscover the ideal of integration and openness, particularly expressed by those who sought to ground their philosophy in empirical evidence, in direct observation, or in historical accounts gathered from first-hand testimonies: Locke, Bayle, and Toland. Even the most radical views of these thinkers are justified, provided they index their truths,⁶⁵ situating each within its own region and time, under a given point of view. All these thinkers, including those who simply recount gossip, have essentially built a Leibnizian system of their own.⁶⁶ But saving ‘the appearances’ is not only achieved through a genetic progression of norms, a continuous approximation of truth, or variations in the source of light (which, all of a sudden, will occupy a position that does not cast a shadow); it is not only achieved through the *stabilization of a particular norm at a level*⁶⁷ *where it extracts all possible truth from its prior or current falsehood*; but it is also *explained* by a shift towards the knowing subject.

It has often been seen as paradoxical that Leibniz concludes his *Meditations* with an explanation of sensory knowledge. There is nothing strange about that: he simply completes his demonstration by referring it back to the subject. Within a genetic classification, sensations are still reduced to their constitutive elements, this can be attributed once again to the crudeness of the filters: not the filters I apply to external objects, but those that comprise my very own being. Green, for instance, is a mixture of “yellow and blue particles that have blend together.” This mixture is infinitesimal: I would need an infinitely small mesh filter to separate the yellow from the blue. But sensation is precisely that filter: it consists of the perceptions of minute movements and microscopic particles, which I integrate into my apperception when I see something green. Therefore, my mind, “in its present state”—a splendid admission that the *Aufklärung*⁶⁸ would not disavow—“is not sufficient to consider distinctly” the elements of the composition one by one. The limitations of sensory perception within the region of ‘the clear,’ and our inability to progress toward ‘the distinct,’ is simply due to the imperfection of our mind, which is unable to conduct a distributive analysis of the infinitesimal filter of minute perceptions, itself perfectly adapted to the indistinct mixture of color particles, movements, shapes, and odors. *The a priori form of our sensibility is this network of infinitely minute meshes that correlates compositional differentials with perceptual differentials*, differentials that our understanding integrates without possessing a distributive comprehension of them.⁶⁹ The decisive step forward for the mind would be to be able to conceive of filters as good as that of our faculty of sensation. Thus, Leibniz’s *Meditations* concludes with a description of the best of all

⁶⁵ Kant’s remark that Hume awakened him from his dogmatic slumber has become famous. But this very fame prevents us from seeing that, among the great English empiricists, Hume was not the first to awaken Europe from its rationalist slumber. Leibniz’s work signifies that it was the first to feel the impact of empiricism: to use Kant’s phrase, Leibnizian philosophy is a rationalism *awakened* [*un rationalisme réveillé*], awakened by Locke, Bayle, Toland, and so on. The conventional commentaries have turned it into a sleeping dogmatism that saved itself from contradictions by arguing from dreams.

⁶⁶ Hence the essential complexity of the Leibnizian system: it not only tries to accommodate earlier actual (existing) systems by indexing them, but it also tries to accommodate all possible systems, each within its own region.

⁶⁷ Indeed, it is interesting to note that each norm (each criterion, each marker) remains stable within its region. This means that there are truths specific to each region, but that the genetic process itself causes the norms to vary according to a law.

⁶⁸ No doubt this admission contains some allusion to van Leeuwenhoek’s microscope.

⁶⁹ An integration is precisely a summation that does not recognize all its elements one by one.

possible filters,⁷⁰ compared to which the previous ones are less unified. The notion of harmony between body and soul will further clarify this issue.

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⁷⁰ This is the height of anti-Cartesianism: for Descartes, the body generates error; for Leibniz, in contrast, sensation is the perfectly faithful filter.