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### The Ordering of Knowledge in Early Modern Europe Leibniz and the *Encyclopédie*

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#### ABSTRACT

My paper discusses a certain worry that was apparent among European intellectuals in the 17th and 18th century, a worry that sounds all too familiar in the age of internet, namely, that with the progress of knowledge, there are simply too many books. I will focus on the idea of encyclopedias being a possible remedy for this. In various texts from this era, an encyclopedia is portrayed as a compact library, a book of all books that almost makes other books redundant. But for such a project to succeed, for an encyclopedia to be useful and readable, it must not only summarize the achievements of the sciences, but even more importantly, it must organize its content well. This had proven to be by far the greatest challenge for those who dared undertaking such a venture. Drawing the lines between disciplines and imagining a system of their divisions and subdivisions is an arbitrary affair. In fact, it can be claimed that the early modern period had produced as many classifications of knowledge as there were reformers who conceived them. My paper focuses on describing two strategies of the early modern encyclopedias (or plans for them) to keep a sense of unity in this multitude: the one by Diderot and d’Alembert in their *Encyclopédie* and the one envisioned by Leibniz. I argue that Leibniz’s plan, although overly ambitious and therefore never executed, provided some truly novel tools, such as an comprehensive use of an index, that surpassed the organizational structure of the later French work in its organizing potential.

KEYWORDS: Early modern philosophy, Diderot, d’Alembert, Leibniz, encyclopedias, unity of sciences

#### **I. The information overload and the encyclopedia**

It has been well documented, especially by scholars writing on the early modern period, that the so-called information overload is nothing peculiar to our digital age.<sup>1</sup> Yet the philosophers of the 17<sup>th</sup> and 18<sup>th</sup> centuries had wholly different standards for the form in which knowledge should be presented in order to avoid a sense of unmanageability. Not only is it necessary, as they thought, that anybody be able to find quickly a piece of information, a description of a phenomenon, a definition, or an evidence, but also should these units of knowledge be presented in a way that reveals their placement in the general scheme of human *scientia*. Thinkers like Bacon, Descartes, Locke, Leibniz, and Diderot saw the abundance of books, experiments, descriptions, theories, calculations, reports, letters etc. as something that had become increasingly difficult to follow. But the reason for concern was not simply the volume of data, but rather the absence of an articulated framework, of a sort of map of knowledge these contributions would conform to. An endless accumulation of writing was principally a challenge of taxonomy. Assumed novelty and utility were often merely disguised repetition and futility, and even in the cases when important findings had been made, the fact that they were rarely presented as genuine *contributions* to the existing body of science annoyed Leibniz to the point where he feared that mankind would fall back into barbarism. One can sense a mixture of panic and resignation in the following laments:

However, we are not aware of our wealth, like a trader without bookkeeping or a library without an index. In the form we actually operate, we may perhaps be useful for our remote descendants, but we will not benefit from the fruit of our work. We endlessly dispute, we endlessly accumulate, we seldom reach a demonstration of anything or its consignment to a repertoire – in short, we hardly make use of our studies. If we go on like this, it is to be feared that an irremediable damage be caused, and barbarian times will return due to the tediousness of scholarship, in view of the fact that the huge multitude of objects and books destroys all hope for pleasure and hides solid and useful knowledge under a mass of useless things.<sup>2</sup>

Diderot went even further in his article “Encyclopédie,” saying that because books constantly multiply without order or measure, “one can predict a time when it will be almost as difficult to learn something from books as from the universe itself.”<sup>3</sup>

The idea of a carefully compiled encyclopedia, which could provide a solution for the incessant torrent of books by rendering the majority of them redundant, is suggested by a number of very similar statements in the introductions to many such works of the

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<sup>1</sup> See, for example, *Journal of the History of Ideas* 1 (2003). This special issue is dedicated to the problem in the early modern period.

<sup>2</sup> Gottfried Wilhelm Leibniz, “Project of a New Encyclopedia to be written following the method of invention,” in *The Art of Controversies*, ed. and trans. Marcelo Dascal (Dordrecht: Springer, 2006), 130. See also his “Precepts for Advancing the Sciences and Arts,” in *Leibniz. Selections*, ed. and trans. Philip Wiener (New York: Scribner’s, 1951), 29f.

<sup>3</sup> Denis Diderot, “Encyclopédie,” in *Encyclopédie, ou Dictionnaire raisonné des arts et des métiers*, 17 vols., ed. Denis Diderot and Jean le Rond d’Alembert (Paris: Le Breton [et al.], 1651-1665), vol. 5, 644A. Wherever the original source in French is quoted, the translation is my own.

seventeenth and eighteenth centuries. Ephraim Chambers, for instance, wrote in the Preface to his *Cyclopaedia* (1728):

[A] Work accomplished as it ought to be, on the Footing of this, would answer all the Purposes of a Library, except Parade and Incumbrance, and contribute more to the propagating of useful Knowledge through the Body of a People, than any, I had almost said all, the Books extant.<sup>4</sup>

By the time Diderot and d’Alembert had started the editorial work on the first volumes of the *Encyclopédie*, the idea of a complete catalogue of human knowledge had lost some of its boldness, yet the plan of making their encyclopedia a substitution for a library remained. Diderot was convinced that »for a sophisticated man [*un homme du monde*], this work could replace a library in all fields of knowledge; and for a professional scholar, in all fields but his own.«<sup>5</sup> One can find a similar ambition even in Bayle’s *Dictionnaire historique et critique*, which is, of course, far from an encyclopedia in the proper sense: “I considered that a work such as this should replace a library to a great many people.”<sup>6</sup> So, if the encyclopedia was supposed to become the book of all books, then the bulk of treatises, ideas, documents, and experiment reports had to be reread, reviewed and classified; duplications had to be omitted, mistakes corrected, in a word, the whole literary production of mankind had to be ruthlessly edited, so that it would not take up more than a very limited number of volumes.

I shall outline the main features of two great endeavours of this period, the *Encyclopédie* of Diderot and d’Alembert (probably the most important work of the Enlightenment), and Leibniz’s idea of a demonstrative encyclopedia, of which only a series of outlines were made. The two projects have a lot in common. Leibniz is perhaps one of the first reformers of science to understand that a project of the complete catalogue of knowledge, rationally organized, could not possibly be a one-man affair. He can perhaps be viewed as a predecessor of the *Encyclopédie* in that – unlike some of the authors of comparable works in the 17<sup>th</sup> and 18<sup>th</sup> centuries, like Johann Alsted, John Comenius or Chambers – he saw cooperation of professionals as the only way to carry through such an enterprise. Another element shared by both endeavours is the recognition of the fact that the catalogue of human knowledge would not be complete without the description of various arts and trades, manual skills, manufacturing processes, but also children’s games and other matters of life quite unconnected to what had traditionally been counted among things worthy of scholars’ attention. Leibniz was aware before Diderot that there exists a whole world of practical knowledge that had never been properly described. It is evident, then, that the idea of the encyclopedia shared by Leibniz and the two editors of the *Encyclopédie* went even beyond the editing of the written knowledge, as it was designed to publish the reports about human

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<sup>4</sup> Ephraim Chambers, *Cyclopaedia, or, An universal dictionary of arts and sciences*, 2 vols. (London: 1728), vol. 1, ii.

<sup>5</sup> Diderot, “Prospectus,” in *Oeuvres complètes*, ed. Hans Dieckmann, Jacques Proust and Jean Varloot (Paris: Hermann, 1975-), vol. 5, 104.

<sup>6</sup> Pierre Bayle, *Dictionnaire historique et critique*, 4 vols. (Amsterdam, Leiden, Haag and Utrecht: 1740), vol. 1, v.

activities that were not new, but had until then remained undocumented or private. In both cases was the principal benefit of an encyclopedia found in public access to knowledge, which was obstructed by the disorder of books in the case of sciences and by their deficiency in the case of the arts and trades. In short, written but unorganized knowledge and unwritten knowledge were considered equally useless.

It might be said that although Diderot and d'Alembert admired Leibniz's encyclopedic attempts, as far as they were acquainted with them, they managed to complete their project precisely for the fact that they had abandoned the system of unprecedented complexity that Leibniz's plan seemed to presuppose. I will try to show how Leibniz's ideals about an encyclopedic work can be understood as a critique of all traditionally organized encyclopaedias, including – anachronistically – the one of Diderot and d'Alembert. For this reason I will start with the historically later French work.

## II. The *Encyclopédie*

The *Encyclopédie*, published by d'Alembert and Diderot continually from 1751 to 1772, was an enormous project: seventeen volumes of textual entries (accompanied by eleven volumes of plates) contain almost seventy-three thousand articles and sub-articles written by more than hundred and forty contributors. The very idea of creating a complete catalogue of human knowledge in sciences, arts and crafts, must have appeared to the general editors as facing the impossible. But the *Encyclopédie* was meant to be much more than that and this is where the problem begins: is it possible to collect such an immense body of knowledge in one place but at the same time to connect its particular parts (entries or articles) into some form of a system? What would it take to devise an adequate system, one that would represent the structure of both the intellectual and natural world?

Both editors put a lot of effort in this so-called encyclopedic order. The alphabetical ordering of the articles, however useful it may be, was perceived by them as baring a significant inconvenience, namely, that the interconnections of individual parts of knowledge, represented here as explanations in the form of articles, became radically fragmented and scattered throughout the volumes of the work. As they believed, a particular science or an art is constituted by a chain of explanations starting with its principal terms and proceeding to its more relative, subordinate terms, or terms that cannot be understood without knowledge of the former. The alphabetical ordering, while necessary, does not reflect this systematic unity. In an attempt to remind the readers of the essential integrity of the work, the editors had chosen a title, which underlined its double structure: *Encyclopedia, or, a Reasoned Dictionary of the Sciences, Arts and Trades*. 'Encyclopedia' and 'Dictionary' are not synonyms, or, as d'Alembert puts it in the beginning of the *Preliminary Discourse*, "[a]s a *Reasoned Dictionary of the Sciences, Arts, and Trades*, it is to contain the general principles that form the basis of each science and each art, liberal or mechanical, and the most essential facts that make up the body and substance of each." As an Encyclopedia, on the other

hand, “it is to set forth as well as possible the order and connection of the parts of human knowledge.”<sup>7</sup> Or as Diderot notes in the etymological reminder in the *Prospectus* (a text announcing the *Encyclopédie* one year prior to the publication of its first volume), the word ‘encyclopaedia’ means *l’enchaînement*, the linking of knowledge into a circle of sciences.<sup>8</sup>

What, then, does this encyclopaedic ordering, designed to transform the contents of the alphabetical dictionary into a connected whole, consist in? In general, it can be said to have two basic elements. The first is the so-called  *système figuré*, a systematic chart, or a classificatory tree of sciences, arts, and trades, which the editors based on Bacon’s classification in the *Advancement of learning*. This chart, which is a part of the *Preliminary discourse*, divides all human knowledge according to the three principal faculties of the soul, namely *memory*, *reason*, and *imagination*, to which three main branches of human activity correspond – history, philosophy, and art. These are then subdivided further according to subject matters, for example, philosophy is ruled by a general science of metaphysics, or science of being, and has three parts, science of God (theology), science of man, and science of nature. Science of nature, generally defined by particular metaphysics of bodies (or general physics), is divided into mathematical and physical sciences, the mathematical are pure and mixed, etc. Or, to take an example from a different branch: history is sacred, civil, or natural; natural history, for instance, deals with either uniformity of nature (history of the universe, heavenly bodies), its irregularities (monsters, natural marvels and nature’s special effects), and the different usages of nature (crafts, manufactures). The latter are then subdivided into special activities according to the type of material they use, etc. Every article head then also contains the name of the science, or an art, to which the entry belongs, so that the reader can quickly consult this systematic chart and thus know to which part of the tree of sciences an article relates.

Diderot and d’Alembert were aware of the arbitrariness of all such taxonomies. Every division takes specific criteria into account and classifies everything in accordance with them. Every systematic chart bold enough to include the totality of human endeavours inevitably adopts a certain point of view, from which it describes and thus excludes other points of view. In a famous and probably most quoted passage of the *Preliminary Discourse*, d’Alembert compares the editor’s work to cartography:

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<sup>7</sup> Jean le Rond d’Alembert, *Preliminary Discourse to the Encyclopedia of Diderot*, trans. Richard N. Schwab (Chicago: University of Chicago Press, 1995), 4.

<sup>8</sup> See Diderot, “Prospectus,” 85. However, though it is precisely this network of connections between articles that makes such a work an encyclopaedia as opposed to a mere dictionary, the philosophical idea of such a system became somewhat less ambitious in the 18th century. As great as the aspirations of both editors might have been, d’Alembert is clear in the *Preliminary Discourse* that the era of philosophical systems is definitely past (inspired by Condillac’s critique of the overly ambitious and all-embracing rationalist systems from Descartes to Leibniz in *Traité de systèmes*). I think that the spirit of the French Enlightenment in the time of forming the *Encyclopédie* is best depicted by what d’Alembert calls *l’esprit systématique* as opposed to *l’esprit de système*. The latter, ‘spirit of system,’ criticised by Condillac, i.e. an autonomous creation of a Cartesian subject of knowledge, where metaphysical foundations in a way determine all future possible experience, is replaced by the ‘systematic spirit,’ a rational and patient experimental method, a classifying impulse that makes no final claims about the totality of what it

[The encyclopedic arrangement of our knowledge] consists of collecting knowledge into the smallest area possible and of placing the philosopher at a vantage point, so to speak, high above this vast labyrinth, whence he can perceive the principal sciences and the arts simultaneously. From there he can [...] discern the general branches of human knowledge, the points that separate or unite them; and sometimes he can even glimpse the secrets that relate them to one another. It is a kind of world map [*mappemonde*], which is to show the principal countries, their position and their mutual dependence, the road that leads directly from one to the other. This road is often cut by a thousand obstacles, which are known in each country only to the inhabitants or to travellers, and which cannot be represented except in individual, highly detailed maps. These individual maps will be the different articles of the *Encyclopedia* and the Tree or Systematic Chart will be its world map.<sup>9</sup>

The form of the encyclopaedic tree of sciences therefore necessarily depends on the chosen viewpoint of the philosopher-cartographer. No point of view is a priori privileged, and thus one can create as many different systems of human knowledge as there are *mappemondes* drawn from different viewpoints. But even if we drop the illusion of the single right order, the question still remains, what the criteria of *the best* encyclopaedic order are. For d'Alembert, since *l'enchaînement* of sciences is the goal of the *Encyclopédie*, “of all the encyclopedic trees the one that offered the largest number of connections and relationships among the sciences would doubtless deserve preference.”<sup>10</sup>

As we can see, Diderot and d'Alembert were struggling with their classification because it involved an important decision, which cannot be easily revoked. As d'Alembert admits, one could choose to distribute knowledge according to entirely different sets of categories, like “natural and revealed knowledge, or useful and pleasing knowledge, or speculative and practical knowledge, or evident, certain, probable, and sensitive knowledge, or knowledge of things and knowledge of signs, and so on into infinity.”<sup>11</sup> The division by subject matters is thus a compromise, which must be amended using a second, complementing layer of classification, so that the encyclopedic order would better express the logical connections of ideas.

In the article “Encyclopédie” (published in the fifth volume in 1755), Diderot defends cross-references as the most important part of the encyclopedic order. There are two types of cross-references: the ones that have a more technical use (*les renvois des mots*), because they link particular terms in an entry with another entry, where this very term is explained. These are intended to avoid duplicating definitions. But the second type of cross-references (*les renvois des choses*) is more important because they provide links between different articles that are not in direct affiliation in the encyclopedic classificatory tree.<sup>12</sup> If we consult the article “Analogy,” for instance, we find that it is a term in logic and grammar, which in turn reveals the place of the article in the systematic chart. But analogy is something pertaining to a much wider use than only these two branches, and so when the explanation touches the topic of reasoning from

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investigates. See d'Alembert, *Preliminary Discourse*, 22f.

<sup>9</sup> D'Alembert, *Preliminary Discourse*, 47.

<sup>10</sup> *Ibid.*, 48.

<sup>11</sup> *Ibid.*, 49.

analogy (for example, from similar visible qualities of two objects to the similarity of their internal invisible qualities), one may follow a cross-reference “Knowledge” (*Connaissance*), consult the article by that name and find there the topic discussed more thoroughly. It enables the reader to easily jump from one article to another, and, more importantly, to introduce a whole new layer of connections between parts of knowledge that are not present in the systematic chart. The general classification knows only the relations of subordination of sciences while cross-references also introduced the logical relations and resemblances between parts of knowledge very far apart in the classificatory tree. Also, cross-references mitigated or counter-balanced the effect of arbitrariness necessarily involved in the systematic chart because by adding a whole new network of links between articles the editors had actually included a series of alternative classifications and had thereby multiplied the points of view from which human knowledge could be observed.

While it is hard to underestimate the importance of the *Encyclopédie* for the philosophical and social project of Enlightenment, one should not forget that Diderot and d’Alembert were also the pioneers of editorship in the history of encyclopedic publishing. If it seems natural to a modern reader to find the articles in this type of reference work organized alphabetically and cross-referenced, it must be said that for the editors of the *Encyclopédie* such practices called for some apologetics. Leibniz, on the other hand, envisioned an encyclopedia radically different from the principles adopted in the *Encyclopédie* and from the ones we have come to expect a modern encyclopedia should exemplify.

### **III. Leibniz’s demonstrative encyclopedia**

The main objection Leibniz would have addressed to the French editors probably would have been that to base the encyclopedic order on anything like the *système figuré*, that is, on arbitrary lines between subject matters that constitute different sciences and arts, is essentially missing the point that there is a fundamental unity underlying all knowledge. No additional arrangement of cross-references can restore this unity after the original divisions have been made. The principal method of presenting knowledge should always be the way in which it is internally structured, that is, either discovered or demonstrated. It is the laws of logic, and not an extrinsic taxonomy of human activities, that govern Leibniz’s encyclopedia.

This, in fact, may be the most important idea Leibniz shared with Descartes. As we shall see, the borders separating the disciplines are not only arbitrary for Leibniz, but even unnecessary altogether since science is but one. As Descartes says in the opening sections of the *Rules for the Direction of the Mind*, there is only one wisdom and one science and it is unreasonable for a philosopher to pursue truth in the way artisans work, namely, by dedicating themselves to only one skill. While the rules of every art might

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<sup>12</sup> See Diderot, “Encyclopédie,” 642A.

differ, the laws of reason are always the same regardless of what they are applied to.<sup>13</sup> In fact, knowledge is constituted by the very fact that all of its parts are logically connected. It is in this sense that Leibniz's encyclopedia manifests its demonstrative character. Not only was it supposed to refer to or describe demonstrations carried out elsewhere, but also encyclopedia itself was intended to become a book of demonstrations.

As we know, Leibniz never got to carry out his encyclopedia. What we have from him are countless notes, letters and sketches that only give us a very general idea, although an original one, of how the whole project would have been constructed. That is not to say that it was on the periphery of his interests. Quite on the contrary, he was very much engaged in trying to define the project from as early as 1660's when he conceived of an ordered bibliographic review of literature on the matters of jurisprudence.

Leibniz plan revolves around a cluster of ideas in his logic that he had been developing throughout his life. It is tightly connected to his universal characteristic, a new kind of ideal scientific language based on a notation not unlike that of algebra, and to the idea of general science of synthesis and analysis, which he considered the core of all logic. What this general science consists of, in short, is a method of analysis of any truth into simpler ones by way of definitions, which makes possible the subsequent synthesis of simple truths into complex ones by what Leibniz had called 'the art of combinations' in his *Dissertatione de arte combinatoria* (1666). Because for Leibniz a demonstration of a typical proposition containing a subject and a predicate contains definitions of both terms, which might then be analysable further into simpler truths, it is possible, at least for the knowledge which is attainable *a priori*, to arrive at the first and most simple truths or pure indefinable identities or tautologies. For Leibniz, as for Locke, a true definition of a thing is not a simple affair of finding the *genus proximum* and *differentia specifica*, but rather a complete list of predicates of the subject, organized hierarchically according to their order of dependencies, so that the gradual composition of simpler truths into more complex ones gives us a complete explanation and a demonstration of the proposition we are researching.<sup>14</sup> That alone is one of the principle ideas of Leibniz, but it is nothing new as a very similar view of the method of discovery, albeit much less developed, can also be found in Descartes' *Rules*. But Leibniz had taken this approach much further in that he imagined that we would, if we could analyse all truths using this method, arrive at what he called 'an alphabet of human thoughts,'<sup>15</sup> that is, an inventory of simple truths every fact about the world is composed of, not unlike words are composed of the letters of the alphabet. As we shall see, these simple thoughts were to become the main building blocks of his encyclopedia so that its principal part would put forward a catalogue of human thoughts, rationally organized according to their logical successions.

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<sup>13</sup> See René Descartes, "Rules for the Directions of the Mind," in *The Philosophical Writings of Descartes*, 3 vols., trans. John Cottingham, Robert Stoothoff, Dugald Murdoch [and Anthony Kenny] (Cambridge: Cambridge University Press, 1985-1991), vol. 1, 9.

<sup>14</sup> See, for example, Leibniz, "On Wisdom," in *Leibniz: Selections*, ed. and trans. Philip Wiener, 78-80.

<sup>15</sup> See Leibniz, "Characteristic Numbers for a Universal Language," in *The Art of Controversies*, 122.



Besides the principle of sufficient reason, Leibniz's logic contains another famous idea tightly connected with it, namely, the claim that the predicate is not something attributed to the subject from without, but that it is always *in* the subject, which means that for a true proposition about anything, the predicates attributed to that thing add up to its complete concept – they are a part of its definition. The reason this principle was important for Leibniz's encyclopedic project is that it enabled him to enlarge his general science of synthesis and analysis to all truths, even empirical ones, the ones that are not necessary but merely contingent. This »wonderful secret,«<sup>16</sup> as Leibniz called it, reveals that the only difference between necessary and contingent truth is that of the scope of their analyses. The decomposition into simpler elements in a complex contingent truth is infinite, it rests on an infinite number of conditions unachievable by human finite intellect, but that is not to say that they are any less necessary to the One that *can* execute the infinite decomposition of truths, that is, to God. The alphabet of human thoughts is thus an ideal, which is not within reach of human mind in its entirety. We will never complete the analysis of the world and so it will be necessary, in the field of empirical knowledge, to work with concepts which are not entirely simple, but, as Leibniz puts it, are at least »not very far from being simple.«<sup>17</sup>

After his journey to Paris, probably around 1676,<sup>18</sup> Leibniz added another layer to his grand project: the universal characteristic. In one of the many shorter texts about this wonderful invention, Leibniz wrote:

If there were either a certain precise language (called Adamic by some authors) or at least a kind of truly philosophical writing, through which notions would be retraced to an alphabet of human thoughts, then all those things that can be reached by reason from the data would be discoverable by means of a sort of calculus – like problems in arithmetic or geometry are solved.<sup>19</sup>

Leibniz conceived of assigning a system of unique characters to our thoughts in such a way that the only possible combinations of characters would mirror the possible combinations of concepts represented by them. He was convinced that with such consistency, where language of written characters would be reduced to a calculus, false propositions could simply not be written as the implicit grammar of this language would not permit, for instance, the combination of 'square' and 'circle' into a new composed character. The term 'alphabet of human thoughts,' if we consider that it was to be equipped with actual written signs, was for Leibniz much more than a convenient metaphor. The demonstrations using this language would in fact be unambiguous just like the demonstrations of mathematical theorems. Leibniz had repeatedly imagined that

once this is performed, every *paralogism* will be nothing but a *calculation mistake* and every sophism expressed in this new kind of writing will in turn be nothing but a *solecism* or *barbarism*, easily refutable by this philosophical grammar's rules.

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<sup>16</sup> Leibniz, "First Truths," in *Philosophical Papers and Letters*, trans. Leroy E. Loemker (Dordrecht: Kluwer, 1989), 268.

<sup>17</sup> Leibniz, "On Wisdom," 80.

<sup>18</sup> See Louis Couturat, *La logique de Leibniz* (Paris: Félix Alcan, 1901), 126-7.

<sup>19</sup> Leibniz, untitled text in *The Art of Controversies*, 264.

Henceforth, whenever controversies arise, there will be no need of more disputation than what occurs between two philosophers or calculators. It will be sufficient to pick up their pens, sit down at the desks (abacus) and say to each other (eventually addressing each other friendly): *let us calculate*.<sup>20</sup>

Moreover, the characteristic signs attributed to our thoughts would significantly facilitate not only the demonstration of truths but also the art of discovery of new ones as particular characters would, by means of a simple notation, imply both the subordinate characters they could be analysed into and the possible characters representing thoughts they could compose. It is perhaps no surprise that Leibniz had come to the conclusion that numbers were the best candidates for such a language and he had worked out several attempts, which indicate how these characteristic numbers should be assigned to concepts that constitute our thoughts.<sup>21</sup> Again, the knowledge drawn from empirical observations and experiments is not exempted from this tool of logic, for while it is true that in this domain the simple truths are not completely within reach, Leibniz maintained that one could start with hypothetical numerical characters and work with them until more is known about the subject. Leibniz was confident that the characteristic would still permit knowledge of the merely probable to be demonstrative and deductive by way of testing hypotheses and conjectures. However, how this logic of probability would conform to the universal characteristic of the truths known *a priori* is not entirely clear from the numerous partial designs left to us by Leibniz.

The general science of analysis and synthesis together with the universal characteristic forms the central structure of Leibniz's encyclopedia and, as Couturat noted, there seems to be a central paradox in that the two presuppose one another.<sup>22</sup> An encyclopedia, as far as it is designed to be an inventory of human thoughts, can be rendered truly demonstrative only insofar as it is expressed in the language of the characteristic, but the characteristic, on the other hand, requires that the alphabet of human thoughts had already been completed, in other words, that human knowledge had already been analysed into simple thoughts as far as possible. The only viable procedure for Leibniz was that the two be developed together. Leibniz was convinced that with a team of experts the project could be completed in a few years and during his life he made several unsuccessful efforts to convince men of power and scientific societies, such as the Royal Society of London or the Académie des Sciences, to grant support for his project.

Of course, one would be excused to think that all this is not enough. After all, this general science is not an encyclopedia in any familiar sense of the word but rather a scientific method. Leibniz wrote several shorter texts containing details about what the encyclopedia should contain and his proposals differ according to how his idea developed over time. A few elements, though, are remarkably persistent:

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<sup>20</sup> *Ibid.*, 226.

<sup>21</sup> See, for example, Leibniz, "Samples of the Numerical Characteristic," in *Philosophical Essays*, trans. Daniel Garber and Roger Ariew (Indianapolis: Hackett, 1989), 10-14.

<sup>22</sup> See Couturat, *La logique de Leibniz*, 117.

The first is that an encyclopedia, in a large part, would still be a summary of all books, only that their contents would now be distributed according to the logical order. Every description, demonstration, proof or discovery would be given a proper place according to the logical order of general science. In this way – and this is probably the most striking feature of Leibniz’s project – the map of human achievements would become visible, as it would become immediately apparent what discoveries are yet to be made and what gaps are to be filled, which proofs can be deduced on the basis of what observations and nobody would waste their efforts with research and experiments that have already been made.<sup>23</sup> In a sense, the encyclopedia would become not only a catalogue of knowledge but also a true platform of scientific progress since new achievements would not need to be published separately as treatises, but rather as amendments to the encyclopedia.

Further, an encyclopedia would include an Universal Atlas of tables, charts, figures, maps, diagrams, genealogical trees, lists, etc., in short, an enormous non textual reference book covering everything from the arts and geography to mathematics and history.<sup>24</sup>

Finally, and perhaps most importantly, Leibniz was well aware of the importance of an index. Unfortunately, like in the case of so many other elements of his encyclopedia, Leibniz said very little about how this index was to be carried out in the physical volumes of his encyclopedia, but it is clear from the final chapter the *New Essays on Human Understanding* that he considered an index to be the main tool of orientation. While it is true that he is far from being an originator of the index as we know it today as these had appeared in printed reference works soon after Gutenberg, there is nevertheless a distinctive and original feature in Leibniz’s application of it in that he seems to imply that a well composed index is something that can substitute hierarchical classifications of sciences altogether. The critique of Locke’s division of sciences in the *New Essays* can be read against any classifying impulse that ends up drawing a genealogical or hierarchical tree of sciences and arts, including the one of Diderot’s and d’Alembert’s kind.

In the final chapter of his *Essay*, Locke adopts the traditional threefold division of sciences into physics or natural philosophy, ethics or practical philosophy, and logic or the doctrine of signs that had been suggested by the Stoics. Locke maintained that these were »the three great provinces of the intellectual world, wholly separate and distinct one from another«<sup>25</sup> and it is these concluding words of the whole *Essay* that Leibniz could not agree with. For him, these »great provinces of the encyclopedia«<sup>26</sup> (although Locke does not mention an encyclopedia at all, it is clear that Leibniz saw Locke’s division as a possible distribution of topics in one) are destined to be in »a continuous

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<sup>23</sup> See Leibniz, “Recommandation pour instituer la science générale,” in *Sämtliche Schriften und Briefe*, VI, 4, ed. Hans Schepers *et al.* (Berlin: Akademie Verlag, 1999), 694ff. See also Couturat, *La logique de Leibniz*, 150-1.

<sup>24</sup> See Leibniz, “Atlas Universalis,” in *Sämtliche Schriften und Briefe*, VI, 4, 86-90.

<sup>25</sup> John Locke, *An Essay Concerning Human Understanding*, ed. Peter H. Niddich (Oxford: Clarendon Press, 1975), IV.xxi, §5.

<sup>26</sup> Leibniz, *New Essays on Human Understanding*, trans. Peter Remnant and Jonathan Bennett (Cambridge: Cambridge University Press, 1997), IV.xxi, §4.

war«<sup>27</sup> because each of these disciplines can accommodate the other two. Minds or spirits, for instance, can be treated in natural philosophy insofar as they are substances, in practical philosophy insofar as they are the subjects of good and evil, and in logic, since it prescribes the laws of thinking. Any topic can be discussed as a part of practical philosophy if it contributes to human happiness. And logic or the doctrine of signs, of which language is a part, is once again a doctrine that can accommodate anything whatsoever as far as it is expressed through various forms of communication. Divisions of sciences are thus for Leibniz not real partitions, but rather wholly arbitrary points of view of the whole. All traditional tree-like divisions are subject to one principal shortcoming, namely, that any subject never belongs only to a single category, a problem librarians are well aware of, as they often have difficulties finding a place for a book, which could be put into two or three equally relevant places.<sup>28</sup>

For Leibniz, as for Diderot and d'Alembert, the problem of division of sciences was not only theoretical but also practical as it was necessary to arrange the contents of the encyclopedia in a particular way. The solution Leibniz proposed was not so different from Locke, but he did reinterpret the scheme in a novel way to conform to his idea of general science: physics, being in Leibniz's view a deductive science, follows a synthetic (or theoretical) method of ordering truths »according to their origins«; practical philosophy or ethics, on the other hand, orders truths in an analytical way »according to their usage«, starting from the aims of man (his happiness) it analyses phenomena and seeks their causes.<sup>29</sup> The theoretical and the practical, which correspond to physics and ethics of the Stoics and Locke, are thus not two distinct disciplines, but rather »different arrangements of the same truths«.<sup>30</sup> The third disposition that needs to be added into this picture is logic or the doctrine of signs, that is, the disposition according to the terms of language and its sole purpose is to provide a repertoire of all the terms used in the first two arrangements. And that is precisely what an index is to Leibniz: a systematic and an alphabetical list of predicaments any concept can be combined with, which is designed to »find together all the propositions into which the term enters in a sufficiently remarkable manner«.<sup>31</sup> The index is a tool, which enables the reader to educate himself about a particular topic, regardless whether it is treated from the point of view of theoretical or practical philosophy.

#### IV. Conclusion

Thus we have at least two reasons to abandon the *systeme figuré* in a Leibnizian approach: the first is that because the truths of human knowledge exhibit a fundamental unity of their logical structure, the borders between different fields of knowledge based on subject matters are but arbitrary and have, so to speak, no ontological value; and the

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<sup>27</sup> *Ibid.*

<sup>28</sup> *Ibid.*

<sup>29</sup> *Ibid.*

<sup>30</sup> *Ibid.*

<sup>31</sup> *Ibid.*

second, that with a good index, the tree-like structure becomes redundant in that it provides us with an alternative and much better method of finding truths. While Diderot and D'Alembert acknowledged the arbitrariness of their taxonomy but had nevertheless kept it for practical reasons of orientation, Leibniz, with his experience with library catalogues and alphabetical indices,<sup>32</sup> imagined a much more powerful organizing tool, a sort of universal inventory of categories and ideas with their possible combinations. As has been pointed out by Robert McRae, it seems that while in the *Encyclopédie* the classification of sciences and arts by subject-matters of the *système figuré* is primary but its arbitrariness and rigidity has to be amended with a complex network of logical cross-references, in Leibniz's encyclopedia the logical arrangement of truths based on synthesis and analysis is everything, and the index is introduced only to facilitate searching by topics.<sup>33</sup>

Any hierarchical system of knowledge which takes types of objects rather than the alphabet of human thoughts as its fundamental elements suffers from a critical flaw according to Leibniz, namely that it ends up fragmenting the unity of knowledge according to arbitrary instead of logical, or rather, contingent instead of necessary criteria. An encyclopedia of which the contents are arranged around the boundaries of particular sciences, regardless whether they be organized by topics (as in the case of the *Natural History* of Pliny the Elder and the *Etymologies* of Isidore of Seville) or alphabetically (as in Chambers' *Cyclopaedia* and the *Encyclopédie*), fails to represent the world we live in completely, as it doesn't make the logical structure of knowledge its primary principle of organization.

Leibniz's idea of an index as a primary searching tool that enables to keep the logical unity of knowledge intact thus makes all metaphors of 'fields of knowledge,' 'trees of sciences' and '*mappemondes*' misleading at best, since it is not the contents of the encyclopedia that need to be distributed into various branches, provinces and categories but rather it is that each unit of the contents is to be equipped with a series of categories, keywords or tags. And this, I claim, is the true shift of the perspective: it enables orientation without parcelling as things do not dwell *inside* categories anymore, each thing restricted to only one of them, but rather is each thing attributed with a number of common descriptors that compose an index. In short, it is not things that are distributed into categories but rather are categories assigned to things. That is perhaps the Aristotelian side of Leibniz and although he never advanced his work on the encyclopedia beyond plans, it seems that the strategies for coping with information overload in our digital age favour the Leibnizian approach rather than the later model of the *Encyclopédie*.

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<sup>32</sup> Not only should an encyclopedia be a rational organization of the thoughts contained in a whole library according to Leibniz, but also should libraries themselves be arranged in an encyclopedic way. Indices and catalogues, if done properly, allow for easy orientation in any system, regardless whether the basic units are ideas or books. See "Leibniz au duc Jean Frédéric" [1679?], in *Die Werke von Leibniz (erste Reihe)*, edited by Onno Klopp, 11 vols. (Hannover: Klindworth, 1864-1884), vol. 4 (1865), 426.

<sup>33</sup> See Robert McRae, *The Problem of the Unity of Sciences: Bacon to Kant* (Toronto: University of Toronto Press, 1961), 8-9.