G. W. LEIBNIZ'S PHILOSOPHY AND PRACTICAL PROJECTS

Licentiate thesis

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6. THE UNIVERSAL LANGUAGE

We have already seen how Leibniz's logic is an important part of his metaphysics and ethics. His logical ideas have an important practical dimension in his thought - the universal language. The universal language was one of Leibniz's most important philosophical ideas, which can be seen in almost all of his practical plans. According to him, progress in every branch of rational knowledge (including philosophy) is linked to the development of suitable signs or characters.[1] He had in mind a system, which would not only mirror the mind adequately, but function as an instrument of reason.[2] The language that Leibniz outlined is an idiographic system of signs that can be manipulated to produce logical deductions without recourse to natural language.

Leibniz never produced a detailed scheme of his universal language (or languages, because he produced several different versions of the characteristica universalis). He probably intended it to be a script in which the non-formal notions would be represented by signs other than words. Sometimes he says that it would be like algebra, and sometimes that it would be an improved version of the Chinese idiographic system.[3] His system went through many stages and never finished, but the nature of ideography was maintained except a short period of experiments with Latin.

This instrument of reason would be a method by which thinking and reasoning can happen mechanically, without any relation to the content of the subject in question (calculus). As G. H. von Wright says, "The concept of calculus can be conceived as a game of signs and from this it follows that the idea of a calculus is basically the same idea than that of a

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[1]The scope of characters is very wide : "Words, letters, chemical, astronomical, and chinese figures; hieroglyphs; musical, cryptographic, mathematical, algebric notations; and all other symbols which in our thoughts we use for signified things. When the signs are written, drawn, or carved, they are called characters."
"Signorum igitur numero comprehendo vocabula, literas, figuras chemicas, astronomicas, algebraicas aliasque omnes quibus inter cogitandum pro rebus utimur. Signa autem scripta, vel delineata vel scupta characteres appellantur."
(G VII, p. 204). Cited in Rutherford, *Philosophy and Language in Leibniz* (In : *Cambridge Companion to Leibniz*, ed. Nicholas Jolley), p. 234.
[2]Couturat & Leau, *Histoire de la langue universelle*, p. 23.
[3]Kneale & Kneale, *The Development of Logic*, p. 328.

calculator."[1] No wonder that Leibniz constructed, along with Pascal, one of the first calculating machines. One could also add, that the idea of calculus is basically the same as in modern-day computers and computer-mediated telecommunications.[2]

One has to remember that the concept of universal language in modern-day discussion differs somewhat from the times of Leibniz. In the 20th century a distinction between universal language as such and universal language as calculus arose. Leibniz is a great pioneer in developing the notion of language as calculus. In the 20th century Gödel, Husserl and Hilbert developed this theory, but with Frege, Wittgenstein and Heidegger arose the notion of language as universal language. This notion states that there is no world outside of language whereas the supporters of language-as-calculus-theory thought language as a model, which act mostly as a logical device (the model theory).[3] In other words Leibniz, Gödel, Husserl and Hilbert thought that language is a means to find out more about the world and Frege and his followers thought that our language reflects the world and the limits of the language are also the limits of our world.

The universal language was not Leiniz's own idea. The roots of this concept lead to the first half of the 17th century and beyond. Many men of letters believed, that by understanding the language one could solve the various problems concerning the nature and the physical world. During the Renaissance it was fashionable to believe in some kind

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[1]Von Wright, *Logiikka, filosofia ja kieli*, p. 44.
[2]Leibniz invented the principle of binary presentation, by which every number can be presented as combinations of 0 and 1. This principle is the basis of computer languages. Cottingham, *The Rationalists*, p. 64; Heim, *The Metaphysics of Virtual Reality*, p. 93.
[3]Kusch & Hintikka, *Kieli ja maailma*, p. 143-169.

of long lost original language, which was used by Adam, among others[1]. This conception was made popular by Hugo Grotius. Johann Amos Comenius demanded a pansophic language (panglottia), which ought to be rational, precise, economical and harmonius.[2] Perhaps the most important influence on Leibniz was Raymond Lull's mnemonics. Leibniz's many combinatorial writings, *Dissertatio de arte combinatoria* especially, are full of traces to Lull. The philosopher thought Lull's undertakings to be too modest in scale - in *Dissertatio* Leibniz wondered why Lull had limited himself to a restricted number of elements.[3]

In the 17th century men began to search for the universal language, which would be compatible with nature. This idea was not new, either - one can trace the idea up until Plato (the *Republic* and the *Sofist*) and Aristotle (the *Metaphysics*).[4] The most famous authors of universal language before Leibniz in the 17th century were Joachim Becher, who in his work *Character pro notitia linguarum universali* (1661) tried to structure a language depending on various numeral systems and P. Athanase Kircher, whose *Polygraphia novi et universalis, ex combinatoria arte detecta* examines dictionaries of seven different languages and tries to find similar characteristics.[5]

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[1]Leibniz supported this view. His project for the universal language is a search for a single Ursprache, which he called (loaning the term from Jacob Boehme) lingua adamica. This conception included some other beliefs : the Genesis account of Adam's naming of the beasts is true, the adamic language was the first language, from which all other languages developed and that Adam's language is the language of nature. Traces of this language still existed in the languages (faithfully to his native country, he mentioned especially the German language) of his time and one has only to analyze them thoroughly. He never thought it possible to resurrect the Adamic language, but rather to create a contemporary language, which would act as the Adamic language. Michael Losonsky argues that the Adamic conception of language (especially in Boehme) contains a philosophy of mind also, where our language is an expression of our soul, but our soul itself contains internal, mental or spiritual words that themselves are expressions of God's mind.In other words some of the mind's ideas are innate, universal, natural, nonarbitrary, comprehensive, accurate and dynamic representations. One can also see this view in Leibniz. Losonsky, *Leibniz's Adamic Language of Thought* (Journal of the History of Philosophy 30 (4) 1992., p. 525-28;Walker, *Leibniz and language* (In : Gottfried Wilhelm Leibniz : Critical Assessments III, ed. R. S. Woolhouse), p. 441.

[2]Stillman, *The New Philosophy and Universal Languages in Seventeenth-Century England : Bacon, Hobbes and Wilkins*, p. 34.

[3]Eco, *The Search for the Perfect Language*, p. 65.

[4]Belaval, *Études Leibniziennes*, p. 382.

[5]Couturat, *La logique de Leibniz d'après des documents inédits*, p. 52.

Also Descartes trifled with the idea for a while, but he rejected the project as impossible. In his letter to Mersenne, 20.11. 1629, he wrote : "I think it is possible to invent such a language and to discover the science on which it depends...But do not hope ever to see such a language in use. For that the order of nature would had to change so that the world turned into a terrestial paradise; and that is too much to suggest outside of fairyland."[1] Leibniz commented the letter by noting that the universal langue does not depend upon the perfection of the analysis or the definitions of the most simple terms.[2] This theory of "blind thought" will be discussed later.

Other great planners of the universal language were Dalgarno and Wilkins, but Leibniz did not hold them in high regard because he thought that they had neglected the role of the universal characteristic as an "instrument of reason" in order to highlight its function as an effective medium for communication.[3]

Leibniz had nothing against better communication as such. Better communication among nations and individuals would also help spreading Christian faith. In a fragment *Initia et specimina scientiae generalis* Leibniz describes the possibilities to be gained from the universal language :

> "Where this language can once be introduced by missionaries, the true religion, which is in complete agreement with reason, will be established, and apostasy will no more be feared in the future than would an apostasy of men from the arithmetic or geometry which they have once learned. So I repeat what I have often said : that no man who is not a prophet or a prince can ever undertake anything of greater good to mankind or more fitting for the divine glory."[4]

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[1]Descartes, *Philosophical letters*, p. 6.
[2]Belaval, *Leibniz critique de Descartes*, p. 186.
[3]Couturat, La logique de Leibniz, p. 60.
[4]"Nam ubi semel a missionariis hael lingua introduci poterit, religio vera quae maxime rationi consentanea est, stabilita erit et non magis in posterum metuenda erit apostasia, quam ne homines. Arithmeticam aut geometriam, quam semel dedicere, mox damnent. Itaque repeto, quod saepe dixi, hominem qui neque propheta sit neque princeps, majus aliquid generis humani bono nec divinae gloriae accommodatius suscipere nunquam posse."
G VII, p. 188-89; L, p. 225.

Leibniz often compared his universal language to Ariadne's thread, which would lead one out of the labyrinth of opposite views and information.[1] This metaphor is also visible in the following fragment, in which Leibniz praises his invention to the Duke Johann Friedrich

> "My invention comprehends all the uses of reason..[it is] a judge of controversies, an interpreter of notions, a scale for probabilities, a compass to guide us through the ocean of experiences, an inventory of things, a table of thoughts, a microscope to inspect near things, a telescope to discover things far away, a general calculus, an innocent magic, a non-chimerical Cabbala, a language which one could learn in a few weeks."[2]

It is not certain whether Leibniz's method was supposed also to act as a medium for new inventions, but many of Leibniz's passages seem to hint that Leibniz thought his language would help in discovering new truths, act as a tool of scientific reasoning. His criticism towards the English collegues is also based on the fact that their plans for universal language are meant to operate on too small scale, merely to act as a medium between people.

Leibniz held two distinct methods of synthesis and analysis - the combinatorial which operates logical entities treated as terms and the Euclidean, which deals with propositions in the form of theorems and their analytic components - axioms, definitions, and simpler theorems. Leibniz never gave an account of the relation between these two models of method.

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[1]Kauppi, *Über die Leibnizsche Logik*, p. 25.

[2]"...mon invention contient l'usage de la raison tout entier, un juge des controverses, un interprete des notions, une balance pour les probabilités, une boussole qui nous guidera sur l'ocean des experiences, un inventaire des choses, un tableau des pensees, un microscope pour epluscher les choses presentes, un telescope pour deviner les eloignées, un calcul general, une magie innocente, une cabbale non-chimerique; une écriture que chacun lira dans sa alngue: et même une langue, qu'on pourra apprendre en peu de semaines, qui aura bien tout cours parmy le monde."
A I, 2, p. 168; Wilson, *Leibniz's Metaphysics*, p. 33. In addition to this, Leibniz promises to carry out this project far beyond the limits dreamed by Raymond Lull.

We will next present Leibniz's plans for universal language in details. One should remember, however, than Leibniz's plans were developed in parallel processes rather than in chronological order (although our presentation will follow roughly the chronological order). Following Umberto Eco,[1] the projects can be divided to four classes : 1) the identification of a system of primitives, organized in an alphabet of thought or in a general encyclopedia. This would mean the classification of all things in order to find the most simple terms 2) the elaboration of an ideal grammar, of which the simplified Latin, which will be presented shortly, is one example 3) the formulation of a series of rules governing the possible pronunciation of the characters 4) the elaboration of a lexicon of real characters upon which the speaker might perform calculations that would automatically lead formulation of true proposition (by replacing the "undefined terms" with symbols or numbers). This would enable one to calculate the right alternative if several possible solutions were available. In the end, however, the last project was the only one left and Leibniz gathered all his powers to realize the "thought-calcul".

6. 1. Let Us Calculate!

Leibniz submitted his dissertation De arte combinatoria (Of General Theory of Arrangements) to the University of Leipzig.[2] In the dissertation he analyses the individual sciences and tries to combine them to wholes by using the method of analysis and synthesis. This was not a novel idea, but it seems likely that Leibniz did not know about the former undertakings by Tartaglia, Buteo, Cardani and Pascal.[3] Leibniz thought that all the concepts are compounds of a relatively small amount of "alphabets of human thought". An essential part of the dissertation is dedicated to the analysis of the predicate and the subject : Leibniz adopted the view that all propositions consist of a combination of subject and predicate (or at least that all propositions could be reduced to this form). This view is central to his logic and Leibniz maintained the theory all through his life.

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[1]Eco, *The Search for the Perfect Language*, p. 270.
[2]Huber, Leibniz, p. 25.
[3]P, p. xi.

> "Next, in order to establish what everything is made of, we must provide an analysis to fix the categories and as it were the matter of this art. The analysis is this : (1) Let any given terms be analyzed into formal parts, i.e. let its definition be given, and let these parts again be analyzed into parts, i.e. let there be a definition of the terms of the definition, down to simple parts, i.e. indefinable terms..."[1]

These undefined terms, "first terms" form an "alphabet of human thought, because the more complicated concepts are to be constructed with help of these simpler ones.[2] The simple terms include such relational concepts as the same, prior, posterior, number and place.[3] Other, more complicated terms were to be classified according to the number of prime terms they contained : for example, if they were composed from two prime terms, they were to be called com2nations; if from 3 prime terms, com3nations, and so forth. This way a hierarchy of classes of increasing complexity could be created.[4]

An idea of an universal language is also casually presented in the dissertation.[5] Leibniz's conception is modelled after Egyptian and Chinese writings, where ideas are represented by a combination of signs corresponding to their component parts.[6] According to Hans Burkhardt, Francis Bacon's thought presented in *Advancement of Learning* and *De dignitate et augmentis scientiarum* affected him in this point.[7] Leibniz could not produce

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[1] "Porro ut constent ex quibus omnia conficiantur, ad constituenda hujus artis praedicamenta et velut materiam analysis adhibenda est. Analysis haec est: 1. datus quicunque terminus resolvatur in partes formales, seu ponatur ejus definitio; partes autem hae iterum in partes, seu terminorum definitionis definitio, usque ad partes simplices seu terminos indefinibiles." (*Dissertatio de arte combinatoria*) G IV, p. 64-65; P, p. 4.

[2] P, p. xiii.

[3] Rescher, *Logical Difficulties in Leibniz's Metaphysics* (In : *Gottfried Wilhelm Leibniz : Critical Assessments* III, ed. R. S. Woolhouse), p. 193.

[4] Eco, *The Search for the Perfect Language*, p. 274.

[5] Leibniz seems to have arrived to this view in the age of eighteen. Jourdain, *The Logical Work of Leibniz* (In : *Gottfried Wilhelm Leibniz : Critical Assessments* III, ed. R. S. Woolhouse), p. 422.

[6] Aiton, *Leibniz, a Biography*, p. 21.

[7] Burkhardt, *Logik und Semiotik in der Philosophie von* Leibniz, p. 186.

a convincing example of this combinatorial method in the dissertation .[1]

Leibniz was attracted by Hobbes' conception of thinking as a form of calculation. Leibniz would not only provide a direct representation of ideas by signs but would also permit reasoning and demonstration by a calculus analogous to those of arithmetics and algebra. Another possible influence might have been the Cabbala. Leibniz was known to be interested of it and in Hebrew numbers are indicated by letters - in Cabbala this allows mystical relations to be established between words having different meanings through identical numerical values.[2]

Leibniz tried to construct his universal language at first with numbers. *De arte combinatoria* had already touched upon the subject and in a fragment of 1679 called *Initia et specimena sciaentia generales* Leibniz wrote like this :

> "Number is thus a basic metaphysical figure, as it were, and arithmetic is a kind of statics of the universe by which the powers of things are discovered."[3]

In the first of Leibniz's models the ideas are replaced with indivisible numbers and the concepts are combinations of these. The combinations were to be formed by addition and subtraction besides multiplication. In a fragment from 1678, he conceives a system, where consonants are represented by the following numbers :

1 2 3 4 5 6 7 8 9
B C D F G H L M N

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[1]This is due to his obsession with the idea that all complexity must arise from the conjunction of attributes, which is not the way that the complexity of the world can be explained.Kneale & Kneale, *The Development of Logic*, p. 326-27.
[2]Eco, *The Search for the Perfect Language*, p. 27-28.
[3]"Itaque numerus quasi figura metaphysica est, et arithmetica est quedam statica universi, qua rerum potentiae explorantur."
G VII, p. 184; L, p. 340.

and the vocals by following numbers :

1 10 100 1000 10 000[1]
A E I O U

For example, the number 81374 would be written and pronounced as follows : Mubodilefa. The same number can also be written in different order like Bodifalemu (=1000+300+4+70+8000), Famuledibo or Lebomufadi, since the relevant power of ten is shown by the following vowel rather than by the decimal place.[2] Leibniz dreamed about using this language in poetry and music.[3] This hope is based on the vast amount of synonyms available from such a language. "A huge field of variations and allusions and most elegant poems preserving the same meaning"[4] could be produced. In music the numbers would represent the notes and vice versa. This would make the universal language more attractive and tempting in the eyes of the public.

> "Once the characteristic numbers for most concepts have been set up...the human race will have a new kind of instrument which will increase the power of the mind much more than optical lenses strengthen the eyes..."[5]

This model based on numbers had also strong influences from Cabbala, but whereas in Cabbala one goes from words to numbers, Leibniz does the opposite. These plans were not published before the 20th century, otherwise they might have given birth to symbolic logic a few hundred years earlier than actually happened. One application from this kind

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[1]Walker, *Leibniz and language* (In : Gottfried Wilhelm Leibniz : Critical Assessments III, ed. R. S. Woolhouse), p. 438.
[2]Couturat, *La logique de Leibniz d'après des documents inédits*, p. 63; Walker, *Leibniz and language* (In : Gottfried Wilhelm Leibniz : Critical Assessments III, ed. R. S. Woolhouse), p. 439; Eco, *The Search for the Perfect Language*, p. 269.
[3]Couturat & Leau, *Histoire de la langue universelle*, p. 24.
[4]Walker, *Leibniz and language* (In : Gottfried Wilhelm Leibniz : Critical Assessments III, ed. R. S. Woolhouse), p. 439.
[5]"Numeris autem plerarumque notionum characteristicis semel con stitutis habebit genus humanum organi genus novum plus multo mentis potentiam aucturum, quam vitra optica oculos juverunt..." *(Initia et specimina scientiae generalis)*
G VII, p. 187; L, p. 224.

of universal language would work together with Leibniz's calculating machine. When different thoughts would be given appropriate numbers and submitted to his machine, the right result would be found instantly. The disagreements would be solved mechanically.[1]

A little later Leibniz rejected this model and decided to construct his model on natural language, Latin[2]. The easy-to-learn universal language could be attained if Latin was to be stripped off from all unnecessary and only the constituent characters would remain[3]. Only one of each declinations and conjugations would do, both regular. Inclination of verbs according to number and case is useless, since these things are immanent in the subject.[4] The prepositions would denote the case and conjunctives the form. The vocabulary should also be simplified.

> "...distinction of gender is not relevant to a rational grammar; neither do distinctions of declensions and conjugations have any use in a philosophical grammar. For we vary genders, declensions and conjugations without any benefit, without any gain in brevity - unless perhaps the variation pleases the ear; and this consideration does not concern philosophy, especially as we can give beauty to a rational language by another method, in such a way that it will

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[1]MacDonald Ross, Leibniz, p. 12-13.

[2]Leibniz was also interested in languages in general, not only artificial languages. He made some discoveries in philology, which attracted a lot of attention. There has been some discussion about whether Leibniz would have replaced the living language with an artificial one or not. A. Heinekamp thought not, but according to Rutherford he probably would have done it. Rutherford, *Philosophy and Language in Leibniz* (In : Cambridge Companion to Leibniz, ed. Nicholas Jolley), p. 250. My view is that Leibniz would have introduced living languages in elementary education and applied his characteristica universalis in advanced studies. This means that the vernacular would have stayed, but Latin would probably have disapperead because of the universal language. Latin was a self-evident candidate for the role, though. At one point Leibniz considered also chinese language as a basis for the new language. Walker, *Leibniz and language* (In : Gottfried Wilhelm Leibniz : Critical Assessments III, ed. R. S. Woolhouse), p. 440.

[3]To be quite exact, Latin was hardly a natural language in the 17th century anymore. The original latin was corrupted early in the medieval times and the Latin in question is the so called Vulgar Latin. Nissilä, *De rerum humanarum : Johan Amos Comenius ja pansofia*, p. 140, fn 188.

[4]Couturat & Leau, *Histoire de la langue universelle*, p. 25.

not be necessary to think up useless rules."[1]

These two models were born partly because of Leibniz's own needs. Maintaining his own, vast correspondence he had noticed how difficult it was to translate complicated ideas from one language to another and the uncertainty of the language on the whole. This same problem was familiar to many philosophers before him and after : Russell, Austin and Wittgenstein, among others, battled with the same problems.

Leibniz soon found out that the richness of language overpowered the capacity of memory. In order to include all relations between signs, he would have to create thousands of characters. There would be far more simple signs than he first thought and eventually his universal language would be more complicated than the most difficult existing languages.[2]Leibniz solved the problem by arguing that the primitive terms need only be postulated as such for ease of calculation; it was not necessary that they truly be final, atomic and unanalysable. By creating this kind of "pre-symbolic" logic, Leibniz was enabled to carry on and he was lead to conclude that an alphabet of primitive thought could never be formulated.[3]

6. 2. The Concept of Calculus and the Scientia Universalis

After disappointments with numbers and natural languages Leibniz based his project on logic and tried to conceive rules by which the calculation of thoughts can be achieved. With the help of reasoning one could analyze the complicated ideas to simpler ones (analysis, resolution) and by combining these one could form new, complicated ideas (synthesis, composition). In a way Leibniz had returned to the arguments of *De arte combinatoria.* He thought possible to represent the items in question by relations, while

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[1]"...Discrimen generis nihil pertinet ad grammaticam rationalem. <ita> Nec discrimina declinationum et conjugationum in grammatica philosophica usum habet. Nullo enim usu nullo compendio genera conjugationes declinationes variamus, nisi forte aurium gratia, quae consideratio ad philosophiam nihil attinet, praesertim cum alia ratione gratiam linguae rationali conciliare possimus, ut inutiles regulas excogitare necesse non sit."
(*Grammaticae cogitationes*) C, p. 286; P, p. 13.

[2]Couturat & Leau, *Histoire de la langue universelle*, p. 27.

[3]Eco, *The Search for the Perfect Language*, p. 276-77.

relations were reducible to predicates of subjects.

> "Combinatory treats of calculus in general, or of general signs or characters (such as A, B, C, where any one could be taken for another at will), and of the various laws of arrangement and transition, or of formulas in general. The algebraic calculus is a certain species of the general calculus, [in which], for example, there is a law of multiplication...Not all formulas signify quantity, and an infinite number of ways of calculating can be conceived."[1]

The idea of analysis and synthesis leads to Plato, who distinguished division (diairesis) from bringing together (sunagoge).[2] Plato used these ways of reasoning as methods (he also maintained that the method is suitable for rhetoric and constituted the basis of Hippocrates' practice). Aristotle used analysis and synthesis only as instruments of logic and not as methods. Leibniz's conception of analysis and synthesis can be traced to the founding fathers of geometry Euclid and Galen, who established the axiomatic argumentation.

Leibniz was especially struck by the lower quality of philosophical reasoning compared to geometrical or mathematical reasoning and thought possible, with help of the characteristics, to achieve the same kind of certainty in ethics and metaphysics. Descartes had also substantial influence on the formation of Leibniz's scientific methodology - the idea that all sciences should be based on geometrical reasoning, is essentially a Cartesian one.[3]

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[1]"Combinatoria agit de calculo in universum, seu de notis <sive characteribus> universalibus.....Non omnes formulae significant quantitatem, et infiniti modi calculandi excogitare possunt."
C, p. 556; Rutherford, *Philosophy and Language in Leibniz* (In : Cambridge Companion to Leibniz, ed. Nicholas Jolley), p. 238.

[2]MacKeon, *Philosophy and the development of scientific methods* (Journal of the history of ideas XXVII (1) 1966), p. 5.

[3]Kallinen, *Change and Stability*, p. 290.

In the 17th century there were also a group of philosophers who presented a new way of thinking about natural law. This rational theory of natural law, propounded by Grotius, Hobbes, Spinoza and Pufendorf, was also based on geometrical method. The science of politics and moral philosophy should employ the new geometrical-deductive method, made fashionable by Descartes, in its problems.

According to Leroy Loemker, Leibniz used both combinatorial and geometrical methods together : first, the test of the meaningfullness of terms by the combinatorial method of consistency and resovability into primitive, empirically supported concepts, and then the application of Euclidean methods of proof to the propositions which contain these tested terms.[1]

One pre-condition to the calculus is, however, that the whole of human knowledge is to be analyzed into simple terms.

> "It is useful for the sciences that symbols are so assumed that from a few assumptions many deductions can easily be made; and this is the case if symbols are assigned to the simplest elements of thought."[2]

This view changed later to a form of blind thought, where the form of the analysis is more important than the individual components involved in the analysis. The blind thought is adequate knowledge, which operates by using substitutional, referential signs. [3] In other words, exact results might be achieved by calculations carried out upon symbols whose meanings remained unknown, or of which it was at least impossible to form clear and distinct notions.[4] The final goal of analysis is intuitive knowledge, in where we are able to think simultaneo usly all the notions composing the object in question and the total grasp

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[1]Loemker, *Leibniz's Method* (In : Gottfried Wilhelm Leibniz : Critical Assessments I, ed. R. S. Woolhouse), p. 515.

[2]"Utile aurem ad scientias ita assumi characteres, ut ex paucis assumtis multa facile duci possint, quod fit si simplicissimis cogitandi elementis charateres assignentur."
C, p. 286, P, p. 33-34.

[3]Heidegger, *The Metaphysical Foundations of Logic*, p. 62.

[4]Eco, *The Search for the Perfect Language*, p. 279-80.

of the harmony of multiplicity.[1] But this is hardly possible to a finite mind or a rational soul.

This work would require co-operation of the scholars, which would be best realized in scientific academies. The results would be published in an encyclopedia, which contains all human knowledge in a tight (formal) form. The universal science would also produce a universal language as a sideline. And, on the other hand, the process mentioned above would require at least a primitive form of universal language.

Leibniz adopted the following main ideas as a basis of his calculus :

a) all concepts can be reduced into simple concepts much the same way as in mathematical division.
b) all complicated concepts can be formed by arranging the simple concepts
c) there are only a small amount of simple concepts, but they form the basis of all concepts
d) simple concepts are represented by simple signs or terms, complicated concepts are represented by complicated signs or terms. The complicated signs are definitions of the complicated concepts.
e) reasoning is based on analysis of the relations between simple concepts.[2]

For example, phrase "Bachelors are rational" can be analyzed as follows[3] :

1) replace "bachelor" by "unmarried man" = Unmàrried men are rational
2) replace "man" by "human being of male sex" = Unmarried human beings of male sex are rational
3) replace "human being" by "rational animal" = Unmarried rational animals of male sex are rational, which is a tautology and has no truth values.

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[1]Heidegger, *The Metaphysical Foundations of Logic*, p. 63, 68.
[2]Saw, *Leibniz,* p. 212-213.
[3]MacDonald Ross, *Leibniz*, p. 63.

In Leibniz's calculus the concepts are substituted by combinations of characters, propositions by relations of characters and reasoning by calculations.[1] Although Leibniz's plans of universal language developed relatively early in his life, he never gave up the idea.

When this logical universal language, characteristica universalis, is developed, it would lead to an universal science, scientia generalis (and vice versa), which would provide principles and methods for all the sciences. The scope of universal science would also be larger than merely the language : it would contain axioms fit for any specific science and transformation rules for symbolic formulations. Besides logic, the universal science would include the logic of invention (immanent in analysis and synthesis), the mnemonics of Raymond Lull and a discipline of argumentation.[2] Leibniz argued that Lull's system is not sufficient. It seems though that he was ready to suppose it as a part of the universal science.

This impact is very large and contains some popular paradigms of the time, but also some mystical influences (especially the influence of Cabbala is evident). Leibniz often saw himself as a final phase of a long development in the series, which included the Pythagoreans, Lull, Cabbala and Giordano Bruno.

Ars experimentandi, the experimental method is also present, but in a surprinsingly small way. This is, I think, probably because Leibniz thought all sciences to be some kind of mathematical systems.[3] The universal science functions as a kind of supervisor science, which would estimate reached results and also to act as a tool for invention.[4] This would return to the concept of philosophy as the mother of all sciences, which I am sure, Leibniz accepted.

The sciences can be classified hierarchically because of the same standpoints. Higher in the hierarchy are the sciences, which are "right and useful" : logic, mathematics, arithmetics and geometry. In the lower group are, among others, knowledge of the world and sciences

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[1]Saw, *Leibniz*, p. 213.
[2]Kauppi, *Über die Leibnizsche Logik*, p. 26.
[3]L, p. 21.
[4]Martin, *Leibniz, Logic and Metaphysics*, p. 64.

concerning the human body and customs.[1] Theology is not included in this classification - my view is that this is because Leibniz thought his universal science to replace theology (as we have seen earlier). Philosophy was to be the science, which is mirrored by the other sciences and which acts as a model for specific problems[2].

According to Kurt Huber[3], the hierarchy of sciences according to Leibniz would look like this :

rational grammar (grammatica rationalis)
logic
mnemonics (by Raymond Lull)
the art of invention

combinatorics
logistics (mathesis universalis)
arithmetics (algebra)
geometry
mechanics

geography
anatomy
cosmographics
- astronomy
- geographics
- meteorology

ideographics
- botanics
- zoology

moral science
geopolitics
- political history
- (history at large)

natural theology

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[1]Grua, *Jurisprudence universelle et théodicée selon Leibniz*, p. 26.
[2]L, p. 22.
[3]Huber, *Leibniz*, p. 116.

6. 3. Encyclopedia of the Human Sciences

The results of scholarly co-operation were to be collected to a large work, encyclopedia. The universal characteristics is a key to the encyclopedia and therefore they are inseparable from each other. The encyclopedia was to consist of following parts :

1) *Bibliotheca contracta*; a presentative bibliography with criticism and views of all important books. This bibliography can be issued as a periodical.
2) *Atlas universalis*; a presentation of all the concepts, formulations, plans etc. in the encyclopedia and in the sciences.[1]
3) *Cimeliorum literariorum corpus*; a collection of unpublished and rare manuscripts.
4) *Thesaurus experientiae*; a collection of scientific results from all kinds of different sciences.
5) *Vera methodus inveniendi ac judicandi*; this part includes analytic and combinatorial material and contains a key to the logic, which can be used to combine the material of the four other parts and find the results with the help of the deductive method.

There had been encyclopedias since the antiquity. These former encyclopedias were limited in their scope although they often tried to comprise all known science. The encyclopedias of the medieval ages were meant primarily to mirror the whole of Divine creation. Well known medieval encyclopedias were concerned primarily about natural science and theology; among the most famous encyclopedias were *Etymologine* by Isidore of Seville and *De vegetabilibus et plantis* by Albertus Magnus.[2] Didactics and practical nature were characteristic of these works. In the 16th century most famous "universal scholars" were Gesner (died in 1565) and Buffon. The works of Gesner were based on the world-view of antiquity and contained almost all the knowledge of the world in this limited respect.[3]

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[1]This section of the work would be a massive undertaking. It was to include - besides information on topography, heraldry, genealogy, alphabets, costumes and numismatics - full details on hieroglyphs, iconology, practical geometry and optics, music, architecture and decoration, seacraft, agriculture, textiles, chemistry,anatomy, microscopy and moral emblems.
Wilson, *Leibniz's Metaphysics*, p. 18.
[2]Crombie, *Augustine to Galileo*, p. 151.
[3]Leikola, *Oppineisuuden hirmu*, p. 222.

The scientific revolution needed a new view of knowledge. The encyclopedias that followed in the 17th century were full of faith in the new science, but fragmentary by nature. For example, one of the most famous encyclopedias edited by Alsted (*Cogitata quaedam de ratione perficiendi et emendandi Encyclopaediam*, 1620) was a collection of articles, where such authors as Hobbes, Galilei and Descartes were cited.[1] Alsted's encyclopedia was not only a collection of materials, however, but meant to act as a circle of science, as a complete system of knowledge.[2] According to Catherine Wilson, Leibniz's work occupied a middle position between the older Christian encyclopedia of Raymond Lull, or of ten fabulous compendia of beasts and plants of the ancient and medieval authors, and the factual, "reasoned" encyclopedias of the enlightenment.[3]

Leibniz's view of encyclopedia resembles much of the mystical view of Alsted's (and Comenius'), who thought that by combining all knowledge into one book one was able to find a key to the labyrinth of the world and that the book would mirror the universal harmony. Leibniz had in fact thought (before the Paris years) of editing an encyclopedia like Alsted's himself, which would be a compilation from the works of other authors (logic would have been taken from Junge and physics from Hobbes) with a table of contents. This work would correct and complete Alsted's encyclopedia.[4]

Leibniz's conception is tightly dependent on the characteristica universalis. He even says in one connecection that he who learns this language is at the same time learning the encyclopedia, which is the true entry into science. This is because his encyclopedia would contain the definitions for all important concepts and the basic axioms of all sciences. The idea of a universal encyclopedia grew less and less dependent on the primitive terms to be classified and more and more to an idea of a practical and flexible instrument which might provide for everyone an access to and control the immense edifice of human learning.[5] The encyclopedia would be of "demonstrative value, which might serve, that is, as a guide to

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[1]Couturat, *La logique de Leibniz d'après des documents inédits*, p. 125.
[2]Dierse, *Enzyklopädie*, p. 143. The same view of encyclopedia was held by Comenius.
[3]Wilson, *Leibniz's Metaphysics*, p. 17.
[4]Aiton, *Leibniz, a Biography*, p. 93; Couturat, *La logique de Leibniz d'après des documents inédits*, p.125.
[5]Eco, *The Search for the Perfect Language*, p. 278.

on-going scientific research".[1]

He tried to expose his universal science in order to gain support for the project, which would finally result in the encyclopedia. He had in mind a large work called *Plus ultra*, which would contain two parts : the first part (*Initia scientiae generalis*) would include presentation of his method and the second part (*Specimina scientiae generalis*) would consist of practical examples. The work was never realized.

This plan did not gain any great support from academic institutions and Leibniz turned to the princes of Europe. In a memoir drawn up for Louis XIV called *Discours touchant la méthode de la certitude et l' art d' inventer et précepted pour avancer les sciences* (1680) he praises Alexander the Great as a model of an enlightened prince and mourns of the scatterness of knowledge[2]. This memoir did not lead to any results.

Although Leibniz deserted the project for a while, he never gave up the idea. His mature views of composing an encyclopedia can be read from the *Nouveaux essais.* In a discussion of the division of sciences he makes the following division between different kinds of eternal truths :

1) Synthetical-theoretical - "It involves setting out truths according to the order in which they are proved, as the mathemacians do, so that each proposition comes after those on which it depends".
2) Analytical-practical - "It starts with the goal of mankind, namely with the goods whose sum total is happiness, and conducts an orderly search for means which will achieve these goods and avoid the corresponding ills"[3].

Besides these general methods, one elementary feature of the science would be a classification of terms and an index, which would help to find wanted terms when necessary. Although this discussion concerns the division of sciences, it is easy to see that

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[1]Rossi, *The Twisted Roots of Leibniz' Characteristic*, p. 282.
[2]Couturat, *La logique de Leibniz d'après des documents inédits*, p. 145.
[3]RB, p. 524.

the logical result of this kind of work would be an encyclopedia of human sciences. Leibniz's final views of encyclopedia are expressed in a memoir from 1716, which concerns the promotion of arts and sciences in Russia. This memoir is discussed exclusively in a later chapter.

6. 4. Is the Universal Science Possible?

According to Leroy Loemker the human thought is not able to proceed as smoothly as Leibniz conceived. Such categories as pluralism, monism or activity and passiveness are hindering factors that cannot be avoided. These categories were taken for face value later by Immanuel Kant. Leibniz performed some successful analysis, but these are based primarily on empirical knowledge. Metaphysical thought cannot proceed mechanically since it is dependent of human self-consciousness.[1] Another problem was that one was not able to draw a language until the scientific research of analysing the concepts was brought to its completion[2], as Descartes held (and Leibniz replied to him by trusting in his "blind thought").

It seems also, that the process of analysis, or the scholarly co-operation at least, would be greatly facilitated by some kind of universal language. Leibniz thought the projects to be parallel and to be developed at the same time.

Louis Couturat emphasized Leibniz's inability to understand the logical meaning of negation. Leibniz's logic stands and falls with his conception of the function of predicate in a proposition, which Couturat (along with William and Martha Kneale) condemns too one-sided and simplifying.[3] This conception is also repeated by Bertrand Russell : "The universal characteristics...though in matematics it was an idea of the highest importance, showed, in philosophy, a radical misconception, encouraged by the syllogism, and based

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[1]L, p. 22.

[2]Kneale & Kneale, *The Development of Logic*, p. 329.

[3]Couturat, *La logique de Leibniz d'après des documents inédits*, p. 432; Kneale & Kneale, *The Development of Logic*, p. 329. Raili Kauppi has criticised Couturat for being unable to understand all the aspects of Leibniz's thought and consequently for being too harsh in his judgement of his logic. See Kauppi, *Über Leibnische Logik*, p. 231f.

upon the belief in the analytic nature of the necessary truths."[1] Writing in the beginning of the 20th century, Couturat believed in principle to the possibility of universal science (later also supported by the positivists), but later commentators, like Gottfried Martin or Donald Rutherford, tend to judge the project as sheer utopia.[2] Still, the dream of lingua characteristica affected logicians like Frege, Peano, Wittgenstein, Russell (Russell's philosophy of logical atomism and Wittgenstein's *Tractatus* can be seen influenced by Leibniz's logic[3]) and Whitehead who developed logic later in the 20th century, not to mention all the artificial languages, like volapük, esperanto and the artificial language of Couturat himself, developed in modern times.

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[1]Russell, *A Critical Exposition of the Philosophy of Leibniz*, p. 171.
[2]Martin, *Leibniz, Logic and Metaphysics*, p. 62.;Rutherford, *Philosophy and language in Leibniz* (In : Cambridge Companion to Leibniz, ed. Nicholas Jolley), p. 231-32.
[3]Ishiguro, *Leibniz's Philosophy of Logic and Language*, p. 12.