

# Ramon Llull's Ars Magna

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**Abstract.** The Ars Magna of Ramon Llull must be seen as one of the first attempts to formalize language, thought processes, and creating a basis for rational discussions. It consists of so-called principles, concepts, which are defined and combined through the use of four main figures. These are explained and an example of their application is given. Llull's contribution and influences are shown and traced through history. Finally, an overview is given of computer science related fields in which Llull's ideas have had or could have had valid contributions.

**Keywords:** Ramon Llull · Ars Magna · Conceptual systems

## 1 Vita

Llull was born 1232 in Palma de Mallorca, a melting pot of different cultures and religions at the time. Being educated at the king's court, Llull learned the trade of the troubadour as well as reading and writing in Catalan. He became a devout Christian later in life only after he had married. Christ showed himself to Llull on several occasions, and eventually Llull resumed his rather debauched life and decided to dedicate the rest of his life to three purposes. These were to become a missionary and die for Christ, to develop, write and teach the Ars Magna, and finally, to build monasteries which should teach various languages of the infidels [1, 2].

The rest of his life, Llull spent travelling around the Mediterranean in an effort to convince Muslims, especially, of the truth of the Christian faith. He soon discovered that the main challenge was to explain the divine Trinity to non-Christians. He realized that cultural and language barriers had to be taken into account when anyone tried to explain about the Christian faith. Instead of focusing on the differences between the three main religions, Llull sought out similarities, even going so far as to copying the worshipping style of Muslims.

Legend has it that Llull was stoned to death in the city of Tunis in 1316 by an angry mob of Muslims who were unable to dismantle his arguments for the truth of the Christian faith. His dead body was brought back to Mallorca, and the people of Mallorca have since tried to have Llull canonised as their saint.

## 2 Ars Magna

A few years before his death Lull began writing the most thorough and final version of his *Ars Magna*, the *Ars Generalis Ultima* [3]. It consists of several books, explaining the different parts of the *Ars*, which are the principles or concepts, the questions, definitions, and finally, the possible combinations. The four main figures are Figure A, Figure T, the Third Figure and the Fourth Figure.

Figure A, which is called the divine figure, contains nine divine or basic concepts. It is made up by two concentric circles on top of each other. The inner circle holds nine compartments with the letters B to K (J is missing in the Latin alphabet). The outer circle has the nine concepts written on it (see Fig. 1). The various combinations of letters are by substituting each letter with its corresponding concept are turned into quaestios, inquiries. These are expanded by the use of the definitions or the use of concepts from the other figures.

Figure T is made up by three triangles on top of each other. The triangles are coloured, representing the three different religions: the green triangle with the letters B-C-D represents Islam; the red triangle with the letters E-F-G Christianity; and the yellow triangle with the letters H-I-K Judaism. Each triangle points at its designated letters, which are placed in a circle around the triangles. Each letter is assigned its corresponding concept, which for the figure T are all concerned with a triad of elements, such as difference, concord, opposition (green triangle); beginning, middle, end (red triangle); majority, equality, minority (yellow triangle). On the outer circle, each triad is further explained in its possible combinations. E.g. beginning can be a cause, a quantity or a temporal indication.

The Third Figure shows every possible combination of two of the nine letters. The place of a given pair of letters is interchangeable. Thus, the pair of BC and CB are to be seen as the same pairing. Each letter stands for the concepts found in figures A and T, but can also denote concepts from older figures, such as the judiciary figure or the figure of elements, found in earlier editions of the *Ars Magna*.

The Fourth Figure, also called the syllogism figure, consists of three moving circles, each with nine compartments for one of the nine letters denoting concepts from Figure A and T, or like with the Third Figure from older figures of earlier versions of the *Ars*. The Fourth Figure is further extended in the *Tabula Generalis*, a list of all possible combinations of pairings of three from the Figures A and T.

Finally, Lull provides an extensive list of definitions and explanations, both for the particular concepts as well as their various combinations. The *Ars Magna* is thought of as a tool to enable a rational and logical discussion among peers, that is among learned theologians of the three religions. The chosen concepts were common for the theological and philosophical trained scholars of that time. Through the design and use of the different figures and concepts of the *Ars*, Lull enabled a discussion which was removed from the holy scriptures and their interpretations. Instead, his *Ars* revolves around a common understanding of the very nature of belief, life, and God as such.

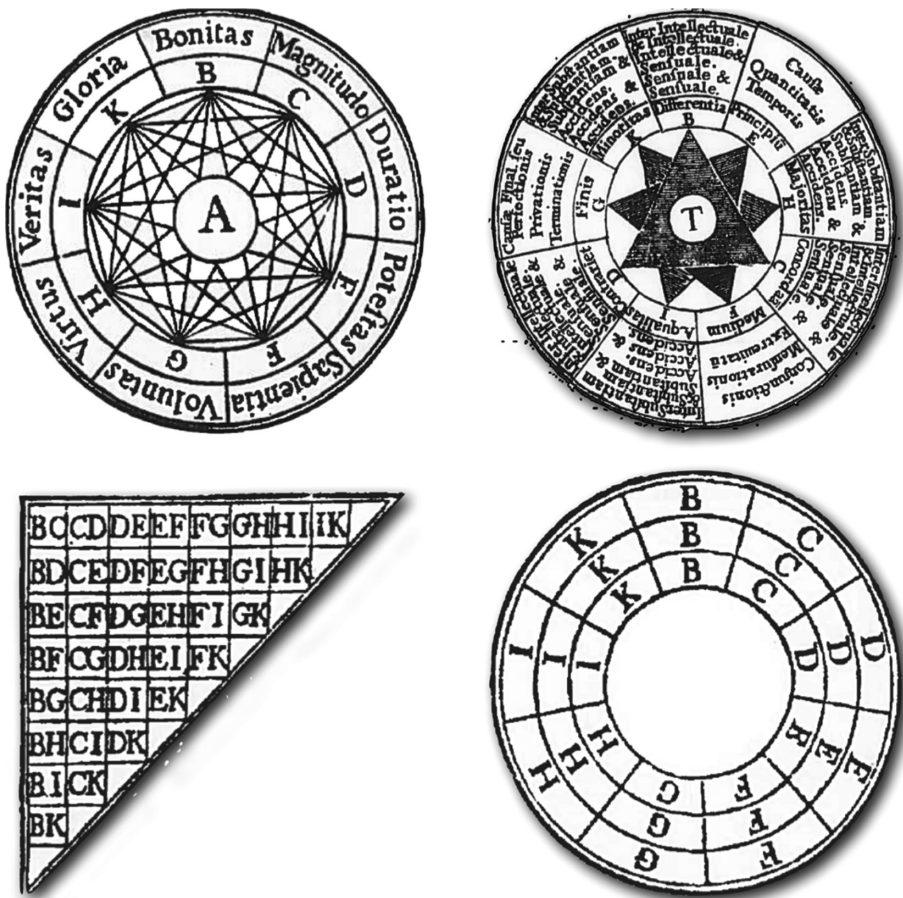


Fig. 1. The four figures of the Ars Magna. From upper left to lower right: Figure A, Figure T, the Third Figure and the Fourth Figure [3].

### 3 Providing an Example

Using the Fourth Figure and the Tabula Generalis the following is an example on how the figures are applied. The main concept will be the concept of ‘Good’ denoted by the letter B in Figure A.

Each concept in the Ars Magna has three states. Thus, ‘Good’ is defined by producing good (bonificative), an active state in which the concept creates goodness; doing good (bonifies) in which the concept interacts with the world around it, influencing other concepts, things, and people by doing good; and finally, affected by good (bonifiable), a passive state in which the concept affects other concepts, things, and people. Lull perceives the concepts of his Ars as a network, in which each concept can and will be affected by and interact with all the other concepts as well as the world beyond.

A node in this network could be the combination of the letters BCD, retrieved by turning the three concentric circles in Third Figure and finding the combination of the three letters in the Tabula Generalis, column 1, which shows all the possible combinations of the letters with regard to Figure A and T. Thus, the clean pairing of BCD means using the three corresponding letters from Figure A, which would be goodness, greatness and eternity. The other pairings in column 1 are denoting the use of both Figure A and T, by placing the letter T in front of subsequent letters which then denote concepts from the Figure T. Thus, the combination BTCD, column 1, compartment 10, denote the following concepts: goodness (Figure A), concordance (Figure T) and contrariety (Figure T).

The Tabula Generalis is followed by an expanded list of explanations or questions, which gives examples on how to interpret and discuss the given combination of concepts. The scholar would only need to find the matching section, clearly denoted by ‘Column BCD, camera BTCD’. In this section, the scholar is presented with an extensive explanation of how the three concepts work in the world using the elements as illustrations. This is a short excerpt: “The tenth question asks whether goodness contains any concordance and contrariety, and the answer is that it does in some subjects habituated with goodness and in which fire agrees with air through heat, and air with water through moisture, and water with earth through cold, and fire with earth through dryness.” [4] It shows how Lull systematically works through the consequences of applying different concepts to each other in different contexts. This excerpt explains how the concordance of different elements provide goodness in the form of heat, moisture, cold and dryness.

Lull’s Ars is remarkable in its exhaustive, objective, and systematic approach to the question of faith and—through it—life in all its different aspects. The Ars provides not only examples on how nature is understood at Lull’s time, it also contains small manuals on agricultural or seafaring issues, just to name a few.

## 4 The Influence of the Ars

Lull’s Ars Magna was to become an inspiration for later philosophers and scientists. His influence can, at times, be hard to track since his Ars and many of his other writings were blacklisted by the Inquisition. Thomas Le Myésier (?–1336) is his pupil and compiled the first collection of Lull’s work. Nicolaus de Cusa (1401–1464) is named as one of the first to develop Lull’s Ars into a new understanding of faith and science [5]. Agrippa of Nettesheim (1468–1535) writes the first commentary on Lull’s Ars, calling it the art of discourse [6]. Giordano Bruno (1548–1600) repeatedly references Lull in his own attempts to create a consistent system of knowledge and faith [6]. Bruno’s work on Lull will become one of Leibniz’ inspiration to examine Lull’s Ars as a basis of his own attempt to create a similar system.

Johann Heinrich Alsted (1588–1638) attempts to unite Lull’s work with the logic of Aristoteles in his *Clavis artis lullianae*. Alsted expands the number of concepts and figures used in the Ars in an effort to create a new encyclopedia which would describe the existing as well as invent new knowledge [8]. Finally, Athansius Kircher (1602–1680) should be mentioned, because his work on trying to establish a method to

develop a mechanical method to create German words and sentences to be applied in scientific discussions was heavily influenced by Llull's Fourth Figure with movable concentric circles on top of each other. Kircher's 'fünffacher Denckring der Teutschen Sprache' was designed as five circles with letters and syllables drawn on each ring. Turning the circles would create a lexicon of the German language, according to Kircher [9]. Also, Kircher's work is used by Leibniz and his attempts on creating a universal language.

Llull's Ars is mentioned by Descartes, Newton, and even Peirce. Mostly, in a rather dismissive tone which could be due to a large number of alchemistic and mystical works which have falsely been attributed to Llull. Due to the work of Ivo Salzinger (1669–1728) Llull's original works were collected and in part published. As the head of the Lullian University of Mallorca, Salzinger collected, translated and published Llull's works in eight volumes. It has since been republished in 1965. Like Le Myésier, Salzinger's books kept the knowledge about Llull's work and ideas alive and made it possible to examine its potential for later generations.

One of the other great lullian scholars is Anthony Bonner, who through several translations and commentaries has made Llull's philosophy accessible to the modern scientist. For further reading, his *Doctor Illuminatus: A Ramon Llull Reader* is highly recommended [1].

## 5 The Relevance of the Ars Magna in Computer Science

When Gottfried Wilhelm Leibniz (1646–1716) as a twenty-year old writes his dissertation *De Arte Combinatoria* he draws heavily on Llull's Ars Magna and the idea of creating a system of networked concepts, which through mechanical rule of reasoning shows a universal system of knowledge. This idea continues throughout his life, the development of a universal language which can be applied to find and proof knowledge in an objective, rational way. The basic foundation is to be found in an encyclopedic list of concepts, syllogisms, variables and constants, bound together by rules and procedures.

These basic ideas can be traced from Leibniz to the work of Sowa [10] and the development of conceptual graphs in language understanding and artificial intelligence. Sowa cites Llull as an inspiration for his work, as do Sørensen and Sørensen [11] in their explanation of the conceptual pond, a tool for understanding the reception, understanding, and evaluation of knowledge in a teaching environment.

Likewise, Umberto Eco explains Llull's Ars in his book *The Search for the Perfect Language*. It tells the quest for discovering the basic language which would enable people to understand or translate everything easily from one language to another. Artificial intelligence, knowledge representation and language understanding all seek to formalize language and knowledge in ways which could be translated into a computer programme.

Fidora and Sierra's anthology [12] on Ramon Llull's importance shows how profound the relevance and influence of Llull's thoughts still are in a large range of fields. From Peirce's pragmatic thinking over social choice theory, which Llull anticipated several hundred years earlier than previously thought. In his novel *Blanquerna*,

written in 1283, Llull explains the process on how nuns should elect their abbess by a majority rule.

From logical analysis to adaptive reasoning, these theories can be traced back to the Catalan lay monk, who tried to create an approach to the missionary quest which included the ethical consideration of the other, a systematic, combinatoric, rational and logical Ars, which should be used as a tool for discourse and discussion.

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