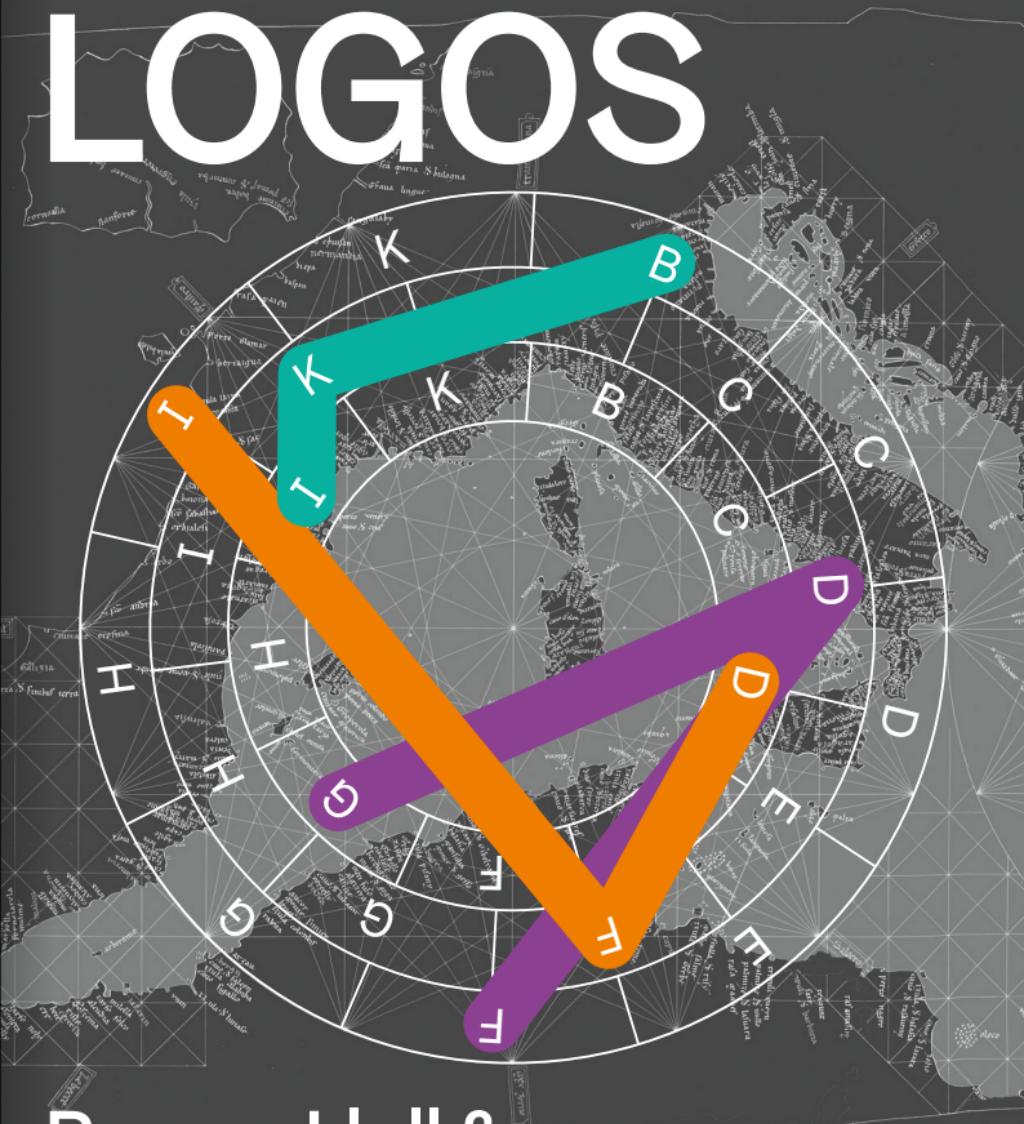


# DIA— LOGOS

17.3.—  
5.8.2018



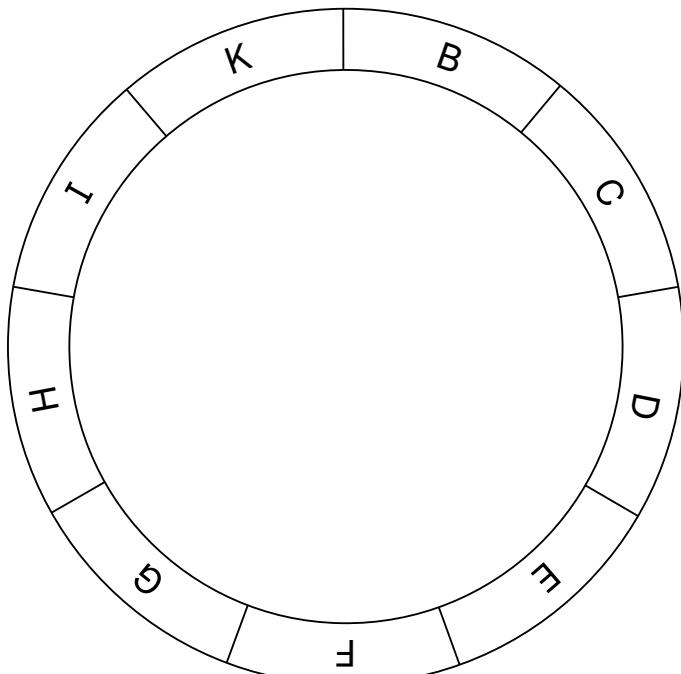
Ramon Llull &  
the Ars  
Combinatoria

# Ars generalis ultima

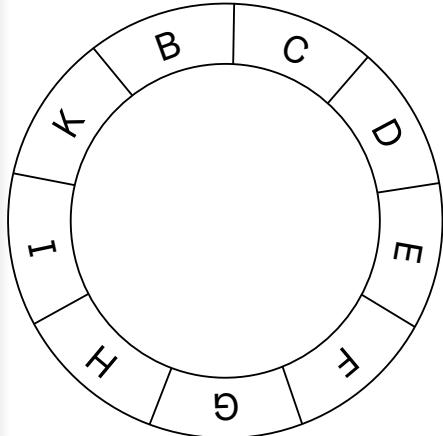
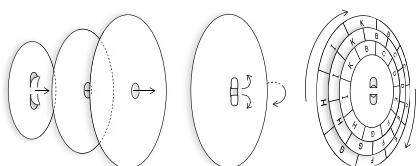
## Fourth Figure

With the *Ars generalis ultima*, which Ramon Llull completed c.1308, a variety of philosophical contexts can be associated.

Instructions for using the Fourth Figure can be found on → Page 26.



Remove the disks  
and assemble  
your own logical  
machine.

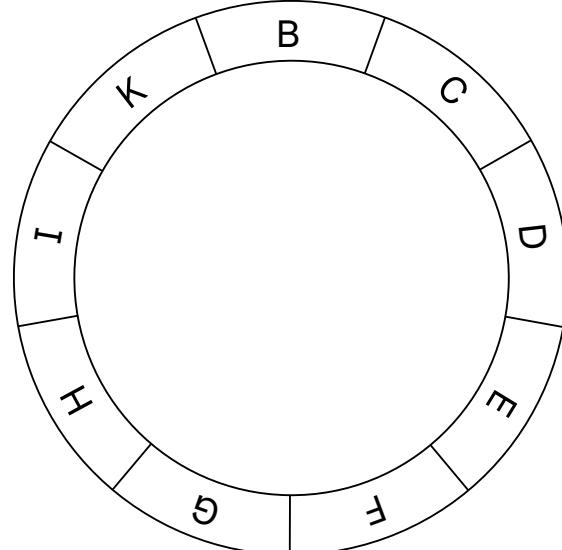


### Absolute Principles

B	Goodness
C	Greatness
D	Eternity
E	Power
F	Wisdom
G	Will
H	Virtue
I	Truth
K	Glory

### Questions

B	If/Whether?
C	What?
D	From what?
E	Why?
F	How much?
G	How is it?
H	When?
I	Where?
K	In what way?



# DIA— LOGOS

Ramon Llull &  
the Ars  
Combinatoria

17.3.—  
5.8.2018

That the Western European Middle Ages were “dark” ages is a myth. The Middle Ages were by no means as grim as tradition suggests. This period has been a victim of distorted historiography. During the age of scholasticism, outstanding medieval philosophers, theologians, and ecclesio-political authors, such as the Scot John Duns Scotus (1266–1308) or the Englishman William of Ockham (c. 1287–1347), wrote fundamental works on logic, epistemology, scientific theory, and natural philosophy. In his *Summa logicae* (1341), Ockham made a trenchant demand for the separation of logic and ontology, of language and being, of logical propositions and ontological issues (Ockham’s Razor), which is why he is considered one of the founders of modern semiotics (Charles S. Peirce), logic (Bertrand Russell), and constructivism. Umberto Eco took Ockham as the model for the fictional friar William of Baskerville in his novel *The Name of the Rose* (1980). Duns Scotus also used logical categories (possibility and necessity; thus an early form of modal logic) to sever rationalist philosophy, which is deductive and proceeds from a few initial true propositions, rigorously from theology. His epistemology, strongly influenced by mathematics and logic, is based on arguments that are free from contradictions (consistent) and univocal, and possess clear relations; thus, they exclude

contradictions and fallacies. This idea of an ideal language continued to be influential right up to the modern logicians Gottlob Frege, Bertrand Russell, and Willard Van Orman Quine. The ethics derived from Duns Scotus' epistemology—for example, the issue of free will—still echoes in the work of Immanuel Kant. Surprisingly, in addition to Charles S. Peirce, Martin Heidegger is also among Duns Scotus' admirers, as evidenced by his Habilitation thesis *Die Kategorien- und Bedeutungslehre des Duns Scotus [Duns Scotus' Theory of the Categories and of Meaning]*, 1915]. In the light of this finding, it can be concluded that either (a) the Middle Ages have not yet ended; the Middle Ages still reverberate in the present, or (b) the Middle Ages are the basis of modernity and its mathematization of the world. As the works by Duns Scotus and Ockham show, we can find sources of the notion of *The Logical Structure of the World* (the title of a 1928 book by philosopher Rudolf Carnap) already in the Middle Ages. It may sound incredible, but did the computer era actually begin in the Middle Ages?

A historical figure who confirms this hypothesis, this rereading of the Middle Ages, is the outstanding Catalan-Majorcan philosopher and theologian Ramon Llull (c. 1232–1316). Llull not only invented a new method of gaining insights, theoretically and based on language, he also gave it a material form, made it into an apparatus, like an engineer. His device consisted of several (usually three) connected, rotatable, circular paper disks with concepts inscribed on them. By rotating the disks, the linguistic symbols, the concepts, and the letters displayed could be connected, correlated, and combined. The scholastic hypothesis, that the world could possess a logical structure, Llull sought to transfer from the

level of symbols and linguistic deduction to the level of being and machine-based arguments. He had invented so to speak, *avant la lettre*, a kind of logical machine (a paper computer), which could physically effect the combinations of terms. In a similar way, Claude E. Shannon demonstrated that logical statements, for example, Boolean algebra, can be transferred to switching algebra of electric currents; that is, to ontological issues. From this Llullian formalization of terms the school of the *ars combinatoria* emerged, which has been influential from Gottfried Wilhelm Leibniz (*Dissertatio de arte combinatoria*, 1660/1666) up to and including the present-day arts. Like Llull, Leibniz assumed that all terms can be assigned to symbols, and that through their formal and mechanical combination, new terms can be derived from them. In this way, it would be possible to construct an ideal language, which Duns Scotus already dreamed of, and in the present day Umberto Eco (*The Search for the Perfect Language*, 1993).

The aspiration of the method invented by Llull was universal, and it introduced a new kind of learning. It postulated the unity of the various contemporary disciplines of knowledge, and envisaged that through deduction, argumentation, and dialogue there would be peace among the religions. Long before Leibniz, Ramon Llull strived to put reason in the service of religion, and not religion in the service of irrationality. With his communication devices, Llull designed a medium with which the three monotheistic Abrahamic religions could communicate better with each other. His main work *Ars generalis ultima*, or rather *Ars brevis*, was published in 1308, first in Latin, and later translated into Hebrew (1476) and Arabic (1682). To disseminate his new discoveries widely,

Llull wrote over 250 books in Catalan, Latin, and Arabic, travelled in North Africa as well in the Middle East and Western Europe, and had audiences with kings and popes. According to legend, he died for his convictions. Llull is one of the greatest founders and most enlightened minds of European culture, which is dedicated to the trinity of humanism, Renaissance, and Enlightenment. Europe's copyright on modernity and innovation is also based on the work by Ramon Llull. His universal concepts and intercultural ideas can be found to this day in literature, the visual arts, music, and philosophy, as well as in information theory and media technology. This enormous influence of Llull's radical concept is the main focus of the exhibition, which presents numerous treasures from and about Llull from regions all over the globe. By merging historic and documentary materials with contemporary artworks that engage with Llull's work, the exhibition enables insights into surprising and thus far unknown facets of Llull's way of thinking and his work.

After the exhibition *Allah's Automata* (2015/2016), with which the ZKM enabled a new way of approaching the first renaissance, the Arab-Islamic Golden Age from 800 to 1200, this exhibition again proposes correcting Western historical consciousness in the light of research on the arts.

#### Participating artists/thinkers

Abraham Abulafia · Friedrich Achleitner · Johann Heinrich Alsted · Peter Apian · Ralf Baecker · Manuel Barbadillo · Konrad Bayer · Berlin Society for Nontrivial Pursuits (S4NTP) · Jens W. Beyrich · Michael Bielicky, Kamila B. Richter · Jorge Luis Borges · John Cage · Italo Calvino · Juan Eduardo Cirlot · Gianni Colombo · Honorius Cordier · Nicolaus Cusanus · Salvador Dalí · Joan Desí · Götz Dipper, Manfred Hauffen · Ugo Dossi · Umberto Eco · Sabine Groschup · Márton Fernezelyi, Miklós Peternák, Zoltán Szegedy-Maszák · Johann Balthasar Friderici · Johann Wolfgang von Goethe · Philipp Goldbach · Matthias Gommel · Jean-Jacques Grandville · René Grillet · Philipp Matthäus Hahn · Gisbert Hasenjaeger · Curt Herzstark · Sarah Kenderdine, Jeffrey Shaw, Edwin Thumboo · Anselm Kiefer · Yunchul Kim · Athanasius Kircher · Kurt Kranz · Werner Künzeli · Pe Lang · Bernard de Lavinhetá · Gottfried Wilhelm Leibniz · Thomas Le Myésier · Yehudah ha-Levi · Sol LeWitt · Daniel Libeskind · David Link · Ramon Llull · Jennifer und Kevin McCoy · Josep Maria Mestres Quadreny · Manfred Mohr · William Morris · Luis Negrón van Grieken, Juan Orozco Velazquez · A. Michael Noll · Valère Novarina · Bartolomeo Olivo · Santiago Ortiz · Jorge Oteiza · Perejaume · Otto Piene · Giovanni Battista della Porta · Robert Preusse, Stefanie Rau · Francesc Pujols · Raymond Queneau · Ludovicus Cornelius Rigius · Petrus Roselli · Marius Schneider · Arnold Schönberg · Raimund von Sabunde · semiconductor (Ruth Jarman, Joe Gerhardt) · Adam Słowik · Josep Soler · Josep Maria Subirachs · Antoni Tàpies · Philipp Tögel · Jacint Verdaguer · José María Yturralde

# Between Worlds. Middle Eastern and Western Wisdom

Ramon Llull was a thinker, who moved between different worlds: his life was spent between Majorca and the Spanish mainland, Western Europe, North Africa, and the cultures of the Eastern Mediterranean, and thus where the Christian, Jewish, and Muslim cultures of the late Middle Ages intersected. As visionary and poet, realist and rationalist, he sought to connect the Latin-Christian with the Arab-Muslim and Hebrew-Jewish ways of thinking. Llull's journey towards intellectual farsightedness began on his home island of Majorca. Born into a wealthy family, he at first lived the life of a dissolute bon viveur. He had no academic education, yet wrote profane poetry, love poetry, and was intimately acquainted with the art of the troubadours. The turning point in Llull's life came when he had a series of religious visions during a severe illness, which prompted him to change his life radically and dedicate it to serving God. When he was thirty, Llull made pilgrimages to the holy sites of Rocamadour and Santiago de Compostela. When he returned to Majorca, he began to study the knowledge of his time in the natural sciences, theology, and philosophy. His goal was to write a book that contained all truths, a "book that is best suited to confront the errors of the unbelievers", to whom he wished to pass on his knowledge. To implement his plans, Llull approached the powerful people of his time. However, these rarely had any sympathy for his ideas, so Llull independently undertook a number of dangerous journeys to the Middle East and to North Africa, because he was convinced of the persuasive power and necessity of his mission. After Llull's death at the age of over eighty, his first pupils

preserved the memory of his life and work. This was the beginning of producing copies of his works and distributing them, which laid the foundations of a tradition of Lullism that would continue for decades, and even today retains the power to fascinate and instruct in multifarious ways.

- 2 Michael Bielicky, Kamila B. Richter · *The Names* · Programming: Wilhelm Brodt, Andreas Hampp. Sound arrangement: Lorenz Schwarz. 2018. Mini PC, projector, custom made program. Produced by ZKM | Center for Art and Media Karlsruhe. Courtesy the artists.
- 6 Razen · *Mount Randa (Lulian Circles)* · 2013. Sound recording. 10:32 min.
- 7 Thomas Le Myésier · *Breviculum ex artibus Raimundi Lulli electum* · after 1321. Manuscript, digital reproduction. © Badische Landesbibliothek, Karlsruhe, Cod. St. Peter perg. 92.
- 8a Thomas Le Myésier · *Breviculum ex artibus Raimundi Lulli electum* · North of France (?) after 1321, manuscript. Badische Landesbibliothek, Karlsruhe, Cod. St. Peter perg. 92. [Shown March 17–18, 2018]
- 8b Thomas Le Myésier · *Breviculum ex artibus Raimundi Lulli electum* · North of France (?) after 1321, manuscript. (Facsimile: Wiesbaden 1988, print.) Badische Landesbibliothek, Karlsruhe, Cod. St. Peter perg. 92. [Shown after March 21, 2018]
- 9 Ramon Llull · *Raimundi Lulli Ars generalis ultima* · s.l. 1395, manuscript. Bayerische Staatsbibliothek, Munich, Clm 10522.
- 10 Ramon Llull · *Melakahah ketsarah (Ars brevis)* · Senigallia 1476, manuscript. Library of The Jewish Theological Seminary.

- 11 Ramon Llull · *Sincah baſiṭah*  
1–10v. III.77 (*Ars brevis*) ·  
s.l. c. 1682, manuscript, digital  
reproduction. Maronite  
Archbishopric of Aleppo, Ms 127.
- 12 Ramon Llull · *Opera omnia. Vol. II* ·  
Mainz 1722, print. Martinus-  
Bibliothek – Wissenschaftliche  
Diözesanbibliothek – Mainz,  
B / 622,II.
- 13 Alphonsorus de Proaza · *Divi  
Raymundi Lulli doctoris  
illuminatis. Ars inventiva  
veritatis* · Valencia 1515, print.  
Badische Landesbibliothek,  
Karlsruhe, 93B 75042 RH.
- 14 Yehudah ha-Levi · *Song of Zion* ·  
Berlin 1933, print. Universitäts-  
bibliothek Freiburg.
- 15 Hartwig Hirschfeld (Ed.) · *Book  
Al-Chazari by Abū-L-Hasan Juheda  
Halewwi* · Leipzig 1887, print.  
Universitätsbibliothek Freiburg.
- 16 Ramon Llull · *Raymundi Lulli  
Ars inventiva veritatis* · s.l.  
14<sup>th</sup> cent., manuscript.  
Bayerische Staatsbibliothek,  
Munich, Clm10501.
- 17 Ramon Llull · *De quadratura et  
triangulatura de cercle* · s.l.  
15<sup>th</sup> cent., manuscript.  
Bayerische Staatsbibliothek,  
Munich, Cod.hisp. 64.
- 18 Nicholas of Cusa · *Raymundus  
Lullus Opera* · s.l. 1428,  
manuscript. St. Nikolaus  
Hospital / Cusanusstift,  
Bernkastel-Kues, Cod. Cus. 83.
- 19 Abraham Abulafia · *Sefer Chaje  
olam ha-ba* | 1400/1499.  
Print, digital reproduction.  
© The British Library Board.

## Variantology

Llull's great discovery was a variant of the *ars combinatoria*, which he presented in his first work, the *Ars magna*. It is a method based on divine intuition for generating truths by means of a logical, algebraic language. The basic ideas were both simple and complex: all three religions that worship only one god, are religions of the word. They build upon the axiom that in the beginning of existence there was the word, and, therefore, being and word can only be conceived as inextricably interwoven. This means that both within the systems of each of the religions and in their interactions there must exist processes, which are now designated communication. That was the great discovery of Ramon Llull

700 years ago: If he could succeed in formulating a code that would be comprehensible in all languages that constituted the basis of the religions of the word, one would possess an instrument which could be applied to all monotheistic views of the world and God, an instrument that was in this sense a “universal machine.”

Basically, to invent such a machine, at least three media steps are necessary, which must pass through all technology-based forms of communication, and which also serve as the minimum requirements for algorithmic artefacts:

- (1) Condensing the multiplicity of the messages to be transmitted into a manageable number of elemental truths—the prerequisite for breaking down mental activity into basic operational steps.
- (2) Reducing the semiological complexity of the spoken and written languages in which the messages are formulated to a few symbolic elements (in Llull's case, selected letters of the alphabet).
- (3) Rendering the symbolic signs and their combinatory possibilities material in hardware, which provides for the physical game with constant repetition in the production of different meanings.

Llull's specific method, which is structured by a fixed series of questions and answers, was intended to serve as a universal theory, which, as Llull believed, could be used in all the different knowledge disciplines of his time.

- 20 Philipp Tögel · Re-Interpretation of the Ars Generalis Ultima · 2018. Interactive, processing-based installation. Courtesy the artist.
- 21 Ramon Llull · Anthology including fortyone sheets, transcriptions and drawings in addition to the work of Ramon Llull · s.l. 18<sup>th</sup> cent., manuscript. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, Hs 220q.
- 22 Ramon Llull · Liber secretorum naturae and other manuscripts by I. Salzinger · s.l. 18<sup>th</sup> cent., manuscript. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, Hs 220f.
- 23 Ludovicus Cornelius Rigius · Pseudo-Lullist alchemical tracts · s.l. 18<sup>th</sup> cent., manuscript. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, Hs 220d.
- 24 Ramon Llull · Anthology containing three press proofs with handwritten notes: printed single sided with press proofs of the Ars brevis. Parts of the Ars magna et major. Parts of the Ars universalis · Mainz 1721–1742, print. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, Hs 220q.
- 25 Ramon Llull · Opera omnia. Vol. I · Mainz 1721, partial print with handwritten remarks by I. Salzinger. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, Hs 220c.
- 26 Ramon Llull · Opera omnia. Vol X · Mainz 1742, print with handwritten remarks. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, B/622,X.
- 27 Athanasius Kircher · Ars Magna Sciendi · Amstelodami 1669, print. Badische Landesbibliothek, Karlsruhe, 82C9 RH.
- 28 Ramon Llull · De laudibus B.V. Mariae · Paris 1499, print / manuscript. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, Inc 370.
- 29 Ramon Llull · Ars demonstrativa (catalan) · s.l. c.1300, manuscript. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, Hs 220a(h).
- 30 Gottfried Wilhelm Leibniz · Dissertatio de arte combinatoria [...] · Leipzig 1666, print. Universitätsbibliothek Erlangen-Nürnberg.
- 31 Diagram of I Chin/I Ging hexagrams owned by Gottfried Wilhelm Leibniz · 1701. Ink on paper. 28 × 23,3 cm. Gottfried Wilhelm Leibniz Bibliothek Niedersächsische Landesbibliothek, Hannover, LK-MOW Bouvet10, Bl. 27–28.
- 32 Nikolaus Joachim Lehmann · Leibniz' calculating machine from 1690–1720 (replica) · 1995. Brass, wood. 15 × 70 × 21 cm. Heinz Nixdorf MuseumsForum (HNF), Paderborn.
- 33 John Cage · Music of Changes · 1951. Sound recording, digitized, 44:01 min.
- 34a Petrus Roselli · Portolan chart of the Mediterranean Sea and the Black Sea · 1449. Map on parchment. 105 × 61 × 10 cm. Badische Landesbibliothek, Karlsruhe. [Shown from March 17 to April 29, 2018]
- 34b Bartolomeo Olivo · Portolan chart of the Mediterranean Sea · Around 1550. Map on parchment. 82 × 43 × 10 cm. Badische Landesbibliothek, Karlsruhe. [Shown from May 2 to June 6, 2018]
- 35 The movements of Ramon Llull and his teaching – a cartogram · Robert Preusse, Stefanie Rau, Daniel Irrgang, Amador Vega Esquerre, Sophie Reiser, Siegfried Zielinski. 2018. Digital animation. ZKM | Center for Art and Media Karlsruhe and Karlsruhe University of Arts and Design (HfG).
- 36 René Grillet's calculating device from 1678 (replica) · n. d. Paper, cardboard, wood, brass. 3,1 × 14,43 × 5,47 cm. Heinz Nixdorf MuseumsForum (HNF), Paderborn.
- 37 Philipp Matthäus Hahn · Calculating machine · 1770–1774. Brass, iron, vitreous enamel. Height: 18 cm, diameter: 28,6 cm. Landesmuseum Württemberg, Stuttgart.
- 38 3D-simulation to the calculating machine by Philipp Matthäus Hahn · 2018. Produced by Arithmeum Bonn.
- 39 Ralf Baecker · Rechnender Raum · 2007. Lightweight sculpture, strip of beechwood, string, lever, weights, electronics, servomotor. 250 × 300 × 300 cm. Courtesy the artist.
- 40 Werner Künzel, Heiko Cornelius · arsmag1.c-Ars Magna oder Ars Generalis Ultima · Idea: Werner Künzel. Graphic design: Udo Hartinger. 1989. COBOL program. Courtesy Werner Künzel.
- 41 Werner Künzel · Working material for the COBOL program arsmag1.c-Ars Magna oder Ars Generalis Ultima · Print on paper, cardboard. Courtesy Werner Künzel.
- 42 Werner Künzel, Heiko Cornelius · Ars Generalis Ultima by Raymundus Lullus · Berlin 1987 [1986], print. Courtesy Werner Künzel.
- 43 Werner Künzel, Heiko Cornelius · arsmag1.c-Ars Magna oder Ars Generalis Ultima · Idea: Werner Künzel. Graphic design: Udo Hartinger. 1989. Print of the COBOL program. Courtesy Werner Künzel.
- 44 Werner Künzel, Heiko Cornelius · Ars Generalis Ultima by Raymundus Lullus · 1987 [1986]. Print, digital reproduction. Courtesy Werner Künzel.
- 45 Philipp Goldbach · Ars Generalis Ultima (R. Lullus) (from the series Read Only Memory) · 2016. Four-part, double-sided copper-coated epoxy resin glass fabric laminate, electrical components, lead solder. 108,5 × 108,5 × 1 cm. Courtesy the artist.
- 46 Philipp Goldbach · Ars Signorum (G. Dalgarno) (from the series Read Only Memory) · 2016. Four-part, double-sided copper-coated epoxy resin glass fabric laminate, electrical components, lead solder. 108,5 × 108,5 × 1 cm. Courtesy the artist.
- 47 Philipp Goldbach · Lettre à Marin Mersenne (R. Descartes) (from the series Read Only Memory) · 2016.

- Four-part, double-sided copper-coated epoxy resin glass fabric laminate, electrical components, lead solder. 108,5×108,5×1cm. Courtesy the artist.
- 48 **Philipp Goldbach** · *Polygraphia nova et universalis ex combinatoria arte detecta* (A. Kircher) (from the series *Read Only Memory*) · 2016. Four-part, double-sided copper-coated epoxy resin glass fabric laminate, electrical components, lead solder. 108,5×108,5×1cm. Courtesy the artist.
- 49 **Gisbert Hasenjaeger** · *Kasimir. Logic evaluator* · 1957. Wood, metal, plastic. 20×41×40cm. Heinz Nixdorf MuseumsForum (HNF), Paderborn.
- 50 **Gisbert Hasenjaeger** · *Kasimir. Logic evaluator. Control unit* · 1957. Wood, metal, plastic. 18×26×32cm. Heinz Nixdorf MuseumsForum (HNF), Paderborn.
- 51 **Gisbert Hasenjaeger** · *Transistorized Turing machine* · n. d. Cardboard, metal, wood, plastic. 15×25×35 cm. Heinz Nixdorf MuseumsForum (HNF), Paderborn.
- 52 **Márton Fernezelyi, Miklós Peternák, Zoltán Szegedy-Maszák** · *Combinatorial History of Images* · 2017–2018. Interactive installation, custom made LED display, touchscreen. Produced by ZKM | Center for Art and Media Karlsruhe. Courtesy the artists.
- 53 **Daniel Libeskind** · *Virtual House* · 1997. Two-part, chipboard, sandpaper, glued. Each 30×43×22cm. Courtesy the artist.
- 54 **Daniel Libeskind** · *Virtual House Drawing* · n. d. Print, digital reproduction. Courtesy the artist.
- 55 **Photograph of Virtual House by Daniel Libeskind** · Photograph by Sebastian Pfuetze. 1997/2018. Photograph, digital reproduction. Courtesy Daniel Libeskind. © Sebastian Pfuetze.
- 56 **Photograph of Virtual House by Daniel Libeskind** · Photograph by Sebastian Pfuetze. 1997/2018. Photograph, digital reproduction. Courtesy Daniel Libeskind. © Sebastian Pfuetze.
- 57 **Photograph of Virtual House by Daniel Libeskind** · Photograph by Sebastian Pfuetze. 1997/2018. Photograph, digital reproduction. Courtesy Daniel Libeskind. © Sebastian Pfuetze.
- 58 **Photograph of the Reading Machine by Daniel Libeskind, 1985** · Photograph by Hélène Binet. 2018. Lightbox, UV print on blended fabric. 80×80 cm. Courtesy Daniel Libeskind. © Hélène Binet.
- 59 **Photograph of the Memory Machine by Daniel Libeskind, 1985** · Photograph by Hélène Binet. 2018. Lightbox, UV print on blended fabric. 80×80 cm. Courtesy Daniel Libeskind. © Hélène Binet.
- 60 **Photograph of the Writing Machine by Daniel Libeskind, 1985** · Photograph by Hélène Binet. 2018. Lightbox, UV print on blended fabric. 80×80 cm. Courtesy Daniel Libeskind. © Hélène Binet.

## Poetics of Knowledge

Ramon Llull started out as a writer of love poetry in the style of Provençal singers of the Middle Ages, the troubadours, whose name likely derives from French “trouver” as well as from Provençal “trobar” (find, invent, compose in verse). In their quest to find the perfect combination of “motz el son” (Ezra Pound, “motz el son” – *Wort und Weise*, 1957) the troubadours invoked the *inventio* of classical rhetoric. For the processes of finding and inventing, they developed complex composition techniques, which can be studied in the paradigmatic work of Arnaut Daniel (c. 1150–c. 1200). The invention of the sestina is attributed to Daniel, a formally highly sophisticated and complex fixed verse form, which already exhibits rudimentary combinatorics. In the sestina the same words appear at different positions in the poem, which gives rise at each occurrence to new meanings and/or relationships between statements. Daniel forged the words – similar to a blacksmith, who forms red-hot iron – according to technical rules, and was praised by Dante Alighieri as the best verse-smith (“Il miglior fabbro del parlar materno”). Following this tradition, T. S. Eliot dedicated his famous poem *The Waste Land* (1922) to Ezra Pound, whom he described as “il miglior fabbro.”

After his religious epiphany, Llull dedicated his complex verse technique to the service of God. The systematic methods of thought acquired when he wrote poetry, he expanded into a language of logic, and transferred the mechanisms of poetry to thought processes. The skills, which he had learned through studying the complex relationships of phonetic repetitions and variations in his art of poetry, he applied to terminology in general. It can be assumed that Llull, with his combinatorics

based on numbers, his tables and disks of permutations, wanted to find the earliest, primeval book, just as later Stéphane Mallarmé would invent a cosmic text architecture in his *Le Livre* (1957) that would reveal nothing less than “all existing relations between everything”. The poem “*Cent mille milliards de poèmes*” [*A Hundred Thousand Billion Poems*] by Raymond Queneau in 1961, consisting of thousands of cut-up lines, realized this idea of Mallarmé’s in a reduced form. Thus Llull’s *ars combinatoria* can be viewed as a universal method for poetic inspiration and a poetry of knowledge.

- 61 Manfred Mohr · *Cubic Limit* · 1973–1974. 16 mm film, digitized, b/w, no sound. 4:01 min. Courtesy the artist.
- 62 A. Michael Noll · *Rotating Four-Dimensional Hyperobject* · 1965. Video, digitized, b/w, no sound. 3:40 min. Courtesy the artist.
- 63 Gianni Colombo · *Vobulazione e bieloquenza NEG* · 1973. Video, digitized, b/w, sound. 10:16 min. Archivio Gianni Colombo, Milan.
- 64 Sol LeWitt · *Serial Project No. 1 (ABCD)* · 1966. Oak wood, iron, enamel. 25,5 × 175 × 175 cm. LWL – Museum für Kunst und Kultur. Westfälisches Landesmuseum, Münster.
- 65 *Ospite di Roma. Salvador Dalí* · In the newsreel *La Settimana Incom*, 05/14/1954 · Video, digitized, b/w, sound, english subtitle. 1:30 min. Archivio Storico Istituto Luce, Rome.
- 66 Salvador Dalí · *Doble imatge amb cavalls, números i claus* · c.1960. Oil on canvas. 40,1 × 30,7 cm. © Salvador Dalí, Fundació Gala-Salvador Dalí, Figueres, 2017.
- 67 Joan Úbeda, Susi Marquès, Eli Pons · *Dimension Dalí. L'obsession d'un artiste pour la science* · 2004. Video, digitized, color, sound. 52:55 min. Editrama.
- 68 *Proceso al azar* · Documentation of the conference in the Teatro-Museo Dalí, Figueres 1985. Organized by Jorge Wagensberg. 2004. Video, digitized, color, sound. © Trasbals S.A., Barcelona, 2004.
- 69 Salvador Dalí · *Manifeste mystique* · Paris 1951, print. Bayerische Staatsbibliothek, Munich, 2L.sel.1828.
- 70 Juan de Herrera · *Explicación del Cubo en el Arte Luliana* · 17<sup>th</sup> cent. manuscript, digital reproduction. Colecciones Reales. Patrimonio Nacional. Biblioteca del Real Monasterio de San Lorenzo de El Escorial. © Patrimonio Nacional.
- 71 Jorge Oteiza · *Caja metafísica por conjunción de dos triédros* · 1959. Copper-plated steel and marble sculpture. 27 × 34,5 × 24,5 cm. MACBA collection. Fundació MACBA. Donated by the Fundación Bertrán.
- 72 *Photograph of the installation of the Laboratorio Experimental* by Jorge Oteiza in his house in Alzuza (Navarra, ES) 1950–1959 / 1972–1974 · Photographs by Txomin Sáez, 1980s. 2018. Lightbox, color photograph, digital reproduction. 55 × 180 cm. Courtesy Fundació La Caixa. Courtesy Fundació Museo Oteiza Fundazio Museoa, Alzuza (Navarra).
- 73 José María Yturralde · *Impossible Figure* · 1973. Serigraphy on cardboard. 80,5 × 60 cm. ZKM | Center for Art and Media Karlsruhe.
- 74 José María Yturralde · *Impossible Figure (Grey Prism)* · 1973. Serigraphy on cardboard. 81 × 61 cm. ZKM | Center for Art and Media Karlsruhe.
- 75 José María Yturralde · *Impossible Figure (Grey Cubes)* · 1973. Serigraphy on cardboard. 81 × 61 cm. ZKM | Center for Art and Media Karlsruhe.

- 76 Yunchul Kim · *Self\_portrait.jpg* · 2005. Ink on paper. 248×160×5 cm. Courtesy the artist.
- 77 Manuel Barbadillo · *Collage I* · 1969. Collage, silkscreen on paper. 50×68 cm. ZKM | Center for Art and Media Karlsruhe.
- 78 Manuel Barbadillo · *Collage II* · 1969. Collage, silkscreen on paper. 50×68 cm. ZKM | Center for Art and Media Karlsruhe.
- 79 Manuel Barbadillo · *Adfera* · 1972. Silkscreen on laid paper. 50×66 cm. ZKM | Center for Art and Media Karlsruhe.
- 80 Manuel Barbadillo · *No title* · 1972. Silkscreen on laid paper. 45×61 cm. ZKM | Center for Art and Media Karlsruhe.
- 81 Konrad Bayer · *der vogel singt* · 1957. Typoscript, digital reproduction. Literaturarchiv der Österreichischen Nationalbibliothek, Sammlung Wiener Gruppe/Vorlass Gerhard Rühm, LIT397/S44.
- 82 Friedrich Achleitner · *Quadratroman* · Darmstadt and Neuwied 1973, print. ZKM | Center for Art and Media Karlsruhe.
- 83 Gerhard Rühm (Ed.) · *Die Wiener Gruppe: Achleitner, Artmann, Bayer, Rühm, Wiener* · Reinbek near Hamburg 1967, print. ZKM | Center for Art and Media Karlsruhe.
- 84 Christina Bechtler · *Sol LeWitt – 100 Cubes* · Ostfildern 1996, print. ZKM | Center for Art and Media Karlsruhe.
- 85 Jean-Jacques Grandville · Illustration of the word-machine in Jonathan Swifts *Voyages de Gulliver dans des contrées lointaines* · Paris 1845, print.
- 86 Centre de Cultura Contemporània de Barcelona – CCCB.
- 86 Umberto Eco · *La ricerca della lingua perfetta nella cultura europea* · Roma-Bari 1993, print. ZKM | Center for Art and Media Karlsruhe.
- 87 Juan Eduardo Cirlot · *Lilith* · Barcelona 1949, print. E. Granell collection, Barcelona. © Antoni Tàpies, VEGAP, Barcelona, 2016.
- 88 Juan Eduardo Cirlot · *El Palacio de Plata* · Barcelona 1955, print. Victoria Cirlot Collection, Barcelona.
- 89 Juan Eduardo Cirlot · *Cuaderno de Alquimia* · Beginning of the 1950s. Ring notebook, handwritten with draft. Courtesy Lourdes Cirlot, Barcelona.
- 90 Ramon Llull · *Livre de l'Ami et de l'Aime: petits cantiques d'amour dialogués par lesquels l'entendement et la dévotion s'augmentent* · Translated by Antonio de Barrau and Max Jacob. Paris 1919, print. ZKM | Center for Art and Media Karlsruhe.
- 91 Jorge Luis Borges · *El libro de los seres imaginarios* · Buenos Aires 1967, print. ZKM | Center for Art and Media Karlsruhe.
- 92 Italo Calvino · *Le città invisibili* · Turin 1972, print. Centre de Cultura Contemporània de Barcelona – CCCB.
- 93 Raymond Queneau · *Cent mille milliards de poèmes* · Paris 1961, print. ZKM | Center for Art and Media Karlsruhe.
- 94 William Morris · *Ramon Llull. The Order of Chivalry* · Translated from French by William Caxton. London 1892–1893, print. Biblioteca de Catalunya, Barcelona.
- 95 Jacint Verdaguer · *Perles del Llibre d'Amic e Amat* (written 1895–1896) · Barcelona 1908, manuscript. Biblioteca de Catalunya, Barcelona.
- 96 Inger Permutationen · Created from the text *Inger permutaciones* (1971) *Suite atonal* (1947) by Juan Eduardo Cirlot. Recitation by Javier Maderuelo. Directed by Toni Curcó. 2016. Digital animation, b/w, sound. 8:15 min. Produced by the Centre de Cultura Contemporània de Barcelona – CCCB.
- 97 Santiago Ortiz · *Rayuela* · 2013. Web-based interactive visualization of data. Courtesy the artist.
- 98 Pe Lang · *moving objects / n° 1755–1899 (from the series Modular)* · 200×200×8 cm. Courtesy the artist.
- 99 Luis Negrón van Grieken, Juan Orozco Velazquez · *De umbris idearum* · 2017. 5-channel video installation with more than 100 live generated video sequences, color, sound. Courtesy the artists.
- 100 Adam Słowiak · Selection of nine objects from the *ABC-matrix* · Idea, concept: Adam Słowiak. Software, 3D-print: Christian Lölkes. 2018. 9 lenticular prints. Each 50×50 cm. Courtesy the artist.
- 101 Adam Słowiak · Selection of one object from the *ABC-matrix* · Idea, concept: Adam Słowiak. Software, 3D-print: Christian Lölkes. 30×30×30 cm. Courtesy the artist.
- 102 Ars Brevis Moderna · Berlin Society for Nontrivial Pursuits (S4NTP), Alberto de Campo, Hannes Hoelzl, Students of the Generative Art class, UDK Berlin. Special Thanks to Daniel Hromada. Mac Mini, monitor, keyboard, trackpad. Courtesy the artists.
- 103 Jeffrey Shaw, Sarah Kenderdine, Edwin Thumboo · *Recombinatorial Poetry Wheel* · 2015 / 2018. Interactive video projection. Courtesy the artists.
- 104 Jennifer and Kevin McCoy · *Horror Chase* · 2002. Video, color, sound. Courtesy Postmasters Gallery, New York. Courtesy the artists.
- 105 Ugo Dossi · *Bibliothek von Babylon* · 1974. Selection of 25 plates. 150×100 cm. Paper collage on cardboard, red and black ink, pencil, stamp-ink. Private collection Brigitte March, Stuttgart.

# Stairway of the Cosmos

From the mystical moment of his religious visions onwards, Llull believed in a higher spiritual power, and viewed reality as a complex whole in which everything is connected with everything else: The largest is manifested in the smallest and the highest divine presence is to be found in the smallest creature. His entire philosophical and literary oeuvre is permeated by the idea that everything that exists is interwoven with everything else by the finest lines, like a network. Since the beginning of the twentieth century, artists and writers of the European avant-garde felt that with their works, they were destined to renew the decaying world of modern spirituality. They tried to pick up the strands of divided and forgotten relationships to bring them to life again. To increase interest in his system, Llull chose the archaic symbols of the ladder and the tree. Both stand for the connection between above and below, heaven and earth, macrocosm and microcosm. Basically, this is an Aristotelian idea: If one wishes to comprehend reality, which stretches in between these two dimensions, the human mind has to move up and down incessantly. In the course of this the seeker becomes aware of the analogies and similarities between everything that exists — from the stones, plants, and animals to the human beings and the angels.

- 1 *Scala Guidoniana* · Concept, realization: Götz Dipper, Manfred Hauffen. Idea: Peter Weibel, Siegfried Zielinski. Support: Matthias Gommel, Bettina Korintenberg, Sebastian Schottke. 2018. Steps of a staircase, light sensor, contact-loudspeaker, computer. Produced by ZKM | Center for Art and Media Karlsruhe.
- 104 David Link · *Meditationes* · 2016. Mixed media installation. Produced by David Link, Cologne and the Centre de Cultura Contemporània de Barcelona – CCCB. Courtesy the artist.
- 105 Yunchul Kim · *Flare* · 2014. Flare solution, motor, micro-controller, double jacket reactor, aluminium. 153 × 80 × 80 cm. Courtesy the artist.
- 106 Ramon Llull · *Recull factici de textos astronòmics* · s.l. 15<sup>th</sup> cent., print. Biblioteca de Catalunya, Barcelona.
- 107 Peter Apian · *Astronomicum Caesarium* · Ingolstadt 1540, print (Facsimile: Leipzig 1967, print.) Arithmeum Bonn.
- 108 Bolton disk from c.1800–1806 (replica) · 2013. Brass. Diameter: 7 cm. Heinz Nixdorf MuseumsForum (HNF), Paderborn.
- 109 Kryha Liliput. Cipher machine in pocket watch shape · 1926. Metal. 2,5 × 7 cm. Heinz Nixdorf MuseumsForum (HNF), Paderborn.
- 110 Curt Herzstark · *Curta II*. Cylindrical calculating machine · 20<sup>th</sup> cent. Metal, plastic, laquer. Height: 18 cm, diameter: 7 cm. Arithmeum Bonn.
- 111 Athanasius Kircher · *Ars Magna Scienti* · 1669. Print, digital reproduction. Badische Landesbibliothek, Karlsruhe.
- 112 Johann Schultes (Ed.) · *Cabala. Spiegel der Kunst und Natur in Alchymia [...]* · Augsburg 1663, print. Badische Landesbibliothek, Karlsruhe, 87B 76164.
- 113 Johann Friedrich Braun (Ed.) · *Pretiosa Margarita* · Leipzig 1714, print with copper engraving. Badische Landesbibliothek, Karlsruhe, 87B 76408.
- 114 Luca Jennis (Ed.) · *Dyas Chymica Tripartita: Das ist Sechs herrliche Teutsche Philosophische Traktätelein [...]* · Frankfurt am Main 1625, print. Badische Landesbibliothek, Karlsruhe, 87B 76509.
- 115 Giovanni Battista della Porta · *Magiae Naturalis* · s.l. 1651, print. Private collection, Berlin.
- 116 Giovanni Battista della Porta · *De Occultis Literarum Notis* · Strasbourg 1603, print. Private collection, Berlin.
- 117 Johann Balthasar Friderici · *Cryptographia* · Hamburg 1685, print. Arithmeum Bonn.
- 118 Johann Wolfgang von Goethe · *Sixteen plates and the explanation of Goethe's Theory of Color* · Tübingen 1810, print. Martinus-Bibliothek – Wissenschaftliche Diözesanbibliothek – Mainz, 3/528.
- 119 Honorius Cordier · *Articuli Catholicae Fidei De Deo ad intra & ad extra Consistente & Operante ex B. Raymundi Lulli Doctoris Illuminati Principiis Ostensi* · Coloniae 1760, print. Badische Landesbibliothek, Karlsruhe, 117E1256R.

- 120 **Raymond of Sabunde** · *Theologia naturalis* [...] · Argentinae 1501, print. Badische Landesbibliothek, Karlsruhe, Dd 8.
- 121 **Bernard de Lavinheta** · *Opera omnia quibus tradidit artis Raymundi Lulli compendiosam explicationem* [...] · Coloniae 1612, print. Badische Landesbibliothek, Karlsruhe, 68A 2020 R.
- 122 **Johann Heinrich Alsted** · *Clavis Artis Lullianae Et Verae Logices* [...] · Strasbourg 1652, print. Badische Landesbibliothek, Karlsruhe, 87B 76494.
- 123 **Marius Schneider** · *El origen musical de los animales-símbolos en la mitología y la escultura antiguas: ensayo histórico-etnográfico sobre la subestructura totemística y megalítica de las culturas y su supervivencia en el folklore español* · Barcelona 1946, print. Victoria Cirlot Collection, Barcelona.
- 124 **Francesc Pujols** · *Hiparxiologi o ritual de la religió catalana. Drama líric en tres actes en prosa i un entreacte en prosa científica* · 1937. Typewritten text with corrections in pencil, bound on paper. Fundació Francesc Pujols, Martorell Barcelona.
- 125 **Josep Maria Subirachs** · *Escala de l'enteniment* · 2005. Ink on paper. 37,5 × 44 cm. ESPAI SUBIRACHS, Barcelona.
- 126 **N. N.** · *Francesc Pujols i l'escala de la vida* · n.d. Photographic reproduction, digitized, b/w.
- 17,5 × 12,6 cm. Centre de Cultura Contemporània de Barcelona – CCCB  
© Fundació Francesc Pujols, Martorell Barcelona.
- 127 **Ralf Baecker** · *Random Access Memory* · 2016. Aluminium profiles, custom pick and place mechanism, microscope camera, computer and electronics. 60 × 60 × 150 cm. Courtesy the artist.
- 128 **Jens W. Beyrich** · *Flower* · 2013. Two-part, three-color metal foil print on embossed cardboard. Each 70 × 100 cm. Courtesy the artist.
- 129 **Salvador Dalí** · *Fesonomia divinatória de Francesc Pujols si hagués viscut a l'època de l'Emperador Trajà* · 1974. Lithograph on paper. 94,7 × 67 × 2,5 cm. Fundació Francesc Pujols, Martorell, Barcelona.
- 130 **J. Pal-LaTorre** · *Pujols Dalí* · 1956. Video, digitized, b/w, no sound. 11:08 min. Fundació Francesc Pujols, Martorell Barcelona.
- 131 **semiconductor** (Ruth Jarman, Joe Gerhardt) · *Black Rain* · 2009. Video, digitized, b/w, sound. 3:03 min. Courtesy Semiconductor – Ruth Jarman and Joe Gerhardt, Brighton.
- 132 **Otto Piene** · *Lightroom with Mönchengladbach Wall* · 1963 / 2013. Lightwall with six light objects, cardboard, wood, metal, motor, light. Dimension variable. Courtesy Sprüth Magers.
- 133 **Matthias Gommel** · *Listening Chair* · 2002 / 2008. Steel, plastic, loudspeaker, audioplayer. 240 × 120 × 140 cm. ZKM | Center for Art and Media Karlsruhe. Permanent loan by LUBW Karlsruhe.
- 134 **Josep Soler** · *Cantavan los auells a l'auba* [...] based on a verse by Ramon Llull from the *Libre d'Amic e Amat*. Performed by the vocal group Auditexaudi, 06/01/2016. Sound recording. 4:00 min. Produced by the Centre de Cultura Contemporània de Barcelona – CCCB.
- 135 **Josep Maria Mestres Quadreny** · *L'Estro aleatorio* · Series of six concerts for soloists and symphony orchestra. 1973–1978. Sound recording, digitized. 69:11 min. Ars Harmonica.
- 136 **Arnold Schönberg** · *Die Jakobsleiter. Oratio* · 1917–1922. Sound recording, digitized. 44:00 min.
- 137 **Arnold Schönberg** · *Structural Functions of Harmony. Chart of Regions* · 1939–1948. Pencil, ink and emulsion paint on paper. 20,1 × 30,7 cm. Arnold Schönberg Center, Vienna. © Belmont Music Publishers, Pacific Palisades.
- 138 **Arnold Schönberg** · *Twelve-tone selection dial* · n.d. Ink and emulsion paint on hardboard. Diameter: 9 cm. Arnold Schönberg Center, Vienna. © Belmont Music Publishers, Pacific Palisades.
- 139 **Arnold Schönberg** · *III. String quartet op. 30. Ranked panel* · 1927. Cardboard, paper, string.
- 18,9 × 14,2 cm. Arnold Schönberg Center, Vienna. © Belmont Music Publishers, Pacific Palisades.
- 140 **Arnold Schönberg** · *Notes to the Jacob's Ladder* · 1915–1917. Colored pencil on paper. 13,4 × 21 cm. Arnold Schönberg Center, Vienna. © Belmont Music Publishers, Pacific Palisades.
- 141 **Arnold Schönberg** · *Notes to the Jacob's Ladder* · 1915–1917. Copy with stage sketch, ink, pencil and colored pencil on paper. 32,4 × 6,7 cm. Arnold Schönberg Center, Vienna. © Belmont Music Publishers, Pacific Palisades.
- 142 **Josep Maria Mestres Quadreny** · *Quartet de Catroc* · 1962. Four-part, letraset and printed ink on paper. Each 53,4 × 79,2 cm. MACBA Collection. MACBA Consortium.
- 143 **Josep Maria Mestres Quadreny** · *L'Estro aleatorio* · 1973–1978. Ink, pencil and print on paper and print on vegetal paper. 47,9 × 95,1 × 2,8 cm. MACBA Collection. MACBA Consortium.
- 144 **Antoni Tàpies** · *Abre de la vida (Miquel)* · 1982. Pencil on paper. 96,5 × 65 cm. Private collection, Barcelona.
- 145 **Antoni Tàpies** · *Abre de la vida (Toni)* · 1982. Pencil and charcoal on paper. 97 × 65 cm. Private collection, Barcelona.
- 146 **Antoni Tàpies** · *Foll* · 1973. Acrylic painting over ancient romantic painting. 59 × 62 cm. Private collection, Barcelona. Courtesy Fundació Antoni Tàpies, Barcelona.

- 147 Antoni Tàpies · *Llull Tàpies* · 1973/1985. Case containing work on paper. 37,5×51cm. Private collection, Barcelona.
- 148 Anselm Kiefer · *Im Herbst dreht sich die Erde ein wenig schneller* · 2017. Glass, metal, wood, lead, acrylic and dried plants. 170×200×100 cm. Courtesy the artist.
- 158 Anselm Kiefer · *Am Anfang* · 2008. Oil, emulsion and lead on photographic paper. 3,80×5,60 m. Kiefer-Sammlung Grothe in der Kunsthalle Mannheim.
- 149 Salvador Dalí · *Raimundo Lulio lo sabía hacer* (from the series *Les caprices de Goya*) · 1977. Photogravure, dry point, stencil printing on paper. 44,4×31,2cm. © Salvador Dalí, Fundació Gala-Salvador Dalí, Figueres, 2017.
- 150 Salvador Dalí · *Cuerda hipnagógica de Lulio estringida* (from the series *Les caprices de Goya*) · 1977. Photogravure, dry point, stencil printing. 44,7×31,2×0,41cm. © Salvador Dalí, Fundació Gala-Salvador Dalí, Figueres, 2017.
- 151 Perejaume · *La rel de l'arbre és una roda* · Audiovisual installation scripted and directed by Perejaume; singers: Sebastià Bardolet, Pol Blancafont, Jaume Ayats and Josep Pieres; selection of texts by Ramon Llull by Perejaume; musical adaption and arrangements: Jaume Ayats; excerpts from *Llibre de Gentil*, "Sant Gil"; *Començament de medicina*, "Misere d'Ànger"; *Arbre Exemplificat*, "Goigs de

la Mare de Déu del Roser"; *Arbre de la Ciència*, psalm "In exitu Israel"; recorded in the Abbot's Hall of Pedralbes Monastery and in a forest in Sant Iscle on 03/22/2016; live sound recording by Eric Arajol; shooting and post-production: Wasabi Produccions S.L. 2016. Multi-channel video installation, digitized, color, sound. 12:47 min. Produced by Can Castellar and the Centre de Cultura Contemporània de Barcelona - CCCB. Courtesy the artist.

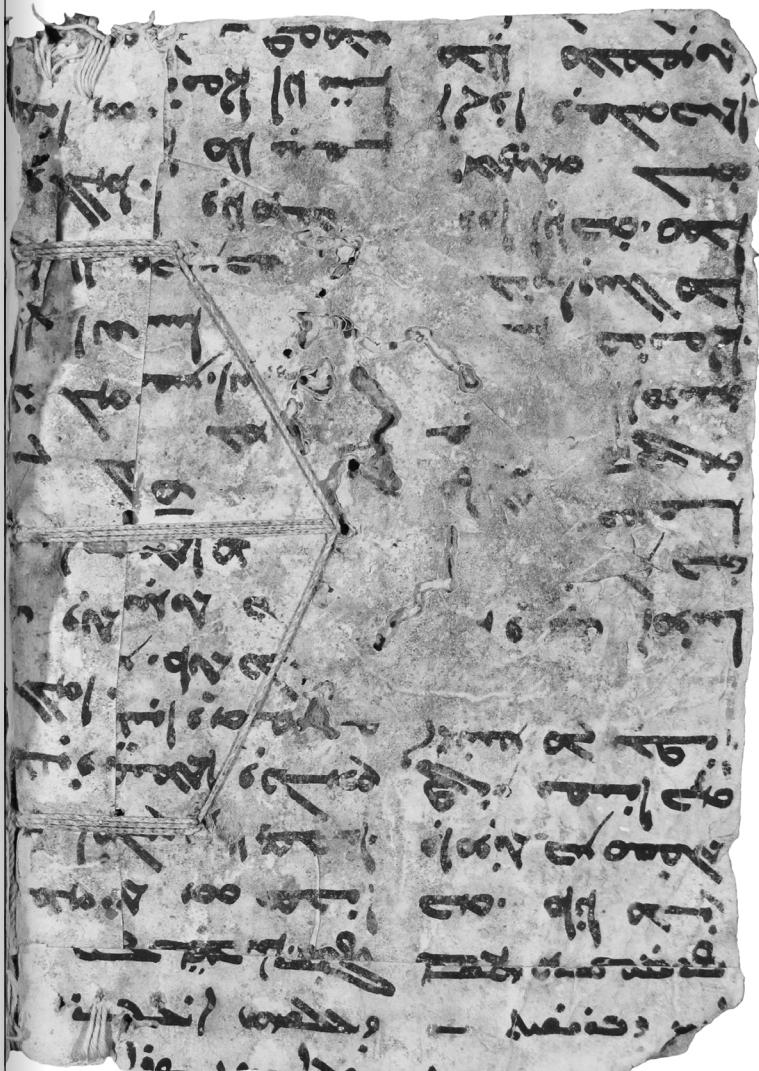
152 N.N. · *En Joan Estrada de Taradell amb un carro carregat de feixos per escafar el forn de pa* · 2016. Photograph. 18×24 cm. Archive of Taradell.

153 Ramon Llull · *Ars compendiosa medicinae* · s.l. 1450–1457, manuscript. Biblioteca de Catalunya, Barcelona.

154 *Kalila wa Dimna* · Persian translation by Abu'l-Ma'ali Nasr-Ullah munsi. 1350–1401. Manuscript, digital reproduction, selection. Produced by the Centre de Cultura Contemporània de Barcelona - CCCB.

© Bibliothèque nationale de France, Paris.

155 Sabine Groschup · *(JC{639}) Aleatory variation #1/89: Jozef Cseres* · 2006/2012. Digital video, color, sound, OmeU. 29:14 min (31:33 min). Courtesy of the artist & John Cage Organ Foundation Halberstadt, Edition Peters and John Cage Trust.





# Ramon Llull's combinatory figures

Ramon Llull's *Ars brevis* (1308) presents a summary of the *Ars generalis ultima*, published in the same year. This abridged version was intended to make the *Ars generalis ultima* accessible to a wider public. Because it was Llull's goal to create a dialogue between believers of different faiths, he explained the mechanisms by which all questions can be answered that are common to the basic concepts of the three Abrahamic religions (Christianity, Judaism, and Islam).

The technique used by Llull represents an early attempt to mathematize and mechanize thought. The hardware of this thinking machine consists of the alphabet and four combinatory figures.

**Figure 1**

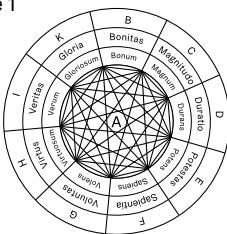


Figure 2

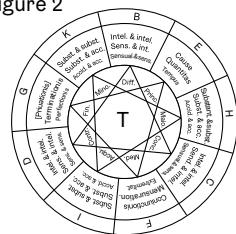
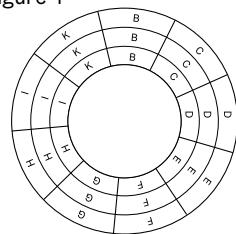


Figure 3

BC	CD	DE	EF	FG	GH	HI	IK
BD	CE	DF	EG	FH	GI	HK	
BE	CF	DG	EH	FI	GK		
BF	CG	DH	EI	FK			
BG	CH	DI	EI				
BH	CI	DK					
BI	CK						
BK							

Figure 4



The software of the thinking machine consists of meanings, principles, and rules according to which connections are produced and which make up the program.

Absolute Principles	Relative Principles	Questions
B Goodness	Difference	If/Whether?
C Greatness	Accordance	What?
D Eternity/Duration	Contrariety	From what?
E Power	Beginning	Why?
F Wisdom	Center	How much?
G Will	Goal	How is it?
H Virtue	Being greater	When?
I Truth	Equality	Where?
K Glory	Being smaller	In what way?

Subjects	Virtues	Vices
B God	Justice	Avarice
C Angel	Prudence	Gluttony
D Heaven	Strength	Unchastity
E Human being	Moderation	Hubris
F Imagination	Religious faith	Inertia
G Power of the senses	Hope	Envy
H Vegetative power	Charity	Wrath
I Elemenaty power	Patience	Falsehood
K Instrumental power	Compassion	Inconstancy

The letters BCDEFGHIK correspond to different principles. Each letter has six different meanings. “Because one letter has many meanings, reason is more receptive to grasping many meanings as well as to acquiring knowledge.”  
(Ramon Llull)

## Ramon Llull's Fourth Figure

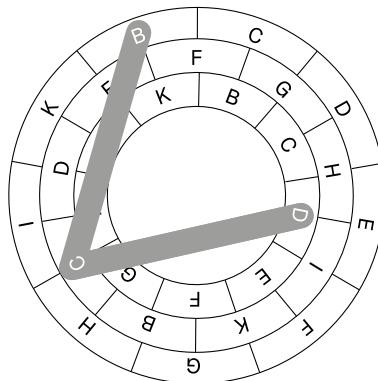
The Fourth Figure is the most famous and the one that was distributed most widely in the Lullist tradition. This figure is a combination of the other three figures and consists of three concentric circles: the largest is fixed, and the other two can be rotated. Nine elements in groups of three give 84 combinations (e.g., BCD, BCE, CDE, and so on). For each of these combinations, three interrogatives can be applied that belong to the three letters, which results in a total of 252 different questions.

The combination of letters BCD, for example, gives the following three questions:

*Whether goodness is as great as it is eternal?*

*What makes goodness great and eternal?*

*From what does goodness become great and eternal?*



Exhibition visitors can try out for themselves the principle of Ramon Llull's *ars combinatoria* and make their own simplified Fourth Figure. The parts and assembly instructions are found in the flap of this brochure.

## ZKM Learning with Art

### GUIDED TOURS

Information and registration:

Monday + Tuesday 1–6 p.m.

Wednesday–Friday 9 a.m.–1 p.m.

Tel. (0721) 8100-1990, Fax -1999

### Guided tours through Atrium 8+9

Every Wednesday + Saturday 4.30 p.m., duration: 1 hour

Price: 3 Euros per person + museum entrance fee

Registration not required, meeting point: ZKM\_Foyer

### Encuentros con Ramon Llull/Trobades amb Ramon Llull

Guided tour in Spanish or Catalan with Helena Palomero

7 April; 5 May; 2 June 2018

Saturday 4.30 p.m., duration: 1 hour

Price: 3 Euros per person + museum entrance fee

Registration not required, meeting point: ZKM\_Foyer

### Ars Combinatoria Hands-On Tour

In this tour, we will explore the logical magic of combining and on a journey through the centuries create our own artistic, algorithmically inspired works of combination.

Duration: 1.5 hours

Prices per group: 105 Euros + museum entrance fee

For groups of more than 10 people there is a reduced entrance fee

School classes 68 Euros + 1 Euro museum entrance fee per person

Max. 15 participants

### WORKSHOPS

Information and registration:

Monday + Tuesday 1–6 p.m.

Wednesday–Friday 9 a.m.–1 p.m.

Tel. (0721) 8100-1330, Fax -1339

### Tricks with Magic!

Inspired by the magic visual worlds of the mystic Ramon Llull, you will create your own animated family movie. You will design fantastic figures like magicians and sorcerers, as well as awesome hybrid creatures. You will write your own script, and conjure up the images on an iPad. At the end, you will add a soundtrack of magical sounds to your movie.

Carmen Beckenbach, arts educator

20 May 2018, Sunday 11 a.m.–3 p.m., ages 5 and upward, for families

Prices: children 8 Euros,

adults 11 Euros

## Dancing Alchemy

Alchemy is the philosophy and practice of materials and how they interact with each other. Transmutability, combinations, synthesis, and a touch of magic—these are the elements that also constitute dance. What makes dance and its experiments magical? What transformation processes trigger magic? Through the exhibition, we will provide physical answers to these questions and experiments in the workshop and the performance. If you have dancing experience that's fine, but it is not a requirement for participating in the workshop.

Gabriela Lang, dancer and choreographer  
24 June 2018, 2–6 p.m., ages 18 and upward  
Price: 36 Euros

## ALCHEMISTIC BÄMLAB

These are special BÄMlab dates for the exhibition *DIA-LOGOS. Ramon Llull and the Ars Combinatoria*. In our makerspace BÄM we will tread in the footsteps of the exceptional Majorcan-Catalan philosopher, logician, and mystic Ramon Llull (c. 1232–1316). In our open BÄMlab we will think, conceive, and produce like the alchemists used to do: from experiments with sugar crystals to rainbow-rain and a gold laboratory, we will delve into their mystical, universal system of knowledge and make our own discoveries.

Fridays from 2–6 p.m. in the BÄM Creative Space (1<sup>st</sup> floor, Atrium 9)  
20 April; 27 April; 4 May; 8 June; 15 June; 22 June 2018  
Ages 8 and upward, entrance is free

## Film Screening: *Right Now, Wrong Then* (South Korea, 2015)

by Hong Sang-soo with Jung Jae-young, Kim Min-hee, and Youn Yuh-jung  
Digital, 121 min., Korean, with German subtitles

How does a romantic encounter, where everything goes wrong, change when the conditions are slightly changed? Film director Ham and Yoon, an artist, meet by chance in a temple and decide on the spur of the moment to spend the day together. At the end Yoon is unhappy, and Ham is extremely irritable. Then, in Hong Sang-soo's film *Right Now, Wrong Then* the day begins over again—it is a variation of the first part of the film. Right and wrong are in themselves opposites, + and −, but in this film they should rather be understood as A and B. These are terms that point up a difference, and are not moral categories. Although both parts are very much stand-alone films, their enjoyment derives to a large extent from the interaction of repetitions, variations, and combinations—under the gentle guidance of chance. And it is chance that decrees Yoon will in the end go to the screening of Ham's film.

6 June 2018, Wednesday, 7 p.m., followed by a discussion

9 June 2018, Saturday, 9.15 p.m.

Location: Kinemathek Karlsruhe, Kaiserpassage 6, 76133 Karlsruhe  
Entrance fees: 7 Euros; members: 5 Euros

## DIA-LOGOS. Ramon Llull and the Ars Combinatoria

17.3.–5.8.2018

### Curated by

Amador Vega, Peter Weibel,  
Siegfried Zielinski

### Curatorial assistance and project management

Bettina Korintenberg

### Project assistance Daniel Irrgang

### Project team Sophie Reiser,

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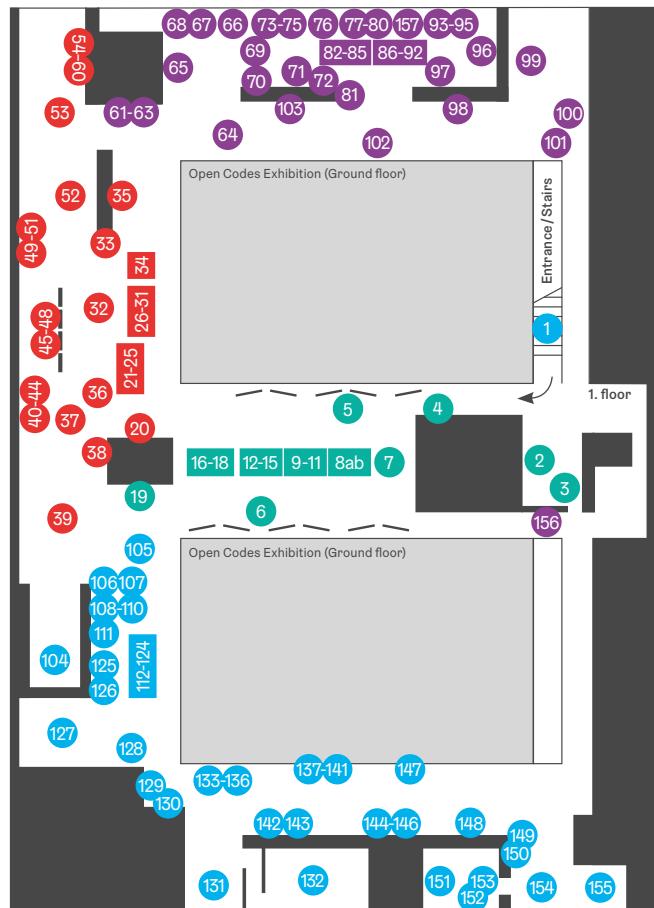
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