

# The Golden Compass and [E8 Physics](#)

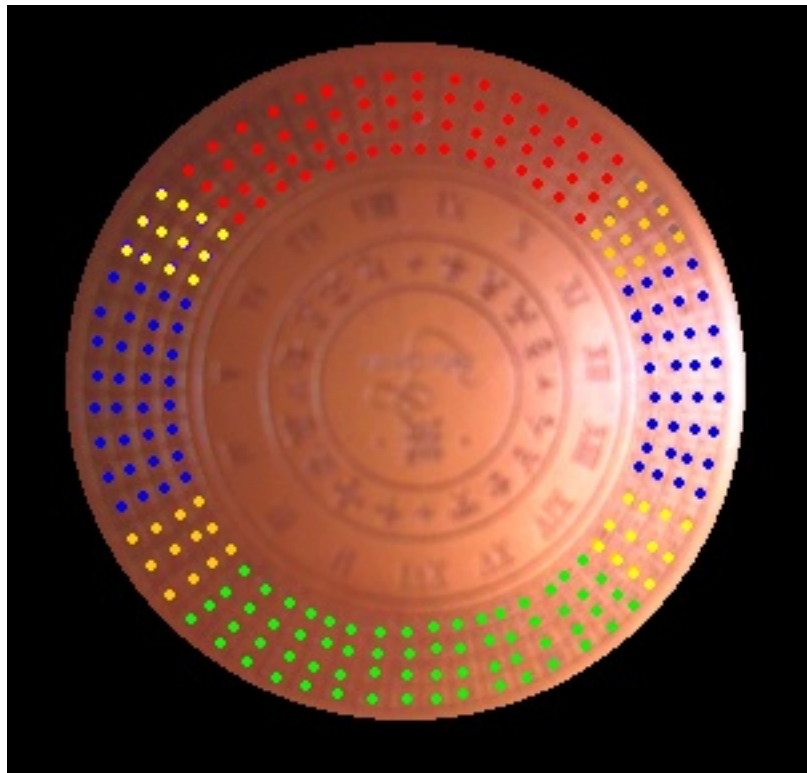


The movie titled in the USA as "The Golden Compass" is based on the first part of the trilogy "His Dark Materials" by Philip Pullman. In it, the protagonist ( a young girl in a world similar but not identical to our own ) is fighting for free will and free thought against a controlling bureaucracy called the Magisterium. A tool she uses, called an alethiometer, enables her to see the real truth.

The alethiometer has 36 symbols arranged in a circle, and three red hands with which she can point to 3 of the 36 symbols in order to formulate a question, upon which the clockwork moves a large black hand to point to symbols ( perhaps more than one, by going them in sequence ) representing the true answer to the question. The design of the Alethiometer in the movie has a pattern of 4 concentric circles of 60 elements each



which seems to me to correspond to



the  $4 \times 60 = 240$  root vectors of  $E_8$  and therefore to  $E_8$  physics.

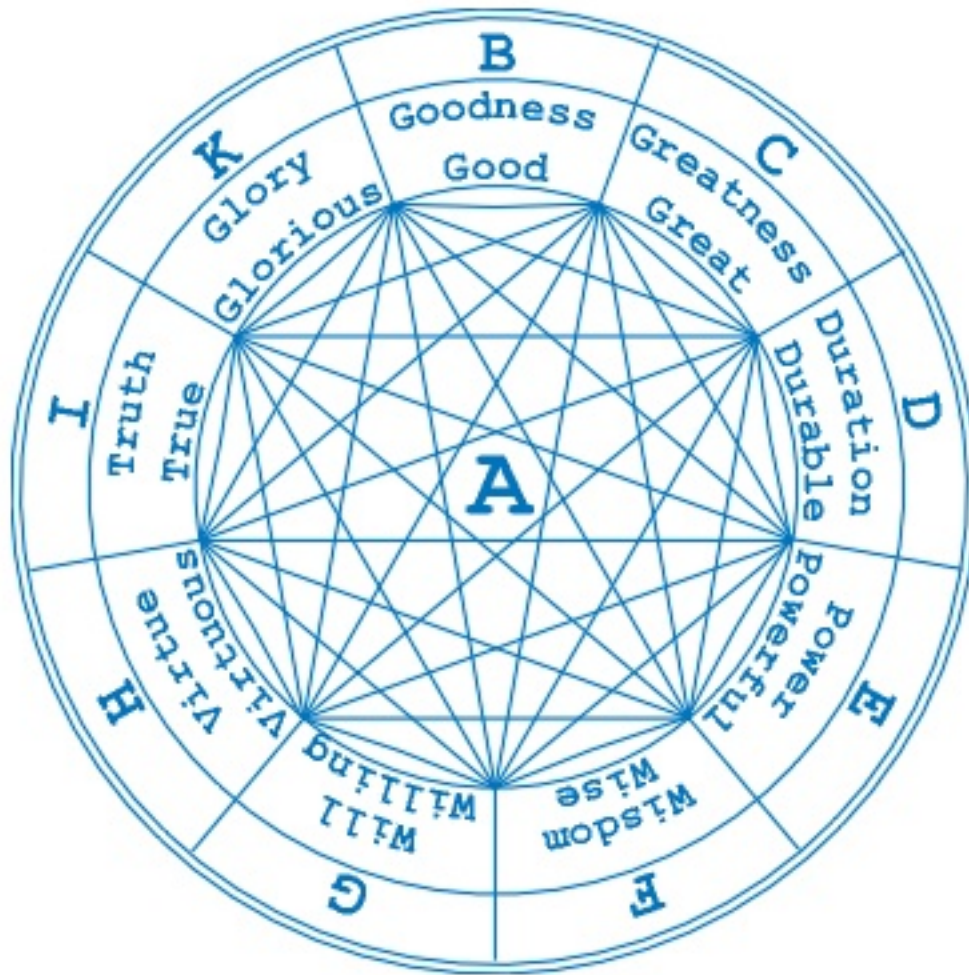
A BBC Radio 4 web chat with the author contained the following exchange:

"... From Graham King Q: Did you base the alethiometer on Ramon Lull's medieval art for seeking the truth, his Ars Combinatoria, based on three circles each divided into topics or symbols which can be individually turned to produce endless connections?"

Philip Pullman: A: Well, how interesting. I didn't know about this. My source for the alethiometer was partly the emblem books of the Renaissance and partly the memory theatre as described in a wonderful book by Frances Yates called The Art of Memory. I was aware of Ramon Lull but not about this Ars Combinatoria, which sounds extremely fascinating. Thank you for telling me about it. ...".

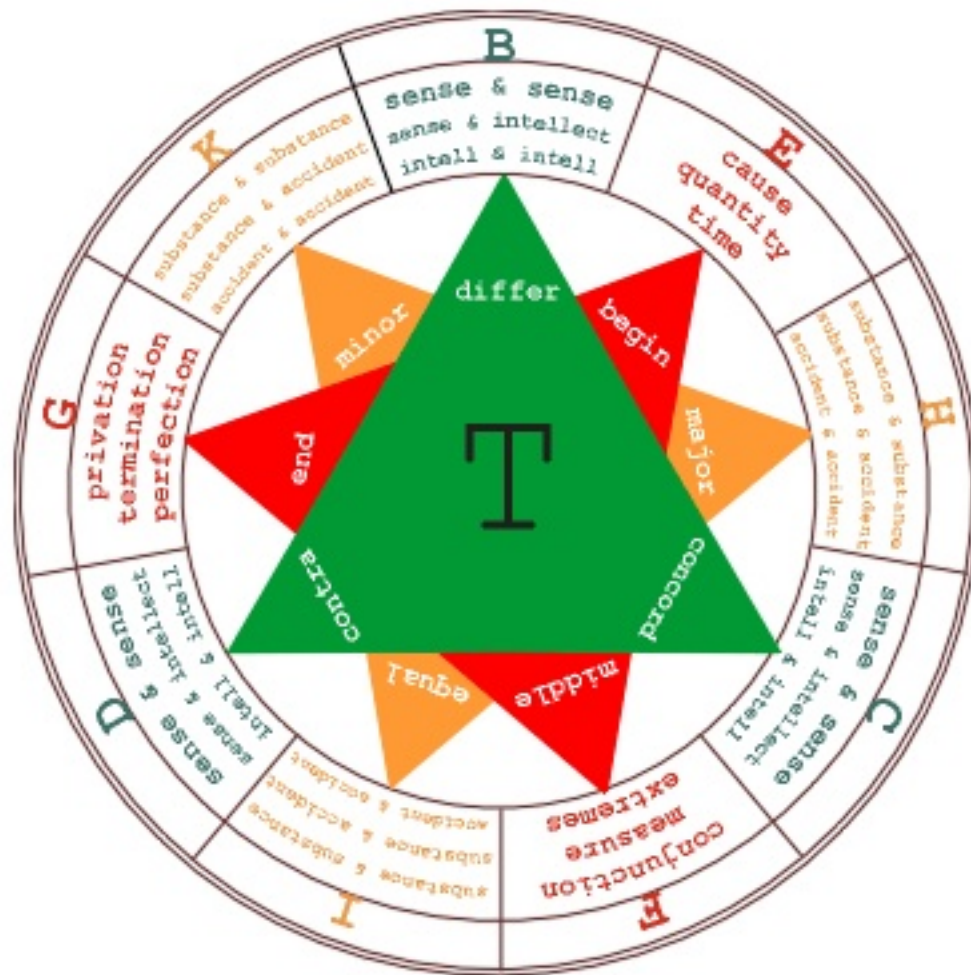
In fact, the book "The Art of Memory" by Frances Yates has an entire chapter ( VIII ) entitled "Lullism as an Art of Memory" which chapter describes figures taken from Ars brevis. In her book, Yates says:

"... The A figure ...["



]... shows ...[ 9 elements ]... B to K and joined by ...[ 36 lines ]...

the T figure ...[



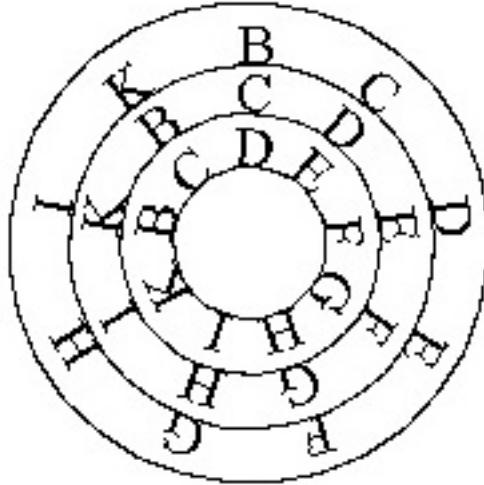
]... shows the relata of the Art ... set out as triangles within a circle ... the Trinitarian structure of the Art is maintained ...

[ In terms of [an F4 view of physics](#) the three triangles represent respectively

- the 3 red, green, and blue colors of fermion quark particles
- the 3 cyan, magenta, and yellow colors of fermion quark antiparticles
- the 3 spatial dimensions of 4-dimensional physical spacetime

each of which can be regarded as a fundamental 3-dimensional representation of 8-dimensional SU(3) of the color force that acts on quarks and acts within the framework of 8-dimensional Kaluza-Klein spacetime, and each of which is related to the others by Triality. ]

The most famous of all the Lullian figures is the combinatory figure ...[



]... The outer circle, inscribed [ with the 90 elements ] B to K . is stationary and within it revolves circles similarly inscribed and concentric with it. As the circles revolve [ corresponding to setting the three red hands of the Alethiometer ] combinations of the letters B to K can be read off. ... The Lullian Art works with abstractions ... B to K . It is ... like a mystical and cosmological geometry and algebra ...

the practice of meditating on combinations of letters was, before Lull, ... developed particularly in Spanish Cabala as the meditation on combinations of the sacred Hebrew alphabet ... Lull ... combines B to K ... therefore ... adapting a Cabalist practice ... in the Renaissance Lullism was certainly closely associated with Cabalism ...

Giordano Bruno ... entered the Dominican Order ... in Naples ... in 1563 ... The first book on memory which Bruno published , the "De umbris idearum" ... the Shadows of Ideas (1582) was dedicated to a French king, Henri III ; its opening words promise to reveal a Hermetic secret. ... The reader of "Shadows" immediately notices the several times repeated figure of a circle marked with thirty letters. In some of these figures, concentric circles, marked with the thirty letters, are shown ... Paris in the sixteenth century was the foremost European centre of Lullism, and no Parisian could have failed to recognise these circles as the famous combinatory wheels of the Lullian Art. ... in the list of star-images in "Shadows" ...[are]... the thirty-six images of the decans ... three "faces" of ten degrees each ...[ in ]... each of ... the twelve signs of the zodiac ...".

Lull's "A" Figure shows ( as 36 lines connecting 9 vertices ) that 36 binary statements can be formed from 9 principles, and the 3-concentric-circle Combinatory Figure shows how formulate an issue/question in ternary form of three choices among the principles, so it seems to me that, even though some of the symbols on the alethiometer circumference may have come from emblem books,

**the number, 36 , of the symbols on the Alethiometer and the ternary way of**

## formulating questions probably came from Llull through Yates.

The 36 binary statements from 9 principles corresponds to the 36-dimensional Lie algebra Spin(9), which when combined with the Spin(9) 16-dimensional spinor space forms the  $36+16 = 52$ -dimensional [exceptional Lie algebra F4 which has physical interpretations](#).

[It is interesting that Llull started with a Cl\(16\) model corresponding to E8 and then \( to try to accommodate the "weakness of human intellect" \) simplified his model to the F4 version](#) and in doing so made explicit the ternary structures ( such as that of the exceptional Jordan algebra J3(O) of 3x3 Hermitian Octonion Matrices ) that were implicit in the Octonionic structures of E8

[while I started building physics models with F4 and then went to E6 and then followed Garrett Lisi to Llull's initial E8 vision.](#)

Mary and John Gribbin, in their book "The Science of Philip Pullman's "His Dark Materials"" (Random House 2003-2005), say:

"... Jung ... thought that the collective unconscious was a part of all living people ... and that it could influence the minds of people far apart from one another, especially through dreams. ... In "His Dark Materials" , the Dust is like Jung's collective unconscious. It knows what is going on everywhere, and it can make people aware of what is going on ... through ... the alethiometer. ...

[ The Alethiometer is based on [Llullian Ancient Wisdom](#). and [Modern Physics](#) such as the [E8 Physics Model](#). ]

Jung ... believed that he had his own spirit companion, a kind of angel he called Philemon ... he seemed real to Jung ...

the Many-Worlds Interpretation ... of quantum physics ... says that the atom ... in a mixed-up state ... deciding whether to decay or not ... does both! It says that the whole world ( the whole Universe ) splits in two. In one world, the atom decays ... In the other world, there is no decay ... So there are also to "yous" and two of everybody and everything else ... this splitting happens every time anything in the quantum world is faced with a choice. So there are millions and millions of worlds, all different from one another, which somehow exist side by side ... in "His Dark Materials" ... the goose daemon of the witch Serafina Pekkala ... tells Lyra that: "... the lights ... in the Northern Lights ... [ image from The

Golden Compass movie trailers etc prior to cutting the movie short for December 2007 release



]... show us a different universe entirely ... interpenetrating with this one. ... millions of universes exist, unaware of one another. ..." ...

[ In "His Dark Materials": "... Dr. Mary Malone ...[said]... "... Dust ... sound like something we've been investigating... for ... the stars and galaxies ... all to hang together and not fly apart, there needs to be a lot ...[of]... Dark matter ... particles are strange l... We call them shadow particles, Shadows ... They're conscious ... Shadows are particles of consciousness .. if you think, the Shadows respond ... The Shadows flock to your thinking like birds. ..." . ]

[ Dust = Shadows represents the [graviton and graviphoton](#) carriers of the force of Gravity as in [Hameroff-Penrose Superposition Separation among Separate Worlds of the Many-Worlds](#), and is correlated with, but not identical to, the [Dark Matter of Primordial Black Holes](#). ]

The real purpose of the subtle knife was to ... cut slices in space ... windows into the dimensions where parallel universes existed. ... If you could cut a hole in space, you could also cut a hole in time - a window into the past of the future ... "... If there was such a thing as shadow colored, it was the blade of the subtle knife ...

space-time isn't really smooth and continuous ... It's more like a fabric that has been woven ... the knife bearer .. can unpick the fabric of space-time using the subtle knife ... "... Think about the knife tip ... looking for a gap so small ... the knife tip will find it, if you put your mind there ..." ...

[ The Woven Fabric of the Many-Worlds is based on the [Simplex Physics](#) of the [Clifford Tensor Product Universe](#). ]

the "... resonator" ...[ for ]... instant...communicat[ion] ...[with]... a different world ... [ is



based on ]... "... quantum entanglement ... When I play on this one ... the other one reproduces ...[ it ]... exactly, and so we communicate." ...".

The VooDoo Bomb ... "We place the hair in the resonating chamber. You understand, each individual is unique, and the arrangement of genetic particles is quite distinct. ... Well, as soon as it's analyzed, the information is coded ... and transferred to the aiming device. That locates the origin of the material, the hair, wherever she may be. ... The force of the bomb is directed ... To each of the hairs from which these ones were cut ... So when it's detonated, the child will be destroyed, wherever she is ...". ...

[ The Subtle Knife and the Resonator work by [Quantum Consciousness Resonant Connections](#). ]

"... when she looked though ...[ the amber spyglass ... to see Dust ]... Everywhere she looked she could see gold ... sparkles of light, floating and drifting and sometimes moving in a current of purpose ... wherever she saw a conscious being ... the light was thicker and more full of movement. It didn't obscure their shapes in any way; if anything it made them clearer. ..." ...".

[ The Amber Spyglass works by the same principles as a [Chiao Gravity Antenna](#) and [Dolphin Vision](#) of the [Fates of the Many-Worlds](#). ]

In [Shinto](#) terms:

- the Alethiometer, Dust = Shadows, and Woven Fabric represent the Jewel
- the Subtle Knife and Resonator represent the Sword
- the Amber Spyglass represents the Mirror

The movie has become controversial in the USA. For example, a Boston Globe article by Donna Freitas dated 25 November 2007 said:

"... even before it opens, "The Golden Compass" finds itself at the center of a controversy. The Catholic League, a conservative religious organization, launched a campaign on Oct. 9 calling on all Catholics to boycott the film. The group also published a lengthy pamphlet attacking the story and distributed the pamphlet to Catholic schools across the country. Other groups have joined the fray, including the evangelical nonprofit Focus on the Family, whose magazine Plugged In urged parents to keep kids out of theaters showing the film. And the Christian blogosphere is alive with warnings not only about the movie trilogy, but also about the series of books it is based on.

Bill Donohue, president of the Catholic League, charges that

the books, known as the "His Dark Materials" trilogy, are deeply anti-Christian. Donohue says he fears that the film will inspire parents to purchase "His Dark Materials" for their fantasy-hungry kids on Christmas, unaware that the third book of the series, "The Amber Spyglass," climaxes in an epic battle to destroy God. Some of the book's villains are referred to as the Magisterium - a term used to refer to the Catholic hierarchy. The British author, Philip Pullman, has said openly that he is an atheist, and Donohue charges that his books are designed to eradicate faith among children.

But this is a sad misreading of the trilogy. These books are deeply theological, and deeply Christian in their theology. The universe of "His Dark Materials" is permeated by a God in love with creation, who watches out for the meekest of all beings - the poor, the marginalized, and the lost. It is a God who yearns to be loved through our respect for the body, the earth, and through our lives in the here and now. This is a rejection of the more classical notion of a detached, transcendent God, but I am a Catholic theologian, and reading this fantasy trilogy enhanced my sense of the divine, of virtue, of the soul, of my faith in God.

The book's concept of God, in fact, is what makes Pullman's work so threatening. His trilogy is not filled with attacks on Christianity, but with attacks on authorities who claim access to one true interpretation of a religion. Pullman's work is filled with the feminist and liberation strands of Catholic theology that have sustained my own faith, and which threaten the power structure of the church. Pullman's work is not anti-Christian, but anti-orthodox. ...".

The movie cost \$180 million. After it had been out for 2 weeks, the box office report as of 20 December 2007 showed a total USA gross of \$44 million. However, the movie seems to be doing better outside the USA. A 20 December 2007 web article by Conor Bresnan said:

"... The Golden Compass' overall total climbed to \$91.5 million, nearly double its disappointing domestic [ USA ] gross. ...".

**Anthony Bonner, author of the new book "The Art and Logic of Ramon Llull : A User's Guide" (Brill 2007, available from Amazon.com) , said in an email:**

**"... Extraordinary business about a movie based on a device based on Lull's Art! Odd, too, the author using Yates without realizing that she was talking about Lull, and it's being the BBC radio host who mentions Lull. It's all really rather amazing ...**

**Depressing, though, how it's being subjected to censorship by what Pullman calls the Magisterium. ...".**

Here is a brief outline of the life and work of Lull taken from the new book by Anthony Bonner ( for the fascinating details, read the book ):

"Ramon Lull was born in 1232 ... or 1233 ... after the Catalans under the Aragonese crown had conquered the island of Majorca from its Muslim rulers. This meant that he grew up in a place where Muslims ( enslaved by the conquerors ) occupied perhaps a third of the population, and where Jews, although numerically far inferior, were economically, politically, and ... culturally important. ...

At the age of thirty ...[ around 1263 ]... He ... abandoned his former way of life, left provisions for his family, and ... settled down to nine years of study, during which he bought himself an Arab slave so as to learn ...[ Arabic ]... language and culture ...

At the end of these years of study ... on Mount Randa, a solitary hillock rising out of the plain some 15 miles east of Palma, he experienced ... a ... divine intervention ... he was given the "form and method" ... for writing the ... books ... he felt he had to write ...

the first work of ... Lull's Art ... the *Ars compendiosa inveniendi veritatem* ... took place in about 1274, and ... began ... the quaternary phase of the Art [ related to CI(16) and E8 ] ... In about 1283 Lull ...[ wrote ]... the *Ars demonstrativa* ...

negative reception in Paris ... brought on by the radicalism of Lull's system, seen as too alien to the accepted ways of discussing theology and philosophy ...[ caused ]... Lull ... to adapt his system and make it more acceptable. This change from sixteen to four figures signals the change from the quaternary [ related to CI(16) and E8 ] to the ternary [ related to F4 , Triality, and J3(O) ] phase of the Art, which begins with the *Ars inventiva veritatis* written upon his return to Montpellier in 1290. ... in Pisa ... in 1308 ... Lull ... finished ... the *Ars generalis ultima* and ... the *Ars brevis* ...

during the last period ... the post-Art phase (1309-1315) ... he produced no reformulations

of his system, but ... replaced ...[ emphasis by using ]... an increasingly all-pervading logic and syllogistics. ... as to possible reasons for this tactical reorientation ... he realized that , as effective as the Art might be, its potential audience of scholastic theologians would never consider its methods as constituting real proofs ... as Charles Lohr put it, "Llull's encounter with the position of the theologians of the university of Paris ... forced him to turn his attention to the theory of scientific demonstration". This meant trying to make his arguments conform to the existing canon, whose cornerstone was Aristotle's statement ... "By demonstration I mean a syllogism which produces scientific knowledge." ...

His last works are dated ...[ in ]... Tunis ... in December, 1315 ... he must have died sometime between then and March 1316, in Tunis, on the boat back, or upon arriving in Majorca.

... the combinatory mechanisms with their accompanying graphic devices made possible what was perhaps the most innovative of Llull's accomplishments:

to create an Art that was generative, which upon a base of a strictly limited number of concepts could build a whole constellation of demonstrations and explanations.

... Arnaldez ... makes the interesting suggestion that "the Art would seem to be capable of allowing not only the discovery of the truth, but also the rules for its own use, which would make it "autocritical", a necessary condition for arriving at a universal agreement." ...

... it was this generative nature of the Art which held such a powerful fascination for later thinkers, such as Agrippa von Nettesheim ... Giordano Bruno who saw it as a way to explore the connections among his infinity of worlds, to Leibniz whose youthful interest in the Art planted the seed that led to his later Mathesis universalis. ...

one of the prime goals of Llull's project ...[ was ]... to make his readers capable of thinking for themselves, and to show them how to do so correctly in both an intellectual and spiritual sense. ... he wants to teach them all the techniques they'll need, point the way, and then let them achieve the goal on their own. ...

Perhaps the most unusual aspect of the Art ... is the fact that it can be used impartially by everybody, as in the Book of the Gentile it is used identically by the Jew, the Christian, and the Muslim to prove their respective articles of faith ... allowing all to dispute on an equal footing ... this identity of polemical opportunity ... is carried out to the end, where ... the reader is left hanging as to which religion the gentile has chosen ... So the chief protagonist is the Art ... created to take the place of sterile doctrinal confrontations ... [ which is one thing on which all three can and do agree, thus showing that in a sense ]...

all three can be of a single faith [ exemplified by the Art ]...

the elaborate mechanisms of the *Ars demonstrativa* and the *Ars generalis ultima*, so carefully made to appear ... neutral and non-doctrinal, are in fact ... the complete working out ... of Lull's method for religious persuasion, and at the same time the foundations for a science of sciences. ...".

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