Received: 10th October 2017 Accepted: 15th December 2017

Charissime Fili: The Transmission of Alchemical Science from the Manuscript to the Press: the Pseudo-Lullian Diagrams*

Fabio Spadini
Université de Fribourg
fabio.spadini@unifr.ch

Abstract

The massive presence of alchemical diagrams in the *Testamentum* of Pseudo Ramon Llull makes it possible to analyse in a pertinent way the development of a diagrammatic thought aimed at the teaching of alchemical science. The analysis of the key figures of a manuscript kept at the Kantonsbibliothek Vadiana in St Gall allows not only to understand the general functioning of the alchemical figures, but also to underline the methodological changes due to the passage from the manuscript to the printed book.

Key Words: Alchemy, Pseudo Ramon Llull, Geometrical diagrams, Transmission of knowledge.

Charissime fili: la trasmissione del sapere alchemico dal manoscritto alla stampa. Il caso dei diagrammi alchemici pseudo Lulliani

Riassunto

La massiccia presenza di diagrammi alchemici nel *Testamentum* di Pseudo Raimondo Lullo consente di analizzare in modo pertinente lo sviluppo di un pensiero diagrammatico finalizzato all'insegnamento della scienza alchemica. L'analisi delle figure chiave di un manoscritto conservato alla Kantonsbibliothek Vadiana a San Gallo consente non solo di comprendere il funzionamento generale delle figure alchemiche, ma anche di sottolineare i cambiamenti metodologici dovuti al passaggio dal manoscritto al libro stampato.

Parole Chiave: Alchimia, Pseudo Raimondo Lullo, Diagrammi geometrici, Trasmissione della conoscenza.

Alchemical diagrams are found in the medieval treatises called pseudo-Lullian and attributed to Ramon Llull, a Majorcan philosopher who lived during the second half of the 13th and the beginning of the 14th century[1]. These diagrams ensured not only the preservation, but also the transmission of alchemical science. They rep-

* I would like to thank Regula Forster (Freie Universität Berlin) for the suggestions and corrections. My special thanks are extended to my brother Christian, who corrected the English version.

1 Tessari 2015; Villalba i Varreda 2016.

resent a non-verbal communication channel with a mnemonic performative function, allowing the reader to access to alchemical knowledge. The creation of these schemes or diagrams occurs in a specific historical moment, namely the first half of the 14th century. The rapid development of alchemical theories during this period implied the need to create new channels for knowledge transmission. Although the alchemical pseudo-Lullian diagrams are found in a large number of manuscripts since the first half of the 15th century, they have never been thoroughly studied[2]. This paper will present the different types of diagrams found in the pseudo-Lullian *Testamentum: Practica*, a 16th century manuscript kept in the Kantonsbibliothek Vadiana in St Gall (Switzerland). We argue that Bartholomäus Schobinger, the owner of this manuscript, had an active interest in the alchemical science and established a small circle of *socii* who spread the essence of the pseudo-Lullian alchemy. The aim of this research is to examine these schemes according to an epistemic point of view, to analyse their content, and to discuss their development. More precisely, we will focus on the modifications that took place during the transition from the manuscript to the print because of practical difficulties as well as of new function of the diagrams.

1. *Diagrams and medieval alchemy*

No alchemical diagram is depicted in the earliest manuscripts of medieval alchemy[3]. Their late appearance in the first half of the 14th century is associated with the development of the alchemical doctrine which is divided into three main phases in the medieval age. In the first stage (middle of the 12th century), several technical treatises aimed both at theorising and consolidating the new discipline that was circulating in Western Europe. Encyclopaedists, such as Dominicus Gundissalvi (*De divisione philosophiae*, 1145), and Daniel of Morlay (*Liber de naturis inferiorum et superiorum*, 1187), strove to find a suitable definition for this new knowledge in order to fit it into the division of Arts[4]. The second phase started during the 13th century with the first debates in treatises on metallurgic alchemy[5]. The main goal of the

2 The importance of the geometrical figures in alchemy is underlined in the following studies: EVANS 1980; PEREIRA 1995; OBRIST 2003; LÜTHY, SMETS 2009; HIGUERA RUBIO 2012; RAMPLING 2013.

3 In 1144, the West accessed to alchemical knowledge thanks to the translation of the *Liber Morieni de compositione alchimiae* probably due to Robert of Chester. On the debate concerning this authorship, see LEMAY 1991; DAPSENS 2016.

4 For the study of this treatises, see CRISCIANI 1976.

5 The oldest treatises focus on the description of metals and their possible artificial transmutation. This choice comes from the desire first to transmit in the West a well-known arabic knowledge, along with the concept of elixir, and second to explain how Aristotle conceived the generation of metals. A second type of alchemy, the medical one, appears in the middle of the 14th century;

authors was to demonstrate philosophically the feasibility of transmutation. The use of diagrams appears during the third phase in the first half of the 14th century. Alchemical theories were then considerably extended, their main goal was no more to demonstrate the validity of transmutation, although some treatises continued to debate the topic. Most works were more focused on practice, and aimed at conveying the knowledge from the masters to the disciples. New communication tools had to be developed in order to ease the assimilation and dissemination of the alchemical *opus*[6].

2. *Pseudo-Ramon Llull and the pseudo-Lullian diagrams*

The attribution of a treatise to a famous and respected personality, namely Llull, even though he was not the real author, is a well-known procedure in the alchemical domain as in other fields. It aimed at conferring the *auctoritas* of widely respectable and acknowledged authors to the works[7]. The claimed antiquity underscored authority. However, the attribution of these texts to Llull may surprise, as the philosopher was known for his aversion to the alchemical *opus* as clearly indicated in his *Felix* encyclopaedic novel[8]. The answer lies in the use of diagrams in his works that were mainly didactic and thus required a visual and geometrical support to ease their understanding. Llull elaborated a series of combinatory diagrams and tables in order to synthesize his theories on the fundamental concepts of all the arts, from medicine to theology. The pictures of the *Ars Combinatoria*[9] were regarded by pseudo-Lullian authors as the best way to explain alchemical procedures, even though these designs followed a different methodological implementation. The Lullian notion of nature also had affinities with alchemical theories. The attribution of the authorship of dia-

---

it becomes very important at the beginning of the Plague, as it allowed to transfer metallurgic alchemical knowledge on the production of medical drugs able to heal man from all illnesses. About medicine and alchemy, see McVaugh 1974; Crisciani, Pereira 1998; Crisciani 2003; Crisciani 2011; Crisciani 2014.

6 The word *opus* is used here to describe the procedure that produced the elixir or *lapis* as well as the transmutation process itself.

7 For an introduction to authorship and pseudo-authorship, see Minnis 1988; Newman 1991: 57-108; Costanza 2009.

8 Bonner 1989, vol. II: 121: «Molt de meravellà lo foc de la folla opinió de l'alquimista, qui cuidava més saber en la existència des elements simples, que ell...transmutacion és impossible e contra los comencaments naturals, qui són mas forts en apetit natural que en l'artificial de l'alquimista».

9 The main work where Ramon Llull claims that he could teach all the arts, from medicine to theology, using alphabets and geometrical figures combined, the one with the others, in order to explain the fundamental concepts of those Arts. For an introduction to the *Ars Combinatoria* see Neubauer 1978; Bonner 2007; Pecchioli 2015; Vega 2016.

grams to Llull was thus not motivated by a mere practical reason. In addition, those who chose to refer to his *auctoritas* had also adopted some theoretical concepts of the Majorcan philosopher. The legend of an alchemist Llull was created during medieval times[10], and gave the name "pseudo-Lullian" to the diagrams. According to the earliest legend reported by the *Codicillus* and the *Ars Operativa Medica*, Llull was converted to alchemical art after meeting in Paris Arnald of Villanova (1240-1313), a medical doctor whose name was also falsely associated with alchemical treatises. The second legend is reported by the *Testamentum Cremeri*, published by Michael Maier (1518); it described the fictional journey of Llull in England where Abbot Cramer of Westminster asked him to help with alchemy King Edward in need of money. The alchemist operated the transmutation believing that the product would be used to defeat the Saracens, but he was deceived because the gold is used to fight against the French. The author goes on telling how Llull criticized the work of the King and was locked up in the Tower of London for an undeterminate period. In 1449 these two legends merged into a single one[11]. Thus the legend of Llull as an alchemist presents the *topoi* associated with the alchemical world, namely the relationship between the disciple and the master, travel, and troubled and dangerous relationships with power.

2.1. Diagrams

The term "diagram" does not appear in medieval sources. The manuscripts use instead the words *imago*, *pictura* and *figura*[12]. The alchemical diagrams in general, not only the pseudo-Lullian one, can be divided into three main distinct categories with different contents and functions: practical, mnemonic and synoptic[13]. The first one comprises the astrological-alchemical diagrams, widely spread in manuscripts devoted to alchemical medicine, and bound to astrology. These treatises are dynamically organized into several layers of parchment that link different elements of alchemical procedures. The rotatory movement of this kind of diagram permits to find the right moment for the production of a medicament during a determined planetary conjunction. Mnemonic diagrams compose the second group. Their main feature is

10 The first mention of an alchemist Llull is found in the *Summa sedacina totius artis alkimie*, dated during the first half of the 14th century. PEREIRA 1989: 41.

11 For a more in deep analysis of the legend, see PEREIRA 1987: 145-163; PEREIRA 1989: 38-49; PEREIRA 2013; VALRIU 2014.

12 The term *imago* refers to a significant visual form; however, *pictura*, only defines a material image (like the one of an alembic). In manuscripts one often finds the term *figura* used as a synonym of *imago*. An analysis of this words can be found in, LÜTHY, SMETS 2009: 424-433.

13 This is my categorisation. For a general study about diagrams in medieval manuscripts, see MÜLLER 2008. Mnemonic, synoptic and cosmological diagrams already appear in OBRIST 1982, 1993.

to ease the understanding and transmission of the discipline through the development of precise schemes allowing a better memorization of the main alchemical theories. The third category includes diagrams that carefully describe and resume well-determined alchemical procedures, such as fermentation and distillation.

2.2. The pseudo-Lullian *Testamentum*: *Practica*

The manuscript of the pseudo-Lullian *Testamentum: Practica* is kept in the Vadiana library in St Gall[14]. It contains thirty diagrams. The main figures follow the basic Lullian idea according to which the four elements, illustrated in *Elementata*[15], assume the shape of a square, a circle and a triangle. These three combined pictures allow visualising the basics of the alchemical pseudo-Lullian imaginary and are linked to Platonic philosophy as presented in the *Timaeus*, since they take up his geometric reflections, as we will see. They are also adapted to the language of alchemists.

The circle describes a continuous process associated with the idea of generation as well as with that of rotatory movement that are central to the work of the alchemist. Thanks to the rotatory movement he is able to transmutate an element into another[16]. In several representations it is also further split up into concentric circles. The triangle represents the fundamental geometrical shape thanks to its skills to dismantle and rebuild[17], while the square is a shape consisting of twelve triangles, that, according to Plato, generates a circle, when it rotates over itself. These three shapes thus represent the processes of generation and corruption of the matter according to geometric laws in alchemical language. Additionally, they facilitate the learning as the English philosopher Robert Grosseteste (1175-1253) explains: "It is most useful to consider lines, angles and figures, because it is impossible to understand natural philosophy without them"[18]. The basic geometrical shapes are seen as symbolic

---

14 Until now, this manuscript was never the object of a study, even if the text of the *Testamentum: Practica* is very well known thanks to the studies of Pereira, mainly Pereira 1992; Pereira, Spaggiari 1999. This manuscript is rich in diagrams. I will cite the manuscript in the following way: Vad. Slg. MS 425.

15 Yates 1959; Millàs-Vallicrosa 1962.

16 See here fig. 2 for the description of the diagram of creation.

17 Pl., *Ti*. 54CD, " For these three are all naturally compounded of one triangle, so that when the larger bodies are dissolved many small ones will form themselves from these same bodies, receiving the shapes that befit them, and conversely, when many small bodies are resolved into their triangles they will produce, when unified, one single large mass of another kind. So let thus much be declared concerning their generation into one another " (trans. R.G. Burg, Loeb).

18 *Utilitas considerationis linearum, angulorum et figurarum est maxima, quoniam impossibile est sciri naturalem philosophiam sine illis*. Robert Grosseteste, *De lineis, angulis et figuris seu de fractionibus et reflexioninus radiorum*, 1231, p. 1, trans. C. Flüeler.

steps of a ladder leading to the truth. According to Aristotle's *De Anima*, the geometrical shape will never be able to trick the human's intellect.

In sum, the circle, the triangle, and the square are used as shapes demonstrating the principles of transmutation: the circle embodies the basic principle of eternal movement, the triangle is close to the first one as it presents the easiest shape among polygons and symbolises the fire. Finally, the square resulting from the composition of the two other shapes, represents the four elements. These geometric forms thus become a tool for creating mental images structuring alchemical knowledge. The strong relationship between picture and knowledge is not new. Already Cicero suggested that rhetoricians should create geometrical shapes. By doing so, he explains, they would memorize more easily what they had to say[19]. In alchemical manuscripts, the diagrams generate a non-verbal iconic reinterpretation of written knowledge. The alchemical work should lead to the formation of the *lapis*-elixir, the tool for transmutation, the principle that enables the transmutation of one metal into another one. In the meantime, if we superimpose the geometrical shapes used for creating the diagrams, we find the picture showing the philosopher's stone, formed by a combination of a circle, a triangle and a square (fig. 1). In short, written text and diagrams have the same aim, the production of the elixir. We find here the basic geometrical images of the alchemic process.

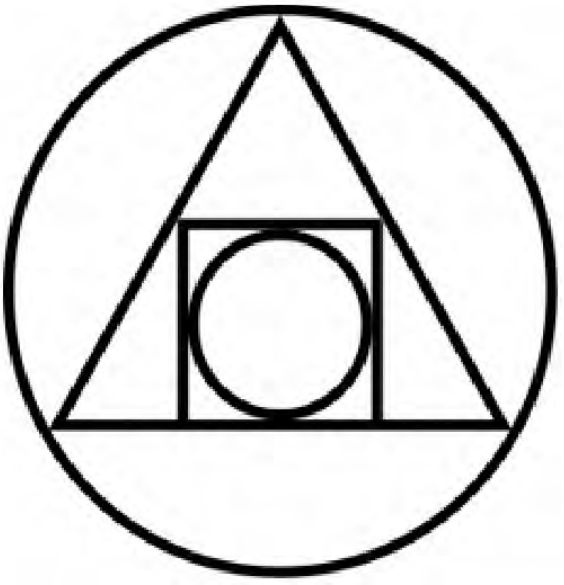

Fig. 1 : The *lapis Philosophorum*

19 Cic. *Orat*., II, LXXXVII, 357: " It has been sagaciously discerned by Simonides or else discovered by some other person, that the most complete pictures are formed in our minds of the things that have been conveyed to them and imprinted on them by the senses, but that the keenest of all our senses is the sense of sight, and that consequently perceptions received by the ears or by reflexion can be most easily retained in the mind if they are also conveyed to our minds by the mediation of the eyes, with the result that things not seen and not lying in the field of visual discernment are earmarked by a sort of outline and image and shape so that we keep hold of as it were by an act of sight things that we can scarcely embrace by an act of thought" (trans. E.W. SUTTON, H. RACKHAM, Loeb)

Two examples[20] demonstrate this iconic agency, the first one in the manuscript tradition and in print, the second one only in the manuscript tradition.

The 'diagram of creation[21]' (fig. 2), is composed of six double circles. In the middle of the central one, the fundamental formula is inscribed: *Omnia in Unum*. In its exter-

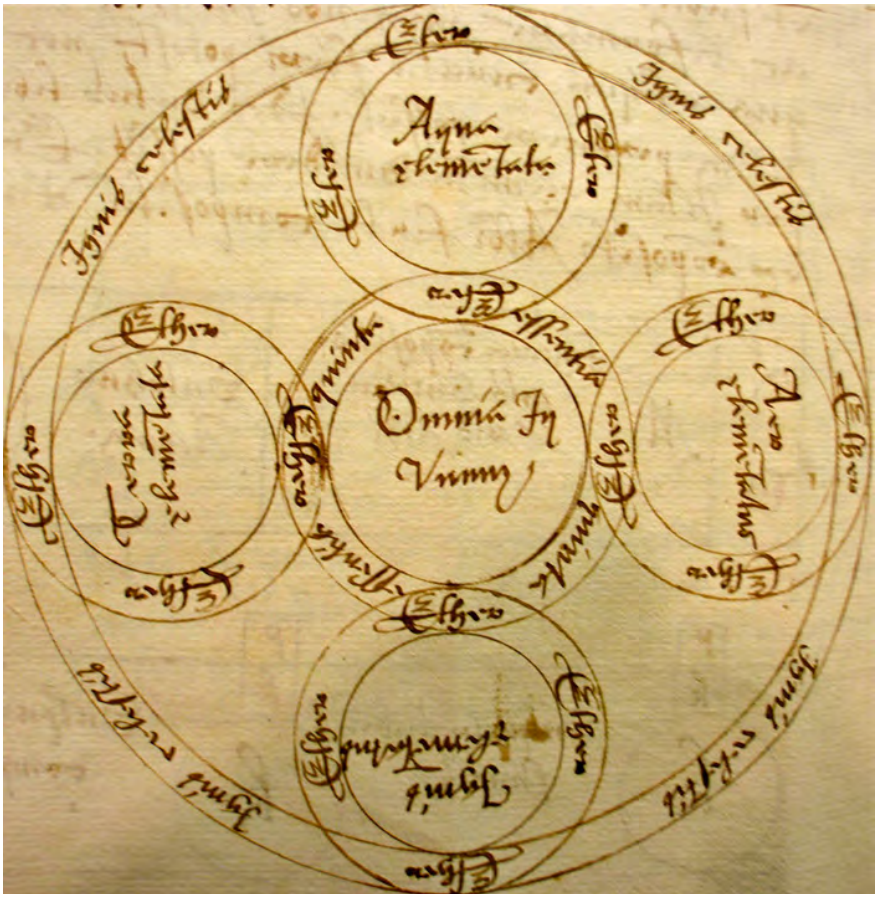

Fig. 2: The diagram of creation, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 425, fol. 12r. (photo: Fabio Spadini).

nal circumference one finds the inscription *Quinta Essentia*. It is surrounded by four other double circles representing the four elements in their *elementata* version, namely *Aqua Elementata*, *Aer Elementatus*, *Terra Elementata*, *Ignis Elementatus*, followed by

20 The description of the different alchemical process typical of the pseudo-Lullian alchemy presented here is based on Pereira 1992.

21 This is my terminology.

an additional word, *Ether,* located in the external portion. Finally, the whole is circumscribed by a large double circle inscribed with *Ignis Celestis*. Under the diagram a brief caption describes how the figure depicts the dynamics of the four elements, *elementati:* "This figure shows how the elements constitute a circular element in a way that the biggest part of one of the four elements will be the minimal part of the other[22]".

This diagram concentrates the basics of alchemical theories. First, the One-in-All defines what the alchemist can produce in his laboratory. Secondly, according to the *Magister Testamenti* all the tangible bodies are made up by the prime matter of creation, the constituent of all created realities, terrestrial as well as celestial. This prime matter is identified with the "Fifth Essence[23]" from which the elements are extracted. In order to be efficient, the *artifex* must decompose gold and silver in order to obtain the prime matter. This is typical for pseudo-Lullian alchemy[24]. In other treatises, gold and silver represent the final product of the alchemist; here they become active principles, used to obtain the *fermentum*, a substance found in precious metals, able to multiply the natural perfection in all metals as well as in the human body[25]. From the prime matter it is thus possible to produce the "elemental[26]" four elements. Each element can generate its quintessential, or *elementatus*, homologous. The reversal process is also possible because the concrete elements, which are created after the first solutive process, can be brought back to the Fifth Essence by the alchemist who can improve them.

I argue that this scheme can be called a diagram of creation. In alchemy, the craftsman aims at reproducing a microcosm. When the alchemist works with the Fifth Essence he is not just imitating the work of Nature, he is operating a real resumption of creation[27]. The One-in-All concept refers to the possibility of artificial and natural transformation. Since the alchemist can shape the elements in their primordial state, he has the possibility to achieve, with the passing of time, the perfection of the act of creation by working with the matter of creation itself. He works with the Fifth Es-

22 *Haec figura ostendit quomodo elementata per artificium constituntur unum elementatum rotundum ita que maior pars unius est in parte minima alterius*, Vad. Slg. MS 425, fol. 13v, trans. F. SPADINI.

23 MANGET, 1702, p. 709: *Hanc naturam supremus Deus primo de nihilo creavit sua pura liberalitate et voluntate pura substantia, quae vocatur essentia quinta, in qua tota natura comprehenditur.*

24 PEREIRA 1991: 30-31.

25 *Ibid*.: 36-37.

26 This word describes the process of decomposition needed to separate the four elements from each other.

27 PEREIRA 2015: 113-120.

sence, which is the third principle of creation after God and the Son[28]. In short, this diagram shows the action of the craftsman during the solutive process, when he succeeds to obtain the prime matter from which he can extract the four elements in their quintessential state. This explains the inscription of the term *Ether* in each double circle associated with every element. In the pseudo-Lullian treatises, *Ether* is used as synonymous of the Fifth Essence.

A detail in the diagram is significant: the double space of each circle intersects partially the One-in-All. The intersection demonstrates the separation process from a single mixture into four well-defined elements. The inscription *Ignis Celestis* in the large external double circle reinforces the concept of creation. In *Genesis*, two heavens are described: the first one is created before the seven days, the second one is the firmament, brought into existence during the second day[29]. God resides in the first one, defined as "empyrean"[30], namely igneous, the second one is the sky of the stars. The celestial fire is a reminder of the divine creation that the alembic of the alchemic laboratories repeats[31].

This diagram shows both the cosmological dimension of alchemy, as well as the process of producing the four purified elements which are essential to carry out the creation of the elixir. The function of the diagram is not practical, but mnemonic. Thanks to this simple figure, the adept can reproduce, in his mental space, the formative mechanism that constitutes the theory of the Fifth Essence itself. The importance of this figure is revealed by its presence in the printed editions[32], very similar to that of the manuscript version (fig. 3). The printed version of 1573 shows the same elements, which are now organized into a more geometric scheme compared to the older one. Each circle is connected with the other by a double link. It spreads a cosmological image centred on the Fifth Essence or prime matter. It seems that

---

28 Manget 1702: 710: *Primum radicale principium artificiale. Deus est, ominum creator: secundum principium exemplare ab ipso Deo movetur, qui dictus es sapientia* (namely the Son).

29 The heaven where God live was created on the first day, *Genesis* 1:1: "in the beginning, when god created the heavens and the earth". The firmament is brought forth on the second day and made visible on the fourth one, *Genesis* 1:8-10: "God called the dome sky…Then God said: Let there be lights in the dome of the sky".

30 Even if the empyrean heaven is not explicitly mentioned in *Genesis*, most Christian authors agreed that it was the heavean created on the first day, see Grant 1994: chap. XV.

31 As a matter of fact, each alchemist defined himself as "someone who revives", since he acted as a new creator of the world.

32 This text knows at least seven printed editions: Köln 1566, 1573; Ursell 1602; Strasbourg 1613, 1659; Rouen 1663; Genève 1702.

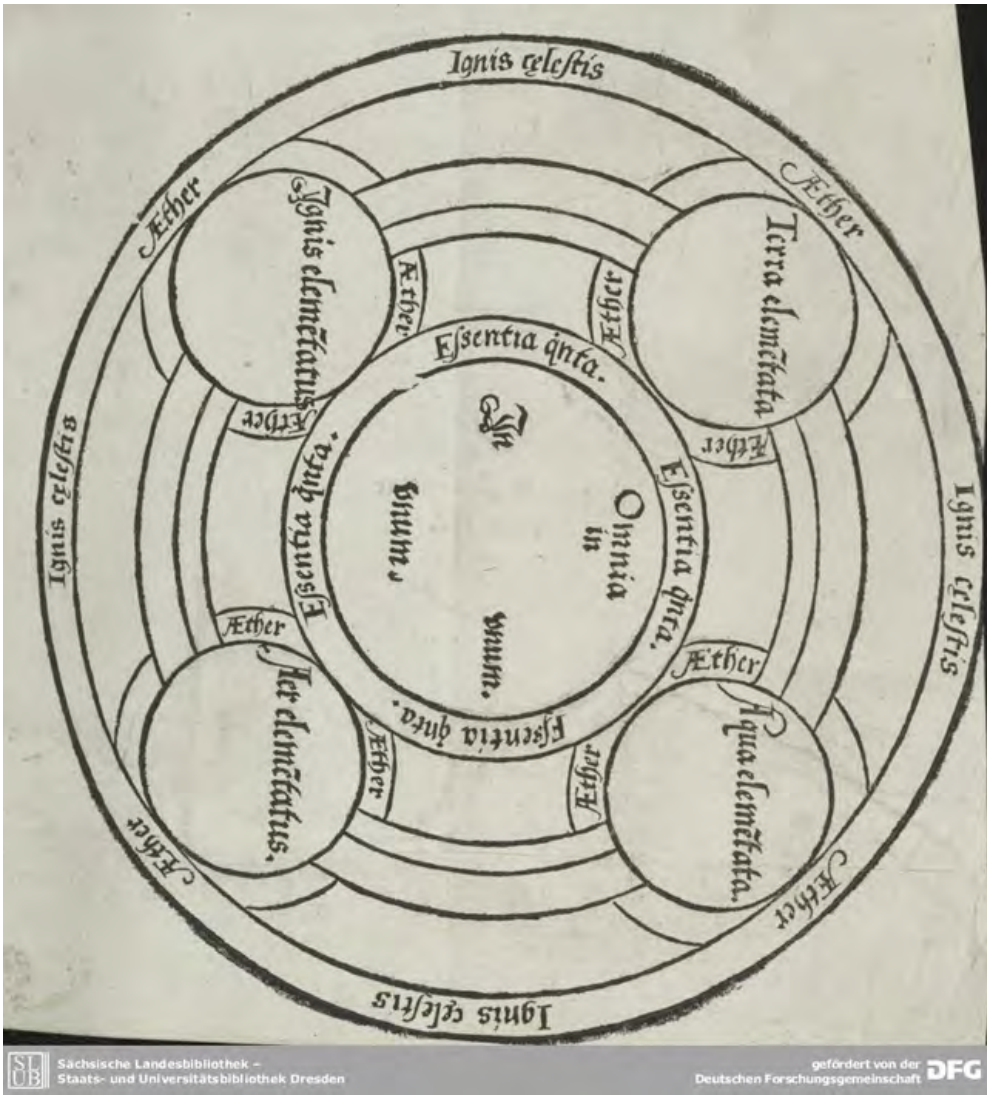

Fig. 3: The diagram of creation, *Testamentum Raymundi Lulli*, Brickmann, Coloniae Agrippinae, 1573, p. 178v.

in the printed versions editors were directly inspired by a figure very similar to the archetype: the Prague manuscript of 1425[33].

The second example concerns the T figure (fig. 4). The caption of the figure explains that it is a symbolic representation of the alchemical process. The diagram is composed of the following elements: in the center the letter T is included in four

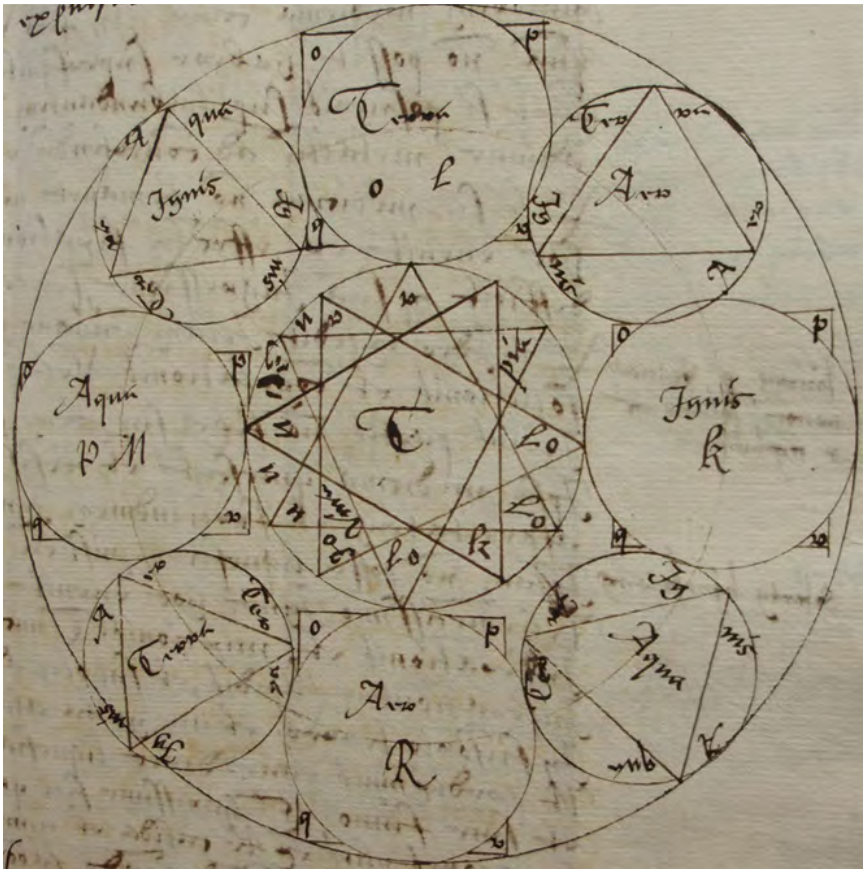

Fig. 4: The T figure, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 425, fol. 31v. (photo: Fabio Spadini).

superposed triangles, and it is inscribed into a circumference which is surrounded by four elements in a quadrangular as well as a triangular form. A caption is written below the diagram: "this figure shows how it is possible to obtain a circle from a

33 The manuscript Universitni Knihovna XXIIID 132 kept in Prague, dated ante 1425.

triangle and a square[34]". This description reflects Aristotelian concepts. The "squaring of the circle", as I define it from now on, concentrates the relations between the four elements during the alchemical processes. The squares and triangles schematize the Aristotelian idea expressed in *De generatione et corruptione*, about the ability of each different element to be changed into another: "Hence, it is clear, if we take a general view, that every one of them naturally comes-to-be out of every one of them and, if we take them separately, it is not difficult now to see how this happen"[35]. Such a transmutation is possible thanks to the fact that each element possesses two qualities. Thus water is cold and moist, fire is hot and dry, earth is dry and cold, air is moist and hot. In this way, opposed elements (air/earth, fire/water), transmute one into another[36], through the movement conferred by the shared qualities.

I will use the example of water in the external part of the diagram to show how this works. The word *Aqua* is written in the center of the triangle inscribed in a circle (fig. 5), while at the three angles the term water is repeated and associated with two elements of similar qualities: earth with similar cold, and fire with similar heat. Thus water can become fire, represented as a circle surrounded by a square (fig. 6) through the qualities of coldness, shared with the earth, and hotness, shared with fire. The same interpretation can be applied to the transmutation of air into earth, fire into water and earth into air. All this creates an anticlockwise circular movement of transmutation which is emphasized by the circle surrounding all the figures. This figure clarifies how Nature, symbolised by the four elements, is also a creative process represented by the perfection of the geometrics forms of circle, rectangle and square. A similar scheme is found in a recapitulative form in the *Tractatus Novus de Astronomia* of Ramon Llull (fig. 7).

In his treatise, Llull explains how each element possesses two qualities, one intrinsic, the other stemming from the opposing element. The latter quality could al-

---

34 *Haec figura ostendit quomodo ex triangulis et quadrangulis compositor figura circularis*, Vad. Slg. MS 425, fol. 31v, trans. F. Spadini.

35 Aris., *GC*, II, 4 (trans, E.S. Forster, D.J. Forley, Loeb).

36 Aristotle, *GC*, II, 4: " […] but slow when these do not exist, because it is easier for one thing to change than for many; for example, Air will result from Fire by the change of one quality; for Fire, as we said, is hot and dry, while Air is hot and moist, so that Air will result if the dry is overpowered by the moist. Again, Water will result from Air, if the hot is overpowered by the cold; for Air, as we said, is hot and moist, while Water is cold and moist, so that Water will result if the hot undergoes a change. In the same way, too, Earth will result from Water, and Fire from Earth; for both members of each pair have qualities which correspond to one another, since Water is moist and cold, and Earth is cold and dry, and so, when the moist is overpowered, Earth will result. Again, since Fire is dry and hot, and Earth is cold and dry, if the cold were to pass away, Fire will result from Earth" (trans., E.S. Forster, D.J. Forley, Loeb).

Fig. 5: The triangle of water, Kantonsbibliothek Vadiana St. Gall, Vad. Slg. MS 425, fol. 31v. (photo: Fabio Spadini).

Fig. 6: Fire, Kantonsbibliothek Vadiana St. Gall, Vad. Slg. MS 425, fol. 31v. (photo: Fabio Spadini).

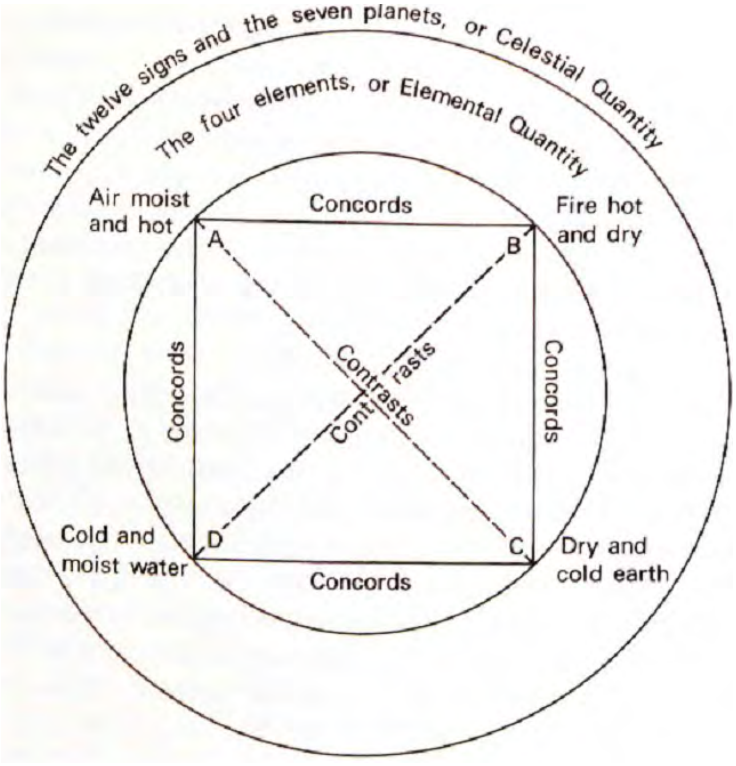

Fig. 7: *The squaring of the circle*, in: Yates, *Llull and Bruno*, London, 1982, p. 48.

low the circular movement described previously[37]. In this specific situation, I note that pseudo-Lullian alchemists show a deep knowledge of the texts by the Majorcan philosopher. This explains why they decided to refer to his *auctoritas*. The theories about elements which are found in every Lullian treatise, especially in the one devoted to astronomy, aroused a vivid interest[38].

The central part of the diagram (fig. 8) follows the interpretation of the generative movement according to Aristotelian theories: it is the one which poses major identification problems. It depicts four superposed triangles, with the T-letter in the middle, which is the final product of the opus. The T refer to the Rubean Medicine

Fig. 8: The central part, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 425, fol. 31v. (photo: Fabio Spadini).

37 " Dear son, fire is hot and dry, and air is moist and hot, and water is cold and moist, and earth is dry and cold. Fire is hot through its own property, and dry through the property of earth, air is moist through its own nature, and warm through the nature of fire, water is cold through its own nature, and moist through air, earth is dry through itself, and cold through water. And therefore, son, each element has a First Intention towards its own quality and a Second Intention towards that of another element. Dear son, through this order the two Intentions of the elements enter into composition through generation and corruption, and they are *contraria et concordantia per medium*", Llull, *Tractatus Novus de Astronomia*, cited in Yates 1954: 156.

38 A detailed analysis about the importance of the four elements for the Lullian art in general is found in, Yates 1954.

according to the pseudo-Lullian *alphabetum*, which is the name of the *lapis*/elixir produced with gold for starting the alchemical process.

Each triangle contains two to three letters; the combinations are the following: r, n, ol; pm, ol; n,k; r, ol and the "symbol of mercury". It is very likely that the four figures recall the four elements located in the outer part of the diagram which could show the essential steps for the production of the *lapis*/elixir. The pm/ol pair indicates the production of *lapis* which takes place during the phase of the opus called *congelatio*. It consists in the watering of the two earths, *terra lunae* (o) and *terra solis* (l), both obtained at the end of the first phase of the opus as already seen in the diagram related to creation, with water (m)[39]. The product obtained during this procedure is called *sulphur album*. The *sulphur rubeum* is produced by mixing *sulphur album* with the red water. This one originates from the ablution of the elements brought back to their primary state through gold[40]. Both compounds, *sulphur rubeum* and *sulphur album* will be called ferments[41]. After having obtained the two sulphurs, one has to produce the proper lapis/elixir by adding the mercurial ferment as shown by the triangle containing r, ol and "symbol of the mercury". This is the last step, namely the moment in which the lapis/elixir is produced by the addition of heat and water. However, two triangles are hard to interpret: the one related to the pair n, k, and the other formed by the letters r, n, ol. In the first case, the letter k indicates the *sulphur album* while the letter n represents the *aer albi compositus*. It might relate to the intermediate step of the process related to the fixation of air. This moment is crucial, as the consolidation of the volatile substances then takes place, allowing the sulphur to keep its potential. If this interpretation is correct, this triangle would come after the one concerned with the production of the two ferments[42].

The T figure thus shows the central moment of the *opus*, namely the production of the *lapis*/elixir, that takes place during a generative movement. This movement symbolises the alchemical process in general, which allows to obtain the elixir. The ultimate aim of the squaring is to show how a square, obviously constituted by its four elements and their opposed qualities, when exposed to a continuous rotation,

39 Pereira 1991: 34-35.

40 *Charissime fili accipe sulphur album et illud imbibe per imbibitionem rosacei et aquae rubee et post ipsius liquefactionem seu distillationem in dicta aqua…Charissime fili scire debes que sublimatum erit sulphur album nobile valdo et quem remanebunt in basi vasis fixum, erit sulphur rubeum*, Vad. Slg., Ms 425 fol. 16v.

41 The ferment (red if the starting metal used to produce it is gold, white if it is silver) is the main ingredient for the production of the *lapis*/elixir.

42 Pereira 1991: 35-36.

generates a fifth element, which is the elixir located at the center of the figure. That a single substance can be generated from the square of the elements belonged to an alchemic doctrine which was consolidated at the end of the 14th century[43].

The two examples of diagrams show two essential moments of the *opus*. Only the first one has been handed down to the printed versions, while the second, which is even more relevant, occurs only in the manuscripts. We will try to determine the criteria explaining the selection of the figures in the printed versions. We will then propose a general interpretation of the use of such diagrams within the pseudo-Lullian text.

The transfer of this type of figures from the manuscript to the printed text is complex. The diagrams, especially the most difficult ones, could be mistakenly reproduced from one manuscript to the other thus producing involuntary modifications that could alter the contents. In the printed editions, the reproduction of the concentric circles created technical difficulties; the fact that the contents of the images also had to be restrained in a continuously smaller space contributed to their decrease. Reasons linked to the educational system also added to these technical problems. The pseudo-Lu alchemical diagrams in *Testamentum* played a strictly mnemonic and pedagogic function; they developed at a time when there was a strong need to create new techniques to ease the understanding of the alchemical doctrines. Each diagram represents a truly visual help, amplifying the text in a way that was essential to stimulate the imagination of the disciple and help him or her assimilate the art. The author of *Testamentum* insists several times on the importance of memory: results cannot be obtained if one does not perfectly know the whole *opus* by heart[44]. The diagrams associate a mnemonic and performative system with a pedagogic background. The images are thus an active aid of the training. With this graphic help the disciple is able to rebuild the theory, concentrated in the picture. The activation of each of these corresponds to a reasoning act whose genesis lies in a purely mental space. The diagram resumes a very precise step of research thus making it visible. It is a graphical elaboration capable to expose a knowledge according to a pedagogic form. However, this interpretation appears to be correct only in the manuscript field. In the printed texts only some of the thirty figures are mentioned, the most important are the *alphabetum* (fig. 9), which clarifies and defines the correspondence between the twenty-three letters used and the basic contents of *Testamentum; Practica*, and the creation diagram. Two figures whose pedagogic role is limited: the first one, in the

43 Rampling 2013, 60

44 *Et si ignoras vel vilipendis praedictum alphabetum, A, B, C, nil poteris in arti operari*…, Vad. Slg., MS 425, fol. 4r.

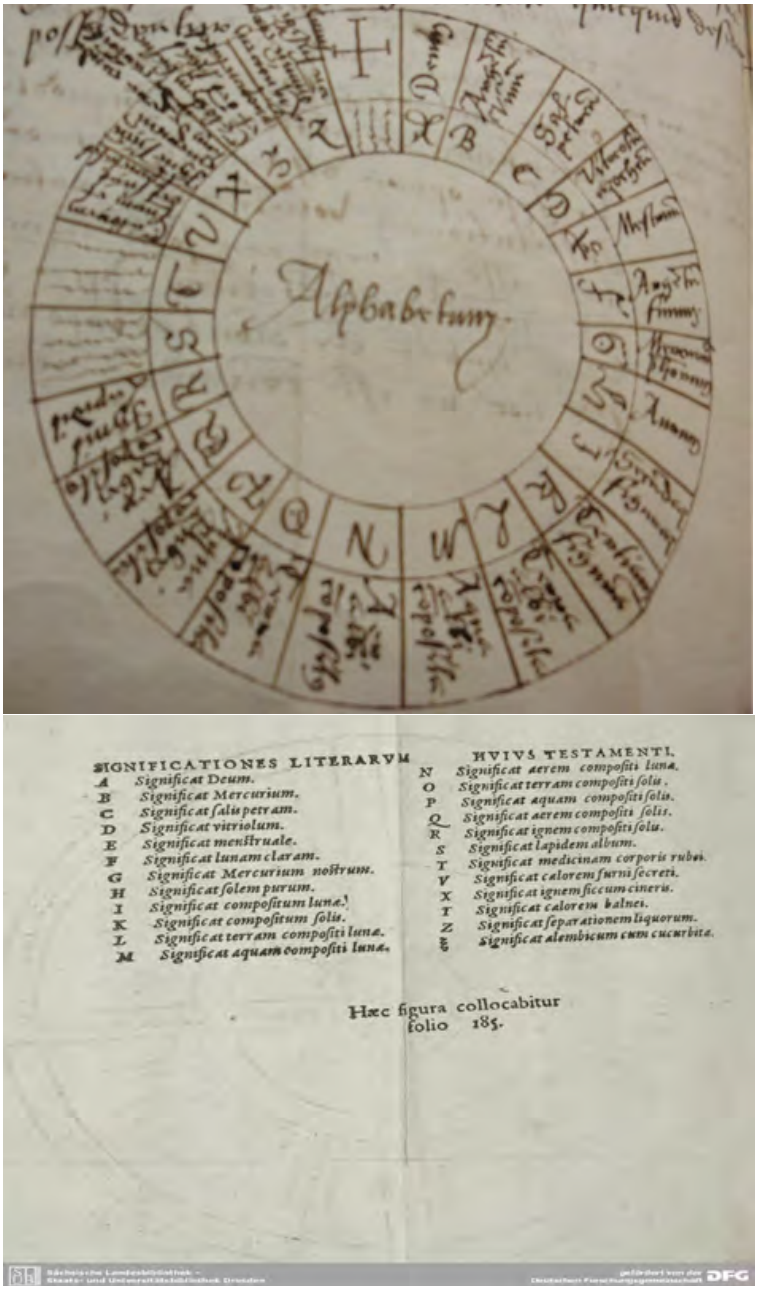

Fig. 9: Upper part, Alphabetum, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 425, fol. 3r. (photo: Fabio Spadini) / Alphabetum, Testamentum Raymundi Lulli, Brickmann, Coloniae Agrippinae, 1573, p. 382 v.

printed text, where the others diagrams are absent, helps just to recall the Lullian value of the work while the second one illustrates the creation without showing precise alchemic operations. Briefly we can consider how the transition from manuscript to printed version brings two intimately linked changes. The educative role of the figures drastically decreases, one can notice the destruction of any mnemonic value, the images in the printed texts of *Testamentum* no longer play an important role as they seem to simply recall the vestiges of a now forgotten learning system. Obviously, this decrease can be explained according to the intellectual milieu of that period. When the first printed edition of the pseudo-Lullian treatise appear, the alchemical knowledge vehiculated in the work was less popular compared to the end of the 14th century. During the 16th century Paracelsus's influence increases, meaning that it is no longer necessary to include pedagogic figures to learn a knowledge which is no more central to the alchemical concerns.

2.3. Bartholomäus Schobinger

The owner of this manuscript, Bartholomäus Schobinger, was the promoter of the first systematic collection of alchemical manuscripts in Switzerland. Among their various users, we find the prestigious name of Theophrastus from Hohenheim, better known as Paracelsus. The history of alchemy on the confederate territory during the 16th and 17th centuries deserves a brief description in order to understand better the historical and cultural landscape of Bartholomäus'journey[45]. It seems that the Confederacy encounters the alchemical knowledge only from the end of the 15th century when research in this field had already found fertile ground among the rest of Europe. Philip Ulstadt (early 16th century) is the first confederate alchemist who wrote a work *Coelum Philosophorum* (1525) unfortunately not printed in his country.

The development of alchemical studies in Switzerland can be divided into three main stages[46]. First, a vast interest is attested by the print of a large series of alchemical collections, that were reprinted during the 16th and 18th centuries, stirring up the curiosity of a large group of intellectuals. Among the main collections, in addition to the one mentioned above, we must remember Pseudo-Geber's Alchemy (1545), due to the publisher Samuel Aparius and the *Verae Alchemiae Artisque Metallicae Vera Doctrina*, published in Basel by Pietro Perna in 1562. Basel became one of the three main poles of the alchemical publishing activities, as the mains collections were printed there. The other two important centers were St Gall, whose importance

45 The history of alchemy in Switzerland was never deeply studied the main works on this subject are, HUGGENBERG 1956; GAMPER, HOFMEIER 2002.

46 This part is based on the article of GILLY 2001.

appears by studying the role of Bartholomäus, and Geneva[47], which became a key reprinting place starting from 1628 onwards. The famous *Bibliotheca Chemica Curiosa* by Jean Jacques Manget, an edition of 141 works, still essential today for anyone who wants to get closer to the study of medieval alchemy, was published in 1702.

In the second stage, individuals fascinated by the opus tried real experiments, thus attracting the criticism from local authorities. Among them, the physician and philologist Theodor Zwinger (1533-1588), initially sceptical towards the advancement of Paracelsism and the truth of alchemy. His first approach of alchemical studies took place at the University of Basel. Here the medical faculty was giving alchemical lessons linked with medicine which attracted people coming from every corner of Europe.

In the third stage, another type of alchemical knowledge developed associated this time with experiments practiced in castles or more widely in private homes, usually without success, in order to produce alchemical gold. In these cases, it was a less dignified and precise application of alchemy. Outside the field of the publishing and the university studies, the opus covered a very popular, rustic form animated by numerous charlatans engaged in keeping promises impossible to keep. Interest in this area was only about metallurgical alchemy. The individuals who practiced it were subject to accusations and imprisonments as it was the case in the rest of Europe. Their works were dangerous for the economic stability of societies as they produced false coins. The confessionals changes of the 16th and 17th centuries deeply modified the practice of alchemy on the whole territory, but especially in Basel, where between 1593 and 1605 several prohibitions were imposed against the alchemists. In Zurich, St Gall and Geneva measures of the same kind take place from 1590, in Geneva at the requests of Thédore de Bèze. Only in 1597 the Federal Diet will elaborate recesses aimed at expelling alchemists from the Swiss soil as well as preventing their entry. In the city of Basel, the phenomenon of Paracelsism was a target of heavy criticisms which arose from the religious environment. In fact the founder of this movement considered the Biblical account of creation as an alchemical process elaborated in a metaphorical form. These and other similar declarations developed the death sentence of Paracelsians expressly showed in the work of Thomas Erastus entitled *Disputationes de medicina nova Theofrasti Paracelsi* (1571). During this hard time, the Scottish Alexander Seton (his real name was William Alexander) was able to demonstrate twice to an educated audience composed of University profes-

47 Bern also played an important role in the alchemical field but not for the printing. Nevertheless, after St Gall, the Burgerbibliothek in Bern still holds the largest number of alchemical works in Switzerland, especially important for allegorical iconography.

sors the possibility of producing a red powder capable to turn lead into gold. The news of this success is also found in a letter of Barholomäus Schobinger the Younger who seeks to exploit the success of this transmutatory enterprise to avoid the imposition of a prohibition against the alchemical practices envisaged for St Gall in 1607. Exploiting this success the alchemists of Zurich and Basel pushed to continue the research in this field against the prohibitions imposed by their authorities, who, however, remained firm in theirs position. All those who will be surprised to practice the opus will be driven out of their territories. Despite this lively opposition alchemy will not lose ground and will continue to be present in Switzerland until the first half of the 18h century. Only one alchemist was subjected to a trial and executed, David Zollikofer, who was judged in St Gall in 1603 on the charge of producing 200 ducats using alchemical gold.

The figure of Bartholomäus Schobinger (1500-1585) belongs to this environment[48]. He was a renowned St Gall alchemist. He worked in textile trade and the iron ore industry, first alone, later together with his brother, with whom he founded the mining company Schobinger. Schobinger was an eccentric man able to achieve great successes and great richness in a short time. From 1550 to 1582 he first become a member of the little council of St Gall. Then he buy the Tartar mines of the Rhone valley as well as the zone of the Horn of the Lake of Constance. In 1581, his family's heraldic coat of arms will be recognized by King Ferdinand I. In addition to his business affairs, Bartholomäus had a profound love for science. He possessed a vast library of many scientific volumes.

Although as Rudolf Gamper has pointed out, most of his private letters have been lost, a specimen of 1576, of which the recipient is not known, is extant. It refers to the purpose of the "opus", namely obtaining a product capable not only of perfecting metals, but also of healing human illnesses[49]. We immediately notice the presence of a subject dear to the pseudo-Lullian corpus. Schobinger's interest in this type of medieval alchemy is linked to his respect and admiration of Paracelsus with whom

---

48 An introduction to his life is found in Dierauer 1891. I have based my argument on, Gamper 1999: 19-25; Gamper, Hofmeier 2014.

49 *«der nutzlichen und lustigen kunst der distillation, durch welliche man auss ainer jeden materie die quinta essentia, als die aller subtilist substanz und hochste krafft durch hitz dess feurs schaiden und ausszieh en mag, ... durch welche man den menschen in gsundhait enthaltten, oder dem kranckhen mit gwissen artzneien ze hilf kommen und gsund machen mag»,* cited in, Gamper 1999: 19. *«The useful and funny art of distilation, that permits to obtain form every matter the Fifth Essence, that like to scoff and pull out all the subtle substance by the highest force through the heat of fire…that can be used for healing men, and helping healing back the sick »,* trans. F. Spadini. *Italics are mine.*

he had occasion to discuss probably about alchemical science in St Gall in 1531. Theophrastus was in this city because he had to flee from Basel where his university teaching had been heavily criticized as seen earlier. He will then stop in St Gall before leaving for the German territory. The presence of pseudo-Lullian texts in the Schobinger collection is not surprising, mainly for two reasons. Firstly, the concepts expressed in the *Practica* of the *Testamentum* were a fertile ground for the development of Paracelsism. Secondly, pseudo-Lullian works often circulated among those by Paracelsus. Since 1500, pseudo-Lullian works are found in alchemic volumes edited by Paracelsus's followers. An example is the work entitled *Verae alchemiae artisque metallicae citra aenigmata doctrina*, 1561, or the *De alchimia opuscola complura veterum philosophorum*, printed in 1559 in Frankfurt, as well as the *Secreto alchimiae magnolia D. Tomae Aquinatis*, published in Köln by Giovanni Herinus in 1579. It is important to note that already in the 19th century the first historians of alchemy did not hesitate to identify a pre-Paracelsian taste in the alchemy-medicine association operated in the pseudo-Lullian corpus. The presence of pseudo-Lullian manuscripts such as *Testamentum: Practica*, *Liber Mercuriorum*, or the book of ferments in his library show Schobinger's great interest in the practical aspect of the *opus*. He was a collector of recipes, that, as shown by Gamper's study, were transmitted to him by the Benedictine Wolfgang Saidel, preacher at the Augustinian church in Munich from 1532 to 1560. Bartholomäus was also in contact with a close circle of confederate alchemists among whom the only known is Michel Cicherin, active from 1526 to 1533. He was also author of two works that never came to print. We are therefore confronted with a figure open to experimentations and philosophical naturalistic concepts entirely original.

The presence of a further pseudo-Lullian alchemical manuscript kept at the Vadiana[50] allows us to elaborate the hypothesis that Bartholomäus attracted a narrow circle of followers to whom he wanted to convey the secrets of pseudo-Lullian alchemy. In fact, the latter illustrates how the alchemical charts can be used when learning. It is a document composed of only six sheets on which all the main diagrams from the *Testamentum* (fig. 10) appear in series. It would be possible to consider this testimony as a kind of study book belonging to a follower of pseudo-Lullian alchemy. The presence of this manuscript would indicate Bartholomäus's willingness to teach this kind of alchemy. The presence in his collection of other copies of the *Testamentum*, indicate a will to transmit the knowledge contained therein to a circle of pupils. As mentioned earlier Batholomäus was in contact with a loose circle of confederate alchemists, and it seems likely that some of them were interested in pseudo-Lullian alchemy.

50 Vad. Slg., MS 391.

The figures in the manuscript deserve a brief description. In the center of the first sheet (fig. 10) we find the three starting substances of the opus: the menstrual[51] (E), the

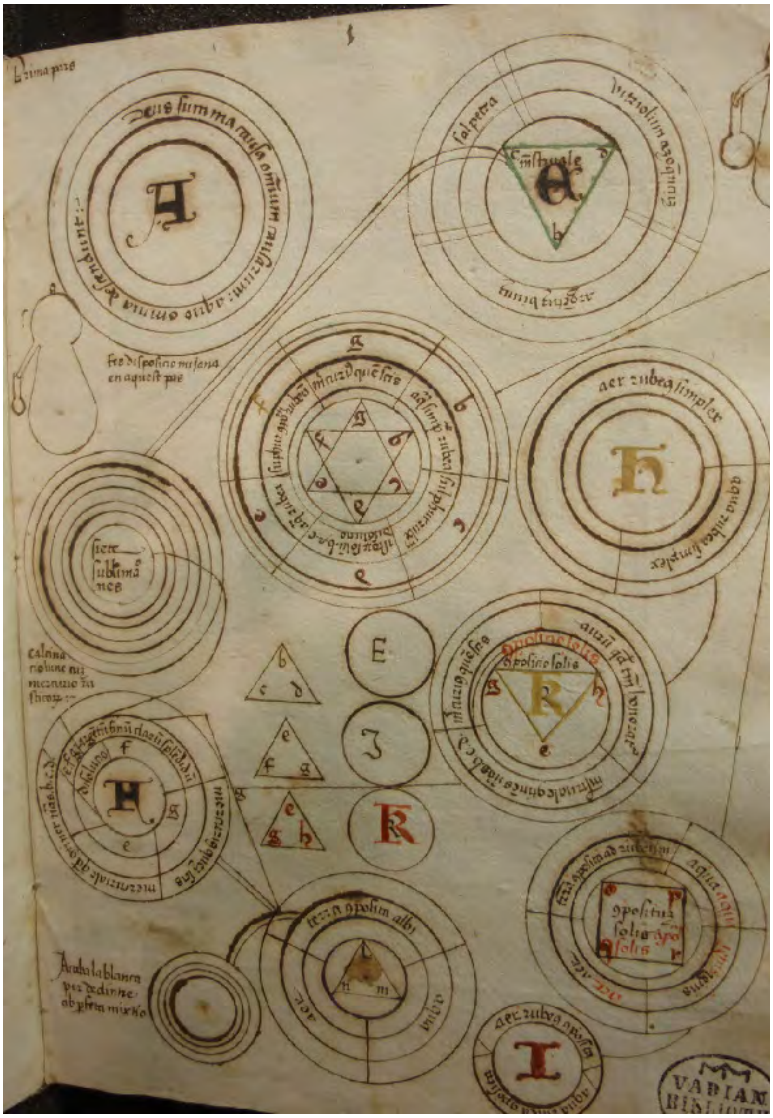

Fig. 10: The sequence for the production of ferments, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 391, fol. 1v. (foto: Fabio Spadini).

51 A substance used during the solution process. This word has a strong meaning in alchemy, in fact in graeco-roman text the menstrual blood, when the newborn come to life, became milk. This change explain the use of the same word in alchemical text.

gold (K), and the silver (I). If gold and silver formed the end of the path followed by the alchemists in other treatises, here they become the starting point. In fact they are used to obtain a virtue of active perfection, the *fermentum*. Its production is described by the figures placed around the six central one. On the left, we find the production of the white ferment, on the right that of the red ferment. In the first case the silver subjected to successive dissolution operations produces the *terra composite albi* (fig. 11), which, if fed with water, allows to obtain the white ferment. This one is represented by a series of concentric circles (fig. 12). To the right, the red ferment production appears to be more complicated because the objective is twofold. First, it is necessary to obtain the compound ferment for the elixir as we see in the image that represents the square

Fig. 11: *Terra composita albi*, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 391, fol. 1v, (foto: Fabio Spadini).

Fig. 12: The white ferment, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 391, fol. 1v, (foto: Fabio Spadini).

and is defined as *compositum solis* (Fig. 13). Secondly, the production of the simple ferment is explained. This one, as mentioned in *Liber Mercuriorum*, made it possible to produce a simpler elixir adapted to a specific element as shown by the diagram that has a triangle in the center also defined in this case as *compositum solis* (Fig. 14). The letters H and I (fig. 15) indicate the addition of water and air to the ferment, essential elements in order to permit its multiplication. The diagrammatic sequence (fig. 10) illustrates the basis of the opus: the production of a ferment from gold and silver.

The second sheet shows through a series of five related images the theory of the creation of the world as well as the importance of the Fifth Essence. The first diagram

Fig. 13: The compositum solis, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 391, fol. 1v, (foto: Fabio Spadini).

Fig. 14: The production of red ferment, Kantonsbibliohtek Vadiana St Gall, Vad. Slg. MS 391, fol. 1v, (foto: Fabio Spadini).

Fig. 15: H and I figures, Kantonsbibliohtek Vadiana St Gall, Vad. Solg. MS 391, fol 1v., (foto: Fabio Spadini).

(fig. 16) depict the origin of the world as it is described in the initial pages of the *Testamentum: Theorica*. Nature is in the center. Below is shown how this was created by God from the Fifth Essence[52]. The latter, divided into three parts, allows the generation of angels, the sky and the planets as well as the sublunary world[53]. The second figure (fig. 17) exposes the idea of the Fifth Essence as the prime material of all the elements. We can immediately notice the presence of graphic links between

Fig. 16: The origin of the world, Kantonsbibliothek Vadiana St Gall, Vad. Slg. MS 391, fol. 2v., (foto: Fabio Spadini).

Fig. 17: The Fifth Essence, Kantonsbibliothek Vadiana, St Gall, Vad. Slg. MS 391, fol. 2v. (foto: Fabio Spadini).

the various diagrams that culminate in the final image, the triangle of creation[54] (fig. 18). The scheme suggests that the alchemist fulfils the perfection of the creative act over time, working on the nature of creation itself. In the center, the dark mass represents the chaos from which, by precise operations, the adept can extract the four elements in their purest, elemental form. In short, we find here a *vademecum* of the Fifth Essence theory, the essen-

52 Manget 1702: 709: *Hanc natura supremus Deus primo de nihilo creavit sua pura liberalitate et voluntate, pura substantia, quae vocatur essentia quinta, in qua tota natura comprehenditur*.

53 *De meliori et puriori parte hujus substantia, in tres partes divisa: creavit altissimus Angelos, de secunda coelos, planetas et stellas. Et de tertia minus pura fecit mundum inferiorem, Ibid.*

54 *Et clare cognosce omnium rerum* ***tria esse principia****, videlicet artificiale, exemplare, et materiale. Primum radicale principium artificiale, Deus est, omnium creator: secundum principium exemplare ab ipso Deo movetur, qui dictus est sapientia, tertium vero succedens principium, quod est materia, creata per Deum, id est, sapientiam: quae movetur ab ipso, est primordiale elementum, quod appellamus hyle, Ibid.* 85.

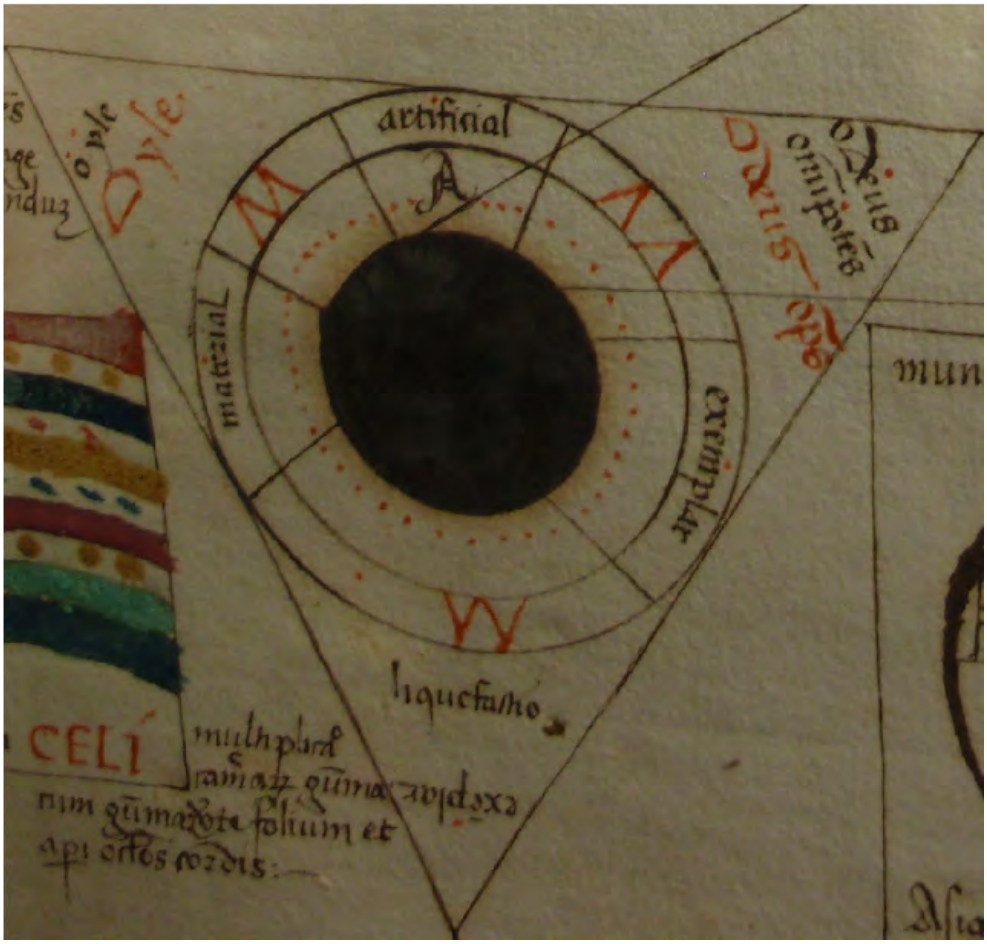

Fig. 18: The triangle of creation, Kantonsbibliothek Vadiana, St Gall, Vad. Slg. MS 391, fol. 2v. (foto: Fabio Spadini).

tial basis for understanding the beginning of the alchemical opus. The five images (fig. 19) were sufficient for the disciple enabling him to mentally reconstruct the essential stages of the theoretical part of the *Testamentum* about the origin of the world and therefore to understand the philosophical bases before going to the stove. In this cosmic structure, the work of the artisan is found. The following sheets are essentially related to the *Practica*. We find the table of ferments, but above all the tree of the practice (fig. 20), accompanied by the description of the stairs it is composed. These are the basic elements one needs to know in order to succeed in the opus. These images were enough to remember the various operations. We are dealing with a real *vade-mecum* that can be used both for practice and

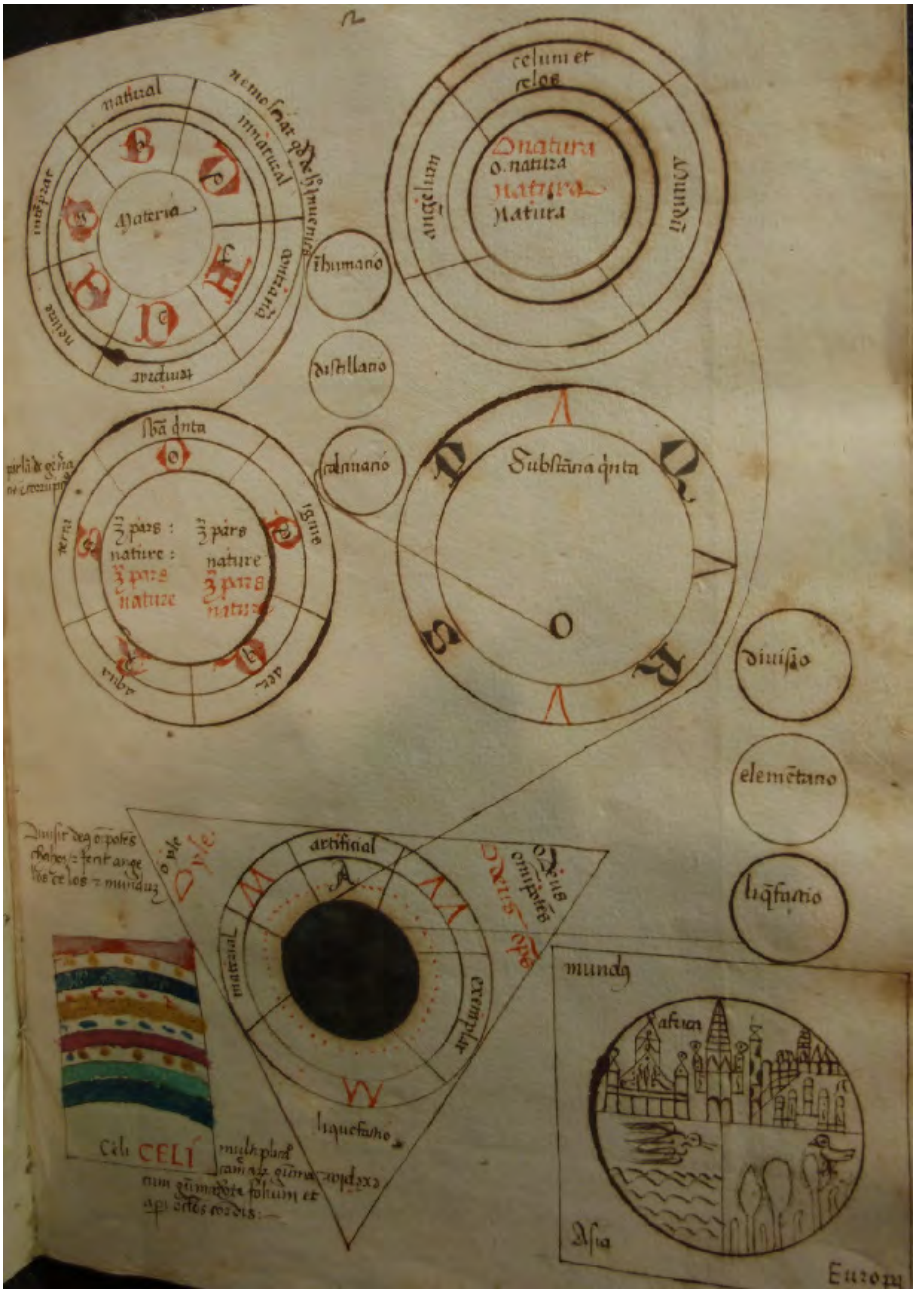

Fig. 19: The theory of the Fifth Essence, Kantonsbibliothek Vadiana, St Gall, Vad. Slg. MS 391, fol. 2v. (foto: Fabio Spadini).

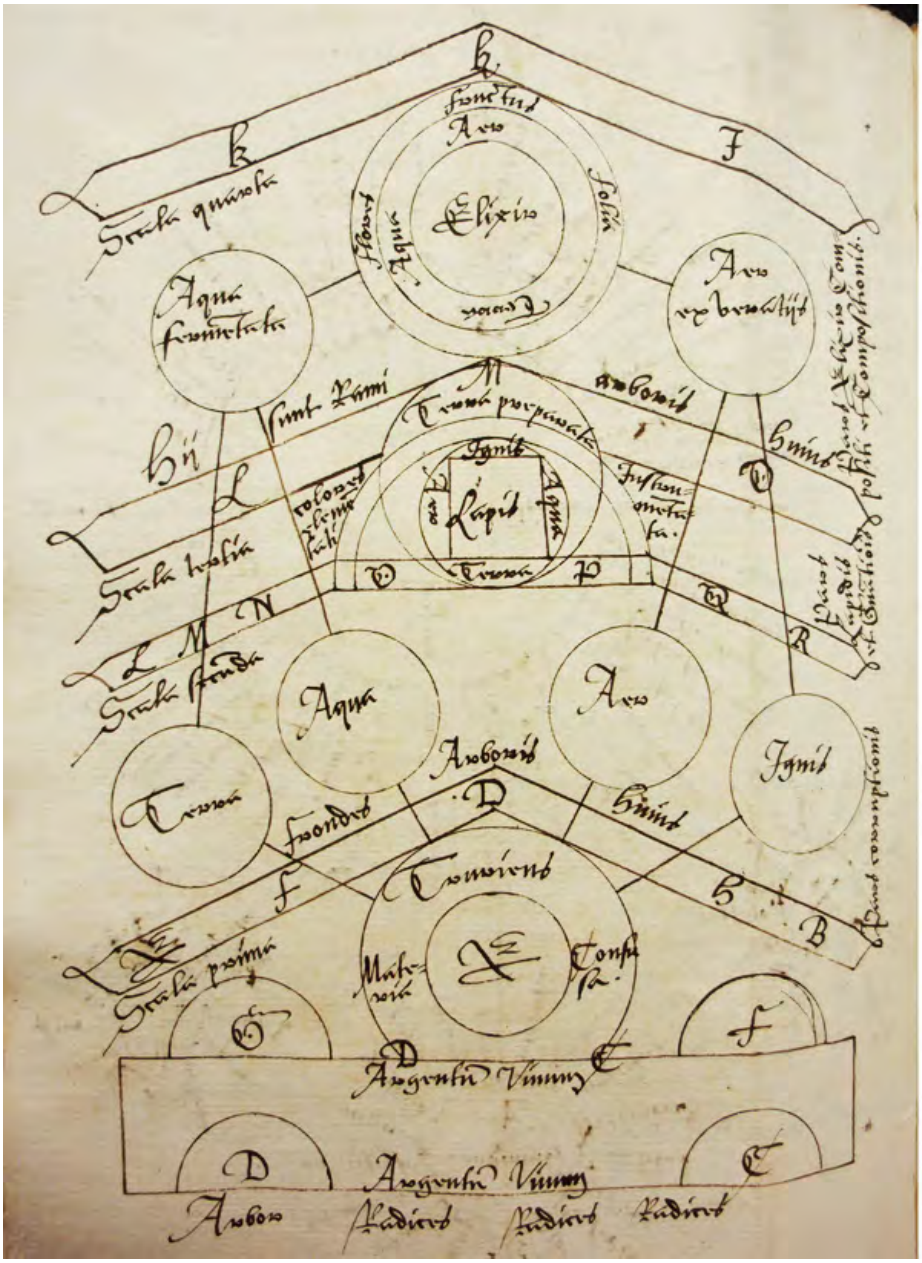

Fig. 20: *Arbor Elementalis*, Kantonsbibliothek Vadiana, St Gall, Vad. Slg. MS 391, fol. 2v. (photo: Fabio Spadini)

learning. Based on this interpretation I argue that the presence of a possible educational document in Schobingers collection indicates a will to instruct students in the pseudo-Lullian alchemy. The presence of more than one copy of *Testamentum: Practica et Theorica*[55] in his collection supports this hypothesis. To sum up, the pseudo-Lullian diagrams are a pedagogic and mnemonic medium. Their genesis is motivated by the need to hand down alchemical knowledge from the master to the disciple. Every diagram is a visual aid, created in order to facilitate the reasoning of the artisan. This use is mainly present in the manuscript tradition. With the passage to the print the figures lose their pedagogic meaning. Their scarce presence is only motivated by the will to show the link with the pseudo-Lullian tradition. The pedagogic dimension of the diagrams can be more clearly observed in the manuscript Vad. Slg. MS 391 where all the figures of the *Testamentum* are presents. This is a learning tool probably used by Bartolomäus Schobinger for teaching pseudo-Lullian alchemy. It is thus possible to look at these figures as prototypes of what is present today in most of the treatises on chemistry. Here too, diagrams aim to explain the function of some chemical operations and ease their learning.

Bibliography

Bonner, A.,
- *Obres selectes de Ramon Llull* (1232-1316), 2 vols., Mallorca, 1989.
- *The art and logic of Ramon Llull: A user's guide*, Leiden, 2007.

Bury, R.G.,
- *Plato Timaeus. Critias. Cleitophon. Menexenus. Epistels*, Harvard, 1929.

Costanza, S.,
- "Libri, cultori e pratica della mantica. Per un bilancio della circolazione di idee e testi della divinazione in età comnena e paleologa", in A. Rigo, ed., *Vie per Bisanzio VIII Congresso Nazionale dell'Associazione Italiana di Studi Bizantini. Venezia, 25-28 novembre 2009*, Bari, 2013, 771-784.

Crisciani, C.,
- "La Quaestio de alchimia fra Duecento e Trecento", *Medioevo. Rivista di Storia della filosofia Medievale* 2 (1976) 119-158.
- "Il farmaco d'oro. Alcuni testi tra i secoli XIV e XV", A. Paravacini-Bagliani, C. Crisciani, eds., *Alchimia e medicina nel Medioevo*, Firenze, 2003, 217-246.
- "Solemnis Medicus: Suggerimenti e farmaci per una sana e lunga vita", S. Perfetti, ed., *Scientia, fides, theologia: studi di filosofia medievale in onore di Gianfranco Fioravanti*, Pisa, 2011, 401-426.
- "Medicine and Philosophy in the Middle Ages. Sisters, Companions, Rivals", M. Gadebusch Bondio, ed., *Medical ethics: premodern negotiations between medicine and philosophy*, Stuttgart, 2014, 29-46.

55 Vad. Slg. MS 388, ff. 116r-157v; Vad. Slg. MS 391, ff. 1r-6v; Vad. Slg. Ms 424, ff. 1v-177v; Vad. Slg. Ms 425 ff. 1v-37v.

Crisciani, C., Pereira, M.,
- "Black Death and golden remedies. Some remarks on alchemy and the plague", in A. Paravacini-Bagliani, F. Santi, eds., *The regulation of Evil. Social and cultural attitudes to epidemics in the late Middle Ages*, Firenze, 1998, 7-39.

Dapsens, M.,
- "De la Risalat Maryanus au De Compositione alchemiae", *Studia graeco-arabica* 6 (2016) 121-140.

Dierauer, J.,
- "Schobinger, Bartholomäus", *Allgemeine Deutsche Biographie* 32 (1891) 209-210.

Evans, M.,
- "The geometry of the mind", *Architectural Association Quarterly*, 12.4 (1980) 32-55.

Gamper, R.,
- "Die St. Galler Alchemisten", in R. Gamper, ed., *Alchemie in St. Gallen*, St. Gallen, 1999, 19-25.

Gamper, R., Hofmeier, T.,
- *Das Alchemiehandbuch des Appenzeller Wundartzes Ulrich Ruosch*, Basel, 2002.
- *Alchemische Vereinigung. Das "Rosarium Philosophorum" und sein Besitzer Bartlome Schobinger*, Zürich, 2014.

Gilly, C.,
- "Alchimie", *Dictionnaire Historique de la Suisse (DHS)*, url: http://www.hls-dhs- dss.ch/textes/f/F8251.php.

Grant, E.,
- *Planets, Stars, and Orbs: The Medieval Cosmos, 1200-1687*, Cambridge, 1994.

Higuera Rubio, J.,
- "Pensamiento Diagramático: antecedentes medievales y renacentistas", Medievalia 15 (2012) 57-60.

Huggenberg, F.M.,
- "Alchemisten und Goldmacher im XVI Jahrhundert in der Schweiz", *Gesnerus*, 13 (1956) 97-163.

Lemay, R.,
- "L'authenticité de la Préface de Robert de Chester à sa traduction du Morienus", *Chrysopoeia* 4 (1990-1991) 3-32.

Lüthy C., Smets A.,
- "Words, lines, diagrams, images: towards a history of scientific imagers", *Early Science and Medicine* 14 (2009) 398-439.

Manget, J.J.,
- *Biblioteca Chemica Curiosa*, vol. I, Genève, 1702.

Milla-Vallicrosa, J.,
- "El tractatus Novus de Astronomia de Ramon Llull", *Studia Lulliana* 6 (1962) 257-273.

Minnis, A.J.,
- *Medieval theory of authorship: scholastic literary attitudes in the later Middle Ages*, Aldershot, 1988.

McVaugh, M.R.,
- "The development of medieval pharmaceutical theory", in M.R. McVaugh, ed., *Arnaldi de Villanova Opera Medica Omnia II Aphorismi de Gradibus*, Barcelona, 1975, 1-20.

Müller, K.,
- *Visuelle Weltaneignung: astronomische und kosmologischen Diagramme in Handschriften des Mittelalters*, Göttingen, 2008.

Neubauer, J.,
- *Symbolismus und symbolische Logik: die Idee der Ars Combinatoria in der Entwicklung der modernen Dichtung*, München, 1978.

Newman, W.R.,
- *The "Summa perfectionis" of pseudo-Geber*, Leiden, 1991.

Obrist, B.,
- *Les débuts de l'imagerie alchimique: XIVe – XVe siècles,* Paris, 1982.
- "Cosmology and alchemy in an illustrated 13th century alchemical tract: Constantine of Pisa, The Book of the Secrets of Alchemy", *Micologus,* 1 (1993) 115-160.
- "Visualization in medieval alchemy", *International Journal of Philosophy of Chemistry* 9.2 (2003) 131-170.

Pecchioli, M.,
- "Il caso di Raymond Lullo (Ars Combinatoria) e della Mnemotecnica (Memoria Artificalis)", M. Pecchioli, ed., *Cronache dal tecno-Medioevo: ipertesti, labirinti, tecno-mondi, realtà virtuali, architetture digitali nel sapere pre-scientifico del mondo antico*, Milano, 2015 ,21-42

Pereira, M.,
- "La leggenda di Lullo alchimista", *Estudios Lulianos* 27 (1987) 145-163.
- *The alchemical corpus attributed to Raymond Lull*, London, 1989.
- "Fermentum, medicina, quinta essentia nel Testamentum attribuito a Raimondo Lullo", in *Atti III Conegno Nazionale di Aotria e Fondamenti della Chimica*, Cosenza, 1991, 29-43.
- *L'oro dei filosofi: saggio sulle idee di un alchimista del Trecento*, Spoleto, 1992.
- "Le figure alchemiche pseudolulliane: un indice oltre il testo?", in C. Leonardi, M. Morelli, F. Santi, eds., *Fabula in Tabula. Una storia degli indici dal manoscritto al testo elettronico*, Spoleto, 1995, 111-117.
- "Il santo alchimista. Intrecci leggendari attorno a Raimondo Lullo", in A. Paravacini-Bagliani, ed., *The medieval legend of philosophers and scholars*, Firenze, 2013, 471-516.
- "Naturam naturam vincit: l'idea di natura nell'alchimia medievale", in F. Herreros, J. Luís, eds., *De Natura: la naturaleza en la Edad Media; VI Congreso Internacional Iberoamericano del Sociedad de Filosofia Medieval*, Ribeirao, 2015, 101-120.

Pereira, M., Spaggiari, B.,
- *Il Testamentum alchemico attribuito a Raimondo Lullo*, Firenze, 1999.

Rampling, J.,
- "Depicting the medieval alchemical cosmos", *Early Science and Medicine* 18 (2013) 45-86.

Sutton, E.W., Rackham, H.,
- *Cicero, De oratore*, London, 1942.

Tessari, A.,
- "Ramon Lull, vida i obres", *Antonianum* 90 (2015) 655-660.

Valriu, C.,
- "Legendary aspects of Ramon Llull", *Fabula. Zeitschrift für Erzählforschung* 55 (2014) 235-259.

Vega, A.,
- *The thinking machine: Ramon Llull and the Ars combinatoria*, Barcelona, 2016.

Villalba i Varreda P.,
- *Ramon Llull. Escriptor i filòsof de l'acció*, Barcelona, 2016.

Williams, C.J.F.,
- *Aristotle's De generatione et corruptione*, Oxford, 1982.

Yates, F.A.,
- "The art of Ramon Lull: an approach to it through Lull's theory of the elements", *Journal of the Warburg and Courtauld Institutes* 17 (1954) 115-173.
- "La teoría luliana de los elementos", *Estudios lulianos* 3 (1959) 237-250.

Manuscripts

Pseudo-Raymundus Lullus
- *Testamentum: Practica*, Kantonsbibliothek Vadiana, St. Gall, Rara Vadianische Sammlung, Vad. Slg. MS 425, ff. 1v-998v.
- *Testamentum: Practica*, Kantonsbibliothek Vafiana, St. Gall, Rara Vadianische Sammlung, Vad. Slg. MS 391, ff. 1r-6v.