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Understanding the Language of Alchemy: The Medieval Arabic Alchemical Lexicon in Berlin, Staatsbibliothek, Ms Sprenger 1908*

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Abstract
The editing of medieval alchemical texts poses a number of challenges to the modern scholar. Problems such as the lack of source identification, complicated compositional structures, and a tendency toward intentionally obfuscatory language make the task of reconstructing the original letter of text a practical impossibility. This paper will argue that an alternative approach toward editing alchemical texts must be considered. This approach will be determined by focusing on issues related to the technical lexicon of practical alchemy, and in particular, to the problems related to the understanding of the words used by the alchemists for describing the substances used in their operations.

Keywords
Alchemy, medieval scientific literature, Latin translation, alchemical manuscripts

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Understanding the Language of Alchemy: The Medieval Arabic Alchemical Lexicon in Berlin, Staatsbibliothek, Ms Sprenger 1908*

Gabriele Ferrario

Only recently has a renewed scholarly interest in the history of alchemy begun to shed a new light on the discipline, which has been neglected and relegated – together with astrology, magic and the knowledge of talismans – to the field of the so-called "pseudo-sciences" since ancient times. Alchemy has gained its own place in the history of science, and the increasing number of publications and international conferences on this subject stand as a proof of the liveliness of this field of research and of its relevance.[1]

In spite of the increased interest in this subject, the scholar interested in working with alchemical manuscripts still has to face a number of obstacles not otherwise met by scholars dealing with more traditional texts. (slide 2) For example, questions of authorship and the true nature of the contents of these texts are often difficult to determine. Since the status of alchemy together with its validity as a science and its compatibility with a religious view of the world have always been debated,[2] authors of alchemical treatises often attempt to elevate the significance of the work by falsely attributing their writings to recognized authorities. For example, biblical characters (e.g. Adam, Moses, Enoch, David, Salomon and other prophets), philosophers of the Hellenic past (e.g. Democritus, Socrates, Aristotle and Pythagoras), and

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[1] International conferences completely devoted to the study of alchemy and chymistry (i.e. early modern chemistry) have been recently held in El Escorial (Madrid, Spain) in September 2008 and at the Chemical Heritage Foundation (Philadelphia, PA) in July 2006.

[2] As far a the Middle Ages is concerned, see William Newman, "Technology and the Alchemical Debate in the Late Middle Ages", *Isis* 80, 3 (1989), 423-425.

mythical forefathers of the esoteric knowledge (like Hermes and Ostanes) are identified as the pseudo-epigraphic authors of a number of medieval alchemical treatises.[3] It is therefore difficult, and sometimes impossible, for the researcher in this area to identify the actual author of the treatises he aims to study.

As far as the content is concerned, many medieval alchemical manuscripts, and mostly those concerned with the practical/operative aspects of the Art, are miscellaneous works. For example, in manuscripts such as Arabic MS Sprenger 1908 of the Staatsbibliothek zu Berlin, on which this paper will focus, there is no attempt to identify the sources from which the compiler extracted the alchemical recipes. Like other alchemical anthologies, MS Sprenger 1908 is closer in nature to a cookbook in which the aim is to compile recipes rather than to preserve or to transmit a complete, coherent text.[4]

The reader of medieval alchemical treatises must also contend with the challenging compositional structure and language. Given the esoteric character of alchemical knowledge, authors have a tendency to obfuscate the true content of the texts. As first recognized by Paul Kraus and recently discussed again by Pierre Lory, authors of alchemical treatises use several structural and lexical strategies in order to paradoxically conceal their doctrines at the same time that they are offering to explain them.[5] Consequently, the modern scholar attempting to prepare an edition of such treatises has to face one basic methodological question about the criteria to follow while editing the text: Is the challenging trial of reconstructing the original letter of the text worthwhile? Would it be more useful to prepare an edition that could testify to a particular stage of the history of the transmission of one alchemical work? The modern editor must mitigate these obfuscations in order to determine a method that allows the reader to best understand the text and at the same time maintain the integrity of the medieval source.

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[3] On the biblical figures quoted as alchemical authorities or as authors of alchemical treatises, see Raphael Patai, *The Jewish Alchemists. A History and Source Book* (Princeton, 1994), pp. 18-40. For a list of the pretended ancient sources of medieval Arabic alchemy, which tend to be cited without change also by Latin medieval alchemists, see G.C. Anawati, "L'alchimie arabe," in *Histoire des Sciences Arabes*, ed. Roshdi Rashed, 3 vols. (Paris 1997), 3:111-141.

[4] Other examples of this approach are the Hebrew alchemical manuscript Orient. klein 514 in Berlin, Staatsbibliothek and two Syriac-Karšuni manuscripts in the British Library: MS Egerton 709 and MS Or. 1593.

[5] Cfr. Paul Kraus, *Jābir ibn Ḥayyān. Contribution à l'histoire des idées scientifiques dans l'Islam*, 3 vols. (Cairo, 1942-3), 1: XXVII-XXX; Jābir ibn Ḥayyān, *Dix traités d'alchimie. Les dix premiers traités du Livre des soixante-dix*, transl. Pierre Lory (Paris, 1983), pp. 21-26. In particular Lory identifies two main features: 1) *tabdīd al-'ilm* (dispersion/scattering of knowledge): the description of a procedure or doctrine does not follow an operative and logical order, but descriptions of other kind – also the insertion of parts of other recipes among the prescriptions for performing the first one; 2) *problematic language*: the abundant use of metaphors, the definition of one substance through the name of the quality which prevails in its composition, the designation of a procedure with the name of another operation that leads to similar results and the use – in general – of a highly technical language.

In this paper, I would like to work toward establishing a method for editing such texts by focussing on the issues related to the technical lexicon of practical alchemy, and in particular, to the problems related to the understanding of the words used by the alchemists for describing the substances used in their operations. A considerable number of these technical words have been studied and collected from different sources by Alfred Siggel in his monograph *Decknamen in der arabischen alchemistischen Literatur*, published in 1951.[6] MS Sprenger 108 represents a further contribution to the study of this technical language since the manuscript preserves an alchemical dictionary of outstanding interest.

MS Sprenger 1908 was described by Wilhelm Ahlwardt in his catalogue of the Arabic material in Berlin and by Siggel, who, in the middle of the last century, listed the alchemical manuscripts of the library.[7] Although devoid of any indication of date, the manuscript has been ascribed to the seventeenth century. It is quite small in size, measuring 5-1/2 inches by less than 4 inches, and it is written in an inelegant but quite legible script. The presence of the alchemical dictionary on folios 3r-6r and of the Arabic *Liber de aluminibus et salibus* testifies to the medieval origin of its contents: the same dictionary is also preserved in two Syriac-Karšuni manuscripts in the British Library, MS Egerton 709 and MS Or. 1593, which were studied by Marcelin Berthelot and Rubes Duval. Berthelet and Duval dated some of the sources they preserve to a time between the eighth and ninth century.[8] As for the origin of the contents of the *De aluminibus et salibus*, Julius Ruska has argued that its compilation should be placed in twelfth century Spain. I am inclined to believe that the text of the *De aluminibis et salibus* preserves many traces of earlier practical knowledge.[9]

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[6] Alfred Siggel, *Decknamen in der arabischen alchemistischen Literatur* (Berlin, 1951). The glossary discussed here was not used by Siggel.

[7] Wilhelm Ahlwardt, *Verzeichniss der arabischen Handschriften der Königlichen Bibliothek zu Berlin* (Berlin, 1887-1889), no. 10361. Alfred Siggel, *Katalog der arabischen alchemistichen Handschriften Deutschlands*, 3 vols. (Berlin, 1949), 1: *Handschriften der öffentlichen wissenschaftlichen Bibliothek* (*früher Staatsbibliothek Berlin*), pp. 139-144.

[8] See Marcelin Berthelot and Rubens Duval, *La Chimie au Moyen Âge*, 3 vols. (Paris, 1893; repr. Osnabrück – Amsterdam, 1967), 3: *L'alchimie syriaque*. The two MSS – whose composition can be dated between the 15th and the 16th century on palaeographical basis - contain the same material and seem to be copies of the same prototype. Their content is divided in two parts: one in Syriac language preserving an alchemical treatise entitled *The Doctrine of Democritus* and one in Karšuni, in which we find the alchemical dictionary object of this paper. Berthelot (2: XII) defines this part as "une compilation de procédés et recettes alchimiques, traduites du grec vers le VIIe, le VIIIe ou le IXe siècle [...]. Un certain nombre de ces recettes ont passé d'ailleurs, à peu près sans changement, jusque chez les auteurs alchimistes latins du XIIIe siècle [...]".

[9] On the *Liber de aluminibus et salibus*, see Robert Steele, "Practical Chemistry in the 12th Century. Rasis de aluminibus et salibus," *Isis* 12 (1929) 10-46, in which the author presents an edition of the Latin version, an English translation and an introduction to the treatise, together with a Latin-English dictionary of the technical lexicon used in the recipes; Julius Ruska, *Das Buch der Alaune und Salze: ein Grundwerk der Spätlateinischer Alchemie* (Berlin 1935), in which the author presents an edition of the Arabic version extant in manuscript, a Latin edition different from that of Steele, German translations of both and an interesting and still fundamental

On the first folio of the manuscript, we find an interesting *colophon*: *Kitāb al-ǧawhar al-naḍīr fī ṣinā'at al-iksīr li-Abī 'Abdallāh al-Ṭuġrā'ī*, (The Precious Gem concerning the preparation of the elixir) by Abū 'Abdallāh al-Ṭuġrā'ī. (slide 3) For many reasons, I consider this attribution to be false and agree with Siggel who argued that the name of the assumed author seems to be due either to a mistake or to pure invention;[10] moreover, in the traditional bio-bibliographical repertoires like the *Kašf Al-Zunūn* by Ḥaǧǧī Khalīfa, there is no trace of any book bearing this title in the list of the original works by the alchemist Al-Ṭuġrā'ī.[11] Finally, the attribution of the content of the whole Sprenger manuscript is liable to the same critics directed by Ruska against Al-Rāzī's paternity of the *De aluminibus et salibus*.[12]

Returning to the dictionary, the problems of lexigraphical study become quickly apparent. As is typical in alchemical manuscripts, the author makes claims to provide clarity to the array of names used for various substances. The author explains to his reader (fol. 3r) (slide 4):

> You have to know that the bodies are seven, the spirits are seven, the stones are seven and the compounds are seven. All of them take part in the composition of the Work. Among the bodies, the spirits, and the stones that we mentioned, those red in colour are used for the preparation of gold and those white in colour for the preparation of silver. I will explain this to you in order to clarify all your doubts regarding this subject. Moreover, I am going to mention the bodies, the spirits and the stones using names that differ from the ones usually known. Those are names that the Sages used for their allusive value. They will be clarified in this treatise, so that nothing will be lost, everything will be in its place and nothing related to the Work will remain unknown to you, with the help of God the Almighty.

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introduction to the treatise. On a Hebrew version of this treatise, see Patai, *The Jewish Alchemists*, pp. 119-125. For my recent contributions on the subject, see Gabriele Ferrario, "Origins and Transmission of the *Liber de aluminibus et salibus*," in Lawrence Principe, ed., *Chymists and Chymistry. Studies in the History of Alchemy and Early Modern Chymistry* (Papers presented at an International Conference on the History of Alchemy and Chymistry held at the Chemical Heritage Foundation, Philadelphia, 19-23 July 2006), (Sagamore Beach, MA, 2007), pp. 137-148 and "Il *Libro degli allumi e dei sali*: *status quaestionis* e prospettive di studio," *Henoch* 26, 3 (2004), 275-296. The most recent study of the Latin translations of the *De aluminibus et salibus* is Catherine J. Arbuthnott, *Pseudo-Razi* De aluminibus et salibus: *a Critical Edition and Translation of the Latin Translation with Notes on the Chemical Procedures* (Unpublished PhD thesis, London, 2002). This new critical edition of the Latin text is going to be published together with an English translation and an introduction to the text.

[10] The correct name of the famous alchemist, who was sentenced to death in 1121 by Al-Simīrūmī, wazīr of the Seljuk Mahmud III, is Mu'ayyid al-Dīn Abū Ismā'īl al-Ḥussayn ibn 'Alī ibn Muḥammad al-Ṭuġrā'ī al-Munši' al-Isbahānī.

[11] Siggel, *Katalog*, pp. 139-144. Ḥaǧǧi Khalīfa, *Kašf al-ẓunūn 'an asāmī al-kutub wa-'l-funūn – Lexicon bibliographicum et encyclopaedicum*, ed. Gustav Flügel (Leipzig, 1835-58; repr. New York, 1964).

[12] See *Appendix*.

The "work" mentioned in this sentence is of course the artificial production of gold and silver, which is to be obtained by a combined use of bodies (i.e. metals), spirits (i.e. more volatile substances like arsenic, sal ammoniac and others) and stones. The author appears to be determined to explain to the reader every single detail regarding the allusive alchemical lexicon used by "the Sages", a common way to address the alchemical authorities of the past. However, when we look more closely at what follows in the dictionary what we find is an example of the paradox of concealment by means of explanation.[13]

The alchemical substances described in the dictionary are divided in bodies – i.e. metals, spirits, stones and compounds.[14] (slides 5-7) The stones are in their turn divided in two groups: those that contain spirits and those that do not. The list of metals includes: gold, silver, iron, copper, white lead, black lead and mercury. For each of these metals the dictionary gives a number of synonyms (*Decknamen*) that varies from fifteen to fifty names. For instance, the possible names of gold can be: "the noble silver", "the sun", "the father of experience", "the jewel", "the tomb", "the discarded", "the wise", "the sunbeam", "the light", "the day", "the red wax", "the permanent sulphur", "the cradle", "the balanced", "the head", "the knot", "the integral", "the complete", "the revolutionary", "the patient", "the king of the bodies", "the rubber". For some of these names, an easy explanation can be found according to the alchemical theory: gold is called "the noble silver" because it represents the last stage of purification and ennobling of the base matter obtained through the alchemical process. In many alchemical recipes, silver is the last metal that is obtained before the appearance of gold. The references to "the light", "the day", "the sunbeam" and so on are all to be traced back to the traditional correspondence between the names of the planets and those of the seven metals that seems to have Babylonian origins and in which gold is always coupled with the sun.[15] As for names like "the balanced" and "the complete", they make direct reference to the fundamental alchemic-mineralogical theory according to which all metals are made up of the same constituents – earth, air, fire and water. The differences among them is given by a

[13] The titles of many alchemical books often seem to promise a clear explanation of the doctrines of the Art – something that never really happens, anyway. The titles of the treatises anthologized in Jean Jacques Manget's *Bibliotheca Chemica Curiosa* (Geneve, 1702), for example, provide many examples of these unfulfilled promises: Petrus Johannes Faber, *Res alchymicorum obscuras extraordinaria perspicuitate explanans* (v. I, p. 291), Joannes Joachim Becher, *Oedipus Chemicus, obscuriorum terminorum et principiorum chymicorum mysteria aperiens et resolvens* (I, 306), and Raymundus Lullus, *Liber dictus Lux Mercuriorum in quo explicatur quod in aliis libris occultum est* (I, 824).

[14] For reasons linked to the availability of the sources and to my personal expertise, I have relied primarily on the version of the dictionary preserved in MS Sprenger 1908 and on Duval's published edition.

[15] See Berthelot, *Collection des anciens alchimistes grecs*, (Osnabrück, 1967; repr. of the ed. 1888), 1: part 1, 74-85.

difference in the proportions and degrees of pureness of these elements. As a consequence, base metals can be turned into noble ones, if the alchemist is able to recreate the perfect composition that is typical of gold, which is considered to be the most balanced and complete of all metals.[16] The name "the discarded" raises some problems, since in the *De aluminibus et salibus* this name is used with reference to arsenic, which is said to be "the popular and cheap stone, that is discarded and thrown away in markets, in mud and in toilettes".[17]

Many synonyms are given for silver, as well: "the moon", "the mother", "the leafy", "Hermes of the egg", "the white wax", "the familiar lion", "the servant", "the night", "the leprous gold", "the ivory", "the path", "the reckless", "the tasteless", "the suitor", "the vagabond". Names like "the leprous gold" are easy to understand. According to a widely attested alchemical theory, base metals were considered as noble metals affected by illnesses; the goal of the alchemist would be that of curing those illnesses and take back the metal to its healthiest form, the form of gold. In this case, this notion is extended to silver – namely a noble metal – that is designated as a form of ill gold that has to be healed.

Mercury occupies a peculiar place, since it is listed twice in the dictionary, once as part of the bodies and then again as part of the spirits. (slide 8) The compiler of the dictionary provides a clear explanation for this double classification, when he writes on fol. 4v:

> As far as mercury is concerned, we already mentioned its names in the description of the bodies, and this was due to the fact that it is the first of the bodies, and all the bodies derive form mercury and are made up of it. As for its mention among the spirits, it is due to the fact that it volatilizes when in contact with fire and it does not stand fire: for this reason, the Sages listed mercury among the spirits. Moreover, in the same way, the bodies are those substances that melt on fire and do not run away from it, while the spirits are fine. The bodies tend to go back to their origin – that is the earth - , while the spirits tend to volatilize, heading towards their world. So, they bear these names, because there is a meaning to names: these are the states convenient to these substances, as a matter of necessity.

Mercury is particularly rich in synonyms: "Hermes", "the paralytic", "Mercury", "the life of the bodies", "the cloud", "the horizon", "the water", "the powerful", "the water of the sun", "the writer", "the water of the moon", "the water of copper", "the water of iron", "the

[16] On the connections between the Aristotelian theory of the qualities and Arabic alchemy, see Paola Carusi, "*Meteorologica IV* e alchimia islamica. Qualità ed elementi a confronto," in *Aristoteles Chemicus. Il IV Libro dei Meteorologica nella tradizione antica e medievale*, ed. Cristina Viano (Sankt Augustin, 2002), pp. 81-97.
[17] MS Sprenger 1908, f. 21v; for the Hebrew version, MS Orient. Oct. 514, f. 23v.

author", "the milk of the virgin",[18] "the turbid", "the support of the bodies", "the one that gives life to lifeless things", "the light of the lights", "the chick of the daemons", "the wise", "the soul", "the oriental", "the Armenian", "the fish", "the fleeting", "the fleeting servant", "the lightning", "the heavy water", "the liquid spirit", "the liquid body", "the water of life", "the faint-hearted", "the living water", "the water of the splendour of sulphur", "the uncovered beggar", "the water of glass", "*aphroselēnon*",[19] "the foam of the sea", "the water of Saturn", "the veiled dog", "the honey", "the heat of all the animals", "the comfort", "the milk of all the bodies", "the medicine", "the ferment", "the urine of the lunatics" and the "sulphur of the aludel".[20]

Besides mercury, which is a sort of bridge between bodies and spirits, the other spirits listed are: sal ammoniac, arsenic, sandarac (i.e. red arsenic), orpiment (i.e. yellow arsenic), red sulphur, and white sulphur. Although the two kinds of sulphur are listed separately, when it comes to listing their synonyms the author of this alchemical dictionary avoids any distinction, and the reader has to understand by himself which of the two sulphurs is being referred to. Their names are: "the king", "the ones that covers", "the yellow bride", "the red bride", "the white bride", "the yellow wax", "the white wax", "the companion of the mineral", "the sun",[21] "the ferment of gold", "the soul", "the air", "the spirit that dyes", "the scorpion", "the lion of the earth", "the honoured stone", "the asphyxiating", "the bird of Socrates", "the string of hemp". Different names are then used for defining the dye extracted from sulphur and the body of sulphur that remains after the extraction of the dye. For the first one we find: "the fire", "the wine", "the dye", "the crying one", "the main door", "the hearth", and "the liver". On the other hand, the body devoid of its tincture is called: "the air", "the soul", "the soap", "Jupiter".

After listing the names of the spirits, the dictionary considers the alternative names of the stones, starting from the stones that are considered to contain a part of spirit, which are: marcasite, magnesia, tutty, hematite, magnetite, vitriol and salt; then the stones that do not contain spirits are listed: talc, antimony, mother-of-pearl, crystal, malachite, lapis lazuli and agate. It is then explained that, after being alchemically processed, the aforementioned stones

[18] This name corresponds to the Latin *lac virginis*.

[19] This Greek name – meaning "froth of the moon" was already used as a *Deckname* by the Hellenistic alchemists. See Bethelot, *Collection des anciens alchimistes grecs*, 2: 18,8, 185,17, 391,14; and also Benjamin Hallum, "Zosimus Arabus. The Reception of Zosimos of Panopolis in the Arabic/Islamic World" (unpublished PhD Thesis, London 2008), p. 231.

[20] This term derives directly from the Arabic *al-uṯāl.*

[21] This synonym is clearly a source of confusion between gold and sulphur, since gold is normally called "the sun" in alchemical literature, while this name does not usually apply to sulphur.

can become: cadmium, litharge, red lead, ceruse, alkali salt, the lime of eggs and other kinds of lime.

As these examples show, the synonyms for the names of the alchemical substances are given in a random order that comprises names taken from different fields. We find, for example, the well-known names of planets, names of common objects (like "the jewel", "the tomb", "the cradle", "the plug", "the rock", "the bud", "the brook", "the foam", "the gum" and so on), names defining intellectual or physical features (like "the wise", "the well-balanced", "the discarded", "the revolutionary", "the indulgent", "the lifeless", "the immortal", "the beggar", "the fleeting" and so on), names defining familial relationships (like "the father of…", "the mother of…", "the brother of…", "the son of…"), names of status (like "the king", "the servant"), names of colours (like "the yellow", "the green", "the fair", "the white", "the black" and so on), names of animals (like "the eagle", "the vulture", "the lion", "the bird", "the wasp", "the chick", "the scorpion", "the fish" and so on) and names describing a provenance (like "the Indian", "the Armenian" and so on).

The clarifying aim of this alchemical dictionary is partially compromised by the repetition of some names as synonyms for different substances. "The sun", according to the compiler can mean "gold" but also "sulphur". The name "the light" can refer both to gold and to mercury; "wax" can refer to gold and sulphur – that are normally defined "red wax" – to sulphur alone – normally called "yellow wax" – and to silver and sulphur again – commonly named "white wax". Gold can be called "the permanent sulphur" and this can lead to further confusion. Both gold and silver can be called "the complete". "Hermes" is the name commonly used for defining mercury, but in this dictionary we read that it can also be used with the meaning of silver. The name "lion" can indicate silver, arsenic and sal ammoniac. When the alchemists speak about "the bird", they can make reference to both sal ammoniac or arsenic. Sal ammoniac, then, can also be called "the oil" which is a name used for defining one of the substances derived form the manufacturing of graphite, as well. Finally, both sulphur and arsenic are said to be called "the king".

This confusion in the list of synonyms can of course be misleading and the reader of alchemical recipes has to rely on the context for understanding whether one or the other ingredient is to be used in a particular recipe. As Kraus and Lorry underlined, it is not possible to identify the ingredients of medieval alchemical recipes by means of interpreting the described practical operations as they were modern chemical procedures. In this way, the

context itself will fail to give the reader sure indications about the nature of the substances implied in alchemical operations.[22]

As an example, I present here the translation of a recipe for the preparation of lead which is found in the Arabic *De aluminibus et salibus* (MS Sprenger 1908, fol. 27r) (slide 9):

> Description of the preparation of lead. Take a part of lead and melt it in an iron spoon. Throw it on the same weight of mercury and leave what you obtained in the mortar. Take the equivalent in weight of one of the previous ingredients of roasted salt, melt it in an equal quantity of sour vinegar, drain it and slowly pulverize the aforementioned lead with it. You have to pulverize it and make it dry until its colour has turned black. Then burn it in the fire until it becomes white and wash the salt away from it. You will use it as one of your ingredients, if God wants. If you put some eagle with the vinegar you use for watering the salt, you will obtain the best results and prosperity.

This is a relatively clear procedure: it is aimed at obtaining a particular kind of lead that can be used in other alchemical operations. It is not a recipe for the preparation of gold or silver out of base metals; it is rather the description of preliminary work to be conducted on lead in order to make it ready for the transmutation, whose description occupies the following paragraphs in the *De aluminibus*. What is interesting here is the reference to the eagle. How should the sentence "put some eagle with the vinegar" be interpreted? In this case, the alchemical dictionary gives us a valuable aid: among the alternative names of the sal ammoniac, we find "the eagle". What has to be added, then, to vinegar is sal ammoniac.

In order to better exemplify the degree of linguistic creativity peculiar to the alchemical language, in what follows I will apply some of the possible combinations of synonyms as given in the Arabic alchemical dictionary to a simple sentence that can be found at fol. 24r of MS Sprenger 1908. This "game" of permutations will provide a glance on the endless possibilities that – according to the alchemical dictionary object of our study – are available to the alchemist who wants to express his doctrines without being immediately understood by the laymen. Only the knowledge of the correct meaning of the synonyms will offer the key for entering the true sense of this sentence (slide 10):

Original sentence:

[22] On the identification of sal ammoniac, see Paola Carusi, "Alchimia ermetica e arte del vetro: il *Tadbīr Harmis al-Harāmisa* (Dār al-Kutub al-Miṣrīya ṭabīʿiyāt 150), *Quaderni di Studi Arabi*, 10 (1992), 192, n. 47; and Paola Carusi and Alberto Bartola, "Un tentativo di non decodificazione del termine 'sale ammoniaco'", in *Atti del II Convegno Nazionale di Storia e Fondamenti della Chimica* (Roma, 1989), pp. 53-61.

> «Silver is the body needed for obtaining the white colour in the great work. Lead can replace it in the minor work. Arsenic is its soul, mercury is its spirit and ammoniac salt is its servant that unites them and makes them firm».
>
> Permutations (slide 11):
>
> 1. «"The moon" is the body needed for obtaining the white colour in the great work. "Saturn" can replace it in the minor work. "The destroyer of the bodies" is its soul, "Hermes" is its spirit and "the eagle" is its servant that unites them and makes them firm».
>
> 2. «"The white wax" is the body needed for obtaining the white colour in the great work. "The black" can replace it in the minor work. "The alloy" is its soul, "the cloud" is its spirit and "the lion" is its servant that unites them and makes them firm».
>
> 3. «"The night" is the body needed for obtaining the white colour in the great work. "The smelter" can replace it in the minor work. "The wasp" is its soul, "the paralytic" is its spirit and "the bird of the Khorasan" is its servant that unites them and makes them firm».
>
> 4. «"Ivory" is the body needed for obtaining the white colour in the great work. "Carbon" can replace it in the minor work. "The Armenian stone" is its soul, "the powerful" is its spirit and "the Armenian pepper" is its servant that unites them and makes them firm».
>
> 5. «"The vagabond" is the body needed for obtaining the white colour in the great work. "The brook" can replace it in the minor work. "The bird" is its soul, "the writer" is its spirit, and "the oil of the salt" is its servant that unites them and makes them firm»
>
> .

As these few examples show, the number of possible permutations of words in such a short passage appears to be endless and, therefore, the understanding of alchemical recipes seems to become more and more difficult for the layman, and for the contemporary scholar as well, notwithstanding the aforementioned explicit aim of the author of the alchemical dictionary (MS Sprenger, fol. 3r) (slide 12):

> […] those are names that the sages used for their allusive value. They will be clarified in this treatise, so that nothing will be lost, everything will be in its place and nothing related to the Work will remain unknown to you, with the help of God the Almighty.

Even though the author's expressed wish to clarify the meaning of alchemical terminology in this sentence is challenged by the presence of the same synonyms for different

substances and by an extremely creative – and almost overwhelming - proliferation of names, the alchemical dictionary preserved in MS Sprenger 1908 can prove to be a useful tool for the reading of medieval alchemical treatises. In terms of creating a critical edition for such a resource, one might choose to forego the traditional print edition in favour of a digital method. For example, the creation of a database would allow the editor to record multiple readings or glosses to allow for a comparative reading, together with the ingredients of the single recipes and their technical names. This type of resource for alchemical recipes would extend our knowledge of the theoretical and practical relationships among different treatises and among the recipes they preserve. I consider the creation of a digital database of alchemical *Decknamen* and recipes that could provide the researcher with an immediate answer about the possible multiple meanings of the words used by the alchemists to conceal – while revealing - their doctrines it as a major objective for the further development of our knowledge in the field of medieval and early modern alchemy.[23]

[23] The utility of the creation of an electronic database of medical and alchemical recipes is strongly underlined by Andrea Scotti, "Ipotesi per la creazione di un repertorio digitale relativo alle ricette mediche e alchemiche", in Chiara Crisciani, Agostino Paravicini Bagliani, eds., *Alchimia e Medicina nel Medioevo* (Firenze 2003), 337-370. Not only Siggel's work on the *Decknamen* could provide potential material for this alchemical database. In the appendices of many editions of Alchemical texts – like the editions of pseudo-Rāzī's treatises by Steele and Ruska - there are lists of alchemical terms that could be a good starting point for the creation this kind of database.

Appendix: Additional Features of the Sprenger Manuscript

Besides the presence of the dictionary, one of the most important features of MS Spenger 1908 of the Staatsbibliothek in Berlin is the fact that it preserves the only extant copy of the Arabic original of the *De aluminibus et salibus*, a "classical work of practical chemistry", according to the definition that Robert Steele gave in the preface of his edition of the Latin translation of the treatise, published in 1929.[24] The margins of the Sprenger manuscript carry a huge number of notes written by the same hand of the main text, but in a smaller and hastier writing. This feature makes the reading of large sections of this *marginalia* more difficult, not to mention that some parts of the longer notes have probably been cut away in the process of trimming and binding of the manuscript.[25] (slide 13) As an example, fol. 13v of the manuscript presents one long marginal note: as in many other cases throughout the manuscript, the content of the note is not directly related to the one of the main text; it is actually a completely different recipe. The writing is upside down, and at the moment, it is hard to say whether we should consider this fact as a lack of care or as a graphical device aimed at distinguishing this addition from the main text. Alternatively, it may also be a sign of the writer's hurry to write down his notes while carrying out his own alchemical experiments.[26] (slide 14):

Fol. 25r of the Sprenger manuscript offers examples of other interesting and recurring features of the Arabic manuscript. At the beginning of line number 3, there is a vertical line and another figure surrounded by a dot, respectively numbers one and thirty in the Hindo-Arabic numeration. In the system of correspondence between Arabic letters and numbers known as *abǧad*, these two figures represent the letters *alif* and *lām*, forming the Arabic invariable article *al*.[27] What follows is an Arabic word in Syriac alphabet: it's the word *milḥ*, "salt".[28] Again on line number 3, next to the Syriac word, we find the verb "*ta<u>kh</u>ruǧ*" – meaning "to come out" and the drawing of a small crescent. Given the correspondence between planets and metals, moon has to be identified with silver: this passage, thus, appears to be a recipe for the artificial production of silver. On the corresponding margin, we find

[24] Steele, "Practical Chemistry in the 12th Century", 10.
[25] This process appears to be contemporary with the renumbering of the folios and with the typewritten note on the *recto* of the first page: "On preparing the elixir by 'Abd Allah Toghrái [sic]".
[26] Examples of this kind of upside-down marginalia can be found on fols. 13v, 14r, 15v, 16v, 17v, 18v and 22v of the Sprenger manuscript.
[27] This feature is quite common in MS Sprenger; for instance, at fols. 11r, 13r, 14r, 16r, 30v, 32r-v.
[28] Examples of the use of Syriac script in MS Sprenger can be found at fols. 25r, 28r, 30r, 32r-v.

three separate letters forming the word *qamar*, "moon", as an explanation of the drawing.[29] How should we interpret these graphical and linguistic features? I am disposed to believe that these are all devices intended to preserve the secrecy of the alchemical discourse that should not fall a pray to non initiated laymen. (slide 15) The *Liber de aluminibus et salibus* begins abruptly at fol. 19r- second half of line 5 - with the *incipit* "*Al-qaul fī 'l-milḥ*" (The treatise on salt). The copyist did not mind signal by any means the beginning of a new treatise. The book ends at fol. 30v with the words: *intahà qawlunā 'alà al-ağsād wa-'l-arwāḥ* (Here ends our speech on the bodies and the spirits).

The traditional attribution of the Arabic *De aluminibus et salibus* Muḥammad ibn Zakarīyā' Al-Rāzī is based probably on a note by Gerard of Cremona in a Latin translation of the book in Paris and was held by historians of chemistry and alchemy.[30] A strong and up to now possibly correct critique to this traditional attribution was proposed by Ruska in 1935: the *De aluminibus et salibus* is the work of an Andalusian alchemist of the XI-XII century.[31]

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[29] The use of planetary signs symbolizing the correspondent metal can be found in MS Sprenger at fols. 11v, 13r, 17r-v, 18r, 22r, 23v, 25r, 28v.

[30] See Lynn Thorndike, *A History of Magic and Experimental Science*, 8 vols. (New York – London, 1923-58), 2: 457-76. Quotations of the *De aluminibus et salibus* as an original work by al-Rāzī are found in Beauvais' *Speculum naturale* and *Speculum historiale*, which – together with the *Speculum doctrinale* – form the *Speculum Maius*, printed by John Mentelin in Strassbourg (1473-76). This encyclopaedia saw many later editions: Nuremberg, 1483-86; Venice, 1484, 1493-4, 1591. Ferdinand Hoefer, *Histoire de la chimie depuis les temps les plus reculés jusqu'a notre époque* (Paris, 1842-3), 1: 323-25; writing about the chemical works by "Rhasès", Hoefer quotes the *Liber Raxis* [sic] *qui dicitur lumen luminum magnum* (MS Paris. Lat. 6514, fol. 113r, XIV sec.), the *Liber perfecti magisterii Rhasei* (*ibid*., fol. 120v) and the *Liber Rasis de aluminibus et salibus, quae in hac arte sunt necessaria* (*ibid*., fol. 125r-v) and ends his description of these treatises with these words: "Rien n'indique que les trois écrits de Rhasès soient apocryphes. Il n'y aurait aucune preuve solide à faire valoir contre leur authenticité"; Hermann Kopp, *Ansichten über die Aufgabe der Chemie und über die Grundbestandtheile der Körper bei den bedeutendern Chemikern* (Braunschweig, 1875), pp. 54-55, n. 63. Steele, "Practical Chemistry", 10: "it purports to be, and no doubt is in substance, the work of one of the most celebrated of eastern physicians, MUHAMMAD ABU BAKR IBN ZAKARYA AL-RAZI, many of whose medical writings were published in the infancy of printing".

[31] Ruska, *Das Buch der Alaune und Salze*, pp. 15-18 and also Julius Ruska, "Pseudoepigraphe Rasis-Schriften," *Osiris,* 7 (1939), 39-40: the German scholar argues that: a) none of the pro-Rāzī positions is based on a real knowledge of Al-Rāzī's work; b) in the *Sirr al-Asrār* ("Secret of Secrets"), an original work by Al-Rāzī, sal ammoniac is listed among spirits, while here it is classified as a salt (Ruska, "Übersetzung und Bearbeitung von al-Razi's Buch Geheimnis der Geheimnisse", in *Quellen und Studien zur Geschichte der Naturwissenschaften*, (Berlin, 1935), 4: 153-238. See MS Sprenger 1908, fol. 20r (in the Hebrew translation – MS Berlin, Staatsbibliothek, Orient. Oct. klein 514 – this passage is at fol. 22v.): "You have to know that sal ammoniac is the best and noblest among the other salts […]". It has to be noted that this classificatory difference is valid only as far as the text of the *Liber de aluminibus et salibus* is concerned while in the alchemical dictionary on which this paper focuses sal ammoniac is placed among the spirits, according to Al-Rāzī's classification; c) in the *De aluminibus et salibus* there are many references to Al-Andalūs (Islamic Spain) as a source of useful alchemical substances; d) Egyptian sal ammoniac was obtained through the decantation of soot in a bath of camel's manure and was produced only after 1100: thus, Al-Rāzī could not know it. (This kind of salt is mentioned in MS Sprenger 1908, fols. 25v and 29r and MS Orient. Oct. 514, fol. 33r. According to al-Bīrūnī, al-Rāzī died in 925. See Julius Ruska, "Al-Bīrūnī als Quelle für das Leben und die Schriften Al-Rāzī's", *Isis* 5 (1923): 26-50. According to Lenn E. Goodman the date of Al-Rāzī's death is to be placed between 925 and 935: Lenn E. Goodman, "Rāzī," in P. Bearman, Th. Bianquis, C.E. Bosworth, E. van Donzel and W.P. Heinrichs (eds.),

Encyclopaedia of Islam, 2nd ed. (Leiden, 2008), 8: 474). At the present state of knowledge, Ruska's assumption seems to be the most reliable even if it does not succeed in identifying the name of the author of this treatise. See also Dorothy W. Singer, *Catalogue of Latin and Vernacular Alchemical Manuscripts in Great Britain and Ireland* (Brussels, 1928), 1: 107-108, where she assumes: "it will be noticed that the ascription of this work to Rhazes came late".