# *ELIXIR ATQUE FERMENTUM*: NEW INVESTIGATIONS ABOUT THE LINK BETWEEN PSEUDO-AVICENNA'S ALCHEMICAL *DE ANIMA* AND ROGER BACON: ALCHEMICAL AND MEDICAL DOCTRINES

By SÉBASTIEN MOUREAU

## Introduction

Between 1994 and 1997, William Newman published three articles[1] in which, for the first time, a profound connection between Roger Bacon's doctrine and Ps.-Avicenna's alchemical *De anima* was pointed out. These studies were a major step in understanding Roger Bacon's elemental physics, alchemy, and alchemical medicine, as well as his *prolongatio vitae* theory. By a thorough study of the physical, alchemical, and medical doctrine of the Jābirian treatises via Ps.-Avicenna's *De anima*, in comparison with Bacon's texts, I will continue the work initiated by Newman and draw some new conclusions. I will specifically focus on some principal differences between Roger Bacon and his favorite alchemical source, which allow us to understand the originality and innovation of the Franciscan. In addition to the *De anima*, a specific aspect of the alchemy of the Ps.-Aristotelian *Secretum secretorum* will also be studied here, being another of Bacon's major sources.

The following pages also include a set of new reflections about the elixir system and the ferment system. The case of Bacon's doctrine and his sources brings new insights into the fundamental system of proportions that is found in those treatises, and allows us to reconsider and rethink both the elixir system and the ferment system, and to continue and perhaps refine the study of these fundamental notions.

First, the alchemical *De anima* will be presented, along with the textual links of Roger Bacon's works with it. Then, the physical, alchemical, and medical doctrines of Ps.-Avicenna's *De anima* will be explained, followed by a description of Bacon's elemental physics, alchemy, and *pro-*

[1] Cf. n. 17.

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The author is chargé de recherches au F.R.S. – FNRS.

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*longatio vitae*. After these observations, a comparison and a conclusion will be drawn.

## *The Alchemical* De anima *of Ps.-Avicenna*

The *De anima* or *Liber de anima*, better known under the title of *De anima in arte alchemiae*,[2] is the compilation and Latin translation of three now-lost Arabic alchemical treatises.[3] It is impossible to date the compilation stage, but the translation seems to have been made around 1226 or 1235.[4] Unfortunately, it is impossible to say whether the treatise was translated before its compilation or compiled before its translation.

[2] The title *De anima in arte alchemiae* is found only in the edition of 1572; all the manuscripts call the treatise *Liber de anima* or *De anima*.

[3] The critical edition, French translation, and commentary of Ps.-Avicenna's alchemical *De anima* were the subject of my PhD dissertation: Sébastien Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne: Edition critique, traduction et étude" (PhD diss., Université catholique de Louvain, Institut orientaliste, 2010). This thesis will be published within the next few years. In this article, the quotations of the *De anima* are extracts of my critical edition, but the pagination is from Celsi's edition, as my edition is not published yet. As for older studies about Ps.-Avicenna's *De anima*, see Marcellin Berthelot, *Histoire des sciences: La chimie au Moyen Âge* (Paris, 1893), 1:293–305; Moritz Steinschneider, "Zur alchimistischen Literatur der Araber," *Zeitschrift der Deutschen Morgenländischen Gesellschaft* 58 (1904): 299–315; idem, *Die europäischen Übersetzungen aus dem Arabischen bis Mitte des 17. Jahrhunderts*, Sitzungsberichte der Akademie der Wissenschaften in Wien 149, 151 (Vienna, 1904–5), §143; Julius Ruska, "Die Alchemie des Avicenna," *Isis* 21 (1934): 13–51; idem, "Zum Avicennatext des Cod. Vadianus 300," *Sudhoffs Archiv* 27 (1934): 499–510; Georges C. Anawati, "Avicenne et l'alchimie," in *Oriente e Occidente nel Medioevo: filosofia e scienze, Convegno internazionale 9–15 aprile 1969*, Accademia nazionale dei Lincei, Fondazione Alessandro Volta, Atti dei convegni 13 (Rome, 1971), 285–341, at 286–88; Manfred Ullmann, *Die Natur- und Geheimwissenschaften im Islam*, Handbuch der Orientalistik, erste Abteilung, Ergänzungsband 6, zweiter Abschnitt (Leiden, 1972), 222–24; Georges C. Anawati, "L'alchimie arabe," in *Histoire des sciences arabes, 3: Technologie, alchimie et sciences de la vie*, ed. Roshdi Rashed (Paris, 1997), 111–41, at 134–35; Sébastien Moureau, "Some Considerations concerning the Alchemy of the *De Anima in Arte Alchemiae* of Pseudo-Avicenna," *Ambix* 56 (2009): 49–56; idem, "Questions of Methodology about Pseudo-Avicenna's *De Anima in Arte Alchemiae*," in *Chymia: Science and Nature in Early Modern Europe (1450–1750)*, ed. Miguel López Pérez, Didier Kahn, and Mar Rey Bueno (Newcastle, 2010), 1–19; idem, "*Ratio et sensus*: les sens au service de l'acquisition des connaissances dans le *De anima in arte alchemiae* du pseudo-Avicenne," in Expertus sum*: L'expérience par les sens en philosophie naturelle médiévale*, Micrologus' Library 40 (Florence, 2011), 269–88; idem, "Physics in the Twelfth Century: The *Porta Elementorum* of Pseudo-Avicenna's Alchemical *De Anima* and Marius' *De elementis*," *Archives d'histoire doctrinale et littéraire du Moyen Âge* (forthcoming).

[4] This date is given in colophons in two manuscripts: Bernkastel-Kues, Bibliothek im St. Nikolaus Hospital, Cusanus 299, fol. 49v; Montreal, McGill University, Osler

The proposed translation date could be the translation date of the compilation, or the translation date of only one of the three parts. The first part is a treatise about elemental physics, the *Porta elementorum* (literally "chapter of the elements"), in which the physical basis of the alchemy of the *De anima* is presented. The Arabic original (no longer extant) was probably written before the mid-twelfth century,[5] and the translation was probably made in Spain or by a translator who knew Castilian, attested by linguistic transformations of a specific word.[6] Another text that seems to be another Latin version of this Arabic treatise is still extant in the manuscript Cotton Galba E IV, under the title *De elementis*, attributed to a certain Marius.[7] The second part of the *De anima*, the main part of the book (about 80%) was written between the third quarter of the eleventh century and the mid-thirteenth century in Al-Andalus (Islamic Spain).[8] This second part was translated in Spain or by a translator who knew Castilian, since many words are Castilian. The Arabic original is lost. The last part of the *De anima*, which was very likely inserted to complete the missing end of the second part, is impossible to date precisely. It was probably translated in Spain, because of linguistic traces, but the original is also lost.[9]

480, fol. 225r (and in Celsi's edition p. 468, of which this manuscript is the original model).

[5] On the account of the *terminus ante quem* of Marius's *De elementis*, i.e., 1151 (cf. n. 7 for references).

[6] *Alginz*, transcription of *al-jins* (genus), *DA*, 10. On the Spanish origin of this linguistic transformation, cf. Giovanni Battista Pellegrini, *Gli arabismi nelle lingue neolatine con speciale riguardo all'Italia* (Brescia, 1972), 43–128, 453–88.

[7] Edited and translated in Richard C. Dales, ed., *Marius: On the Elements*, UCLA, Publications of the Center for Medieval and Renaissance Studies 10 (Berkeley, 1976). This hypothesis of the same Arabic origin of Marius's *De elementis* and the *Porta elementorum* is discussed in a forthcoming article, with information about the dating given here and a detailed *status quaestionis* about the *De elementis*: Moureau, "Physics in the Twelfth Century."

[8] The *terminus post quem* is fixed by several uses of the word *morabetini* (*al-murābiṭūn*, the Almoravids), an Andalusian term that designates a coin of the Almoravids (the maravedis); the dynasty of the Almoravids rose after the mid-eleventh century. The *terminus ante quem* is the quotations of the *De anima* in Vincent of Beauvais's *Speculum maius*, finished around 1259 (Monique Paulmier-Foucart, *Vincent de Beauvais et le grand miroir du monde* [Turnhout, 2004], 23–50). For a historical and philological study of the second part of the *De anima*, cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne," vol. 1, part 1, 26–30 (and forthcoming publication).

[9] The use of some Arabic Castillian words (*anoxate*, etc.) allows one to assume this hypothesis. For a historical and philological study of the third part of the *De anima*, cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne," vol. 1, part 1, 30–31 (and forthcoming publication).

The treatise was wrongly attributed to Avicenna.[10] The *De anima* is characterized by Jābirian alchemy, presenting the same elixir theory as the Jābirian texts. It contains a very interesting description and classification of materials (*dictio* 5),[11] which is indebted to Jābirian texts.[12] The *De anima* is the main alchemical source of Vincent of Beauvais, who quotes it very often in the *Speculum Naturale* and the *Speculum Doctrinale*.[13] The *De anima* is one of the main representative treatises of organic alchemy, using animal material in making the elixir. The treatise is preserved in eight manuscripts.[14] The *De anima* was published by Mino Celsi in 1572 in Basel, in the publishing house of Pietro Perna, in a compendium entitled *Artis chemicae principes, Avicenna atque Geber*.[15]

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[10] The discussion is based on several arguments that are widely discussed ibid., vol. 1, part 1, 16–53 (and forthcoming publication). Here is a summary for each part of the *De anima*: 1) The first part contains no mention of Avicenna, contrary to the rest of the work, in which introductory sentences like *dixit Abuali Abincine* are found several times in each chapter. 2) The place and date of composition of the second part do not allow one to assume a composition by Avicenna. In addition to this, Avicenna denied the possibility of transmuting species (in a section of the *Shifā'*, cf. Ibn Sīnā, *Al-Shifā'. Al-Ṭabī'iyyāt: 5, Al-ma'ādin wa al-āthār al-'ulwiyya [La physique: 5, Les métaux et la météorologie]*, ed. Ibrāhīm Madkūr et al. [Cairo, 1964], 21–22). 3) The last part of the work is only about making elixirs for transmutation, which Avicenna does not recognize as possible. Moreover, the introduction sentences (such as *dixit Abuali Abincine*) differ and seem to be later interpolations in this part. The third part of the treatise is probably an extract inserted to complete the missing end of the second part.

[11] Each section of the *De anima* is called *dictio* (plural *dictiones*), literal translation of the Arabic *maqāla*, which designates a section of a book.

[12] The classification of materials of the *De anima* is sometimes said to be taken from Rāzī's books, but, since the classifications of Jābirian texts and of Rāzī are quite close, it is difficult to assert anything. In addition to this, most of the texts remain unedited.

[13] On this, cf. Sébastien Moureau, "Les sources alchimiques de Vincent de Beauvais," *Spicæ: Cahiers de l'Atelier Vincent de Beauvais,* n. s., 2 (2012): 5–118.

[14] Oxford, Bodleian Library, Laud Misc. 734, fols. 1r–66r (s. XIII$^{ex}$–XIV); Glasgow, University Library, Hunter 253, fols. 1r–28r (s. XIII$^{ex}$–XIV); Paris, BNF, MS Lat. 6514, fols. 144r–171v (s. XIII$^{ex}$–XIV); Bernkastel-Kues, Bibliothek im St. Nikolaus Hospital, 299, fols. 1r–49v (s. XIV); St. Gall, Stadtbibliothek (Kantonsbibliothek), Vadianus 300, fols. 1r–37r (s. XIV); Montréal, McGill University, Osler Library, 480, fols. 1r–227r (s. XIV); London, BL, Sloane 1754, fols. 186v–193r (s. XIV); Oxford, Bodleian Library, Digby 219, containing two versions, fols. 1r–27v, and fols. 28r–74v (s. XVI). To this manuscripts list, several extracts must be added. About the manuscript tradition of the *De anima*, cf. Moureau, "Questions of Methodology" (n. 3 above), 5–12 (and forthcoming publication).

[15] Mino Celsi was actually not interested in alchemy, and probably published it for the purpose of calling it to the attention of Charles IX of France, cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne," vol. 1, part 1, 203–4 (and

*Roger Bacon*

The alchemy and medicine of Roger Bacon have often been studied.[16] Alchemy is one of the main interests of Bacon, as has been shown many times. The information about Bacon in this article is mainly based on four articles, three by William Newman and one by Agostino Paravicini Bagliani.[17] In his three articles, Newman analyzes the elemental physics, the alchemy, and the *prolongatio vitae* theory of Bacon. The article of Paravicini Bagliani focuses more precisely on the *prolongatio vitae* theory. The texts of Bacon that are analyzed in these articles are those in which he explains his alchemy and medical alchemy, as well as his *prolongatio vitae*. The texts are the following (ordered according to the chronological proposition of Paravicini Bagliani):[18]

— *Opus maius*
— *Opus minus*
— *Opus tertium*

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forthcoming publication). I thank Didier Kahn for his help in this. Ps.-Avicenna, *De anima in arte alchemiae*, in *Artis Chemicae Principes, Avicenna atque Geber*, ed. Mino Celsi (Bâle, 1572), 9 pp. not numbered + pp. 1–471 (http://web2.bium.univ-paris5.fr/livanc/?cote=75697&do=livre). The other works of the compendium are: the *De investigatione perfectionis Gebri* (473–97), the *Summa perfectionis Gebri* (497–708), the *De inventione veritatis Gebri* (709–35), and the *Liber Fornacum Gebri* (736–67).

[16] Cf. for a bibliography: Agostino Paravicini Bagliani, "Ruggero Bacone e l'alchimia di lunga vita: Riflessioni sui testi," in *Alchimia e medicina nel Medioevo*, ed. Chiara Crisciani and Agostino Paravicini Bagliani (Florence, 2003), 33–54, at 33–35 (especially n. 2).

[17] William R. Newman, "The Alchemy of Roger Bacon and the *Tres Epistolae* Attributed to Him," in *Comprendre et maîtriser la nature au Moyen Âge, mélanges d'histoire des sciences offerts à Guy Beaujouan* (Geneva, 1994), 461–79; William R. Newman, "The Philosophers' Egg: Theory and Practice in the Alchemy of Roger Bacon," in *Le Crisi dell'alchimia / The Crisis of Alchemy*, Micrologus 3 (Turnhout, 1995), 75–101; idem, "An Overview of Roger Bacon's Alchemy," in *Roger Bacon and the Sciences: Commemorative Essays*, ed. Jeremiah Hackett (Leiden, 1997), 317–36; Paravicini Bagliani, "Ruggero Bacone."

[18] Paravicini Bagliani, "Ruggero Bacone," 35. The editions used for my article are the following: Roger Bacon, "Opus maius," in *The "Opus majus" of Roger Bacon*, ed. John Henry Bridges (Oxford, 1897); Roger Bacon, "Opus minus," in *Opera quaedam hactenus inedita*, 1, *Opus tertium, Opus minus, Compendium philosophiae*, ed. J. S. Brewer (London, 1859), 313–89; Roger Bacon, "Opus tertium," in *Opera quaedam hactenus inedita*, 1, *Opus tertium, Opus minus, Compendium philosophiae*, ed. J. S. Brewer (London, 1859), 3–310; Roger Bacon, "Secretum secretorum cum glossis et notulis, tractatus brevis et utilis ad declarandum quedam obscure dicta Fratris Rogeri," in *Opera hactenus inedita Rogeri Baconis*, 5, ed. Robert Steele (Oxford, 1920), 1–175; Roger Bacon, "Liber sex scientiarum in 3° gradu sapiencie," in *Opera hactenus inedita Rogeri Baconis*, 9, *De retardatione accidentium senectutis, cum aliis opusculis de rebus medicinalibus*, ed. A. G. Little and E. Withington (Oxford, 1928), 181–86.

— *Secretum secretorum cum glossis et notulis*
— *Liber sex scientiarum in 3° gradu sapiencie*

I will not discuss the authenticity or historical context of these works, which would be only a repetition.[19]

*Ps.-Avicenna's* De anima *and Roger Bacon*

As has been shown by Newman, the *De anima* was one of Bacon's main sources. His alchemy is widely indebted to Ps.-Avicenna's work. The *De anima* is quoted in the treatises mentioned above, under various titles: *De anima*, *Liber maior de alkimia*, *Scientia maior de alkimia*, *Liber de anima secundum aenigma*, *Liber maioris alkimie*, and *Maior alkimia*.[20]

In addition to this link between Bacon and the *De anima*, I would like to call attention to a new piece of evidence concerning Bacon's interest in the *De anima*. While searching manuscripts of the *De anima*, I came across a summary of the *De anima* attributed to Roger Bacon himself.[21] Three witnesses of it have been found, two manuscripts and one edition:

— Pennsylvania, Philadelphia, University of Pennsylvania, 110, fols. 42v–50r. First half of the 15th century.
— Oxford, Bodleian Library, Ashmole 1467, fols. 1r–30r. 16th century.
— *Sanioris Medicinae Magistri D. Rogeri Baconis Angli, de arte chymiae scripta: Cui accesserunt opuscula alia eiusdem Authoris* (Frankfurt: Johann Saur et Johann Theobald Schönwetter, 1603), 17–66 (l. 6).[22]

In this summary, the *De anima* is called *Liber Avicennae de anima, id est de maiori alcimia* (*sic*). This title *De maiori alcimia,* very close to the appellation found in the other works of Bacon, is used to distinguish the *De anima* from the *Epistola ad Hasen regem de re tecta*, another alchemical treatise attributed to Avicenna and known to Bacon;[23] indeed, the *De anima* is a very long treatise, while the *Epistola ad Hasen* is quite short. The question of the authenticity of this summary has not been resolved. The summary is attributed to Bacon in the Ashmole manuscript and the

[19] Cf. Paravicini Bagliani, "Ruggero Bacone," 35.

[20] Cf. Newman, "Tres Epistolae," 476, and Paravicini Bagliani, "Ruggero Bacone," 48. *Maior alkimia* (not referred to in the cited articles) is found in Bacon, "Opus tertium," 42.

[21] I intend to prepare a critical edition of this summary. The information hereafter is a sample of a future article about this summary.

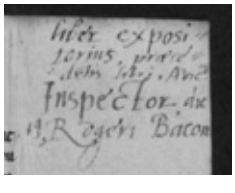
[22] This edition was reprinted later: *Sanioris Medicinae Magistri D. Rogeri Baconis Angli, Thesaurus chemicus: in quo Liber scientiarum, Alchemia major, Breviarium de dono Dei, Verbum abbreviatum de Leone viridi, Secretum Secretorum, Tractatus trium verborum, Speculum Secretorum* (Frankfurt, 1620), 16–66 (line 6).

[23] On this treatise, cf. n. 62.

printed version, but not in the Philadelphia manuscript. The summary of the *De anima* is punctuated with glosses, as Bacon did for the *Secretum secretorum*, but these glosses are very short and rare. However, they revealed that the author had a deep understanding of the *De anima*. No gloss contradicts Bacon's doctrine, and we find a reference to the *Lumen luminum* (a medieval treatise sometimes attributed to Rāzī, sometimes to Aristotle, both wrongly), which is one of Bacon's sources.[24] The summary could be genuine. But one question remains: why does the Philadelphia manuscript not cite Bacon, so famous an authority? No internal element allows one to provide a dating.

As the last evidence of doctrinal link between the *De anima* and Bacon, I would like to present a very late historical testimony of a famous alchemist, John Dee (1527–1608). In the manuscript Glasgow, University Library, Hunter 253, fols. 1r–28r, there is an incomplete copy of the *De anima*. On fols. 28r–39v, i.e., just after the *De anima*, a commentary on the *De anima*, written by a certain *Inspector*, is found.[25] This manuscript was owned by Dee, who signed it "Io<hann>es Dee 1556" on fol. 1r:[26]

On fol. 28r, i.e., at the beginning of the *Inspector*'s commentary, Dee wrote on the margin "liber expositorius praecedentis libri Avicennae, Inspector dictus, Rogeri Bacon":



John Dee attributed this commentary to Bacon, but no internal evidence suggests that Bacon is the writer; his name is not cited and the sur-

[24] This *Lumen luminum* is found in Paris, BNF, MS Lat, 6514, fols. 113r–120v. The treatise is quoted in the *De erroribus medicorum* and the *Opus minus*, cf. Newman, "Tres Epistolae," 86–93. For the manuscripts of the treatise, cf. Lynn Thorndike and Pearl Kibre, *A Catalogue of Incipits of Mediaeval Scientific Writings in Latin* (London, 1963), 290.

[25] Many paragraphs are introduced by the sentence *dixit inspector*.

[26] The two images presented here are published by the permission of University of Glasgow Library, Special Collections.

name *Inspector* is not usual for Bacon. This attribution may be explained by two hypotheses: 1) Dee had another manuscript of the commentary, in which the attribution to Bacon appeared; 2) Dee knew that Bacon had a very close link with the *De anima*, and attributed the commentary to him, perhaps confusing it with the summary cited above. This attribution makes it clear that in the sixteenth century, or at least in Dee's mind, the *De anima* and Roger Bacon were linked together.

## Elemental Physics, Alchemy, and Medicine in the Alchemical *De anima* of Ps.-Avicenna

### *Elemental Physics in Ps.-Avicenna's* De anima

The physical theory of the *De anima* is mainly explained in the *Porta elementorum*. This first part of the *De anima* is heavily corrupted, and some passages are unintelligible.[27] It is, however, possible to draw out the principles of the elemental physics of the *De anima*. The information of the *Porta elementorum* is confirmed in the second part of the *De anima*, sometimes with very slight variations. This theory is not quite original for its time, since it is the common Aristotelian-Arabic mix. The Aristotelian background is the theory of four elements[28] as transmitted by the Arab thinkers (especially the authors of the Jābirian corpus; see below). All things in the sublunary world are compounds of the four elements. Each element is characterized by two of the four elementary properties (called *naturae* in the *De anima*, from the Arabic[29]): fire is hot and dry, air is hot and moist, water is cold and moist, earth is cold and dry. Things differ according to their proportions of elements, and, consequently, according to their proportions of elementary properties. In addition to this system, the elements can be transmuted into one another.[30] To this background, several Arabic features are added. Firstly, the mercury and

[27] With the help of the other supposed Latin version of the same lost Arabic original, i.e., Marius's *De elementis*, which is not corrupted but could have been reworked later, it is even possible to understand some of these unintelligible passages of the *Porta elementorum*. For a more detailed analysis of the physics of the *Porta elementorum*, cf. Moureau, "Physics in the Twelfth Century" (n. 3 above).

[28] Aristotle, *De generatione et corruptione* 2 (esp. 2, 3).

[29] In the texts attributed to Jābir ibn Ḥayyān and in most part of the alchemical Arabic treatises, the elementary properties are called *ṭabīʿa* (nature), cf. Paul Kraus, *Jābir ibn Ḥayyān, contribution à l'histoire des idées scientifiques dans l'Islam*, 2, *Jābir et la science grecque*, Mémoires présentés à l'Institut d'Egypte 45 (Cairo, 1942), 4–7.

[30] As already asserted in Aristotle, *De generatione et corruptione* 2, 4 (331a).

sulphur theory: metals are produced in the depths of the earth by coction of a watery vapor over hundreds of years. This vapor condenses and becomes mercury (*argentum vivum*); then coction continues to condense this mercury, which becomes a metal. However, during its coction, the mercury absorbs sulphur. The proportion and kind of mercury and sulphur that form the metal give it its specificity.[31] In addition to this, each metal (compounded of the four elements) is characterized by two external and two internal properties: for example, silver is described as a cold and dry substance, which means, in the occult-manifest properties system, that silver is cold and dry in its exterior and hot and moist in its interior;[32] coldness and dryness have pushed heat and moisture into the depths of the metals, being more abundant than they. This Aristotelian-Arabic physical doctrine is very close to the doctrine found in the texts attributed to Jābir ibn Ḥayyān, except that the *De anima* considers, in addition to the four elementary properties, three other properties: lightness (*levitas*), heaviness (*ponderositas*), and the ability to dissolve (*solutio*, which is *tardis* or *festinata*). However, these three additional properties are not much used in the *De anima*; they are something like a minor theoretical addition rather than a real modification.[33] In order to know

[31] This theory (based on Aristotle's theory of the double exhalation) was already explained in Balīnūs's (Ps.-Appolonius of Tyana) *Sirr al-khalīqa*. Cf., for example, the creation of lead in Balīnūs, *Buch über das Geheimnis der Schöpfung und die Darstellung der Natur (Buch der Ursachen) von Pseudo-Apollonios von Tyana*, ed. Ursula Weisser, Sources and Studies in the History of Arabic-Islamic Science 1 (Aleppo, 1979), 246–47. A simpler and influential (in the Latin world) explanation of it is found in Avicenna's *De mineralibus*, better known under its erroneous title *De congelatione et conglutinatione lapidum*, the Latin translation of the *Kitāb al-ma'ādin wa-al-āthār al-'ulwiyya* (section of the *Ṭabī'iyyāt* of the *Shifā'*, cf. Ibn Sīnā, *Al-ma'ādin wa al-āthār al-'ulwiyya* [n. 10 above]); cf. Eric John Holmyard and Desmond Christopher Mandeville, *Avicennae De Congelatione et Conglutinatione Lapidum: Being Sections of the Kitâb Al-shifâ'* (Paris, 1927), 49–54 (also contains the Arabic version with an English translation).

[32] This very simple system is, however, much more complicated in the Jābirian corpus, as will be studied below, pp. 302–4.

[33] If heaviness and lightness are already found in the description of the elements in Plato's *Timaeus*, they are not the usual properties used to classify the elements in the Middle Ages, neither in the Neoplatonic system nor in the Aristotelian system. On this complex question, see the recent study by Irene Caiazzo, "La forme et les qualités des éléments: lectures médiévales du Timée," in *Il Timeo: Esegesi greche, arabe, latine; Relazioni introduttive ai seminari della V "Settimana di Formazione" del Centro Interuniversitario "Incontri di culture: La trasmissione dei testi filosofici e scientifici dalla tarda antichità al medioevo islamico e cristiano," Pisa, Santa Croce in Fossabanda, 26–30 aprile 2010*, ed. Francesco Celia and Angela Ulacco (Pisa, 2012), 307–44. Cf. *DA*, 30: "Et dicunt quod auripigmentum est contra aurum vivum et non omnino, quia sicut illi dicunt — et est verum, quicquid homo naturalis

the elemental proportions in each thing, a complex theory was developed in the Jābirian texts, the *'ilm al-mīzān* (science of the balance), i.e., a system based on alphanumerical calculations in order to identify the proportion of elements in each thing from its name.[34] This *'ilm al-mīzān* is not at all present in the *De anima*: Ps.-Avicenna says only that it must be known, without further explanation.[35]

### *Alchemy in Ps.-Avicenna's* De anima

The alchemy of the *De anima* is completely indebted to the Jābirian corpus: its vocabulary (translated into Latin), its principles, and its classification of materials are the same.[36] Various kinds of materials enter in the alchemical work (only the four direct ingredients are listed here). The Arabic alchemical vocabulary is indebted to a medical background, since medical theories are the source of the elixir theory;[37] alchemy came to the Latin world only by translation from Arabic (twelfth and thirteenth century), so this terminology is also found in Latin. 1) The "bodies" (*corpus*) are the six metals, i.e., copper, lead, tin, iron, silver, and gold, also called the "six that are stretched out with the hammer" (*sex quae per malleum se elongant*).[38] However, in the alchemical work, the body is precisely the

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dicat est verum, et ita est de omni homine quamvis naturalis sit verus — quia in quacumque causa huius mundi debet homo quaerere septem proprietates et hae sunt calor, frigiditas, siccitas, humiditas, levitas, ponderositas, solutio; in omnibus rebus quae in hoc saeculo sunt debes scire in unaquaque quod sint istarum." *DA*, 149: "Et quando mittunt in alutel et dant ei ignem, calefit, et exit calor absconditus et vincit frigiditatem, et siccitas vincit humiditatem; et levitas non est nisi de calore et siccitate et pondus de frigiditate et humiditate, et postquam calefit et siccatur, facit se leve et ascendit." In another passage of the *DA*, Ps.-Avicenna quotes Morienus (the quotation is not identified) and a list of seven properties in which the *solutio* property is replaced by *parvitas*, probably referring to the size of the particles of the metal, *DA*, 64: "Et adhuc magis dixit [i.e., Morienus] regi: 'Noster pulvis de nostra alexir est mixtus de septem naturis: de calore, de frigore, de siccitate, de humiditate, de levitate, de ponderositate, de parvitate.'"

[34] Kraus, *Jābir ibn Ḥayyān II*, 187–303. The Jābirian physics will also be investigated in the section devoted to Bacon's physics, cf. pp. 302–6. Cf. also Syed Nomanul Haq, *Names, Natures and Things: The Alchemist Jābir Ibn Ḥayyān and His* Kitāb al-Aḥjār *(Book of Stones)*, Boston Studies in the Philosophy of Science 158 (Dordrecht, 1994), 49–80.

[35] He explains how to calculate the proportion of elementary properties from the proportion of elements, but not how to know this proportion of elements.

[36] Cf. n. 12.

[37] Cf. p. 297.

[38] *DA*, 36. In some very rare passages of the *De anima*, mercury is found among the metals, and in another a certain *acerium* (literally "steel"), but it could also be a corrupted reading for the *khārṣīnī*, an alloy that varies according to different authors and appears in the *De anima*; cf. H. E. Stapleton, R. F. Azo, and M. Hidāyat

metal that will be transmuted into gold or silver,[39] lead for gold, copper for silver.[40] The body is prepared by a series of various operations:[41] a preliminary washing (*ablutio minor*), a calcination (*calcefactio*, i.e., reduction into a *calx*),[42] an inhumation (*inhumatio*, which is not always counted as an operation), a second washing (*ablutio maior*), a hardening (*induratio*), a ceration (*inceratio*), and a sublimation (*sublimatio*). The aim of these operations is to subtilize the particles of the metal so that the small particles of the elixir could enter into the body, and to reduce the body to its prime matter, i.e., mercury and sulphur. 2) The second ingredient is the most important of the four "spirits": mercury (called *aurum vivum*, living gold, instead of the usual *argentum vivum*).[43] The other spirits are sulphur, sal ammoniac, and orpiment.[44] The mercury is prepared by vari-

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Ḥusain, "Chemistry in 'Irāq and Persia in the Tenth Century A. D.," *Memoirs of the Asiatic Society of Bengal* 8, no. 6 (1927): 317–418, at 340–42, 345, 405–11; Ruska, "Die Alchemie des Avicenna" (n. 3 above), 37; Ruska, "Al-Rāzī's Buch Geheimnis der Geheimnisse, mit Einleitung und Erlauterungen in deutscher Übersetzung," *Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* 6 (1937): 1–246, at 42–43; J. R. Partington, "The Chemistry of al-Rāzī," *Ambix* 1 (1938): 192–96, at 193; Dietlinde Goltz, *Studien zur Geschichte der Mineralnamen in Pharmazie, Chemie und Medizin von den Anfängen bis Paracelsus*, Sudhoffs Archiv: Zeitschrift für Wissenschaftsgeschichte, Beihefte 14 (Wiesbaden, 1972), 254; Albert Dietrich, "Khārṣīnī," *Encyclopedia of Islam*, new edition, 1978; Fabian Käs, *Die Mineralien in der arabischen Pharmakognosie: Eine Konkordanz zur mineralischen Materia medica der klassischen arabischen Heilmittelkunde nebst überlieferungsgeschichtlichen Studien*, Akademie der Wissenschaften und der Literatur, Veröffentlichungen der orientalischen Kommission 54 (Wiesbaden, 2010), 537–39, 763–65.

[39] For example, *DA*, 59: "et nos accipimus parum de eo et proicimus super corpus, et facit aurum sive argentum."

[40] *DA*, 206–7: "et per ad lunam fac de cupro et per ad solem de plumbo."

[41] *DA*, 59: "et nos accipimus parum de eo et proicimus super corpus, et facit aurum sive argentum; hoc non potest fieri sine praeparatione et subtiliatione corporis quia suae partes minimae non possent ingredi nisi in minimis partibus corporis." And *DA*, 101: "Praeparatio sua est subtiliare eum et mutare in naturam primam et in aliam naturam altiorem."

[42] Cf. n. 58.

[43] I did not find any other mention of this appellation for mercury in previous texts. In the Jābirian *Kitāb muṣaḥḥaḥāt Iflāṭūn* (cf. Kraus, *Jābir ibn Ḥayyān II*, 5 [n. 29 above]), n. 4 the "living gold" designates the earth element obtained by the distillation of a substance. The *aurum vivum* for *argentum vivum* is found in later texts, but these occurrences are very likely references to the vocabulary of the *De anima*, for example in Martin Ruland, *Lexicon alchemiae, sive dictionarium alchemisticum, cum obscuriorum verborum, et rerum Hermeticarum, tum Theoprast-Paracelsicarum phrasium, planam explicationem continens* (Frankfurt, 1612), 95.

[44] In the *De anima*, the sal ammoniac designates the ammonium chloride ($NH_4Cl$), and not the ancient mix of sodium carbonate and sodium chloride. The orpiment is one of arsenic sulphide ($As_2S_3$).

ous operations[45] and then projected into the body. The mercury must be: a) white prepared mercury, i.e., prepared mercury, for the creation of silver, and b) red prepared mercury, i.e., either prepared cinnabar (HgS) or an unidentified substance,[46] for the creation of gold. The projection of the spirit allows the body to unite with the "soul."[47] 3) Regarding this soul, we can explain the third ingredient, i.e., the "stone" (*lapis*). This word is the literal translation of the Arabic *ḥajar*, which designates, in Arabic alchemy, any substance from which the elixir is made (even if it is not a stone). In Jābirian texts, the stone may be a mineral, a vegetal, or an animal substance, and preference is usually given to animal substances, especially human, but, as is often the case in the Jābirian corpus, many contradictions are found.[48] In the *De anima*, there are three

[45] The list varies in the treatise. The operations are generally: sublimation, wash, dissolution, hardening.

[46] *DA*, 142: "Et de sulphure faciunt multa magisteria: colorant argentum vivum et cum illo argento faciunt aurum, quia incorporant cum plumbo et faciunt inde multa magisteria." The coloration of mercury with sulphur is the creation of cinnabar (mercury sulfide, HgS) in this case. The author uses red and yellow substances to make gold, and white substances to make silver, as usual in alchemical treatises. However, in other passages of the *De anima*, the red mercury is mercury dyed with "fire of the stone," i.e., the fire element obtained by the distillation of the alchemical stone (the substance from which the elixir is made); *DA*, 231: "Et debes scire quod calx per ad lunam quando sublimas cum argento vivo debet esse et mercurius album, et mercurius cum quo tu sublimas calcem ad solem debet esse rubeus, scilicet rubefactus cum igne lapidis."

[47] *DA*, 106: "Spiritus sunt ut imprimetur corpus ut possit coniungi cum anima."

[48] In the *Book of the Stones*, seven possible combinations of elixir are counted; cf. Jābir ibn Ḥayyān, *Kitāb al-aḥjār*, in Haq, *Names, Natures and Things* (n. 34 above), 145, English trans. 186, modified here: "The things from which the elixir is made are necessarily: pure stones, animal [substances] exclusively, plants only, animal [substances] and plants, stones and plants, stones and animal [substances], or animal [substances], plant, and stones. This makes a total of seven patterns occurring in the pharmaceutical composition of the elixir, each one having its own governing principle." In the *Book of the Divine Nature*, preference is given to blood, cf. Jābir ibn Ḥayyān, *Kitāb al-lāhūt*, in Jābir ibn Ḥayyān, *Tadbīr al-iksīr al-aʿẓam / L'élaboration de l'élixir suprême, Quatorze traités de Ǧābir Ibn Ḥayyān sur le Grand Œuvre alchimique*, ed. Pierre Lory, Publications de l'Institut français de Damas 127 (Damascus, 1988), 8–9 (French translation in Jābir ibn Ḥayyān, *Dix Traités d'alchimie, les dix premiers Traités du livre des Soixante-dix*, trans. Pierre Lory, La bibliothèque de l'Islam [Paris, 1983], 100–101): "We say — and God gives the success: the supreme thing [i.e., the supreme elixir] is first (taken) from the animals; you do not need plants and stones, because the intent to find the thing [i.e., the elixir] while knowing it is not the same as trying to find it without knowing it. This is a degree. You have to know from what [kind of] animal it comes. We say: it must be from the noblest [animal] in which there is a strong heat. We say: lion, adder — in this is the secret of this — fox, and all the animals of this kind. The noblest among them is man."

stones: the animal stone, i.e., blood, the vegetal stone, i.e., hair, and the natural stone, i.e., eggs.[49] Among these substances, Ps.-Avicenna openly gives preference to blood: blood is considered the soul of man by the author, because it is by way of his blood that man lives. As the soul of man is the higher soul, it is used to insert a soul into gold, which is the higher metal.[50] Indeed, the elixir is said to bring a soul to the body, i.e., the metal.[51] So the body, united to the spirit, receives a soul.

In order to understand what exactly the elixir and the principle of this theory are, we can underscore here the main points of the theory

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However, in the *Book of mercy* (*Kitāb al-raḥma*), it seems that matters taken from animals are criticized (cf. Berthelot, *La chimie au Moyen Âge* [n. 3 above], 3:178). In al-Khwārizmī's *Keys of Wisdom* (*Mafātīḥ al-'ulūm*), we find only two possible matters for the elixir; cf. Stapleton, Azo, and Hidāyat Ḥusain, "Chemistry in 'Irāq and Persia," 367: "*Al-ḥajar* ('The Stone'). Among them (i.e., the Alchemists), this is anything by which the Art can be performed, that is, anything out of which Elixir can be made. It is of two kinds, Animal and Mineral. The best of these are the Animal. The latter are: Hair, Blood, Urine, Eggs, Bile, Brains, Skull, Mother of Pearl, and Horn. The best of these is Man's Hair, and next the Egg. The varieties of Mineral ('Stones') are, among the 'Bodies,' Gold, Silver, Lead, and Tin; and among the 'Spirits,' Mercury, *Zarnīkh* (Arsenic Sulfide), Sulphur, and Sal-ammoniac." Rāzī, in his *Book of Testimonies* (*Kitāb al-Shawāhid*), asserts many times that the stone of the ancients was hair and eggs but does not mention blood (I thank Bink Hallum, who is editing this text at the moment, for this last reference).

[49] *DA*, 55: "Secundum quod mihi videtur et probavi, petra herbalis sunt capilli, petra naturalis ova, petra animalis sanguis humanus." The word *naturalis* is a bit strange and could be at first considered a misreading for the abbreviation of *mineralis*, but that is actually not the case. Indeed, *mineralis* is never used in the *De anima*; moreover, the natural stone is meant to be natural (*DA*, 84): "Lapis naturalis est illa res quae efficitur in ventre terrae sine opere. Et lapis noster naturalis est res quae per se ipsam nascitur et non crescit et non minuitur."

[50] *DA*, 79: "Et adhuc quod omnes magistri dicunt cum Geber verum est quod sunt ibi alii lapides sed magis valet vitalis lapis." And *DA*, 275: "et anima est sanguis et sanguis est anima, et tota anima sanguis et totus sanguis anima, et qui aliter credit non tenet naturam philosophi. Ideo dicunt philosophi: 'Accipe de petra quae non est petra et non de naturis petrae, divide per quatuor partes — per aerem et ignem et terram et aquam.' Et nos non possumus invenire quod aliter fieri possit nisi in hunc modum, et de sanguine vivit homo et moritur et stat, ita de lapide, ideo dicunt quod iste lapis est lapis animalis; et ideo quia non est anima altior homine ideo accipiunt lapidem hominis, et ideo quia in corporibus non est corpus altius auro ideo facimus de sanguine aurum." However, as in the Jābirian corpus, some contradictions are found, for example *DA*, 276: "Et lapis herbalis est lapis de quo multotiens mentionem fecimus et lapis ille magis valet omnibus aliis."

[51] *DA*, 101–2: "Elementa praeparantur in divisione eorum et in praeparatione singulorum, ignis in parte sua, terra similiter, aqua similiter, aer similiter, quia illi mittunt animam."

according to the Jābirian texts, as they are the source of the *De anima*.[52] As things in the sublunary world differ because of the proportion of their elemental properties, it is possible, by adding a compound of elements, to change that proportion. In order to do this, the alchemist first takes the "stone" (a specific substance, depending on the alchemist, cf. n. 48) at a perfect moment, i.e., according to precise astronomic calculations: the influence of the stars must be propitious.[53] In the *De anima*, this moment must be an "equal time," i.e., a time in which the influences are equal, without an excess of any quality.[54] It is indeed very important for the alchemist to take a stone that is as "equal" as possible:[55]

> By the faith you owe me, do understand the masteries of the philosophers, because you must be careful not to take blood from a man who suffers from any disease, only from a [man] who is healthy and who lets his blood to preserve his health. And if you took [blood] from a sick man and the disease was from coldness, heat, moisture, or dryness, you would not have a stone of the quality you would want. But you must take [blood] from a quite healthy man, in all his limbs, and he must not be fat nor thin, nor white nor black, nor tall nor small, nor yellow nor red, but he must be equal in all his constitution and in all his colors.[56]

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[52] On the elixir theory in the Jābirian corpus, cf. Kraus, *Jābir ibn Ḥayyān II*, 1–18. On the elixir theory in the Latin world, cf. Michela Pereira, "Teorie dell'elixir nell'alchimia latina medievale," in *Le crisi dell'alchimia / The Crisis of Alchemy*, Micrologus 3 (Turnhout, 1995), 103–48.

[53] The calculation of the right time (*iḥsān al waqt*) for the alchemical work is found in several Jābirian treatises; cf. Kraus, *Jābir ibn Ḥayyān II*, 8. The importance of the astral influence reminds one here of the Arabic magic, as, for example, in the making of talismans, cf. also "Conclusion," pp. 332–33.

[54] *DA*, 399: "Sed cum vis colligere sanguinem exalta astrolabium: de hora illa quando intrat sol in primo gradu de postrema facie Piscis usque ad postremum gradum de prima facie Tauri, et de primo gradu de postrema facie Virginis usque ad postremum gradum de prima facie Scorpionis est tempus magis aequale omnibus aliis temporibus."

[55] If the stone must be as equal as possible, this cannot be the case with gold, cf. pp. 302–6.

[56] *DA*, 399–400: "Per fidem quam mihi debes, intellige magisteria philosophorum, quia debes videre et cavere quod non accipias sanguinem de homine aliquam infirmitatem patiente, nisi de illo qui est sanus et abstrahit sibi sanguinem ad *iuvandum* (*correxi*] tuendam Celsi; iuvendam, dividendum, videndum, adiuvandum *inveniuntur in manuscriptis*) sanitatem suam. Et si acciperes de homine aegro et infirmitas esset de frigiditate aut de caliditate aut de humiditate aut de siccitate, non veniret tibi lapis de qualitate quam velles. Sed debes accipere de homine bene sano in totis suis membris, et non sit nec grossus nec tenuis, nec albus nec niger, nec longus nec parvus, nec citrinus nec rubeus, sed sit aequalis in tota factura et in totis suis coloribus." In addition to this extract, another passage also concerns this assertion: *DA*, 397: "Sicut iam diximus hic est sanguis de quo operamur, sed de quibus hominibus accipiemus dicimus: non accipias de fleumatico nec de colerico

After taking the stone, the alchemist distills it. This fractional distillation allows him to divide the substance into its four elements. After this distillation, each element is prepared by means of various and complex operations, so that it becomes an element characterized only by one property (the other being so reduced that it has no effect[57]): fire is hot, air is moist, water is cold, and earth is dry. After this preparation, the elements are mixed in a very precise proportion; this mixture is called elixir. Then the elixir is projected onto the metal: it will change the proportion of, for instance, lead into the proportion of gold. In order to do this, it is necessary to know the proportion of the metal that will be transmuted as well as the proportion of the final metal (thanks to the *'ilm al-mīzān*). In the *De anima*, a little bit of the *calx* of the body is added in the elixir before the projection.[58] The word *alexir*, however, has a double meaning in the *De anima*: it sometimes designates the proper elixir, i.e., the mixture of elements, but it also sometimes designates the

nec de melancolico nec de sanguineo, sed tantum de illo accipias in quo sunt omnes quatuor humores aequales, et non accipias in tempore tali in quo aliquis humor sit superexcellens."

[57] This conception is also found in Constantine the African's *Pantegni* (on this concept cf. Richard P. McKeon, "Medicine and Philosophy in the Eleventh and Twelfth Centuries: The Problem of Elements," *Thomist* 24 [1961]: 211–56, at 229, and Irene Caiazzo, "The Four Elements in the Work of William of Conches," in *Guillaume de Conches: Philosophie et science au XIIe siècle*, ed. Irene Caiazzo and Barbara Obrist [Florence, 2011], 3–66), Constantine the African, *Pantegni*, Theorica I, 4, in Charles Burnett, "*Verba Ypocratis preponderanda omnium generum metallis*: Hippocrates *On the Nature of Man* in Salerno and Montecassino," in *La Scuola medica Salernitana: Gli autori e i testi*, ed. Danielle Jacquart and Agostino Paravicini Bagliani (Florence, 2007), 59–92, at 85–86: "Palam est ergo elementa esse quattuor quae sensu apparent simpla intellectu vero composita. Nunquam enim subsistit terra sine aquae, ignis aeris, parte aliqua, neque cetera similiter. Quodcumque tamen horum sua propria qualitate est contentum, illud proprie est elementum. Quod, etsi non sensui patet, tamen intellectui. Unde philosophi dixere in mundo quattuor esse elementa, id est calidum, frigidum, siccum, humidum. Neque in his solas qualitates intelligunt, set subiecta earum. Calidum enim actualiter perfectum ignem esse dicunt, frigidum actuale et perfectum, aquam, humidum actualiter perfectum aerem, siccum actualiter et perfecte dicunt terram esse." Cf. also Moureau, "Physics in the Twelfth Century" (n. 3 above).

[58] The *calx*, literally "lime," is the powder that results from the calcination of a metal (oxides or salts). For Ps.-Avicenna, it is necessary to add to the elixir a part of the metal that will be transmuted. *DA*, 78: "Et hoc quod facis de calce cupri aut de alia calce quae sit ad sublimandum, non est nisi propter ut mittas in alexir. Et adhuc mittunt in alexir calcem cupri quando est alexir ad proiciendum super cuprum; et si non est ad proiciendum per iactare super cuprum, facies calcem de illa materia cuius fuerit corpus super quod proicere vis."

compound of body, spirit, mixture of elements, and ferment.[59] 4) The last ingredient to be projected into the body is the ferment. In order to transmute lead into gold, it is necessary to have a small amount of prepared gold that will help the lead acquire the nature of gold: as Ps.-Avicenna says, the ferment is nothing other than what reduces the metal from its nature to the nature of the ferment.[60] It acts like leaven in the dough when making bread.[61] After this last projection, the compound turns into gold or silver (I do not give the amounts of the ingredients as they change in each recipe).

## *Medicine in Ps.-Avicenna's* De anima

Although the *De anima* is not a medical treatise, it nevertheless has strong connections with medicine. It is indeed possible to observe medicine in the *De anima* at three levels. The first is the manifest and open insertion of medical allusions and even recipes in the context of a pseudepigraphic writing. The second is a more discreet and deep use of medicine as an analogy for explaining alchemical doctrines, and even more direct and obvious comparison. The last level is a question about a real medical use of an alchemical product.

### 1. *Avicenna medicus:* A Pseudepigraph

Avicenna was (and is) known in the Islamic and the Latin worlds as an authority in philosophy, but also in medicine, being the writer of the *Canon of medicine* (*Qānūn fī al-ṭibb*). The author of the *De anima* needs consequently to argue for this attribution, in order to make the forgery convincing. Several other alchemical treatises have been attributed to

[59] *DA*, 102: "In hoc capitulo tractabo de praeparatione alexiris, quae sic praeparatur quando coniungunt elementa lapidis et spiritus et fermentum et corpus minus."

[60] *DA*, 363: "Fermentum non est aliud nisi hoc quod revertaris causam de illa natura de qua est ad naturam fermenti." We also find one sentence in which the elixir is described as the ferment, in all likelihood a confusion (the only occurrence), *DA*, 215: "Et insuper de hac medicina si dabis mulieri cuilibet concipiet, hoc est dicere quia si proicias hanc alexir super quodlibet omne corpus mutabis eum in suam naturam."

[61] The word *levamen* is used as a synonym of *fermentum* in the *De anima*. This similarity is so important for Ps.-Avicenna that he recommends, in making the ferment, using a gold made with the same stone as the stone that will be used for the alchemical works: for example, if we want to make gold from blood, we must make a ferment with gold made from blood. *DA*, 127: "Quando vis facere fermentum vide si aurum est de magisterio unde tu facis fermentum. Et vide cum quo lapide et cum illo lapide operare magisterium; et nisi cum illo lapide fieret, non coniungeretur magisterium."

Avicenna, of which some are still preserved in Arabic, as the *Risālat al-iksīr* (*Epistle about the Elixir*), translated into Latin under the title of *Epistola ad Hasen regem de re tecta*, which might be a genuine work.[62] However, the author of the *De anima* uses several discreet references to support the attribution.[63]

Some common expressions are used to designate Avicenna: *Abuali Abincine de Babilonia* (*Babilonia* means, in medieval manuscripts, different oriental cities, from Cairo [al-Fusṭāṭ] to Baghdad), *Abuali Abincine senior honoratus* (translation of *Abū ʻAlī Ibn Sīnā al-shaykh al-raʼīs*, usual appellation of Avicenna), *Alguazir Alagel Abuali Abincine* (translation of the also usual *al-wazīr al-ʻāqil*).[64] In addition to this, several anecdotes and hints concerning the life of Avicenna are cited.[65] Three works are mentioned as the author's books in the *De anima*. After a very obscure passage, the author asserts he will explain this extract in a book that he will call *Liber de puritatibus sensus*, which I could not identify as a genuine work of Avicenna.[66] A *Liber de fisica* (*Book about Medicine*) is mentioned in the table of contents, which could correspond to any of the

[62] The Arabic text is edited in Ahmed Ateş, "Ibn Sina, Risālat al-iksīr," *Türkiyat Mecmuası* 10 (1953): 27–54; there is no critical edition of the Latin text, which is found in *Theatrum Chemicum* (Strasbourg, 1602–61), 4 (1659), 863–75. I hope to prepare a critical edition of the Latin text in the coming years. An English translation of an Arabic manuscript is found in H. E. Stapleton et al., "Two Alchemical Treatises Attributed to Avicenna," *Ambix* 10 (1962): 41–82. For more information on this treatise, cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne" (n. 3 above), vol. 1, part 1, 60–62 (and forthcoming publication). On the other treatises attributed to Avicenna, in Arabic and Latin, cf. ibid., vol. 1, part 1, 54–68 (and forthcoming publication), and Anawati, "Avicenne et l'alchimie," 301–41; or, only in Latin, Ruska, "Die Alchemie des Avicenna" (n. 3 above).

[63] For a more complete discussion than the following paragraph, cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne," vol. 1, part 1, 48–52 (and forthcoming publication).

[64] Respectively *DA*, 52, 62, and 209.

[65] Especially about the sobriety and diligence of Avicenna, *DA*, 318: "Dixit Abuali: 'Deus faciat bonum. Ego hoc totum quod didici frequenter legendo et parum dormiendo et parum comedendo et minus bibendo, et quantum expenderunt socii mei in lumine ad potandum vinum de nocte totum ego expendi ad vigilandum et legendum de nocte in oleo, et quantum expendebant in comestione amplius expendebam ego in lumine ad vigilandum et discendum de nocte, et nisi hoc facerem non scirem de magisterio.'" Avicenna was also renowned for being very precocious, *DA*, 443: "Dixit Abincenus: 'Nam sine fermento non exibit sol vel luna sed aliud, et fui operatus in hoc opere per quadraginta annos cum sim quadraginta octo annorum.'"

[66] *DA*, 360: "Et nisi esset propter nimiam dilationem dicerem super hoc verbum amplum, sed explanabo tibi in libro de puritatibus sensus, si Deo placuerit."

medical works of Avicenna.[67] But what interests us in this article is more precisely the mention of the other treatise. Indeed, the author mentions six times a *Liber corporis* / *Liber corporum*, always when speaking about medicine.[68] This citation is probably an allusion to a medical book of Avicenna. Different hypotheses may be put forward, since no extract is quoted: the treatise entitled *al-Jism*[69] (*The Body*); a section of the *Qānūn fī al-ṭibb*[70] (*Canon of Medicine*); less probably, a treatise presented as a translation by Avicenna of a treatise of Galen, the *Khiṣb al-badan*[71] (*The Fertility of the Body*); or the *Siyāsa al-badan wa-faḍā'il al-sharāb*[72] (*Upkeep of the Body and Virtues of the Drink*). In addition to this we find several pieces of medical advice or descriptions of the medical virtues of some materials.[73] None of these is found directly in the book of simples in the *Canon of Medicine*, and I could not identify their origin. As a last mani-

[67] However, this notice in the table does not correspond to an extant part of the text and perhaps refers to the lost end of the second part of the *De anima*. On the prologue and the table of contents of the *De anima*, cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne," vol. 1, part 1, 45–47 (and forthcoming publication).

[68] *DA*, 98, after a list of medical recipes: "Et sunt multae species quas numeravimus in libro corporis." *DA*, 130: "Et utilitates auri per medicinam iam dixi in libro corporis." *DA*, 355: "Et sicut diximus in libro corporum de medicinis qui acciperet quod moreretur qui nescit materiam." *DA*, 355: "Verbi gratia diximus in libro corporis: qui vult purgare corpus accipiat." *DA*, 358: "Et verum est quod non est in saeculo liber melior isto, et quod tibi dicam proderit tibi in hoc libro et in libro corporis et in totis medicinis." *DA*, 452: "In libro corporis dixi tibi medicinas quas haec aqua habet: ad febres."

[69] Georges C. Anawati, *Millénaire d'Avicenne: essai de bibliographie avicennienne* (Cairo, 1950), 130 (no. 58).

[70] Ibid., 192–212 (no. 140).

[71] Ibid., 183–84 (no. 127).

[72] Ibid., 188–89 (no. 133).

[73] *DA*, 46: "Et quidam philosophorum requisitus a discipulis suis: 'Quid dicis in calce?' Ipse respondit: 'Si miserint eam in alutel bonum eveniet inde medicina.' Et dixerunt ei: 'Quid dicis in auripigmento?' Ipse respondit: 'Si miscuerint eum cum calce scindit capillos.' Dixerunt ei: 'Quid dicis in argento vivo?' Respondit: 'Si fecerint inde unguentum cum sulphure et blancheto mundat scabiem.'" *DA*, 130: "Et utilitates auri per medicinam iam dixi in libro corporis. Et naturas absconditas auri modo dicam, Deo volente. In auro sunt naturae absconditae quae prosunt toxico, aut illi qui percussus est ferro, et pueris nascentibus, si quando natus fuerit puer teneat non timebit demonem. Et si praegnans mulier biberit non abortabit. Si proiciant super ignem et faciant fumum fugiunt sortes. Si facias de eo pulverem et bibas cum vino valet ad ventrem." On the medical properties of whitened gold, cf. *DA*, 387: "Et si des secundum physicam calculosis frangit lapidem in ipsa die, et si des mulieri praegnanti de masculo facit eum mulierem." However, the second feature seems to be a symbolic assertion, cf. pp. 300–301. Concerning a rain that falls during the two last days of April and the three first days of May, *DA*, 452–53: "In libro corporis dixi tibi medicinas quas haec aqua habet: ad febres, ad vitium oculorum, et ad maculas

fest hint to medicine, the end of the fourth chapter of *dictio* 2 contains three medical recipes useful for an alchemist:[74] a syrup for injuries due to toxic vapors and for all the diseases occurring from the alchemical work, an ointment to cure injuries caused by spatters, and an eye lotion. These medical recipes contain an obviously different vocabulary: they have been introduced, very likely, to support the attribution.[75] I have not identified their origin, but they are translated from Arabic by a person knowing Castilian: they contain transcriptions of Arabic words such as *alfolba* (from the Arabic *al-ḥulba*, the fenugreek), and a typical Andalusian measure, the *arentium*, a Spanish silver dinar (*arienzo* in Castilian, from the Latin *argenteum*).

If all these medical allusions are interesting for the history of the text, they nevertheless have no real influence on the alchemical doctrine; they

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corporis scilicet morfeam; sed in anima multum valet ad tollendam combustionem, nam omnia corpora rectificat sui acumine."

[74] The identification of the transcriptions from Arabic in the next quotations may be found in Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne," vol. 1, part 2, glossary (s.v.). *DA*, 97–98: "Fac hanc medicinam et non timebis fumum quia hoc acuit sensum et non dimittit ut odores malum faciant in corpore. Haec sunt: galangar, nux muscata, piper longum, spic, folium anacardi, fu, mu, falle, ball, xall, rubarbum pondera aequalia; violae, rosae, absintium, succum olivarum, grana lenticulae et grana plantaginis, scariola, semen portulacae, grana purgata de butefis, de mellonis, de cucurbitis, de pipinellos, semen lactucae, semen herbae sanae, saules quartum, ana pondus 1; tribit, scamonea, ana pondus 1; musci media novena ponderis; perlas, ligna aloen, quintum ponderis; zucarum sex pondera; omnia tere et conficiat cum isto siropum, scilicet pollipodii 2 uncias; radicis feniculi, petrosilli, et de cardo piperato, scalamum, radicis apii ana unciam 1; squinanti 1 unciam; rigaricii, ysopi, feniculi, anisi, collandrelli id est castas ana unciam unam. Coque, fac syropum — et pastam faciant — et misce in syropo sticados, cuscuta ana 2 uncias. Accipe cotidie in mane de confecto 4 arentios et ille syrupus auferet omnes infirmitates istius magisterii, et non timebis nec de auripigmento nec de aliquo fumo.

"Sed si cadat de operibus in tuo corpore extra fac hoc unguentum ad ungendum et non timebis: aurum vivum unciam 1, blancum mediam unciam, litargium quartum unciae, viridis 1 arentium, sarcocolla 3 arentios, aloen epaticum 4 arentios, oleum rosaceum semis unciam, cera alba unciam mediam, dragagantum, gumma arabic, malum ubercum, alfolba, semen lini, sandalum ana 2 arentios; quae sunt terenda tere, scilicet species et gummas, solve in aqua cum malo uberco, et alfolba, et semine lini, coniunge cum cera et fac unguentum; et in loco combusto corporis tui unge bis vel ter vel quater.

"Et si de opere ceciderit in oculo fac hoc alcofol: quem agrestae succum pone super cuprum, et misce tutiam, et tere, et fac alcofol; et si opus fuerit mitte. Et sunt multae species quas numeravimus in libro corporis."

[75] Before, during, or after the compilation stage, as the second part of the *De anima*, in which these extracts are found, was perhaps already attributed to Avicenna before the compilation stage.

are more like a way of supporting the forgery. These hints are not doctrinal assertions of the author.

## 2. *Physica ancilla alchimiae:* Medicine as the Servant of Alchemy

When studying the *De anima* more accurately, it is possible to find other allusions to medicine, real doctrinal information from the author. The author sometimes uses medicine to show and explain how the alchemist must work. This analogy is often very subtle, but sometimes obvious, as, for example, in *dictio* 6, chapter 19:

> As we have said in the *Book of the Bodies* about medicines that he who would take (medicine) without knowing its matter would die, in the same way he who would not know the matter of these medicines [i.e., alchemical ingredients] and would put them into the body [i.e., the metal that will be transmuted] would kill it. For example, we have said in the *Book of the Body*: he who wants to purge a body must take aloes, scammony, turpeth, colocynth, agaricus, polypody, each one one ounce, and one must crush [them] and make a paste with leeks water, and give it to drink a weight of one quarter of an ounce. And we do not convey this recipe except to physicians, who are philosophers, who know all the sorts, the entire matters, and the entire natures [of things]. We do not convey this to the ignorant man, who would come, find this recipe, give it to men to whom it must not be given, and kill them, because he does not know the matter of the medicine nor the matter of the man. So [it is] about the oil which is called *gar* [probably transcription of *qār*, i.e., the bitumen], we do not say how many times one must anoint the eye suffering from coldness, because each philosopher who reads Galen's book knows what the size of the place is that it is advisable to anoint with this oil, because if one would anoint a larger [place], it would harm [the eye] because of the excessive heat of the oil; the place that must be anointed extends from that place in the middle of the forehead which is called *almazarat*[76] to the temple [*pulsus oculorum*],[77] and if we would anoint a larger [place], not a smaller one, it would harm the [eye] because of the excessive heat of the oil. So is it about this hardening and about many other species in this *Book of the Soul*, because he who does not know how to work would kill the body because of the power and heat that are in those [species]. Do understand the matter of the philosophers.[78]

[76] Not identified; maybe wrongly *al-mazrad*, i.e., the throat.

[77] *Pulsus* is often used to designate blood pulse, and also sometimes name, in medieval Latin, the temple of the head. However, the meaning of the expression *pulsus oculorum* is not clear, as the meaning of *almazarat* is hypothetical. The best conjecture seems to be a place from the middle of the forehead to the temple.

[78] The words in brackets are my explanations of the context. *DA*, 355–56: "Et sicut diximus in libro corporum de medicinis qui acciperet quod moreretur qui nescit materiam, ita qui nesciret materiam de istis medicinis qui mitteret in corpore occideret eum. Verbi gratia diximus in libro corporis: qui vult purgare corpus accipiat de aloe, et scamoneam, et turbit, et coloquintida, et agaric, et pollipodium,

Therefore, medicine is used as an analogy for alchemy.[79] The author uses medicine to make the reader understand his alchemical ideas. This use of medicine may also be observed in the vocabulary. As has been said, the words used in the alchemical work are openly borrowed from a consideration of the human body. The metal that is transmuted is the body, the subtle substance that is added to this body is the spirit, and the elixir brings a soul to this compound. The word elixir itself, *al-iksīr* in Arabic, comes from the Greek ξήριον, which was used to designate medicines in the form of a dry powder (ξηρός means "dry"), through the Syriac intermediary *ksīrīn*. The original meaning of *al-iksīr* is actually a medical dry powder.[80]

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de unoquoque 1 unciam, et pistent et pastent cum aqua porrorum, et dent bibendum pondus de quarteron de uncia. Et nos non dicimus istam receptionem nisi medicis, qui sunt philosophi, qui sciunt omnes maneries et totas materias et totas naturas. Et homini insipienti non dicimus hoc, qui veniat et inveniat hanc receptionem et det hominibus quibus non est danda et occidit eos, quia nescit materiam medicinae nec materiam hominis. Et ita de oleo quod vocatur gar, nos non dicimus quotiens ungat oculum dolentem de frigiditate, quia omnis philosophus qui legit librum Galieni scit quantus locus est quem conveniat ungere cum illo oleo, quia si amplius ungeret ex nimio calore olei noceret; et locus qui debet ungi est ab illo loco in media fronte qui dicitur almazarat usque ad pulsum oculorum, et si amplius nec minus ungeret noceret ei ex nimio calore olei. Et ita est de ista induratione et de multis aliis speciebus de isto libro animae, quia qui nescit operari occideret corpus propter fortitudinem et calorem quae sunt in eis. Et intellige materiam philosophorum."

[79] Two other passages are also evidently comparing alchemy and medicine: *DA*, 47: "Et quaesierunt ab alio philosopho quid dicebat in magisterio. Dixit: 'Per Deum ego revelabo vobis et non negabo vobis: qui accipit quod debet et miscet sicut debet et operatur sicut debet et tenet sicut debet, procedit inde quod debet procedere.' Et ita in phisica qui dat medicinam aegroto illam quam debet et sicut debet et quantam debet, exit inde quod debet. Vide ergo quod nullus magistrorum nec ullus philosophus fuit qui negaret magisterium, qui esset sapiens et intelligeret intentiones." *DA*, 182–83: "Dixit filius: 'Quae differentiae erunt inter illas et quae magis valebit? Aut illa in qua mixtum est alexir cum fermento et mercurio et calce, aut ille qui non est mixtum sed mercurius est in parte et calx et fermentum in parte et alexir in parte?' Dixit Abuali: 'Ego dicam tibi differentiam quae est inter illos et quae magis valebit. Primum alexir potes lavare in omnibus rebus quia est confectum de omnibus medicinis, et bene potes comedere, et secundum non potes lavare nisi in tribus rebus, et est sicut species electuarii quando sunt pulverizatae, quia quando vis conficere, primum iactas unam postea aliam postea tertiam et conficis totas simul. Et de prima alexir proicies super quodvis corpus et venies ad illud quod optas, et si proicias pulverem de uno solo et non de alio, nihil valet. Et ideo verum est quia magis valet electuarium confectum quam illud quod non est confectum, et magis valet quando est confectum et comedis quam quando est tantum pulverizatum. Sed feci istud secundum electuarium propter subtiliandum sensum tuum et quod homines habeant de unoquoque modo.'"

[80] Cf. Manfred Ullmann, "Iksīr," *Encyclopedia of Islam*, new edition, 1971. This assertion is of course common to all Arabic alchemical treatises, and the author of the *De anima* was not necessarily conscious of the original meaning.

The aim of the alchemist is to convey to lead the incorruptible nature of gold, i.e., to cure lead, to make it uncorrupted. However, it is important to stress that the *De anima* does not assert the theory that is found in Bālīnūs's *Kitāb sirr al-khalīqa*: in this treatise, all the metals are considered the same species, and lead is regarded as sick gold, i.e., lead is gold that did not completely ripen in the depths of the earth,[81] which is not the case in the *De anima*. In the *De anima*, the "cure" of the metal is to give it incorruptibility, not maturity.

To designate medicine, Ps.-Avicenna uses the word *physica*. *Physica* / *physicus* is used six times.[82] Two occurrences are found in a passage about the "ten sciences,"[83] i.e., the four "mothers" (*matres*): *dialectica*

[81] Balīnūs, *Buch über das Geheimnis der Schöpfung* (n. 31 above), 247: وإنّما تغيّرت هذه الأجساد فى مَواضِعها بقدر البِقاع والأماكن وبقدر اختلاف الطبائع فى نُشوئِها؛ وإنّما ابتدأت الأجساد فى أوّل نُشوئِها لتكونَ ذَهَبًا، ولكن عرضت فيها الأعراض من بعد ما استتمّ الجِرم على الذَّهَبيّة. فلمّا عرضت فيه الأعراض قلّبت لَوْنَه وريحَه وطعمَه لا جرمَه؛ فجرم الأجساد كلّها ذهبٌ وجوهرُها مِثْل جوهره إلا أنّها اختلفت بالعَوارض التى عرضت لها، فأقعدتها عن الذَّهَبيّة بالألوان والطُّعوم والرِّياح لا بالجواهر. This can be translated: "These [fusible] bodies only differ in their position [in the hierarchy of metals] according to the places and locations [of coction] and according to the difference of the natures in [the beginning of] their development [*nushū'* could also be translated as 'birth' or 'becoming']; at the beginning of their development, bodies (*jasad*) begin existing only in order to be gold, but accidents occur in them once the *jirm* [literally 'body,' i.e., the body of the bodies, their substantial core] is completed in aureity. And when the accidents occur in them, they change (in) color, smell, and taste, not in *jirm*. The *jirm* of all the bodies is gold, their substance is like the substance of [gold], except that they differ by the accidents which occur to them and stop them [preventing] their aureity in their colors, tastes and smells, not in their substances." The same is asserted by Albertus Magnus in his *De mineralibus*; cf. Barbara Obrist, "Art et nature dans l'alchimie médiévale," *Revue d'histoire des sciences* 49 (1996): 215–86, at 249–51; the quotations on p. 231, n. 47 and p. 251, n. 121 actually come not from Ps.-Avicenna's *De anima*, but from a later Ps.-Avicennian treatise, the *Declaratio lapidis physici Avicennae filio suo Aboali*; on this treatise, cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne," vol. 1, part 1, 63–65 (and forthcoming publication), and Ruska, "Die Alchemie des Avicenna" (n. 3 above), 45–48.

[82] Four of them are: *DA*, 47: "Et ita in phisica qui dat medicinam aegroto illam quam debet et sicut debet et quantam debet, exit inde quod debet." *DA*, 255: "Calx septima non valet in opere isto, sed valet phisicis et valet ad opus manuum et ad emplastra et ad vulnera et ad alcofol." *DA*, 387: "Et si des secundum physicam calculosis frangit lapidem in ipsa die, et si des mulieri praegnanti de masculo facit eum mulierem." The next occurrence is not clearly about medicine, since it is found in the table of contents and this title does not fit the real content; cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne," vol. 1, part 1, 46 (and forthcoming publication); *DA*, table of contents, not paginated: "2 tractat de hoc quod locutus fuit in libro de fisica."

[83] *DA*, 288–89: "Scientiae sunt decem. Matres scientiae sunt quatuor. Et non dicunt philosophum nisi qui scit magisterium, et non potest scire magisterium donec sciat quatuor matres et sex filias, et quando hoc scit scit magisterium. Et quis est

(dialectic), *geometria* (geometry), *naturae* (science of the natures, i.e., the elementary properties, *ṭabīʿa* in Arabic), and *scientia firmamenti* (science of the firmament, astrology/astronomy); and the six "daughters" (*filiae*): *algorismus* (algorism), *arismetica* (arithmetic), *theorica de physica* (theoretical medicine), *musica* (music), *astronomia* (astronomy/astrology, close to the *scientia firmamenti*), and *scientia quae habitat totum mundum, hoc est magisterium istud et vocatur philosophia* (alchemy). All these sciences are useful for alchemy. The *theorica de physica* is said to be useful for alchemy to "know in which degree things are cold, moist, hot, and dry."[84] This is an allusion to Galen's theory of the four degrees of each elementary property in all things, which is common in medieval medicine.[85] As for the word *medicina*, it always has the meaning of an ingredient that cures something, whether human bodies or metallic bodies. The author makes no lexical distinction between medicines for human bodies and medicines for metallic bodies, but the making of those two medicines is different. The elixir is actually never called *medicina*, but *medicina* is used to designate all the substances that enter in the alchemical works for helping the processes.[86]

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philosophus? ille qui diligit sapientiam. Et quae est sapientia? hoc magisterium. Quae sunt matres sapientiae? dialetica (*sic*), geometria, naturae et scientia firmamenti. Quae sunt sex filiae scientiae? algorismus, arismetica, theorica de physica, musica, astronomia, scientia quae habitat totum mundum, hoc est magisterium istud et vocatur philosophia. Ad quid est necessaria dialetica in hoc magisterio? ut sciamus rationes si est aut non. Et geometria quid prodest huic magisterio? ut sciamus quantitates omnium illorum quae ingrediuntur in magisterio. Quantitas debet esse sicut clibanum et alutelli et cucurbitae. Quid prosunt naturae magisterio? ut sciamus naturas lapidum et omnium rerum. Quid prodest scire <scientiam> firmamenti magisterio? ut sciamus tempora calida et frigida. Et postquam probavimus quod quatuor matres scientiae sunt necessariae nostro magisterio, modo dicemus sex filiae quomodo sunt necessariae in nostro magisterio aut quomodo non. Quid prodest algorismus magisterio? ut sciamus compotum omnium rerum. Quid prodest arismetica magisterio? ut sciamus naturam diminuendi compotum et ascendendi. Quid prodest theorica magisterio? ut sciamus res in quibus gradibus sunt frigidae aut humidae aut calidae aut siccae. Quid prodest musica magisterio? ut sciamus sonos rerum si sint coctae aut non. Quid prodest astronomia? ut sciamus res in qua hora debemus incipere aut non et e converso. Postquam probavimus quod praedicta omnia sunt nostro magisterio necessaria, qui scit scit magisterium et qui non est sicut bestia."

[84] *DA*, 288: "Quid prodest theorica magisterio? ut sciamus res in quibus gradibus sunt frigidae aut humidae aut calidae aut siccae."

[85] Cf. for instance the *Book of Simples* in the *Canon of Medicine* (second book of the *Qānūn fī al-ṭibb*): the degree of the properties of each simple is given in its description.

[86] In *dictio* 5, which is a section entirely devoted to the description and classification of materials, after having finished the explanation of the bodies (metals), Ps.-Avicenna says (*DA*, 133): "Et dixi tibi de naturis corporum, et dicam tibi modo de

So, in Ps.-Avicenna's mind, medicine serves alchemy. It is used as an analogy for explaining alchemy, and theoretical medicine is directly necessary for the alchemist. Both those sciences are related. This use of medicine, already present in Jābirian texts,[87] can actually be explained by the probable origin of the elixir theory. The idea of rebalancing the properties of a metal is actually borrowed from the ancient physicians' theory (e.g., Galen) of rebalancing the four humors of the body to cure it.[88]

### 3. *Alexir sanans:* Medical Alchemy?

An allusion to a real medical use of alchemical products can be found in only one very subtle assertion in the *De anima*, when Ps.-Avicenna quotes, he says, Jābir ibn Ḥayyān: "And he says that if a sick person were to drink of this elixir, he would be cured of any disease."[89] However, the context of this quotation perplexes the reader:[90] the author is actually citing various incredible powers of the elixir, as turning a girl into a boy in the womb of a pregnant woman when she drinks it. Ps.-Avicenna asserts that even if these wonderful powers could be genuine,

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medicinis." Then, he speaks about all the other substances that are used to cure the body: spirits, salts, etc.

[87] Kraus, *Jābir ibn Ḥayyān II* (n. 29 above), 2–3.

[88] Ibid., 189.

[89] *DA*, 50: "Et dicit quod si de illa alexir biberet aeger, quancumque infirmitatem pateretur sanaretur."

[90] *DA*, 50–51: "Et adhuc magis dicit quod de sua alexir si darent feminae praegnanti, de femina efficeretur masculus. Et dicit quod de sua alexir si quis sepeliret in quatuor partibus alicuius civitatis, non ingrederetur ibi neque rata neque raton neque alia res polluta. Et dicit quod si de illa alexir biberet aeger, quancumque infirmitatem pateretur sanaretur. Et dicit de talibus verbis et similibus de quibus omnes libri sui sunt pleni, et hoc non dicit nisi propter obscuritatem magisterii. Et omnis sapiens intelligit hoc ipse cur dicit, et temptant hoc stulti et non inveniunt, et temptant sapientes et inveniunt; quia ille dicit quod ad indurandum mercurium misceant virgas de alchizaram et grana de mirtis et marcasida de auro et argento, et hoc non capit sensus hominis quia ipse miscet via bona malam viam et nemo intelligit nisi sapiens. Qui sciat eligere malum de bono potest cognoscere suam falsitatem, quod ego non dico quod petra non sit herbalis aut petralis aut bestialis, nec nego quod sua alexir non reddat de femina masculum et cetera quae diximus non faciat, et non est mihi grave nisi propter hoc quod vult operire oculos gentium ut nihil videant et corda eorum ut non intelligant; quia hoc quod ipse dicit quod mittat homo de alexir in quatuor partibus civitatis et nullus ibi ingredietur, hoc vult dicere quod in nostro magisterio, quando aliquis mittat ibi de quatuor elementis per rationem, non nascitur ibi aliquid falsum. Et hoc quod dicit quod si femina praegnans bibat de sua alexir revertetur in masculum, verum est: hoc est quod dicit — et nota — quod si aliquis mittat de nostra alexir super lunam efficietur aurum. Sed omnia verba sua non exponemus quia nihil valent et sunt vana, et ideo dimittimus."

and work ("nec nego quod sua alexir non reddat de femina masculum et cetera quae diximus non faciat"), they are nevertheless to be understood as metaphorical assertions. He explains the real meaning of the other wonderful powers, but not of the medical power. In the Jābirian corpus, the medical uses of the elixir are clearly explained (for instance in the *Kitāb al-khawāṣṣ*, chapters 6–11).[91] The way the elixir cures the body is the same as the way it rebalances the properties of the metal:[92] by making a precise compound of elements/elementary properties, it is possible to rebalance the properties of the body, i.e., to give harmony to the human body (humors being compounds of the four elements, in which one is more abundant: blood – air [hot and moist], yellow bile – fire [hot and dry], black bile – earth [cold and dry], phlegm – water [cold and moist]), and equalize man's complexion.

As I have shown, Ps.-Avicenna does not make a claim for medical alchemy, but he gives all the elements needed for any reader to combine the ideas and find a medical alchemy. It would be tempting to assert that, as a fervent reader of the *De anima*, Roger Bacon could have taken the idea of mixing alchemy and medicine from the *De anima*, but we will see that the matter is not at all as easy as that.

## *Ad medicinam*: Elemental Physics, Alchemy, and Medicine in Roger Bacon's Works

As has been said in the introduction, Roger Bacon was an ardent reader of the *De anima*, from which he borrowed many of his alchemical ideas.[93] This section will be divided into three parts, as the previous section, according to Bacon's own view of alchemy. Indeed, in a well-known passage of the *Opus tertium*,[94] Bacon distinguishes two parts of alchemy: theoretical alchemy (*alkimia speculativa*) and practical alchemy (*alkimia operativa et practica*). Theoretical alchemy is the science of "all inanimate (things) and the entire generation of things from the elements." Practical alchemy is about two distinct matters: "making noble metals, colors, and artificial things," and "prolong(ing) human life for a long time." The section will first be devoted to elemental physics (alchemical

[91] Kraus, *Jābir ibn Ḥayyān II*, 3, n. 1. Extracts of these chapters of the *Kitāb al-khawāṣṣ* have been edited in Paul Kraus, *Jābir ibn Ḥayyān, Essai sur l'histoire des idées scientifiques dans l'Islam*, 1, *Textes choisis* / مختار رسائل جابر بن حيان (Paris, 1935), 261–72, 303–10.

[92] Kraus, *Jābir ibn Ḥayyān II*, 234.

[93] The fact was shown in Newman, "Tres Epistolae" (n. 17 above); idem, "The Philosophers' Egg" (n. 17 above); idem, "An Overview" (n. 17 above).

[94] Bacon, "Opus tertium," 39–40, quoted in Newman, "Tres Epistolae," 462, n. 3.

theories), then to alchemy (practical alchemy), and finally to medicine and *prolongatio vitae*.

*Elemental Physics in Roger Bacon's Works*

The elemental physics of Roger Bacon, or more precisely his physical doctrines as they pertain to alchemy, are very close to the elemental physics of the *De anima*, being close to the elemental physics of his time. He adopts common Aristotelian-Arabic thought, as in the *De anima*, but differs from other scholars by borrowing a theory from the *Lumen luminum* (wrongly attributed to Rāzī and Aristotle), mixing the system of the four elements and the system of the four humors and applying it to each thing.[95] He analyzes each thing at three levels. The most basic level is the four elements that are in each thing in the sublunary world, and each element is characterized by two elementary properties. These four elements themselves make four compounds called simple humors: blood (in which there is more air than other elements), yellow bile (more fire), black bile (more earth), and phlegm (more water). These four simple humors produce four compounded humors: blood (in which there is more simple blood than other simple humors), yellow bile, black bile, and phlegm. He asserts that if these compounds are usually called humors in animals, they actually also exist in inanimate and vegetal things.[96] Thus, each thing has three levels of composition: compounded humors, simple humors, and elements. This theory is something like a kind of *elementatum* theory,[97] introducing one more level of composition in things. However, each thing is still qualified by the two major elementary properties in it and may be changed by adding elements.

A fundamental difference between Bacon's elemental physics and Jābirian elemental physics as found in the *De anima*, though it focuses on a specific kind of thing, is especially developed in the context of the *prolongatio vitae* theory: the idea of the proportion of elementary proper-

[95] Newman, "The Philosophers' Egg," 86–93, esp. 86–87; idem, "An Overview," 319–23.

[96] Bacon, "Liber sex scientiarum in 3$^{o}$ gradu sapiencie," 157, quoted in Newman, "The Philosophers' Egg," 87, n. 1: "Et hii humores sunt primo 4$^{or}$ simplices, quorum quilibet est ex elementis 4$^{or}$ sed ex uno per dominium; et deinde sunt 4$^{or}$ humores compositi, quorum quilibet est ex 4$^{or}$ humoribus simplicibus, sed ex uno eorum per dominium, ut in homine colerico, vel a membro colerico, exit humor compositus qui vocatur colera, et tamen componitur ex omnibus simplicibus sed denominatur a dominante."

[97] Cf. McKeon, "The Problem of Elements" (n. 57 above), esp. 235–36; and Theodore Silverstein, "Elementatum: Its Appearance among the Twelfth-Century Cosmogonists," *Mediaeval Studies* 16 (1954): 156–62; cf. also Caiazzo, "The Four Elements in the Work of William of Conches" (n. 57 above), 10–14.

ties in incorruptible things. As has been said, the proportion of elements determines the thing. Things are subject to corruption, but some of them are incorruptible, of which pure gold is evidently the example for alchemists. In the Jābirian corpus, all things in the sublunary world are said to have a specific proportion of elementary properties.[98] Each property may have four different degrees of intensity, and these four degrees are themselves divided into seven subdivisions, which allow one hundred and twelve positions (4 x [7 x 4] = 112). To this theory is added a complex system of internal and external properties: as has been said, Arabic alchemists usually assert that each metal has two external properties and two internal properties, the two external being the predominant properties in the body (i.e., the most abundant of each pair of properties), which have pushed the two other properties into the interior of the metal. In the Jābirian corpus, this theory is a bit more complicated: first, the theory is right not only for metals but for everything in the sublunary world; and second, each thing has external properties and internal properties, but not necessarily two. By way of an alphanumerical system (the *ʿilm al-mīzān*, or *mīzān al-ḥurūf*), it is possible to know the exact amount of external properties of each thing from its name. Once these are known, it is possible, by way of systematic calculations, to calculate the amount of internal properties. The main rule for calculating it is that the four properties are always present in things according to the proportion of 17, following a specific sequence: 1, 3, 5, 8, corresponding to the four degrees.[99] For instance, the analysis of the name *dhahab* (gold) informs the alchemist that the external properties of gold are: one part of coldness and 19/70 parts of heat. As the properties must follow the sequence 1, 3, 5, 8, it is possible to fill in this table:[100]

| Gold (*dhahab*) | External properties | Internal properties | Total |
|---|---|---|---|
| Cold | 1 | 0 | 1 |
| Hot | 19/70 | 191/70 | 3 |
| Moist | 0 | 5 | 5 |
| Dry | 0 | 8 | 8 |

[98] For a more precise and analytic explanation of what will be said here about the Jābirian treatises, cf. Kraus, *Jābir ibn Ḥayyān II*, 187–303.

[99] Ibid., 233: "Est équilibré (*aʿdal*) le corps dont le dehors et le dedans, le résultat du *hijāʾ* [analysis of the letters, calculation of the exterior properties] et du *ḥads* [conjecture, calculation of the interior properties], se complètent selon la relation exprimée par dix-sept. Si l'équilibre du corps est rompu, il se décomposera et perdra la structure qui lui est propre."

[100] This example is taken from ibid., 231–32. I have changed the weights into proportions, which allows for an easier understanding of the table.

The order of the four properties in the table (i.e., the sequence) is given by the color of the metal or by other rules, depending on the treatise.[101] Another example, iron (*ḥadīd*):[102]

| Iron (*ḥadīd*) | External properties | Internal properties | Total |
|---|---|---|---|
| Cold | 0 | 1 | 1 |
| Hot | 25/14 | 17/14 | 3 |
| Moist | 24/7 | 11/7 | 5 |
| Dry | 0 | 8 | 8 |

However, this very complicated system is never exactly the same in all the Jābirian treatises. Paul Kraus has tried to bring out a chronology, but many contradictions remain. For example, in the *Kitāb al-ṭajmī'*, the exterior properties are said to be dominant, and their amount must be greater, which is not the case in the foregoing example.[103] In addition, metals are sometimes said in the Jābirian treatises to have two exterior properties and two interior properties, opposed to each other (gold being hot and moist outside and cold and dry inside). There are too many contradictions to establish a systematic view, but enough common points to understand the principle.[104] All things have a ratio of seventeen (the four properties being always present in things according to the proportion of seventeen, following the sequence 1, 3, 5, 8, as said above), including gold. Gold is not more equal than the other things, it does not have a specific equilibrium that gives it incorruptibility.[105] These considerations are very much simplified in the *De anima*, and no precise proportion is given. However, the principle remains: like every metal, gold has a specific proportion.

[101] Cf. ibid., 231.

[102] From ibid., 230, also with the change from weights to proportions.

[103] Ibid., 229, n. 1.

[104] The synthetic and brilliant work of Paul Kraus allows one to understand the Jābirian principles, but is also full of contradictions, because the Jābirian treatises contain contradictions. Trying to give a general view of the system implies a simplification: the treatises were not written by a single person, and most Jābirian works still need to be thoroughly studied in order to be classified and dated. The necessity to speak about "Jābirian treatises," as we also do, is caused by the lack of precise studies about specific texts.

[105] The only specific kind of thing that has a particular calculation is what is called *al-shay' al-a'ẓam*, literally the "supreme thing," i.e., the supreme elixir, a specific kind of elixir (each elixir being different, as it changes the proportion of a specific thing): the calculation of its external properties is exactly 17 parts, and correspond to the name ABJD, which are the four first letters of the alphabet (the *abjad*, not the *ḥurūf al-hijā'*), cf. Kraus, *Jābir ibn Ḥayyān II*, 233–34.

Bacon asserts that things are corrupted because of the appetite of the matter for forms, and that the only way a thing could be incorruptible would be to have an equal proportion of properties.[106] This equality is not a strict equality of the amount of elements, which Bacon says could not exist until the Last Judgment and the resurrection of the body,[107] but an equality of opposed properties: the properties must cancel each other out two by two: heat against coldness and moisture against dryness.[108] When he speaks about gold, Bacon quotes the *De anima* once, but his principles about it actually differ. In Ps.-Avicenna's mind, as in the minds of most Arabic alchemists, there are different types of gold, of which some, of lesser quality, are corruptible:[109] copper dyed with arsenic, for example, is considered gold, though sharp gold (*aurum acre*), i.e., a gold which breaks when it is worked with the hammer.[110] Among these golds, Ps.-Avicenna gives preference to the alchemical gold, made by the use of the elixir.[111] However, even alchemical, pure gold does not have an equal proportion, but only a specific proportion. Natural gold is said to have a hot and dry nature[112] (it more often has a hot and moist nature in the Jābirian treatises[113]). In Bacon's works, there are also different types of gold, and the best is the alchemical gold, as in the *De anima*. But pure

[106] Bacon, "Liber sex scientiarum in 3° gradu sapiencie," 183–84, quoted in Newman, "An Overview" (n. 17 above), 325, n. 20: "corruptio accidit in rebus propter hoc quod forma non potest complere totum appetitum materie, et ideo semper appetit alteram formam et agentia celestia sufficiunt ad promovendum eius appetitum semper in novam formam usque quo inducatur forma equalis complexionis, que est ultimum bonum nature, et hoc sufficit ad perficiendum in rebus corruptibilibus appetitum materie et tollere corruptionem et excludere in eternum."

[107] Paravicini Bagliani, "Ruggero Bacone" (n. 16 above), 39.

[108] Bacon, "Opus minus," 369–70, partly quoted in Newman, "An Overview," 326, n. 22.

[109] *DA*, 125–30 and 145–46.

[110] *DA*, 72: "Sed Iacob Alharani Iudaeus ostendit mihi valitudinem spermatis: 'Accipe de dentibus dyaboli [i.e., sperm] unciam 1, et de cupro praeparato 10 uncias, et de auripigmento praeparato et sublimato 3 uncias, et commixto et soluto habebis aurum medianum.' Postea docuit ut mittamus ibi de fermento boni auri octavam partem unciae, sed esset acerrimum et non posset operari nisi mitteretur in aliquo modulo."

[111] *DA*, 125: "Aurum est in multis modis: naturale, magistrale, zarchi, zafri, ebrizi, coloti, et multis aliis modis; et est ibi de acre quod non potest operari. Et illud quod est de alexir valet magis et istud est in tribus modis: de petra capillorum, de petra sanguinis, de petra ovorum; et non potest esse aurum de alio lapide."

[112] *DA*, 128: "Redeamus ad aurum naturale. Natura eius est calida et sicca, et quantum habet ferrum de natura siccitatis et de duritie tantum habet aurum bonam naturam et mollem."

[113] Kraus, *Jābir ibn Ḥayyān II*, 2.

and perfect gold is said to have an equal proportion, being an incorruptible thing according to Bacon's system:

> And (to show) that this [the end of the appetite of forms, and therefore incorruptibility] is not extraneous to these corruptible things, we will give the example of gold, which is of equal complexion, because it cannot be corrupted either by earth, or water, or air, or fire, as Avicenna says in the *Liber maioris alkimiae* [i.e., the *De anima*].[114] On the contrary, in fire, which is active to the utmost, gold is improved and becomes purer. Whence nature can make this equal body as it has now been said of gold, and it certainly can be made from any body of unequal complexion by the way of corrupting the dominant element, but nature does not do that without the benefit of art.[115]

This equalization of properties (not found in the Jābirian treatises) was possibly influenced by medical theories: man is healthy when he has an equal complexion (also found in the Jābirian treatises), and Bacon extrapolates it to gold.[116] As will be considered in the next section, this difference changes the theoretical aim of Bacon's alchemy but does not modify the Jābirian doctrine that he uses.

*Alchemy in Roger Bacon's Works*

If Bacon's elemental physics (i.e., his physical theories as they pertain to alchemy) are partly inspired by the *Lumen luminum*, his alchemical

[114] Bacon likely refers to *DA*, 32: "Sed scire debes quod aurum est nimis coctum, et ideo neque ignis neque aer neque terra neque aqua delet eum quia calor terrae coxit eum per cetena annorum et induravit eum nimis ita quod nulla res potest eum delere." This appellation *Liber maioris alkimie* is found in other passages in Bacon's works to designate the *De anima*.

[115] Bacon, "Liber sex scientiarum in 3° gradu sapiencie," 184, quoted in Paravicini Bagliani, "Ruggero Bacone," 48: "Et quod hoc non sit alienum in istis rebus corruptibilibus, dabimus exemplum in auro, quod est equalis complexionis, quia non potest corrumpi per terram nec aquam nec aerem nec ignem, sicut dicit Avicenna in libro maioris alkimie: ymmo in igne, qui est maxime activus, melioratur aurum et purius fit. Unde natura potest facere hoc corpus equale sicut nunc dictum est in auro, et certe de omni corpore inequalis complexionis potest fieri per corruptionem dominantis elementi, sed natura hoc non facit sine beneficio artis."

[116] For example, we find in Ps.-Aristotle's *Secretum secretorum* (Bacon's version), in Bacon, "Secretum secretorum cum glossis et notulis" (n. 18 above), 64: "Sciendum est itaque quod non est via ad aliquam rem faciendam vel aliquam causam adquirendam nisi per potenciam clari intellectus, et non est potencia nisi per sanitatem, et non est sanitas nisi per equalitatem complexionum, et non est equalitas complexionis nisi per temperanciam humorum." If this hypothesis is true, the alchemical theory of balancing the properties, indebted to ancient medicine (Galen's and others'), returned to medicine in Bacon's works.

practice is completely indebted to the *De anima*.[117] A gloss on the *Secretum secretorum*[118] made by Bacon and stressed by Newman gives a clear and precise explanation of the alchemical work according to him. This text of the *Secretum secretorum* is important here, because it has probably influenced Bacon's doctrine, as will be shown:

> Firstly, Alexander, I want to confide in you the greatest secret among the secrets, and may the divine power help you to accomplish the objective and to conceal the arcanum. So, take the animal, vegetal, and mineral stone, which is not a stone, and does not have the nature of a stone. In a certain way, this stone is compared to the stones of the mountains of minerals, plants, and animals. It is found in any place, in any time, and in any man. It may be converted into any color. It contains in itself all the elements. It is called a small world. And I will call it by its name, by which people name it, i.e., the end of the egg — I mean the philosophers' egg. Thus, divide it into four parts; each part has one nature. Then, compose it equally and proportionally, so that there would be no division and no repulsion in it, and you will have the objective, God willing. This way is universal. But I will divide it for you in special operations. So, it must be divided into four, and by two the way is well made and without corruption. Thus, when you will have water from air, air from fire, and fire from earth, then you will have the art completely. Thus, place the airy substance apart, and put the earthy substance through the moisture and heat until they come together and unite, and do not have discrepancies and division. Then, add to them the two operative virtues, water and earth, and then the work will be finished. Because if you add only water, it will be whitened, and if you unite it with fire, it will redden, God willing.[119]

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[117] Newman, "An Overview," 328–32.

[118] On the *Secretum secretorum* and Roger Bacon, cf. Steven J. Williams, "Roger Bacon and His Edition of the Pseudo-Aristotelian *Secretum Secretorum*," *Speculum* 69 (1994): 57–74; Steven J. Williams, "Roger Bacon and the Secret of Secrets," in *Roger Bacon and the Sciences: Commemorative Essays*, ed. Jeremiah Hackett (Leiden, 1997), 365–93; Steven J. Williams, *The Secret of Secrets: The Scholarly Career of a Pseudo-Aristotelian Text in the Latin Middle Ages* (Ann Arbor, 2003).

[119] *Secretum secretorum*, in Bacon, "Secretum secretorum cum glossis et notulis," 114–15, partly quoted in Newman, "An Overview," 332, n. 34: "Inprimis, O Alexander, tradere tibi volo secretorum maximum secretum, et divina potencia juvet te ad perficiendum propositum, et ad celandum archanum. Accipe ergo lapidem animalem, vegetabilem, et mineralem, qui non est lapis, nec habet naturam lapidis. Et iste lapis assimilatur quodammodo lapidibus moncium minerarum, et plantarum, et animalium: Et reperitur in quolibet loco et in quolibet tempore et in quolibet homine: Et convertibilis est in quemlibet colorem: Et in se continet omnia elementa: Et dicitur minor mundus. Et ego nominabo ipsum nomine suo quo nominat ipsum vulgus, scilicet, terminus ovi, hoc est dicere, ovum philosophorum. Divide ergo ipsum in quatuor partes: quelibet pars habet unam naturam. Deinde compone ipsum equaliter et proporcionaliter, ita quod non sit in eo divisio nec repugnancia, et habebis propositum, Domino concedente. Iste modus est universalis, set ego dividam tibi

This extract of the *Secretum secretorum* is actually an example of the very usual Arabic elixir theory,[120] like in the Jābirian theory given above, but with two important differences. The doctrine of the *De anima* is close to what is said here. In order to stress this link, a comparative table is given below, containing the passages that closely correspond. Each comparison is followed by a short explanation of the quotations of the *De anima*:

| *Secretum secretorum* | *De anima* |
|---|---|
| "Accipe ergo lapidem animalem, vegetabilem, et mineralem, qui non est lapis, nec habet naturam lapidis. Et iste lapis assimilatur quodammodo lapidibus moncium minerarum, et plantarum, et animalium:" | "Secundum quod mihi videtur et probavi, petra herbalis sunt capilli, petra naturalis ova, petra animalis sanguis humanus."[121]<br>"Accipe lapidem qui non est lapis et non est de naturis lapidum, et scinde, et fac de eo spiritum et animam et corpus, et proice 1 super 20. Secunda, accipe de lapide qui est in montibus, et mortifica, et iacta super medietatem corporis."[122]<br>"Ideo dicunt philosophi: 'Accipe de petra quae non est petra et non de naturis petrae, divide per quatuor partes — per aerem et ignem et terram et aquam.' Et nos non possumus invenire quod aliter fieri possit nisi in hunc modum, et de sanguine vivit homo et moritur et stat, ita de lapide, ideo dicunt quod iste lapis est lapis animalis."[123] |

ipsum in operaciones speciales. Dividatur itaque in quatuor, et duobus modus fit bene et sine corrupcione. Quando ergo habueris [id est] aquam ex aere, et aerem ex igne, et ignem ex terra, tunc habebis plene artem. Dispone ergo substanciam aeream per discreccionem, et dispone substanciam terream per humiditatem et caliditatem donec conveniant et conjungantur, et non discrepent nec dividantur. Et tunc adjunge eis duas virtutes operativas, aquam et ignem, et tunc complebitur opus. Quia si permiseris aquam solam dealbabitur, et si junxeris ignem rubefaciet, Domino concedente."

[120] The text of the so-called long version of the Arabic text is edited in ʿAbd al-Raḥmān Badawī, *al-Uṣūl al-Yūnānīya li-al-naẓariyyāt al-siyāsiyyah fī al-Islām / Fontes Graecae doctrinarum politicarum Islamicarum*, Dirāsāt Islāmiyya 15 (Cairo, 1954), 67–171. The Latin version that Bacon used is very close to the original Arabic text of the passage (p. 166).

[121] *DA*, 55.

[122] *DA*, 146–47.

[123] *DA*, 275.

| | |
|---|---|
| | "Sed lapis qui non est lapis et lapis est et non est lapis, et nascitur in capite montium, et facit se de multis differentiis et de uno genere, et color suus secundum quod est mons, ille est noster lapis, et Deo gratias."[124] |
| The stones are blood, hair and eggs, and they are called "animal stone, vegetal stone and natural/mineral[125] stone," or also "stone which is not a stone and does not have the nature of stone." | |
| "Et reperitur in quolibet loco et in quolibet tempore et in quolibet homine:" | "et ita Maurienus dixit 'noster lapis pretiosior aliis lapidibus, in omni loco invenies absconditum ubi prudenter inquisieris' hoc est dicere propter sanguinem, et quando dicit 'in omni loco est' hoc dixit quia est in corpore hominis et quia est in omni loco inventus, hoc est dicere quia est ubi homo est."[126] |
| Ps.-Avicenna quotes Morienus and explains his quotation.[127] This explanation is very close to the *Secretum secretorum*: the stone is found everywhere and in every man. Ps.-Avicenna interprets it as an allusion to blood. | |

[124] *DA*, 308.

[125] In the *De anima*, the mineral world is almost always designated by the word *naturalis*, which is uncommon. A more usual reading would be *mineralis*. The hypothesis of a confusion between the abbreviations of these terms is plausible, but not really convincing: indeed, a passage of chapter 11 of the first *dictio* describes the natural stone and the term *mineralis* is not relevant in this passage (*DA*, 84): "Lapis naturalis est illa res quae efficitur in ventre terrae sine opere. Et lapis noster naturalis est res quae per se ipsam nascitur et non crescit et non minuitur. Et lapides naturales sunt: aurum vivum, auripigmentum, sal armoniacum, sulphur; hii sunt naturales et spiritales. Et lapis herbalis non potest esse quod non nascatur et non crescat, et naturalis nascitur et non crescit quia si cresceret non esset inter ea divisio. Acetum, urina, sperma sunt medicinae nostri lapidis naturalis. Et utilitates nostri lapidis naturalis non possunt numerari, quia aqua nostri lapidis naturalis indurat mercurium et tingit omnes res sicut spiritualis. Et inter spiritalem et naturalem sunt duae differentiae, prima differentia est quia naturalis statim operatur et spiritalis non nisi in termino statuto." The word *naturalis* seems therefore to mean both "natural" and "mineral," i.e., "everything which is neither animal nor vegetal." Moreover, Ps.-Avicenna uses the more precise term *petralis* in several passages, which clearly designates the mineral kingdom.

[126] *DA*, 55–56.

[127] The quotation seems to refer to a passage of the *Risālat Maryānus al-Rāhib al-ḥakīm li-al-amīr Khālid ibn Yazīd*, translated into Latin under the title *Liber de compositione alchimiae* (the extract is quoted in Latin as the Arabic version is not edited): Morienus, *Liber de compositione alchimiae*, in Lee Stavenhagen, *A Testament of Alchemy: Being the Revelations of Morienus, Ancient Adept and Hermit of Jerusalem to Khalid Ibn Yazid Ibn Mu'awiyya, King of the Arabs of the Divine Secrets of the Magisterium and Accomplishment of the Alchemical Art, Edited and Translated* (Hanover,

| | |
|---|---|
| "Et in se continet omnia elementa: . . . Divide ergo ipsum in quatuor partes: quelibet pars habet unam naturam." | "'Petra non est petra, levis petra, non diligunt eam gentes, petra invenitur ubicumque, petram non habent reges, petra invenitur in arenis.' Qui accipit eam et dividit per quatuor elementa et facit sicut ipse dicit, habet bonum alexir."[128]<br>"Si tu accipias eos [i.e., the stones], et dividas per quatuor elementa, et laves, et praepares sicut oportet, et facias sponsalitium sicut prudens homo facere debet, invenies magisterium."[129]<br>"Si non dividas lapidem per quatuor elementa non potest bene coniungi cum corpore."[130] |
| The stone is divided into its four elements in order to separate them from each other. The word *natura* means here property (cf. n. 29); the last part of the sentence is an allusion to the preparation of the elements: each element, when separated, is prepared in order to have only one effective property. | |
| "Deinde compone ipsum equaliter et proporcionaliter, ita quod non sit in eo divisio nec repugnancia, et habebis propositum, Domino concedente. Iste modus est universalis. . . ." | "Ideo diximus quod praeparemus suam materiam, et faciamus eam primam, et dividamus in quatuor elementa, et mittamus de uno minus et de alio magis secundum rationem."[131] |
| Here is the main difference, which is very significant. The *De anima* does not claim that the mix of elements must be equal, but only "according to reason," or more precisely "according to a (specific) ratio" (*secundum rationem*) (cf. below, pp. 315 and 318–19). | |
| "Quando ergo habueris aquam ex aere, et aerem ex igne, et ignem ex terra, tunc habebis plene artem." | "trahe ova, et mitte in cucurbita et cooperi cucurbitam, et mitte in furno cineris — et antequam mittas in cucurbita malaxa bene — et da ignem donec distillent; et quod primum distillabitur est aqua sed nondum est pura, postea distillabitur ignis cum aere mixtus, serva donec dividas, et quod in fundo inveneris combustum est terra, serva."[132] |

1974), 26: "Verum est quod ista res sit ea que magis in te fixa a deo creatur, et ubicumque fueris, semper tecum inseparata manet, et omnis a deo creatus, a quo hec res separatur, morietur . . . Hec enim res ex te extrahitur et tu illius minera existis et apud te illam inveniunt et vere ex te excipiunt, et post eius probationem augebitur eius amor in te."

[128] *DA*, 49.

[129] *DA*, 56.

[130] *DA*, 81.

[131] *DA*, 59–60.

[132] *DA*, 409–10.

<table>
<tr><td colspan="2">The stone is divided into its four elements by way of fractional distillation. The order of the extraction varies according to the substance and the method (only one example of the De anima is given but many can be found).</td></tr>
<tr><td>“Dispone ergo substanciam aeream per discreccionem, et dispone substanciam terream per humiditatem et caliditatem donec conveniant et conjungantur, et non discrepent nec dividantur. Et tunc adjunge eis duas virtutes operativas, aquam et ignem, et tunc complebitur opus.”</td><td>“Et modo dicam tibi maneries de alexiris. Prima alexir: accipe de sale armoniaco soluto, sublimato et soluto pondus 1 — . . . quia non debes intelligere per salem armoniacum salem armoniacum solutum, sed debes intelligere per salem aliquas de speciebus id est elementis quae ponis in alexir, ideo intellige verba philosophorum — accipe de auro vivo medium pondus. . . . Et ad lunam intellige per salem armoniacum terram. Intellige per me verba ista et non negligas et intellige magisterium philosophorum. Et si vides salem armoniacum in sole, scias quod vult dicere aerem.”[133]</td></tr>
<tr><td colspan="2">The way of combining the elements (here in the Secretum secretorum: air, earth, water, and fire) is very confused in the De anima, because the author uses coded expressions and often changes them. In this example, he uses the names of the spirits to designate the elements; three keys of this code are given, but they differ.[134]</td></tr>
<tr><td>“Quia si permiseris aquam solam dealbabitur, et si junxeris ignem rubefaciet, Domino concedente.”</td><td>“Ad alexir solis mitte terram, et mercurium, aerem, ignem, fermentum solis, et de corpore — plumbum aut aliud. Ad alexir de luna mittit terram, aquam, mercurium, aerem et fermentum; et ita mittunt in praedictum aurum vivum et fermentum lunae et cuprum aut de corporibus aliis.”[135]</td></tr>
<tr><td colspan="2">Here in the De anima, the word alexir has the meaning of the whole alchemical mixture, i.e., body + spirit + ferment + elixir (elements), cf. n. 59. These mixtures are usual in elixir theories. In order to make silver (opus ad album) the elixir must be made of air, water, and earth of the stone. In order to make gold, the elixir must be made of air, water, earth and fire of the stone. Fire is used only for making gold.[136]</td></tr>
</table>

[133] *DA*, 419–20.

[134] *DA*, 107, 144, 315–16.

[135] *DA*, 102–3.

[136] The same is found, for example, in the *Epistle of the Elixir* (*Risālat al-iksīr*) attributed to Avicenna (cf. n. 62), cf. Ateş, “Ibn Sina, Risālat al-iksīr” (n. 62 above), 54 (line 7): والابيض يتم بثلاثة ليس فيها النارى، والاصفر يتم بالاربعة كلها; and in its Latin translation, the *Epistola ad Hasen regem de re tecta* (I note two manuscript versions because the passage is corrupted in the *Theatrum chemicum*): Oxford, Bodleian Library, Digby 162 (s. XIII–XIV), fol. 7v: “et album quod completur tribus in quibus non est ignis et citrinum completur quatuor totis”; Oxford, Bodleian library, Digby 119 (s. XIV), fol. 180r: “Et album quidem bene completur tribus in quibus non est ignis et citrinum completur quatuor totis.”

As shown here, the *Secretum secretorum* and the *De anima* both present a closely related doctrine, except for two points: Ps.-Aristotle makes no use of the ferment, which is also often the case in texts of the Jābirian corpus, and, more importantly, his elixir is an equal compound of elements; this second difference completely changes the elixir theory, as an equal mix of elements will not change the proportion of the metal in the Jābirian system.[137] This will be studied in the analysis of Bacon's *prolongatio vitae* in the next section.

Bacon glosses the *Secretum secretorum*:

> All the authors, because of the greatness of the secrets, conceal the science of alchemy by metaphorical and figurative words and works. It is God who inspired this in them so that only the wisest and best [men] could perceive it in order to take care of the benefit of the state. Thus, the stone is firstly taken metaphorically for each [thing] upon which the operation of alchemy begins. This could be a mineral thing, such as sulphur and arsenic, but a vegetal thing is better, such as fruit and parts of trees and plants. However, the best are animal things, such as blood, eggs, and hair, especially parts of man, and, among them, blood, in which are distinguished by the eye four humors, i.e., phlegm, [yellow] bile, blood, and melancholy. Thus, the alchemist seeks to separate those humors from each other and purify them from each other. And when, by way of complex operations, they have been reduced to their pure simplicities, then they are mixed in a secret and very particular proportion. To them is added quicksilver, after being mortified and sublimated many times. Similarly *calx*, or powder, of the base metal from which will be made the nobler [metal is added]. And likewise [*calx*] of the nobler [metal is added]. Afterwards, they are incorporated each in turn until

[137] As has been said, the elixir in the *De anima* is made with a specific proportion linked with the metal which will be transmuted, as in the Jābirian texts. Nevertheless, we find in the *De anima* one recipe in which, contrary to the rest of the treatise, the elixir seems to be said to have an equal proportion. However, this recipe is very obscure, the elixir not being named literally. The quotation explains that Avicenna must divide the hair of his "son" into the four elements, then cut his throat and divide his blood into the four elements, and put one part of each element; then he must project it onto copper. This seems to indicate that it is a recipe for making the elixir, but the "son" is said at the end of the recipe to be the mercury. The obscurity of the passage does not allow one to assert that Ps.-Avicenna once proposes a recipe of elixir with an equal amount of elements. *DA*, 214–15: "Quando vides filium tuum transire, accipe urinam suam et distilla, et stercus suum et mitte subtus fimum, et divide capillos suos per quatuor elementa, et iugula eum et sanguinem divide per quatuor elementa, et accipe de unoquoque 1 pondus et proice ibi cuprum. Et si vis facere rem utilem, quando nascitur filia in domo tua, in ipsa nocte iugula eam et sanguinem divide per quatuor elementa. Et non intelligas quod filios tuos et filias iugules, sed propter filios dico tibi argentum vivum et propter filiam petram mollem, intellige scilicet sanguinem."

> they are made one body. Then [this compound] is projected into the base metal liquefied and it will become nobler.[138]

Bacon's explanation is clearly indebted to the *De anima*.[139] He asserts that the science of alchemy is hidden by the alchemists; this assertion is an alchemical topos, and Ps.-Avicenna also says that alchemists are using fake words instead of real ones in order to mislead the readers, and that he is doing the same.[140] In the summary of the *De anima* attributed to Bacon, the affirmation that alchemists are speaking metaphorically is also found twice.[141] The assertion that the stone may be taken from the mineral and vegetal world is, however, firmly criticized in the *De*

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[138] Bacon, "Secretum secretorum cum glossis et notulis," 117–18, n. 5, quoted in Newman, "Tres Epistolae" (n. 17 above), 465, n. 14; and in idem, "The Philosophers' Egg" (n. 17 above), 80, n. 1: "Omnes auctores propter magnitudinem secretorum occultant scienciam alkimie per verba et opera methaphorica et figurativa, et hoc eis inspiravit Deus ut soli sapientissimi et optimi eam percipiant propter bonum reipublice procurandum. Lapis igitur sumitur primo methaphorice pro omni eo super quo incipit operacio alkimie. Et hoc potest esse res mineralis, ut sulphur et arsenicum, set melior est res vegetabilis ut fructus et partes arborum et herbarum, optime vero sunt res animales ut sanguis ovum et capilli, et maxime partes hominis, et inter illas sanguis, in quo ad oculum distinguntur quatuor humores, scilicet, fleuma, colera, sanguis, et melancolia. Alkimista igitur querit separare hos humores abinvicem et purgare quemlibet a quolibet. Et cum per difficilia opera fuerint redacta ad puras simplicitates suas, tunc commiscentur secreta proporcione et certissima, quibus additur argentum vivum postquam mortificatum fuerit et sublimatum pluries. Similiter calx sive pulvis metalli vilioris de quo fiet nobilius. Et similiter nobilioris. Et post hec incorporentur adinvicem donec fiant unum corpus. Et tunc proicitur in metallum vilius liquatum et fit nobilius."

[139] Cf. the first brief comparison in Newman, "An Overview" (n. 17 above), 328–32.

[140] *DA*, 66: "Et in libris suis invenies multa talia verba in quibus unum mittit pro alio, et tu debes super hoc subtiliter intelligere quo non seducant te ille vel alii." *DA*, 77: "Et intelligas, fili, quod quando iuro tibi dicere verum credas esse mendacium, et e converso."

[141] Using the word *metaphoricus*, in *Sanioris Medicinae . . . scripta*, 55–56: "et multa dicit de dentibus diaboli scilicet de spermate, et nullum istorum intelligit esse verum: quia quod est contra legem Dei, <illud est> contra legem philosophiae, ut voluit in sexto capitulo, et verum est hoc quia veritas philosophiae non est contra legem Dei: et ideo usus spermatis non potest hic valere, sed est sermo metaphoricus et illusorius, sicut alibi in hoc libro et propter hoc dicit." The *illud est* is found in manuscript 110 of the University of Pennsylvania, but not in the edition (which has *et*). *Sanioris Medicinae Magistri D. Rogeri Baconis Angli, de arte chymiae scripta: Cui accesserunt opuscula alia eiusdem Authoris* (Frankfurt, 1603), 17: "Excerpta de libro Avicennae de anima i. de maiori Alcimia (*sic*) per fratrem Rog. Bacon. et est titulus hic metaphoricus, sicut ea quae in libro continentur. Nam alius est liber eius de anima, scilicet sextus naturalium; qualis est liber Arist. de anima: et hic liber est sua Alcimia (*sic*) maior: nam minor est libellus quem fecit ad Hasen."

*anima*. This affirmation is usual in Arabic alchemical texts, for example in Jābirian treatises and in al-Khwārizmī's works,[142] but Ps.-Avicenna explicitly insists on the fact that the only real stones are hair, eggs, and blood, three organic substances, even if they are called animal, vegetal, and natural stones.[143] Bacon says only that those three stones are the best. The preference for human parts can already be found in Jābirian texts,[144] but the precise preference for blood was not clearly explained, contrary to the *De anima* and to Bacon's works. However, the reason for this preference for blood is not the same for Ps.-Avicenna as for Bacon. Ps.-Avicenna uses blood because the elixir will give a soul to the body and spirit: blood being the soul of man and the soul of man being the highest soul, it is consequently blood that is the best matter to make the elixir for gold, which is the highest metal.[145] Bacon, according to the elemental principles of his alchemy, insists on the four humors: blood is one of the four compounded humors, and it contains the four simple humors (simple blood being the more abundant in blood). His preference is for blood, or more precisely for simple blood (the simple blood humor in compounded blood), the *humor aereus*, i.e., the hot and moist principle that is called blood in animals but which is also found in vegetal and mineral things.[146] The reason he prefers blood is that he considers it a substance very close to the prime matter of things.[147] Echoing the necessary equality of complexion of the stone in the *De anima*,[148] Bacon asserts that the stone must be of "equal complexion" in order to produce the best gold:

> But the gold of the magistery, as Avicenna says in the *Liber de anima* [i.e., the *De anima*],[149] is better than the natural [gold]. Similarly, there is a great difference between the types of gold of the magistery, and the best is the [gold] which is made with that which is of equal complexion [i.e., equal blood]. And it prolongs life.[150]

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[142] Cf. n. 48.

[143] *DA*, 55: "Secundum quod mihi videtur et probavi, petra herbalis sunt capilli, petra naturalis ova, petra animalis sanguis humanus."

[144] Cf. n. 48.

[145] Cf. n. 50.

[146] Newman, "The Philosophers' Egg," 89–90.

[147] Ibid., 89–92. In "Tres Epistolae," 467–68, Newman proposes to see a link between the preference for blood and "a host of notions prevalent in late thirteenth-century medicine, such as the theory of medicinal *occulta*."

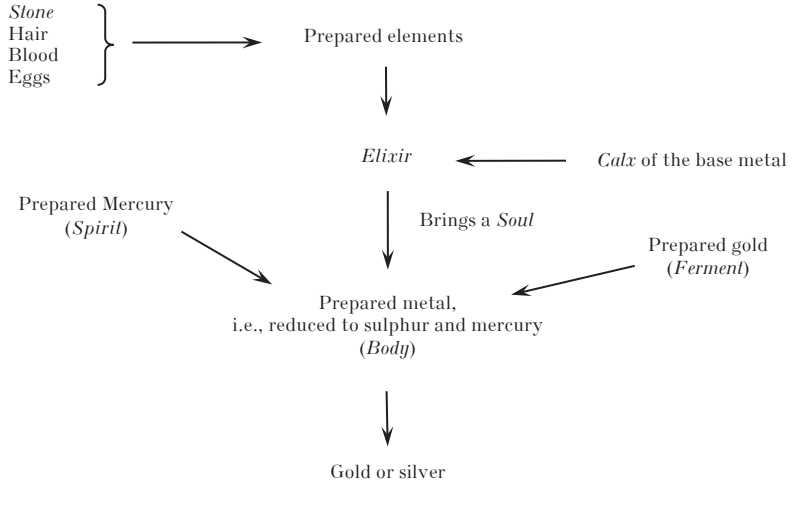
[148] Cf. p. 290.

[149] Cf. n. 111.

[150] Bacon, "Opus minus," 375, quoted in Paravicini Bagliani, "Ruggero Bacone" (n. 16 above), 43: "Sed aurum per magisterium, ut dicit Avicenna, libro de Anima, est melius naturali. Et similiter est magna differentia inter modos auri de magisterio, et optimum est quod fit per illud quod est equalis complexionis. Et prolongat vitam."

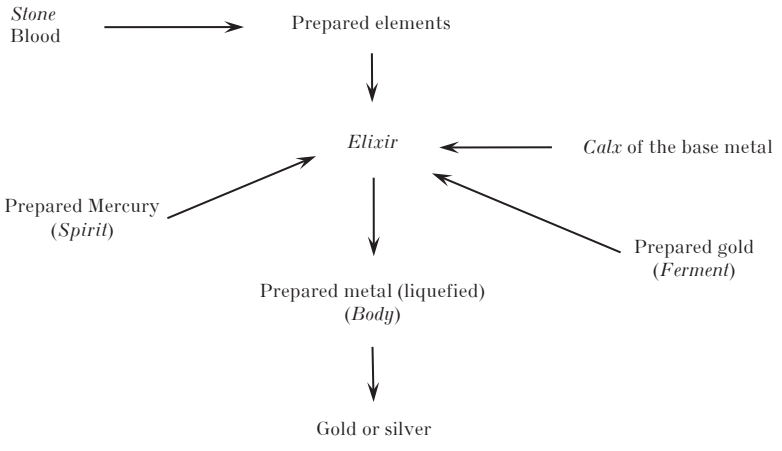
The elements must then be mixed in a precise proportion, in order to change the proportion of the base metal into the proportion of gold: Ps.-Avicenna says that the elements must be mixed *secundum rationem*,[151] Bacon says *secreta proporcione et certissima*. Thus, Bacon uses the elixir system: he changes the proportion of the base metal into the proportion of gold with an elixir containing a specific amount of prepared elements. Here, Bacon does not follow the *Secretum secretorum*, in which the proportion of elements in the elixir must be equal (*equaliter et proporcionaliter*): the *Secretum secretorum* proposes a universal elixir (*iste modus est universalis*), which cures every metal, contrary to the Jābirian texts and Bacon's doctrine, in which each metal requires a particular elixir. However, Bacon will use the *Secretum secretorum* method in his *prolongatio vitae* theory, as will be shown in the next section. Before the projection, a part of *calx* of the base metal is added to the elixir, as in the *De anima*.[152] However, a little change can be observed: the prepared mercury is added directly into the elixir, as well as the ferment (*et similiter nobilioris*), contrary to the *De anima*. In the *De anima*, the work is: unite the spirit (mercury) to the body (base metal), then project the elixir (elements and *calx* of the base metal), then the ferment. In Bacon's view: project mercury, *calx* of the base metal, and ferment into the elements, then project the whole on the base metal. A chart will more easily show the similarities and differences:

Alchemical work in the *De anima*




[151] Cf. p. 310.
[152] Cf. n. 58.

Alchemical work of Roger Bacon




As has been shown, Bacon uses the alchemical method of the *De anima*, but his physical elemental principles are different, and, therefore, his aim is different: both try to give to a base metal the specific proportion of gold, but the gold of Bacon has an equal proportion, and the gold of Ps.-Avicenna does not.

*Medicine and* Prolongatio vitae *in Roger Bacon's Works*

Bacon's alchemy and the doctrine of the *De anima* are very close to each other, although they are different in their physical conception of gold. The next paragraphs will investigate Bacon's medical alchemical theories, and stress some further fundamental differences with the Jābirian system as found in the *De anima*, in order to identify more precisely his dependence on the latter.

Bacon asserts that alchemy may be used for medicine and to prolong human life. We will not linger over the medical use of alchemy, which is only a use of alchemical operations to make medicines: this use is made according to medical doctrine and is more relevant to medical doctrines than to alchemical ones.[153] I am more interested in the *prolongatio vitae* theory. Many studies have been made on this subject, and an abundant bibliography may easily be found.[154] Before stressing the differences, a

[153] On this, cf. particularly the *De erroribus medicorum*. Cf. also Newman, "The Philosophers' Egg," 82, n. 3.

[154] Cf. for instance, Paravicini Bagliani, "Ruggero Bacone," 33–35 (esp. n. 2), in which are found the works where Roger Bacon speaks about this subject. For

quick summary of Bacon's *prolongatio vitae* theory is useful. As Paravicini Bagliani says:

> Bacon's theses may be summarized in this way: in order to reach the last natural terms of the life set by God and nature, man can use the wonderful power of astronomy, alchemy, and optics (the *perspectiva*). Although he has lapsed into sin, man can live *naturaliter* for a period of a thousand years, as the existence of the "patriarchs of long life" indicates to us. However, after the Deluge, life has been reduced bit by bit. Thus, the corruption that leads to death is against nature and also comes from the fact that man, expelled from the Earthly Paradise, has no longer observed the rules of the *regimen sanitatis*. One after the other, generations "have sped up and multiplied the corruption and the shortening of life," as "we can still see and notice nowadays." Bacon sees the remedies to slow down old age in the "experimental" sciences: astronomy, optics, and alchemy.[155]

A certain Artephius is given by Bacon as an example of a macrobiotic sage. This Artephius, Bacon writes, was able to predict the future by means of the concentrated rays of astral influence (cf. below) and lived for 1025 years using techniques of prolongation of life.[156]

In order to effect the *prolongatio vitae*, Bacon develops a complex doctrine. He proposes to use a *corpus aequale*, i.e., a body in which there is an equal proportion. The identification of this *corpus aequale* seems to have changed during Bacon's life, as Paravicini Bagliani has shown:[157]

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other summaries of this theory, cf. Newman, "An Overview" (n. 17 above), 323–28; Newman, "Tres Epistolae," 466–70.

[155] Paravicini Bagliani, "Ruggero Bacone," 45: "Le tesi baconiane possono essere così riassunte: per raggiungere gli ultimi termini naturali della vita fissati da Dio e dalla natura, l'uomo può servirsi del mirabile potere dell'astronomia, dell'alchimia e dell'ottica (la *perspectiva*). Benché sia caduto nel peccato, l'uomo poté vivere *naturaliter* per un periodo di mille anni, come insegna l'esistenza dei 'patriarchi di lunga vita.' Soltanto dopo il Diluvio, la vita si è abbreviata poco a poco. La corruzione che conduce alla morte è dunque contro natura e proviene anche dal fatto che l'uomo, cacciato dal Paradiso terrestre, non ha più osservato le regole del *regimen sanitatis*. Una dopo l'altra, le diverse generazioni 'accellerarono e moltiplicarono la corruzione e l'abbreviazione della vita,' come ancora 'possiamo vedere e constatare ai giorni nostri.' I rimedi per frenare la vecchiaia, Bacone li intravvede nelle scienze 'sperimentali': l'astronomia, l'ottica e l'alchimia."

[156] About Artephius and Bacon, cf. the appendix of this article ("A Note on Artephius"). The relevant extracts about Artephius in Bacon's works are: Bacon, "Opus maius," 2:208 (lines 10–16), 209 (lines 8–14), 212 (lines *ab imo* 7–2), 213 (lines 2–21); Bacon, "Liber sex scientiarum in 3° gradu sapiencie," 185 (lines 22–30), 185–86 (lines 3 *ab imo*–6).

[157] Paravicini Bagliani, "Ruggero Bacone," 36–54.

1) an equal compound of the four elements;[158] 2) a body in which the properties cancel each other out two by two,[159] being a) a very pure alchemical gold, i.e., equal gold,[160] and b) the "stone" cited above, i.e., the *humor aereus*, simple blood, purified and equalized, which is compared to prime matter.[161] Once taken and prepared, this equal compound must receive an astronomical influence, concentrated by the way of optical instruments, i.e., burning mirrors.[162] Then, the *corpus aequale* may be ingested by man: it will communicate its equality to the complexion of this man and prolong his life.

When compared to the alchemical medicine of the Jābirian doctrine, we find that the principle of this system is completely different. In order to understand it easily, a comparison is useful. The aim is to equalize the complexion of man. In order to give equality to the complexion of man, the Jābirian system would propose giving a particular amount of each property to balance the complexion: for instance, if the man has a

[158] Bacon, "Opus maius," 2:211–12 (lines 7 *ab imo*–1), 215 (lines 8–17), respectively quoted in Paravicini Bagliani, "Ruggero Bacone," 39, 42.

[159] Cf. n. 108, and Bacon, "Liber sex scientiarum in 3° gradu sapiencie," 183 (lines *ab imo* 15–7), quoted in Paravicini Bagliani, "Ruggero Bacone," 48.

[160] On gold used for the *prolongatio vitae*, cf. Paravicini Bagliani, "Ruggero Bacone," 42, 51. Cf. also the extract in n. 150. In the *Opus maius*, Roger Bacon also proposes different ingredients of lesser quality, which are quite close to the equality, cf. ibid., 38–39. Michela Pereira, whom I thank for her suggestion, proposes to identify that equal gold with the *humor aereus* (purified simple blood), putting forward a change of vocabulary instead of a change of concept.

[161] Newman, "The Philosophers' Egg," 89–92, and the extract of the *Opus minus* in the manuscript Vaticanus reginensis Latinus, 1317, fol. 127v, quoted in ibid., 92, n. 1: "Et non solus Deus et natura possunt hanc equalitatem facere sed etiam [sed etiam] ars quia ars perficit naturam in multis et ideo potest ars devenire preparationem corporis equalis, nam potest purificare quodlibet elementum alicuius mixti ab infectione alterius ut redigantur ad simplicitatem puram et tunc corrumpere potest quod superfluum est de quolibet donec redigantur ad naturas activas equales tam in substantia quam in qualitatibus. Et hoc est mixtum primum et materia mixta de qua potest intelligi quod dicit Aristoteles in 9 metaphysice quod de mortuo non fit vivum nisi cum fuerit reductum ad materiam primam. Et istum verbum maxime communicat cum resurrectione quia ex tali materia prima mixta fient omnia corpora et partes corporis omnis in resurrectione. Et hec est materia de qua fit mentio in 4 Metheorum sicut in fine cum dicitur quod sciant artifices alkimie species rerum transmutari non posse nisi cum fuerit resolutio ad materiam primam. Materia prima est huiusmodi humor cum aliis humoribus primis et hic humor equalis est in qualibet re et quodlibet homine et in quolibet loco ut Aristoteles dicit libro Secretorum et omnis res potest ad eam reduci et converti et hoc est secretum secretorum."

[162] Newman, "The Philosophers' Egg," 78; idem, "An Overview," 327, 332; and Bacon, "Liber sex scientiarum in 3° gradu sapiencie," 184–85 (lines 8 *ab imo*–1), quoted in Newman, "The Philosophers' Egg," 78, n. 3.

1/0.5/0.2/0.9 proportion (of properties, not of elements), it is necessary to give him a compound with a 0/0.5/0.8/0.1 proportion in order to have a 1/1/1/1 proportion, namely equality. But Bacon proposes to give him a compound of a 1/1/1/1 proportion, to which is added an astronomical influence, which will in turn give to the compound the ability to communicate its equality to the 1/0.5/0.2/0.9 proportion of the man, and change it to a 1/1/1/1 proportion. So, in the Jābirian treatises, the sick person (1/0.5/0.2/0.9) ingests a particular medicine (0/0.5/0.8/0.1) to be cured (1/1/1/1); and in Bacon's works, the sick person (1/0.5/0.2/0.9) ingests a general medicine (1/1/1/1) to be cured (1/1/1/1). The systems are totally different. Where the Jābirian treatises use the elixir system, Bacon actually uses the ferment system[163] to prolong life: he gives man an equal compound that will communicate its equality, as the ferment of gold communicates its nature to the base metal.

This use of an equal compound was already present in the *Secretum secretorum*, as said before, where Ps.-Aristotle asserts that the elixir must be compounded equally and proportionally, proposing a general medicine for all the metals ("Deinde compone ipsum equaliter et proporcionaliter, ita quod non sit in eo divisio nec repugnancia, et habebis propositum, Domino concedente. Iste modus est universalis"). But this use was for metals, not for healing people. However, gold is not said in the *Secretum secretorum* to have an equal proportion. Bacon may have taken the use of an equal compound from the *Secretum secretorum*, especially since he explicitly says in his *Opus maius* that the *Secretum secretorum* contains information for preserving health and postponing old age.[164]

## Roger Bacon's Dependencies

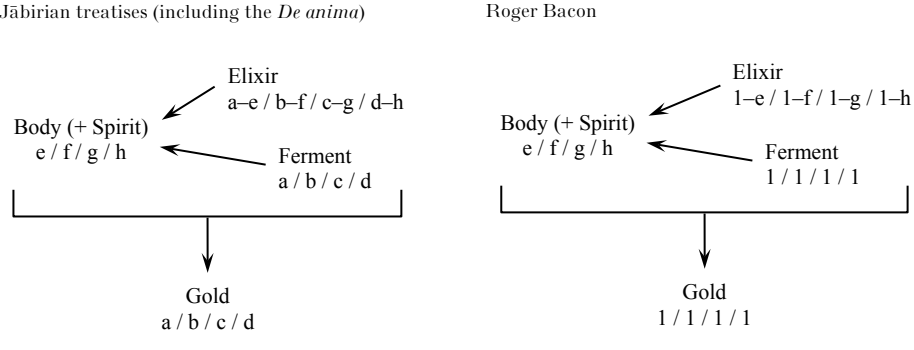
All these similarities and differences make the situation quite complex; the following chart will clarify who asserts what. In the diagrams, the chronological order of the projections is not followed, for it would bring even more confusion. The quantities of the body, the elixir, and the ferment are not taken into account, as they change in each recipe and do not affect the change of proportion: the amounts of elixir and ferment

[163] Cf. n. 60. The elixir changes the body's proportion into another proportion, while the ferment changes the body's proportion into its own proportion.

[164] Bacon, "Opus maius," 2:208: "Sic videndum est per Aristotelem in libro Secretorum, ubi dicit quod Deus excelsus et gloriosus ordinavit modum et remedium ad temperantiam humorum et conservationem sanitatis, et ad plura adquirenda scilicet ad obviandum passionibus senectutis et ad retardandum eas, et mitigandum hujusmodi."

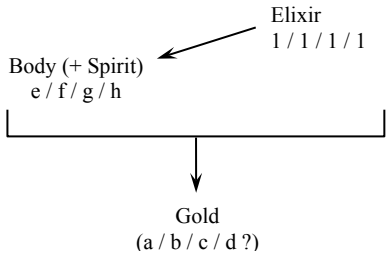
are usually much smaller than the quantity of the body, and one particle of elixir seems to change many particles of the base metal. The sequences under the names of the items designate their proportion of elementary properties. The formulas are a bit complex, but allow one to calculate the elixir for every metal.[165] In addition to this, it is necessary to consider that the Jābirian system is actually even more complicated, as we have proportions of two levels, namely the proportion of external properties and the proportion of internal properties. The texts do not explain clearly whether the elixir must have those two levels, i.e., have internal and external properties, although it seems sufficient for the elixir to have an effect on the external properties, since the internal properties are automatically balanced when the external properties are changed, as everything in the sublunary world has a total proportion of 17 (the four properties, external plus internal, are always present in things according to the proportion of 17, following the sequence 1, 3, 5, 8, as noted above). Moreover, the ferment is not present in many Jābirian treatises, and must be checked in each case; the reference here is the *De anima*.

*Alchemical Work*

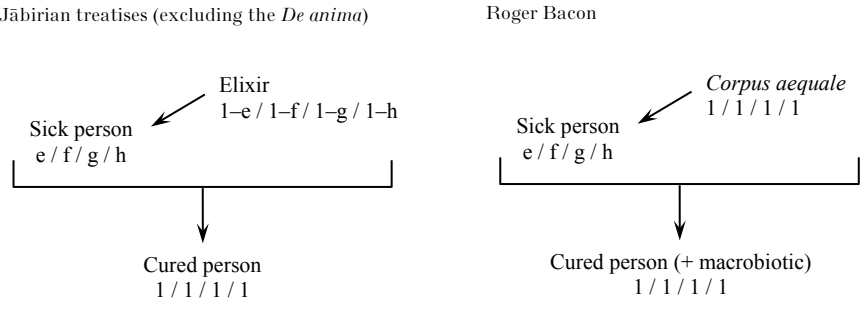



[165] However, one very important rule must be added: if the result of a subtraction for one property in the elixir is negative, it means that, in the elixir, the amount of this property must be 0 and that the same positive amount must be added to the opposite property. For instance, if we want a 1 / 2 / 3 / 4 proportion and we have a 2 / 2 / 1 / 3 proportion, the elixir must remove (and not add) 1 part of the first property; as an amount of property cannot be negative, we must add 1 part of the opposite property to the elixir (so this part will cancel the surplus part in the base metal). If in the cited example, the sequence is heat / coldness / dryness / moisture, the elixir will be 0 / 1 / 2 / 1 (the result being, if we use the formula of the diagram, -1 / 0 / 2 / 1). In brief, if the result of the subtraction for one property is negative in the elixir, we must add 0 parts of this property but add a similar (positive) amount of the opposite property in the elixir.

*Secretum secretorum*




*Alchemical medicine and* prolongatio vitae




It is clear that Bacon borrowed his alchemical transmutation system from the *De anima* (same as the Jābirian treatises), the only difference being in the proportion of gold. The alchemical system of the *Secretum secretorum* is completely different: the elixir is an equal compound. On the Baconian *prolongatio vitae*, it is important to point out first that Bacon had no direct access to the alchemical medical theory of the Jābirian treatises: the *De anima* does not explain this theory,[166] and the *De anima* is the text through which Bacon had access to Jābirian theories. Bacon actually synthetized a personal system, perhaps from both the alchemical doctrines of the *De anima* and the *Secretum secretorum*: his *corpus aequale* is the same as the alchemical elixir of the *Secretum secretorum* but acts as the ferment in the *De anima*. Using the *De anima* and the *Secretum secretorum*, Bacon could have found all he needed to elaborate this theory. And he developed a medical system that is completely different from the system found in the Arabic Jābirian treatises and could actually be considered "less mathematical."

[166] This is the reason why "excluding the *De anima*" is noted in the scheme.

## Conclusion

Roger Bacon is often said to be the first scholar in the West to unite medicine and alchemy. In the East, the Jābirian corpus had already long claimed a medical use of the elixirs. Even if we do not find any literal expression in the *De anima* that proposes to use alchemy for medicine, the idea is already implied in this Jābirian treatise, especially when combined with Ps.-Aristotle's *Secretum secretorum*. However, it would be unjust to concede to Bacon only the merit of having slavishly followed his sources. Bacon and the *De anima* clearly share many doctrinal points. His main dependence on the *De anima* is his alchemical method, his way of doing alchemical work, even if his physical elemental principles are different. Nevertheless, Bacon always uses multiple sources and goes further than they. It is especially in his *prolongatio vitae* theory that Bacon surpasses his sources. This theory is not found in the *De anima*, nor in the *Secretum secretorum*, but is a central point of Bacon's doctrine. His method for preserving human life is clearly different from the Jābirian system and quite distinctive: Bacon does not rebalance the complexion by giving a particular amount of each property, a particular medicine, but gives a prepared equal compound that will communicate its equality to the body — a general medicine. Another example of Bacon going further than his sources may be found in the place of astral influence in the *prolongatio vitae* theory. The importance of the astral influence is already found in the Jābirian system: the stone must be taken when the astral influence is good (the *De anima* says equal), just as in Arabic magic in the making of talismans.[167] This idea of capturing the astral influence is also claimed by Bacon:

> Likewise, just afterwards, the perfect *experimentator* knows which are the constellations of the great operations, in good or in bad, and knows when the stars of the efficient operations rise and when they set, when they are in their power and when their forces are growing weaker because of the earth; [he knows] according to what they are in conjunction with other stars and [according to] what they are in opposition with them and they are related with various aspects to each other. Thus, when he has known and ordered these, he perceives the due times and makes wonderful works during those in which the virtues of stars by which men are spoiled in their body and soul are restrained, so that in these [times] the natural benefit of longevity, morals, good judgment, and wisdom would be achieved, as has been said.[168]

[167] Cf. Toufic Fahd, "Tilsam," *Encyclopedia of Islam*, new edition, 2000.

[168] Bacon, "Liber sex scientiarum in 3° gradu sapiencie," 185, quoted in Paravicini Bagliani, "Ruggero Bacone," 50: "Item parum post experimentator igitur perfectus noscit que sunt constellationes magnarum operationum sive in bonum sive in

However, in Bacon's conception, the astral influence can even be concentrated by way of burning mirrors, and gives to an equal compound the ability to communicate its equality to the human body. Moreover, this concentrated astral influence makes the man who sits in this ray wise.[169] The difference is again significant: Bacon concentrates the astral influences and attributes properties to them. He therefore proposes to do more than the Arabic alchemists and magicians, and adds distinctive doctrinal elements to the Arabic background that he uses.

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malum, et scit quando stelle efficacium operationum oriuntur et quando occidunt et quando sunt in fortitudinibus suis et quando debilitantur vires earum respectu terre, secundum quod coniunguntur stellis aliis et secundum quod opponuntur eis et variis aspectibus ad invicem referuntur. Cum ergo hec noverit et de hiis bene ordinaverit, captat tempora debita et facit opera magnifica in eis in quibus conservantur virtutes stellarum, per que alterantur homines in corpore et anima, ut in eis compleatur naturalis bonitas longevitatis, morum, prudentie et sapientie, sicut dictum est."

[169] As for Artephius, cf. n. 156.

## Appendix: A Note on Artephius

The identity of Artephius is still under discussion among scholars. The main text around which the debate focuses is usually the *Clavis maioris sapientiae*, a cosmological treatise based on the principles of alchemy;[1] in a previous volume of the *Theatrum Chemicum*, this text was erroneously attributed to King Alfonso X of Castile.[2] Artephius was first identified, or at least linked, with Balīnūs, i.e., Ps.-Apollonius of Tyana, as early as the Renaissance; his name was sometimes confused with Orpheus in the West.[3] In 1876, Gildemeister considered Artephius as a transcription of the name of the Persian alchemist of the eleventh-century al-Ṭughrā'ī:[4] this assumption was based on the title of one of al-Ṭughrā'ī's writings, the *Mafātīḥ al-raḥma wa-maṣābīḥ al-ḥikma* (*Keys of Mercifulness and Lamps of Wisdom*). However, the contents of the tracts differ, which invalidates this hypothesis. In 1904–5, Steinschneider assumed that Artephius, or Artesius (close to the written form Artefius), was a transcription of the Arabic name of the famous alchemist Stephanos, Iṣṭafanus.[5] The debate went much further in 1938, when Levi della Vida identified the Arabic original of the *Clavis maioris sapientiae* as the *Miftāḥ al-ḥikma*.[6] In the Arabic work, the author was presented as a disciple of Balīnūs called Ibn Bal'awān in most manuscripts, which is obviously not the original part of the name from which Artephius derives; this invalidates both the hypotheses of Gildemeister and Steinschneider. The redaction of the *Miftāḥ al-ḥikma* probably goes back to the tenth century.[7] This Arabic treatise has so far been found in ten manuscripts.[8] Carusi suggested linking the *Miftāḥ al-ḥikma* with one of the authors mentioned in Ps.-Avicenna's *De anima*, Abimazer Alfarabi, this name being the transcription of the famous philosopher Abū Naṣr al-Fārābī (to whom a lost apocryphal alchemical Arabic treatise had probably been attributed). Carusi suggested that Artephius might be a transcription of Al-Fārābī through Alpharabius.[9] This hypothesis is extremely weak, for

[1] *Theatrum Chemicum*, vol. 6 (1661), 198–213. I thank Didier Kahn for his help in revising this note on Artephius. On the mentions of Artephius in Bacon's work, cf. n. 156.

[2] Ibid., vol. 5 (1622), 855–79.

[3] Herbert D. Austin, "Artephius-Orpheus," *Speculum* 12 (1937): 251–54.

[4] J. Gildemeister, "Alchymie," *Zeitschriften der Deutschen Morgenländischen Gesellschaft* 30 (1876): 534–38, at 538.

[5] Steinschneider, *Die europäischen Übersetzungen* 2 (n. 3 above), 8–9 (§141b).

[6] G. Levi della Vida, "Something More about Artefius and His Clavis Sapientiae," *Speculum* 13 (1938): 80–85.

[7] Kraus, *Jābir ibn Ḥayyān II* (n. 29 above), 298–300.

[8] Fuat Sezgin, *Geschichte des arabischen Schrifttums*, 4, *Alchimie – Chemie – Botanik – Agrikultur, bis ca. 430 H.* (Leiden, 1972), 84–86, 90–91, 167; Ullmann, *Die Natur- und Geheimwissenschaften im Islam* (n. 3 above), 175; and more recently Paola Carusi, "Il trattato di filosofia alchemica 'Miftāḥ al-ḥikma' ed i suoi testimoni presso la Biblioteca Apostolica," *Miscellanea Bibliothecae Apostolicae Vaticanae* 9 (2002): 35–84.

[9] Paola Carusi, "Animalis herbalis naturalis, considerazioni parallele sul De anima in arte alchemiae attribuito ad Avicenna e sul 'Miftāḥ al-ḥikma' (opera di un allievo

the links stressed by Carusi are far too general.[10] The *Clavis maioris sapientiae* was translated several times into vernacular languages.[11]

However, it is obviously not the *Clavis sapientiae* to which Roger Bacon refers in his works, as there is no such assertion about prolongation of life in this treatise. Other works are attributed to Artephius, among which is a *Liber secretus* (inc. *Antimonium est de partibus Saturni*; its oldest manuscripts date from the sixteenth century; the text is attributed to Artephius in the first edition in 1612 with texts of Ps.-Flamel, in Paris by Guillaume Marette), a *De characteribus planetarum, cantu et motibus avium, rerum praeteritarum et futurarum, lapideque philosophico*,[12] a *Speculum speculorum*,[13] and an *Opus solis*.[14] There is a *Liber Artefii* (inc.: *Viris prudentibus et discretis taciturnitatis modestia*) in the manuscript Montpellier, Bibliothèque de la faculté de médecine, 277, fols. 38r–40v (fourteenth–fifteenth century); according to Corbett,[15] it is not the *Clavis maioris sapientiae*. Thorndike and Kibre[16] called this treatise the *Liber secretorum*, and mentioned another copy in Paris, BNF, nouvelles acquisitions, 3033, fols. 1r–10r (fifteenth century); they explain that the treatise is rather more medical than alchemical. I did not inspect it.

Another work is described in the catalogue of Borel:[17] "Idem [Artephius] de vita Proroganda, aitque se anno, 1025. aetatis suae scripsisse librum suum, ex Eodem [Naudaeo, i.e., Gabriel Naudé]." This title is very likely a suggestion of Borel himself, on the basis of other texts mentioning this treatise (Borel usually mentions the manuscript of the treatises that he cites). I found no edition and no manuscript of this *De vita proroganda* (Steinschneider reads *propaganda*) after a quick search.[18]

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di Apollonio di Tiana)," in *Le crisi dell'alchimia | The Crisis of Alchemy*, Micrologus 3 (Turnhout, 1995), 45–74.

[10] Cf. Moureau, "Le *De anima in arte alchemiae* du pseudo-Avicenne" (n. 3 above), vol. 1, part 1, 69–72.

[11] Cf. Didier Kahn, "Les manuscrits originaux des alchimistes de Flers," in *Alchimie: art, histoire et mythes; Actes du I^er^ colloque international de la Société d'Etude de l'Histoire de l'Alchimie, Paris, Collège de France, 14–16 mars 1991*, ed. Didier Kahn and Sylvain Matton, Textes et Travaux de Chrysopœia 1 (Paris and Milan, 1995), 347–427, at 402.

[12] Herbert D. Austin, "Artephius, 'De Characteribus Planetarum,'" *Notes and Queries* s11-II(47) (1910): 407–c–407 and L. L. K, "Artephius, 'De Characteribus Planetarum,'" *Notes and Queries* s11-III(55) (1911): 35–f–36.

[13] Steinschneider, *Die europäischen Übersetzungen* 2, 8–9 (§141b).

[14] On the manuscript London, BL, Sloane 1118, fol. 113r–v, cf. Dorothea Waley Singer, *Catalogue of Latin and Vernacular Alchemical Manuscripts in Great Britain and Ireland, Dating from before the XVI Century* (Brussels, 1928–31), 130 (no. 146).

[15] James Corbett, *Catalogue des manuscrits alchimiques latins* (Brussels, 1939–51), 2:78.

[16] Thorndike and Kibre, *Catalogue* (n. 24 above), 1700.

[17] Pierre Borel, *Bibliotheca Chimica. Seu catalogus librorum philosophicorum hermeticorum* (Heidelberg, 1656), 31.

[18] In the catalogues of Wilson, Singer, and Corbett, as well as the catalogues of Manuscripta Medievalia, the KVK, the Manus catalogue, the National Union catalogue, and the Schoenberg database.