# Avicennian Natural Philosophy and the Alchemical Theory of al-Ṭughrāʾī in *Ḥaqāʾiq al-istishhād*

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## Abstract

This thesis aims at clarifying how alchemists and non-alchemists studied and discussed alchemy in medieval Islam. In order to attain this objective, we first review and reinterpret the accomplishments of Muslim and pre-Islamic alchemists, as well as multiple types of classification of alchemy by non-alchemist authors. Also, we examine in detail non-alchemists' theoretical discussions of alchemy, which had a large influence on the development of alchemy in medieval Islam, as well as discussions by alchemists. Finally, in order to clarify both stances, we investigate al-Ṭughrāʾī's *Ḥaqāʾiq al-istishhād*, which compares alchemists' theoretical foundation concerning alchemical theories with that of non-alchemists.



## L'abstrait

Cette thèse vise à préciser comment les alchimistes et les non alchimistes ont étudié et discuté de l'alchimie dans l'Islam médiéval. Pour atteindre cet objectif, nous examinons d'abord et réinterprétons les réalisations des alchimistes musulmans et pré-islamiques, ainsi que les types multiples de classification de l'alchimie par des auteurs non alchimistes. En outre, nous examinons les discussions théoriques des non alchimistes sur l'alchimie, qui ont eu une grande influence sur le développement de l'alchimie dans l'Islam médiéval ainsi que dans les détails des alchimistes. Enfin, afin de clarifier les deux positions, nous étudions le *Ḥaqā'iq al-istishhād* de al-Ṭughrāʾī, qui compare le fondement théorique des alchimistes concernant les théories alchimiques avec les non alchimistes.

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## Preface and Acknowledgements

Alchemy in medieval Islam is an almost forgotten subject in the study of the history of science. Many facts have not been clarified well, and previous studies often discuss it based on these uncertain facts. This thesis intends to deal with some of the confusion caused by previous studies by reconsidering primary sources and establishing a foundation for my future study of alchemy in medieval Islam. The research for every chapter has been completed by the author. Also, all of the chapters and English translation of al-Ṭughrāʾī's *Ḥaqāʾiq al-istishhād* are written by the author.

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# Introduction

The more we study alchemy in medieval Islam, the more confused we become. Previous studies in the early twentieth century, such as those by Julius Ruska, H. E. Stapleton, Paul Kraus, and E. J. Holmyard tended to avoid generalizing alchemy and focused on individual alchemists. Although Holmyard published a comprehensive study on the history of alchemy,[1] he did not effectively attempt to extract the ideas that alchemists have in common. Some later researchers try to give a generalized idea on alchemy, but they have not reached an agreement. Ahmad Y. al-Hassan and Donald R. Hill say that Arabic *kīmiyāʾ* indicates both "alchemy" and "chemistry," which means that *kīmiyāʾ* is not just a gold-making operation but also the manufacturing of chemically processed products such as perfume and ink.[2] On the other hand, Manfred Ullmann says, "Alchemy, however, the art of transmuting metals, has to be singled out from the other more technically oriented professions because of its theoretical foundations."[3] This ambiguity in interpretation is simply because of the shortage of the studies on alchemy in medieval Islam. Ullmann himself recognizes this situation and says, "Most of what historians of science have written on the Arabic alchemists is second-hand, based on obsolescent literature and disfigured by gross errors."[4] The situation has not improved until now, and Lawrence Principe also says in his book published in 2013 that "despite the importance of this period for alchemy - and for the entire history of science - our knowledge of it remains very incomplete," and that historians "have had to rediscover the primary sources of Arabic alchemy."[5]

Why is it so difficult to discuss alchemy in medieval Islam? This is one of the questions in this thesis. As a first step, we try to organize the basic information on alchemy in medieval Islam. Thus, in the

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1 E. J. Holmyard, *Alchemy* (Harmondsworth: Penguin, 1957).
2 Ahmad Y. al-Hassan and Donald R. Hill, *Islamic Technology: An Illustrated History* (Paris: UNESCO, 1986), p. 133.
3 *Encyclopaedia of Islam*, 2nd ed., s.v. "al-Kīmiyāʾ," by Manfred Ullmann.
4 Ibid.
5 Lawrence M. Principe, *The Secrets of Alchemy* (Chicago and London: University of Chicago Press, 2013), pp. 27-28.

first chapter, we review the accomplishments of Muslim alchemists and pre-Islamic alchemists to which they often refer. At the same time, we discuss how non-alchemists understood alchemy in their works which classify scientific disciplines. The first chapter clarifies that both the approaches to alchemy by alchemists, as well as non-alchemists' understanding of alchemy, were so diverse that we cannot give a simple description of alchemy in medieval Islam. Also, we find a large gap between the understanding of alchemy by alchemists and non-alchemists.

Then, a new question arises. How did alchemists and non-alchemists study and discuss alchemy? To consider this question, *Ḥaqāʾiq al-istishhād*[6] by al-Ṭughrāʾī (d. 515/1121), an alchemist in the period of the Seljūqid dynasty, is a worthy source. The *Ḥaqāʾiq* is usually considered to be a counterargument to Ibn Sīnā's criticism of alchemy.[7] However, simply refuting Ibn Sīnā is not his intention in the *Ḥaqāʾiq*. Rather, he tries to promote a proper understanding of the discipline of alchemy by comparing non-alchemists' theories about alchemy with the sayings of alchemists he relies on. Al-Ṭughrāʾī chose Ibn Sīnā as a representative of non-alchemists, and he comments on the passages of *Kitāb al-shifāʾ*, Ibn Sīnā's well-known encyclopedic work of philosophy, and assesses their commonalities and disagreements with the alchemical theories that al-Ṭughrāʾī considers. Through this work, we can grasp an idea of the theoretical foundations of both sides. Before turning to the *Ḥaqāʾiq*, we further examine in the second chapter discussions of non-alchemists concerning alchemical theories, most of which are criticisms of alchemy, in order to understand al-Ṭughrāʾī's argument in the *Ḥaqāʾiq* precisely. Then, in the third chapter, we investigate the *Ḥaqāʾiq* in detail.

The English translation of the selected parts from the *Ḥaqāʾiq* is appended to the thesis to clarify what al-Ṭughrāʾī discusses in this text.

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[6] al-Ṭughrāʾī, *Ḥaqāʾiq al-istishhād*, ed. Razūq Faraj Razūq (Baghdād: Dar al-Rashīd, 1982). Hereafter *Ḥaqāʾiq*.
[7] *Encyclopaedia of Islam*, 2nd ed., s.v. "al-Ṭughrāʾī," by F. C. de Blois.

# Chapter 1: Alchemy and Alchemists in Medieval Islam

## i. The major alchemists and their works

The previous studies on alchemy in medieval Islam have not clearly identified which alchemists were more prominent than others. Also, they have not found a single alchemical tradition which every alchemist has in common. In this section, we review the alchemists known among Muslims and their accomplishments based on the previous studies in order to clarify the difficulties which these studies encounter. In this regard, we will contend that the alchemists whom we study are not necessarily the major alchemists for Muslims in medieval Islam. Rather, they are the major alchemists as considered by modern researchers.

In order to investigate the Muslim alchemists and pre-Islamic alchemists to whom they refer, most of the previous studies rely on the following two bio-bibliographical works: 1) Ibn al-Nadīm's *Kitāb al-fihrist*[8]; and 2) Ḥājjī Khalīfa's *Kashf al-ẓunūn ʿan asāmī al-kutub wa-'l-funūn*.[9] We also choose the alchemists to investigate based on these works. Of course, some alchemists mentioned in these works have been well-studied in previous works, others have been scarcely studied. Because the purpose of this section is to understand the problems encountered in the previous studies, we here limit ourselves to the well-studied alchemists. Furthermore, since the main focus of this thesis is al-Ṭughrāʾī's *Ḥaqāʾiq*, we also take the names of alchemists listed in the *Ḥaqāʾiq* into consideration.

The *Fihrist* is a book catalog written in 938 AD by Ibn al-Nadīm (d. 385/995), a bookseller. According to Fück, the first six chapters deal with Islamic subjects such as the Qurʾān and holy scriptures, genealogy, poetry, theology, and jurisprudence. The last four chapters deal with non-Islamic subjects: 1)

[8] Abū al-Faraj Muḥammad ibn Isḥāq al-Nadīm (4/10c), *Kitāb al-fihrist*, ed. Ayman Fuʾād Sayyid, 2 vols. (London: Al-Furqan Islamic Heritage Foundation, 2009). Hereafter *Fihrist*.

[9] Ḥājjī Khalīfa (11/17c), *Kashf al-ẓunūn ʿan asāmī al-kutub wa-'l-funūn*, ed. Gustavus Fluegel, 7 vols. (New York and London: London Oriental Translation Fund, 1835). Hereafter *Kashf*.

philosophy and the ancient sciences; 2) legends, fables, magic, conjuring, and so on; 3) doctrines of non-monotheistic creeds; and 4) alchemy.[10] The *Fihrist* has an independent chapter for alchemy (the tenth chapter), and it gives more than 50 names of alchemists, including those of the pre-Islamic period, but only sixteen of those listed include detailed information, such as biographical information and the titles of their works.[11]

Ḥājjī Khalīfa (d. 1067/1657) was an Ottoman scholar in the seventeenth century. His *Kashf* is a bio-bibliographical dictionary, which deals with various disciplines regardless of whether they are religious or non-religious. In the entry for alchemy, he introduces authors of alchemical works and other scholars who have written on alchemy and summarizes their views, referring to some other bibliographers and commentators.[12]

- Hermes Trismegistus and Apollonius of Tyana (Balīnūs)

Hermes Trismegistus arose from a merging of the figures of Thoth, an ancient god of Egypt, and Hermes, a Greek deity, in Hellenistic Egypt.[13] In the Islamic world, he was considered as a legendary sage and sometimes he was regarded as three men because of his name "Trismegistus," which means "thrice great."

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[10] *Encyclopaedia of Islam*, 2nd ed., s.v. "Ibn al-Nadīm," by J. W. Fück.

[11] Ibn al-Nadīm lists: Hermes, Agathodaemon, Anṭus, Malīnūs, Plato, Zosimos, Eustathius, Democritus, Ostanes, Heraclius, Būrūs, Māriya, Rasāwaras, Afrāghasarīs Stephanus, Alexandrus, Chymes, Jāmāsāb, Zoroaster, Archalaeus, Marqūnas, Sinqājā, Simmias, Rawsham, Fūrūs, Pythagoras, Nicolaus, Marianus, Safīdus, Mihr-Arīs, Farnāfānus, Themistius, Kāhin Arṭā, Aras al-Qass, Khālid ibn Yazīd, Stephanus, al-Ḥarbī, Jābir ibn Ḥayyān, Yaḥyā ibn Khālid ibn Barmak, Khāṭif al-Hudhālī, al-Afranjī, Dhū al-Nūn al-Miṣrī, Sālim ibn Farrūkh, Abu ʿĪsā al-Aʿwar, al-Ḥasan ibn Qudāma, Abū Qirān, al-Bīnī, al-Sakhāwī, al-Rāzī, al-Sāʾiḥ al-ʿAlawī, Ibn Waḥshiyya, al-ʿAzāqirī. Ibn al-Nadīm, *Fihrist*, 2: 447. See also Bayard Dodge, trans., *The Fihrist of al-Nadīm* (New York and London: Columbia University Press, 1970), pp. 849-851. The authors described in detail are: Hermes, Ostanes, Zosimos, Khālid ibn Yazīd, Dhū al-Nūn al-Miṣrī, Muḥammad Zakariyyāʾ al-Rāzī, Ibn Waḥshiyya, al-Ikhmīmī (Ibn Suwayd), Abū Qirān, Stephen the Monk, Al-Sāʾiḥ al-ʿAlawī, Dubays, Ibn Sulaymān, Isḥāq ibn Nuṣayr, Ibn Abī al-ʿAzāqir and al-Khanshalīl.

[12] Ḥājjī Khalīfa basically cites al-Ṣafadī's (d. 764/1363) and al-Jildakī's (d. 743/1342) description of alchemy. Ḥājjī Khalīfa listed the names of the following alchemists: Khālid ibn Yazīd, Jābir ibn Ḥayyān, Maslama ibn Aḥmad al-Majrīṭī, Muḥammad Zakariyyāʾ al-Rāzī, Abū al-Iṣbaʿ ibn Tammām, al-Ṭughrāʿī, Ibn Umayl, Ibn Arfaʿ Raʾs and al-Jildakī. Ancient names such as Hermes, Stephenos and Pythagoras are also listed. Ḥājjī Khalīfa, *Kashf*, 5: 280.

[13] Florian Ebeling, *The Secret History of Hermes Trismegistus: Hermeticism from Ancient to Modern Times*, trans. David Lorton, (Ithaca and London: Cornell University Press, 2007), p. 6.

The first Hermes was a grandson of Adam, who lived in Egypt before the Flood and built the Pyramids and the temple of Akhmīm. He rescued primeval wisdom from the destruction of the Flood. The second Hermes lived in Babylon in Egypt after the Flood and taught philosophy and mathematics to Pythagoras. He revived the antediluvian knowledge. The third Hermes also contributed to the revival of wisdom in Egypt, and he taught Asclepius.[14] He also wrote a book on alchemy.[15] The *Fihrist* introduced "one" Hermes, who appears to fit the description of the second Hermes. This Hermes is described as "a Babylonian, who moved to Egypt when the peoples were dispersed from Babylon" and "the king of Egypt, a wise man and philosopher, for whom the Art was validated, and about which he wrote a number of books."[16] However, Ibn al-Nadīm did not necessarily manage to identify the background of Hermes, since he says, "There has been a difference of opinion about him."[17]

The roles of Hermes in alchemical texts seems to differ in age and place. Zosimus, an alchemist in Hellenistic Egypt at the beginning of the fourth century (see below), cites Hermes when he discusses the spiritual sphere of alchemy. Citing Hermes' words, he writes that the practitioner of alchemy should reject magical practice and instead rely on one's own knowledge and on God. Zosimus also introduces Hermetic writings as guides to individual perfection. As for the technical side of alchemy, he rarely cites the authority of Hermes.[18]

In Latin alchemy, the *Emerald Tablet* (*Tabula smaragdina*)[19] has great significance in its reference

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[14] Asclepius is a physician in Greek mythology, but this Asclepius has not been well identified. Fuat Sezgin, *Geschichte des arabischen schrifttums*, vol. 4 (Leiden: E. J. Brill, 1971), pp. 58-59. Hereafter *GAS*. This name appeared in al-Ṭughrāʾī's *Ḥaqāʾiq* as Asfīdirūs. al-Ṭughrāʾī, *Ḥaqāʾiq*, p. 50.

[15] Holmyard, *Alchemy*, p. 100; *Encyclopaedia of Islam*, 2nd ed., s.v. "Hirmis," by M. Plessner; Ebeling, *The Secret History of Hermes Trismegistus*, p. 45.

[16] Dodge, trans., *Fihrist of al-Nadīm*, pp. 843-844.

[17] Ibid., p. 845.

[18] Ebeling, *The Secret History of Hermes Trismegistus*, pp. 26-27.

[19] The text is translated as follows: "1. I speak not fictitious things, but what is true and most certain. 2. What is below is like that which is above, and what is above is like that which is below, to accomplish the miracles of one thing. 3. And as all things were produced by the mediation of one Being, so all things were produced from this one thing by adaption. 4. Its father is the Sun, its mother the Moon; the wind carries it in its belly, its nurse is the earth. 5. It is the cause of all perfection throughout the whole world. 6. Its power is perfect if it be changed into earth. 7. Separate the

to Hermes. As far as we know, the earliest version of this work is in Arabic, written in the eighth century. It appears in a text entitled *Sirr al-khalīqa* (*The Secret of Creation*), attributed to Apollonius of Tyana (Balīnūs), who lived in the first century.[20] According to *Sirr al-khalīqa*, Apollonius himself found the "emerald tablet" beneath the statue of Hermes in Tyana.[21] This *Emerald Tablet* intends to explain the principle of the world: "Following a chronology of the history of creation, the origin and material essence of the world are described according to the Aristotelian doctrine of elements."[22] The text itself of the *Emerald Tablet* is located at the end of the *Sirr al-khalīqa*.[23]

Identifying what kind of Hermetic writing influenced the alchemical theories in the Islamic world requires extensive research. We do not know how many alchemical texts regard Hermes as a spiritual guide, in the way Zosimus did, and how many refer to the *Emerald Tablet*. Moreover, a work in the Jabirian corpus (*Kitāb usṭuqus al-uss al-thānī*) contains another version of the *Emerald Tablet*, but it was written as a quotation from a work of Apollonius (Balīnūs).[24] Al-Ṭughrāʾī's *Ḥaqāʾiq* often cites Hermes' words, mostly in discussions on natural philosophy, but does not mention his sources on Hermes. We will discuss al-Ṭughrāʾī's possible sources in the later part of this thesis, which will hopefully shed some new light on this question.

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earth from the fire, the subtle from the gross, acting prudently and with judgement. 8. Ascend with the greatest sagacity from the earth to heaven, and then again descend to the earth, and unite together the powers of things superior and things inferior. Thus you will obtain the glory of the whole world, and all obscurity will fly far away from you. 9. This thing is the fortitude of all fortitude, because it overcomes all subtle things and penetrates every solid thing. 10. Thus were all things created. 11. Thence proceed wonderful adaptions which are produced in this way. 12. Therefore am I called Hermes Trismegistus, possessing the three parts of the philosophy of the whole world. 13. That which I had to say concerning the operation of the Sun is completed." Ibid., pp. 49-50, which is the citation of the translation from a Latin text in H. Stanley Redgrove, *Alchemy, Ancient and Modern*, 2nd ed. (London: William Rider, 1922).

[20] Holmyard, Alchemy, p. 97; Ebeling, *The Secret History of Hermes Trismegistus*, p. 51.

[21] Ebeling, *The Secret History of Hermes Trismegistus*, pp. 46-47.

[22] Ibid., p. 49.

[23] Ibid.; *Encyclopaedia of Islam*, 2nd ed., s.v. "Balīnūs," by M. Plessner

[24] Holmyard, Alchemy, p. 99; Paul Kraus, *Jābir ibn Ḥayyān: Contribution à l'histoire des idées dans l'Islam*, vol. 1 (Cairo: Imprimerie de l'Institut Français d'Archéologie Orientale, 1943), p. 13.

- Democritus

The earliest surviving alchemical text in Greek, called *Physika kai mystika,* has been dated to the late first or second century AD, and this work is attributed to a certain Democritus.[25] Some researchers just refer to the author as "pseudo-Democritus," others consider that it is by Bolos of Mendes, who wrote under the name of Democritus,[26] so its author can also be called Bolos Democritus. Either way, the alchemical theory in *Physika kai mystika* is not considered to have any relation to the works of the fifth-century BC philosopher who proposed an atomic theory.

*Physika kai mystika* is part of the Leiden and Stockholm papyri, which are the only surviving documents concerning alchemy from Hellenistic Egypt.[27] These papyri were discovered in a grave in Thebes and contain around 250 recipes on practical and commercial usages such as processing gold, silver and other precious stones and dyeing textiles.[28] *Physika kai mystika* survives only in fragments. The literal translation of *Physika kai mystika* would be "physical and mystical matters," but some researchers point out that this is misleading. Jack Lindsay says, "*physika* here refers to the hidden forces in nature. It is equivalent to *phisikai dynameis*, with special reference to sympathies and antipathies."[29] Principe points out "The Greek word *mystika* did not refer in ancient times to what we today call mystical, that is, something having spiritual meaning, or expressing a personal experience of the ineffable. Instead, it simply meant things to be kept secret."[30] *Physika kai mystika* begins with two recipes for purple dyeing, and after the preface, gold-making and silver-making are explained.[31] These recipes, actually, do not

[25] Principe, *The Secrets of Alchemy*, p. 10.
[26] Jack Lindsay, *The Origin of Alchemy in Graeco-Roman Egypt* (London: Frederick Muller, 1970), pp. 90-110.
[27] Principe, *The Secrets of Alchemy*, pp. 10-11.
[28] Ibid., p. 10; Holmyard, *Alchemy*, p. 27.
[29] Lindsay, *The Origin of Alchemy*, p. 100.
[30] Principe, *The Secrets of Alchemy*, p. 12.
[31] Lindsay, *The Origin of Alchemy*, p. 100; Arthur John Hopkins, *Alchemy: Child of Greek Philosophy* (New York: AMS Press, 1967), pp. 64-66. Holmyard say that *Physika kai mystika* is "divided into four parts, dealing respectively with the making of gold, the making of silver, the making of gems, and the making of purple." Holmyard, *Alchemy*, p. 25. However, Lindsay says "Nothing is said of tinting precious stones." Lindsay, *The Origin of Alchemy*, p. 100. Hopkins summarizes its content but does not mention gems or precious stones.

contain a concept of transmutation as discussed in the later period;[32] it is more like changing the color of an object so as to resemble gold, silver or some other gems through metallurgical means.[33]

- Zosimus of Panopolis

Zosimus of Panopolis[34] is regarded as a historical person active around 300 AD, unlike earlier authors such as Hermes and (pseudo-) Democritus. By the time of Zosimus, the discipline of alchemy had been formed, merging different philosophical ideas, such as Hermeticism, Aristotelianism, Neo-Platonism, and Gnosticism, as well as artisanal craftsmanship. By organizing various earlier authorities, Zosimus offers, in his works, basic theories and concepts, to which later alchemists usually refer. Most of his writings also have been lost, and only fragments of some works have survived.[35]

We can find two major principles from Zosimus' writing. One is that he divides a metal into two components, that is, the "body" and the "spirit." The body (*sōma*) is the prime matter for each metal, which does not volatilize. The volatile spirit (*pneuma*) provides the color of metals, which determines the identity of metal.[36] In order to separate the body and the spirit, Zosimus introduces certain processes, such as distillation and sublimation, and apparatuses for carrying out these processes. The vapor volatilized from a substance through such techniques was regarded as the spirit. By using a number of distilling or sublimating apparatuses, such as *tribikos* and *kerotakis*, the practitioner of alchemy is able to separate the spirit from a body or rejoin the spirit to another body by exposing a substance to the vapor.[37] This kind of experimental and instrumental description in Zosimus' work often comes from Maria the Jewess, who

[32] Principe, *The Secrets of Alchemy*, pp. 12-13.
[33] Holmyard, *Alchemy*, pp. 25-26.
[34] Panopolis is today's Akhmīm in Egypt.
[35] Principe, *The Secrets of Alchemy*, p. 15.
[36] Ibid, p. 12; Holmyard, *Alchemy*, p. 26.
[37] Principe, *The Secrets of Alchemy*, p. 16; Holmyard, *Alchemy*, p. 48.

is considered to be a historical person around the first century AD.[38]

Another important principle of Zosimus is secrecy and ciphering. With the aim of concealment, some of the names of substances are replaced by another name, which can also be used for some other substances. For instance, the name "divine water" sometimes indicates a transmuting agent, and sometimes a lime-sulfur composition. It may also mean mercury. The term can be described with a riddle.[39] Another way the secrets of the art are safeguarded is by means of the so-called "*decknamen*."[40] *Decknamen* is a means of encryption of a text by substituting a pseudonym for the common name of the substance. The pseudonym usually has some literal or metaphorical relationship with the substance. Furthermore, the choice of the pseudonym should be logical so that the reader can solve the meaning of the text.[41] Principe argues that there are two purposes of the *decknamen*: not only to keep the meaning of the texts' secret but also to avoid misunderstanding among those who know how to decipher it.[42]

These two principles are widely accepted among Muslim alchemists. In most cases, however, body (*jasad*) and spirit (*rūḥ*) do not indicate the components of metal but a kind of metal and vaporizable mineral in many of the Arabic alchemical texts. Also, there is a process similar to extracting volatile matter, which determines the color, from a substance. Secrecy and *decknamen* are also an important component in Arabic alchemical literature.[43] Al-Ṭughrāʾī also mentions in *Ḥaqāʾiq* that the alchemists usually use ciphers, which are reasonably arranged and have no ambiguity, so they are solvable to anyone, though a long study is required.[44] This is exactly consistent with the definition of *decknamen*.

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[38] Lindsay, *The Origin of Alchemy*, p. 243. Her original writings have not been found, so we have to depend on the quotations of Zosimus and the later alchemists.
[39] Principe, *The Secrets of Alchemy*, p. 17.
[40] It means cover names in German. Ibid., p. 18.
[41] Ibid.
[42] Ibid.
[43] For some examples, see *Encyclopaedia of Islam*, 2nd ed., s.v. "al-Kīmiyāʾ."
[44] al-Ṭughrāʾī, *Ḥaqāʾiq*, p. 52.

- Stephanus and Morienus

Stephanus was a philosopher and public professor in Alexandria during the reign of Herakleios I (610-641), who is also referred as an alchemist in al-Ṭughrāʾī's works. In addition to being an alchemist, he also lectured on Aristotle, Plato, and various disciplines; he wrote a commentary on Aristotle and an astronomical work.[45] In comparison with Zosimus, who introduced apparatuses and described practical techniques of their usage, Stephanus' alchemy was indifferent to actual alchemical processes and transmutation. His interest was rhetorical and philosophical. The transmutation into gold was metaphorical to express men's progression to a nobler state.[46] Lindsay points out that "he wants to feel stirred and uplifted by suggestive enigmatic images or doctrines" and that "the ideas are playthings, instruments for his edification and for the display of his rhetorical and rhapsodical powers before duly dazzled audiences."[47] Nevertheless, Principe remarks, "their [Stephanus and later Greek alchemists] application of Greek philosophical thought, especially regarding matter, to alchemy continued the construction of an increasingly sophisticated theoretical framework for chrysopoeia.[48] Such developments were significant not just in themselves, but also because these later versions of alchemy would be inherited by the Arabic world."[49] In fact, Stephanus is involved in the legend which made Khālid ibn Yazīd (see below) into an alchemist. Some stories say that he taught alchemy to Khālid and translated books on alchemy into Arabic.[50] Although it does not seem to be a historical event, we can recognize his influence in the Islamic world.

Other stories say that Khālid learned alchemy from a Byzantine monk called Morienus (Maryānus)

[45] Lindsay, *The Origin of Alchemy*, p. 372; Holmyard, *Alchemy*, pp. 29-30.
[46] Principe, *The Secrets of Alchemy*, pp. 24-25; Holmyard, *Alchemy*, p. 31.
[47] Lindsay, *The Origin of Alchemy*, p. 372.
[48] Chrysopoeia means "gold-making." See Hopkins, *Alchemy*, p. 64; Principe, *The Secrets of Alchemy*, p. 13.
[49] Principe, *The Secrets of Alchemy*, p. 25.
[50] Ibid., p. 29.

and he was a disciple of Stephanus.[51] In the *Kashf*, written in the seventeenth century, one finds "Morienus the Monk (*Maryānus al-rāhib*), the teacher (*muʿallim*) of Khālid ibn Yazīd."[52] Despite his reputation throughout medieval Islam and even in the Latin tradition, many researchers do not consider him as a historical figure.[53] However, the fact remains that Stephanus' school had an important role in the reception of foreign knowledge in the Islamic world.

- Khālid ibn Yazīd

Now, we move on to alchemists in the Islamic world. Historically, Khālid ibn Yazīd (d. ca. 90/709) was a prince of the Umayyad Dynasty. His father was Caliph Yazīd ibn Muʿāwiya. After the death of Caliph Muʿāwiya II, Khālid's elder brother, Khālid missed the chance to become caliph. Although their relative Marwān ibn al-Ḥakam succeeded the caliph on the condition that Khālid would be the next in line, Marwān ibn al-Ḥakam instead chose his son, ʿAbd al-Malik as his successor.[54]

Both the *Fihrist* and the *Kashf* indicate that Khālid was the first person who was interested in alchemy and introduced it to the Muslim world.[55] However, not only is the story of Khālid and Morienus not considered to be historical, modern studies have not yet established whether Khālid, in fact, had commitments to alchemy. Julius Ruska argues that Khālid cannot have been involved with alchemy Whereas, Holmyard argues that we do not have to rely on Ruska's statement. For example, he regards Ruska's argument that a prince cannot pursue alchemical knowledge as unreasonable.[56] Although Holmyard's study was more than a half century ago, this issue has not been resolved yet.

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[51] Ibid.; Holmyard, *Alchemy*, p. 64; *Encyclopaedia of Islam*, 2nd ed., s.v. "Khālid b. Yazīd b. Muʿāwiya," by Manfred Ullmann.
[52] Ḥājjī Khalīfa, *Kashf*, 5: 276
[53] Principe, *The Secrets of Alchemy*, p. 29; *Encyclopaedia of Islam*, 2nd ed., s.v. "Khālid b. Yazīd b. Muʿāwiya."
[54] *Encyclopaedia of Islam*, 2nd ed., s.v. "Khālid b. Yazīd b. Muʿāwiya."
[55] Ibn al-Nadīm, *Fihrist*, 2: 448; Ḥājjī Khalīfa, *Kashf*, 5: 279-280.
[56] Holmyard, *Alchemy*, pp. 65-66.

- Jābir ibn Ḥayyān

Jābir ibn Ḥayyān is generally known as the greatest alchemist in medieval Islam. The *Kashf* also says that "The first person for whom this science [alchemy] is renowned is Jābir b. Ḥayyān al-Ṣūfī."[57] However, from classical to modern sources, his historical existence and the authorship of the many treatises attributed to him have been unresolved. The *Fihrist* says that "[a] group of scholars and the greatest copyists said that this man, which is meant Jābir, has no ground or reality."[58] Even modern researchers such as Paul Kraus, E. J. Holmyard, H. E. Stapleton and Fuat Sezgin did not reach a consensus on this issue. This is the so-called "Jābir-Problem."

The group of works attributed to Jābir is called the Jabirian corpus. Syed Nomanul Haq summarizes the difficulties for the analysis of this corpus. One of them is that the entire corpus covers so many disciplines and theories that we cannot find theoretical consistency. According to Haq, the corpus involves practical alchemical processes, classification, and theories of substances, medicine, pharmacology, astrology, theurgy, magic, the generation of living things, the topics being discussed in different treatises.[59] Furthermore, the authorities cited also vary from one part of the corpus to another. Not only are ancient alchemical figures cited, such as Zosimus, Democritus, and Hermes, but we also find quotations of philosophers such as Socrates, Plato, Aristotle and his commentators, Galen, Archimedes, and Euclid.[60]

Another difficulty is the obscurity of the texts. Unlike other alchemical texts, which are ciphered and apply *decknamen*, the Jabirian corpus avoids this kind of technique. The obscurity of the corpus lies in other aspects. First, there are unusual technical terms, which standard lexicographical works cannot

[57] Ḥājjī Khalīfa, *Kashf*, 5: 280.
[58] Ibn al-Nadīm, *Fihrist*, 2: 452.
[59] Syed Nomanul Haq, *Names, Natures and Things: The Alchemist Jābir ibn Ḥayyān and His Kitāb al-aḥjār (Book of Stones)* (Dordrecht: Kluwer, 1994), p. 5.
[60] Ibid.

illuminate. Second, the Jabirian corpus applies *tabdīd al-ʿilm* (dispersion of knowledge). This concept means that we cannot understand the truth from reading one part of the corpus - this part is simply a piece of the larger puzzle. We have to complete the entire corpus in order to understand it. Third, the terminology and theories are inconsistent. For example, mercury is classified as a metal in some texts but in other texts as a spirit, a substance which can volatilize.[61]

One more difficulty is how the Jabirian corpus is related to Shīʿism. The corpus contains Shīʿite doctrines such as occultation of the Imam and his messianic return. In addition, the corpus and some other sources mention the relationship between Jābir and the sixth imam Jaʿfar al-Ṣādiq (d. 147/765). However, the historical truth regarding their relationship has not been clearly proven. Paul Kraus does not believe there is one.[62] Instead, he claims that the corpus is due to a group of Ismāʿīlīs sometime after the middle of the ninth century.[63]

Kraus published a comprehensive study on the Jabirian corpus in 1942-1943,[64] and his thesis is still influential among researchers. He has two conclusions on the "Jabir-Problem:" 1) Except for *Kitāb al-raḥma al-kabīr*, one of the oldest titles in the corpus, the works in the corpus were written by a group of authors who share common ideological values, probably Ismāʿīlīs; 2) The earliest works of the Jabirian corpus were written after the middle of the ninth century. Therefore there are no works written in the eighth century when the historical Jābir[65] was alive.[66]

As Haq points out, Kraus' thesis makes it easier for researchers to handle the corpus. The collective authorship can explain the inconsistencies within the corpus. Dating after the mid-ninth century can

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61 Haq, *Names, Natures and Things*, pp. 6-7.
62 Ibid., pp. 14-15.
63 Ibid., pp. 22-22.
64 Paul Kraus, *Jābir ibn Ḥayyān: Contribution à l'histoire des idées dans l'Islam*, 2 vols. (Cairo: Imprimerie de l'Institute Français d'Archéologie Orientale, 1942-1943).
65 According to Holmyard, the historical Jābir is said to have been born in about 721 to 722 and died around 815. Holmyard, *Alchemy*, pp. 70-73.
66 Haq, *Names, Natures and Things*, p. 8.

explain why the corpus contains Arabic translations of Greek philosophical works. If we follow Kraus' thesis, the corpus was written under the influence of the translation movement. However, some researchers do not agree with his conclusions. Sezgin claims that the Arabic translations from Greek works did not necessarily begin from the ninth century. Haq also shows some evidence that some of the translations in the Jabirian corpus are independent of the style of the translation movement.[67] Also, issues regarding the historical Jābir remain in question. Holmyard does not reject the possibility of the authorship of a historical Jābir in the eighth century.[68] As for the Jābir-Jaʿfar relationship, while Kraus claims the inability to find evidence in authentic Shīʿite sources, Haq indicates some evidence to prove that it is historical.[69]

- Muḥammad ibn Zakariyyāʾ al-Rāzī

Muḥammad ibn Zakariyyāʾ al-Rāzī (d. 313/925) is well-known for being a doctor and philosopher as well as an alchemist. He was born in Rayy and worked as a director of a hospital there. He was also involved in the hospital construction project in Baghdād.[70] His medical writings include encyclopedic works, treatises on specific topics, and educational textbooks. In his medical theories, we can find opinions that are independent of conventional Greek medicine, such as Galenic medicine.[71] His philosophy is also idiosyncratic. Al-Rāzī discards the Aristotelian concept of nature, for he regards it as anthropomorphic. Furthermore, he abandons Aristotelian causality and, rather, leans toward Platonism.[72] Modern researchers consider that "we know his metaphysical views almost exclusively through hostile reports,"[73] which suggests few Muslim philosophers accepted his views.

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67 Ibid., pp. 25-29.
68 Holmyard, *Alchemy*, p. 74.
69 Haq, *Names, Natures and Things*, pp. 18-21.
70 Holmyard, *Alchemy*, p. 87.
71 *Encyclopaedia of Islam*, 2nd ed., s.v. "al-Rāzī," by L. E. Goodman.
72 Thérèse-Anne Druart, "Metaphysics," in *The Cambridge Companion to Arabic Philosophy*, ed. Peter Adamson and Richard C. Taylor (Cambridge: Cambridge University Press, 2005), p. 332.
73 Ibid.

As an alchemist, al-Rāzī had a relatively unique approach. He is often called the "experimental" or "skeptical" alchemist among modern researchers. His alchemical writings tend to focus on the description of practical processes rather than conceptual theories. For example, one of the best known works of al-Rāzī is *Kitāb al-asrār*,[74] whose contents are: 1) description and classification of substances; 2) description of instruments and apparatuses for alchemical processes; 3) description and example of each of the processes; and 4) recipes of the elixir. Another work of his, *al-Madkhal al-taʿlīmī*, which is considered the source for the chapter on alchemy in Aḥmad ibn Yūsuf al-Kātib al-Khwārizmī's *Mafātīḥ al-ʿulūm*,[75] consists of a description and classification of substances, apparatuses, and their usage.[76] Stapleton et al. argue that his empirical approach was not totally original. They observe that a part of the Jabirian corpus is a possible source for al-Rāzī's alchemical knowledge, such as the noticeable influence of Jābir's *Kitāb al-sabʿīn* (*Book of the Seventy*) on the text of the *Asrār* and the title headings of al-Rāzī's works which correspond with those of the Jabirian corpus.[77]

Only a few out of al-Rāzī's dozen-or-so surviving alchemical works have been studied carefully. Given this situation, can we really judge that al-Rāzī was a skeptical alchemist and, like modern scientists, indifferent to conceptual theories as some present-day researchers claim? It is true that al-Rāzī was reluctant to make his theory esoteric, but he does not necessarily reject esoteric alchemical theories, which had been developed since ancient times. In the *Kitāb al-shawāhid*, which deals with the ciphers of preceding alchemists such as Hermes, Zosimus, Apollonius, and Khālid, he states that this book is not crucial for his alchemical theory, which he has explained in the previous works, but is written to prove

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[74] Muḥammad Zakariyyāʾ al-Rāzī (4/10c), *Kitāb al-asrār*, in *Kitāb al-asrār wa-sirr al-asrār*, ed. M. T. Dānechepazhūh (Tehran: UNESCO, 1964), pp. 1-116. Hereafter *Asrār*.

[75] H. E. Stapleton, R. F. Azo and M. Hidāyat Ḥusain, "Chemistry in Iraq and Persia in the Tenth Century AD," *Memoirs of the Asiatic Society of Bengal* 8 (1927): 319.

[76] The Arabic edition and English translation of *al-Madkhal al-taʿlīmī* are included in ibid., pp. 412-417 and pp. 345-361. Hereafter *Madkhal*.

[77] Ibid., pp. 335-337.

that his theory does not disagree with that of preceding alchemists.[78] This attitude of his tells us that he was unwilling to enigmatize his own texts with ciphers but showed some respect for previous alchemists without criticizing, unlike what he did in his philosophy and medicine. In his *Asrār*, we also find preceding alchemists' names, such as Hermes, Zosimus, and Stephanus, as sources for his alchemical knowledge.[79] These facts suggest that al-Rāzī does not completely discard conventional views of alchemy.

Whether he was indifferent to conceptual issues or not, we also have to keep in mind that al-Rāzī probably wrote a refutation against al-Kindī's attack on alchemy, which has been lost but is mentioned in the *Fihrist* and *Kashf*.[80] According to the account of al-Kindī's refutation of alchemy in the *Kashf*,[81] his criticism of alchemy had two arguments: the impossibility of artificial reproduction of natural objects and the inseparability of metal into components, namely, tincture and base matter, which can define what kind of metal it is.[82] Since this discussion deals with natural philosophical concepts, it suggests that al-Rāzī's counterargument possibly involved conceptual arguments.

From these facts, it would be an over-simplification to regard al-Rāzī as either skeptical or empirical, like a modern chemist. We need to investigate this question from a more neutral point of view.

- Ibn Waḥshiyya

Ibn Waḥshiyya is better known as an author of works concerning magical crafts than as an alchemist. He was considered to be a pagan, specifically a Nabatean in the middle of the tenth century. The most famous work attributed to him is *Kitāb al-fīlāḥa al-nabaṭiyya*, which discusses agricultural and magical practices based on the Nabatean folk tradition. The *Fihrist* introduces a number of alchemical works attributed to

[78] H. E. Stapleton and R. F. Azo, "An Alchemical Compilation of the Thirteenth Century, A. D.," *Memoirs of the Asiatic Society of Bengal* 3 (1910): 69.
[79] al-Rāzī, *Asrār*, p. 1.
[80] Ibn al-Nadīm, *Fihrist*, 2: 460; Ḥājjī Khalīfa, *Kashf*, 5: 271.
[81] Al-Kindī's criticism of alchemy also has been lost.
[82] Ḥājjī Khalīfa, *Kashf*, 5: 275.

him,[83] but they cannot, as Hämeem-Anttila points out, be included in the same corpus as *Kitāb al-fīlāḥa al-nabaṭiyya*,[84] whose attribution is also still under debate. In this "Nabatean" corpus, we can also find possible alchemical sources. Hämeem-Anttila notes the similarities it shares with Bolos Democritus' works and the influence of Neo-Platonism.[85] Al-Ṭughrāʾī suggests a different tradition of Ibn Waḥshiyya. He considers Ibn Waḥshiyya as one of the figures who refers to the discussion of Pythagoras on numbers.[86] From these circumstances, we cannot identify which of his works or concepts were influential for later alchemists. What we can say is that the alchemical works attributed to him are not helpful in answering this question.

- Ibn Umayl

The name Ibn Umayl is mentioned in *Kashf*. Although his name does not appear in the *Ḥaqāʾiq*, Theodor Abt has pointed out that one of Ibn Umayl's works, *Ḥall al-rumūz*, is quoted in a work of al-Ṭughrāʾī.[87] He is not well known because of his secluded life[88], but we know that he was an alchemist in Egypt who passed away around the first half of the fourth century AH (i.e. 912-961 AD) according to Stapleton and Hidāyat Ḥusain.[89] Ibn Umayl is often regarded as an author of the so-called spiritual side of alchemy. This is because he did not necessarily pursue gold-making; rather, his objective is psychological transformation and perfection. Although his alchemical attitude seems different from other Muslim alchemists introduced here, his sources are similar to others. In his *Kitāb al-māʾ al-waraqī wa-'l-arḍ al-*

[83] Ibn al-Nadīm, *Fihrist*, 2: 460-461.
[84] Jaakko Hämeem-Anttila, "Ibn Waḥshiyya and Magic," *Anaquel de estudios Árabes* 10 (1999): p. 43.
[85] Ibid., pp. 43-44.
[86] al-Ṭughrāʾī, *Ḥaqāʾiq*, p. 57. As well as Ibn Waḥshiyya, Stephanus and Jābir are mentioned there.
[87] Theodor Abt, foreword to *Kitāb ḥall al-rumūz*, by Muḥammad ibn Umayl, eds. Theodor Abt, Wilferd Madelung and Thomas Hofmeier, trans. Salwa Fuad and Theodor Abt (Zurich: Living Human Heritage Publication, 2003), p. VII.
[88] Holmyard, *Alchemy*, p. 102.
[89] H. E. Stapleton and M. Hidāyat Ḥusain, "Muḥammad bin Umail: His Date, Writings, and Place in Alchemical History," in "Three Arabic Treatises on Alchemy by Muhammad bin Umail (10th Century A. D.)," *Memoirs of the Asiatic Society of Bengal* 12, no. 1 (1933): 123.

*najmiyya*, one finds the names of Hermes, Markos,[90] Democritus, Socrates, Plato, Zosimus, Mary the Jewess, Khālid ibn Yazīd, Dhū al-Nūn al-Miṣrī,[91] and Jābir.[92] The "spiritual side" of alchemy can be a useful word for analytical purposes, but we have to be careful regarding this categorization as a historical fact since the alchemists at that time seem to have shared similar sources and traditions, and none of the figures we have mentioned so far belonged to distinct schools with distinct objectives.

One of the reasons why Ibn Umayl has been studied is that his works contain quotations of preceding and contemporary works. In some parts of his *Māʾ al-waraqī*, he quotes from *The Convention of Philosophers*, an alchemical text read widely in the Latin world. Moreover, Stapleton and Hidāyat Ḥusain have pointed out that these two texts have some connection with al-Rāzī's *Kitāb al-shawāhid*, his compendium of earlier alchemists, especially on enigmatic expressions.[93] This means that al-Rāzī, who is said to be an experimental alchemist, and Ibn Umayl, a spiritual alchemist far from practical matters, possibly referred to the same sources. This suggests that no matter how different the alchemists' approaches to their craft may be, they had a common set of materials to study alchemy. Further study on this issue may contribute to identifying the authoritative sources for alchemists in medieval Islam, one of the major problems for the study of alchemy. This topic is discussed in detail in the later part of this chapter.

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[90] A king of Egypt, known as Marqūnis among Muslim alchemists. Sezgin, *GAS*, 4: 57.

[91] A Sufi and alchemist who lived in Akhmīm (Panopolis) and passed away in 246/861. Abt et al., introduction to *Kitāb Ḥall al-rumūz*, p. XIV; Ibn al-Nadīm, *Fihrist*, 2: 459.

[92] *Encyclopaedia of Islam*, 2nd ed., s.v. "Ibn Umayl," by G. Strohmaier; Muḥammad Ibn Umayl (4/10c), *Kitāb al-Māʾ al-waraqī wa-'l-ard al-najmiyya*, ed. Muḥammad Turāb ʿAlī, in Stapleton and Hidāyat Ḥusain, "Three Arabic Treatises on Alchemy," pp. 1-104.

[93] Stapleton and Hidāyat Ḥusain, "Muḥammad bin Umail," pp. 134-141.

## ii. Classification of alchemy within the rational sciences

The previous section focused on alchemists and their views on alchemy. This section discusses alchemy from the viewpoint of non-alchemists. First of all, how do the bibliographical works previously mentioned, the *Fihrist* and *Kashf*, describe alchemy?

In the *Fihrist*, Ibn al-Nadīm did not include alchemy in the section on philosophy and ancient science but, rather, assigns alchemy its own independent chapter. He also says that "there were authors and learned men in this field among the people of Egypt, where there was the beginning of talk about the Art and from which place they derived it."[94] In his view, alchemy has little relationship with Greek philosophy. Furthermore, he states that "the first man who spoke about the science of this art (alchemy) was Hermes."[95] In other words, Ibn al-Nadīm considers Hermes as the original author of alchemical knowledge. This difference of the origin may be one reason why he distinguishes alchemy from other philosophical disciplines.

In the *Kashf*, alchemy's origin is also discussed. The introduction discusses the importance of learning and classifies the various branches of knowledge.[96] In this introduction, Ḥājjī Khalīfa classifies knowledge by its origins with the following eight groups: 1) Indian; 2) Persian; 3) Chaldean; 4) Greek; 5) Roman; 6) Egyptian; 7) Hebrew; and 8) Arab. Alchemy belongs to the knowledge of the Egyptian people. Ḥājjī Khalīfa says that the "Ancients had an interest in various knowledge. One of them was Hermes Trismegistus before the Flood. After the Flood, he was a scholar of similar disciplines to philosophy (*ḍurūb al-falsafa*), especially the science of the talisman, incantation, glasses,[97] and alchemy."[98] Thus, Ḥājjī Khalīfa pays less attention to its relationship with Greek philosophy just as Ibn al-Nadīm, above. On

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[94] Dodge, trans., *The Fihrist of al-Nadīm*, p. 868.
[95] Ibid., p. 843.
[96] *Encyclopaedia of Islam*, 2nd ed., s.v. "Kātib Čelebi," by Orhan Ṣaik Gökyay.
[97] *Marāyā muḥriqa*. According to Ḥājjī Khalīfa, it is the knowledge for protection of city or castle utilizing reflection and refraction of sunlight. See Ḥājjī Khalīfa, *Kashf*, 5: 490.
[98] Ḥājjī Khalīfa, *Kashf*, 1: 74.

the other hand, in the entry on alchemy in the *Kashf*, he quotes discussions of Muslim philosophers such as al-Kindī, al-Fārābī, and Ibn Sīnā. Is alchemy a philosophical subject in Ḥājjī Khalīfa's classification? Judging from his description, he seems to consider that alchemy did not originally belong to the system of Greek philosophy, but via Muslim philosophers, it began to be involved in the philosophical discussion.

Unlike the *Fihrist* and *Kashf*, most works on the classification of disciplines do not mention the origins of alchemy. However, as we see in the *Kashf*, they tend to classify alchemy as a discipline of the rational sciences, which may involve Greek philosophy. We now discuss some examples of how alchemy was classified within the rational sciences.

- al-Khwārizmī's *Mafātīḥ al-ʿulūm*

*Mafātīḥ al-ʿulūm*[99] by al-Khwārizmī is a book dedicated to a vizier to the Sāmānid monarch Nūḥ II (976-997). It was a guidebook addressed to secretaries and bureaucrats to introduce basic elements and terms of each discipline.[100] Like the *Fihrist*, the *Mafātīḥ* consists of two parts: 1) Islamic sciences and related knowledge of the Arabs; and 2) foreign sciences from the Greeks and peoples of other nations.[101] The foreign knowledge part has nine chapters: 1) philosophy; 2) logic; 3) medicine; 4) arithmetic; 5) geometry; 6) astronomy; 7) music; 8) mechanics; and 9) alchemy. The chapter on alchemy is divided into three sections: 1) on the instruments of this craft; 2) on the substances (*ʿaqāqīr*) and medicine (*adwiyya*)[102] from gems and stones; and 3) on the preparation of these things and their treatment.[103]

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[99] Muḥammad ibn Aḥmad al-Khwārizmī (4/10c), *Mafātīḥ al-ʿulūm*, ed. G. Van Vloten (Leiden: E. J. Brill, 1895; repr., Leiden: E. J. Brill, 1968). Hereafter *Mafātīḥ*.

[100] *Encyclopaedia of Islam*, 2nd ed., s.v. "al-Khwārazmī," by A. I. Sabra.

[101] al-Khwārizmī, *Mafātīḥ*, p. 5.

[102] English words are from the translations of the chapter on alchemy of *Mafātīḥ* in Stapleton et al., "Chemistry in Iraq and Persia," pp. 362-368. The terms *ʿaqāqīr* and *adwiyya* often appear in al-Rāzī's works. According to *Asrār*, those two can be used interchangeably. The term "substance," which is usually the translation of *jawhar*, indicates a matter which can be a part of a compounded body (e.g. Ibn Sīnā's usage of *jawhar*. See the second section of the second chapter). On the other hand, according to *Asrār*, *ʿaqāqīr* and *adwiyya* specifically mean purified or processed matters through some operations.

[103] al-Khwārizmī, *Mafātīḥ*, pp. 205-206.

As previously mentioned, the content of this chapter was mainly influenced by al-Rāzī's *Madkhal*.[104] Thus, al-Khwārizmī also deals with practical issues in alchemy. The first section enumerates the names and usage of instruments. Mainly, the instruments for metallurgy, distillation and sublimation, and several kinds of stoves are introduced. The second section enumerates the names of substances. Metals (*ajsād*)[105] and spirits (*arwāḥ*)[106] are introduced first. He also introduces the corresponding names of planets to the metals as symbolic names, which can be regarded as a kind of *decknamen*. Next, he describes how metals withstand fire while spirits vaporize (*ṭāra*) upon contact with fire.[107] Then the names of other minerals[108] and substances called derivative substances (*ʿaqāqīr muwallada*)[109] are introduced. The third section is a glossary of alchemical operations. Eleven types of operations are introduced (sublimation, solution, coagulation, assation, ceration, rusting, calcination, lixivation, amalgamation, fixation, and *istinzāl*[110]). Important terms in alchemical operations are also explained. Specifically, he describes philosopher's clay (*ṭīn al-ḥikma*)[111], elixir (*iksīr*), "the stone" (*ḥajar*) and the role of arsenic sulfide, sulfur, and mercury in the operations.

As for al-Khwārizmī's classification of alchemy, alchemy belongs to the natural sciences (*ʿilm al-ṭabīʿa*). In the first chapter on the foreign sciences, which is a part of philosophy, he produces an Aristotelian classification of disciplines.[112] The disciplines of the natural sciences are medicine,

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[104] Stapleton et al., "Chemistry in Iraq and Persia," p. 319.

[105] Although the term "*ajsād*" usually means "bodies," al-Khwārizmī here defines *ajsād* as gold, silver, iron, copper, lead, tin and *kharṣīnī*. See ibid., p. 363. *Ajsād* often means "metals" in an alchemical context.

[106] Sulfur, arsenic sulfide (*zarnīkh*), mercury, sal-ammoniac (*nūshādar*).

[107] Ibid., pp. 258-259.

[108] Salt, sal-ammoniac, borax, vitriol, marcasite, *maghnisiyya*, *tūtiya*, Malachite, lapis lazuli, mica, gypsum, *shādhana*, galena, dross of glass, arsenic oxide, *daws*, *sakta*, rātīnaj, arsenic sulfide and *maghnāṭīs*. The translations of these names are from Stapleton et al., "Chemistry in Iraq and Persia," pp. 364-365.

[109] Eight substances are introduced, which are *zanjār*, *zunjufr*, *usrunj*, litharge, *qalīmiya*, *isfīdāj*, ferric oxide and *tūṭiyā*. The translation of those names from ibid., pp. 365-366.

[110] A purification process using an apparatus called *būt-bar-būt*. For a further description, see ibid., pp. 328-329.

[111] It is usually used to fix the connection between instruments and to coat glass instruments to protect them from the heat of fire.

[112] In al-Khwārizmī's classification, philosophy consists of two parts: 1) theoretical (*naẓarī*) and 2) applied (*ʿamalī*). The theoretical part has natural science (*ʿilm al-ṭabīʿa*), theology or metaphysics (*ʿilm al-umūr al-ilāhiyya*),

meteorology, mineralogy, botany, zoology, physics and the crafts of alchemy. He includes alchemy "because it does research on mineral matters (*li-anna-hā bāḥitha ʿan al-maʿdaniyyāt*)."[113] In *Mafātīḥ*, alchemy is introduced as if it is one of the Aristotelian philosophical disciplines. In contrast to the *Kashf*, the *Mafātīḥ* does not include alchemy in the same group as the talismanic art and incantation; nor does al-Khwārizmī refer to Hermes Trismegistus. Some classifications, such as that of Ibn Sīnā, group alchemy with these arts, though they basically apply the Aristotelian classification. This will be discussed in detail later.

On the other hand, the *Mafātīḥ* mentions alchemy's secrecy and ciphers like a *decknamen*. Al-Khwārizmī states that "the masters of this art (alchemy) use ciphers metonymically."[114] He also says that the word *kīmiyāʾ* is derived from a phrase meaning hiding or concealing.[115] However, he never discusses the difficulty of mastering alchemy and its esoteric nature. Rather, he seems to describe alchemy as exoteric knowledge, for he includes alchemy within the Aristotelian philosophical classification and describes only the practical aspects such as classification of minerals, substances, instruments and their usage. His description of alchemy gives the impression that it is a discipline that anyone would be able to learn.

- Al-Fārābī's classification

A philosopher in the ninth century, Abū Naṣr Muḥammad al-Fārābī (d. 339/950) also wrote a work on the classification of disciplines, called *Iḥṣāʾ al-ʿulūm*.[116] He divided it into five parts: 1) linguistics (*ʿilm al-*

mathematics (*al-ʿilm al-taʿlīmī wa-'l-riyāḍī*) and logic (*al-mantiq*). The applied part has ethics (*ʿilm al-akhlāq*), governance of household or economics (*tadbīr al-manzil*), and politics (*siyāsa*). al-Khwārizmī, *Mafātīḥ*, pp. 132-133.

[113] Ibid., p. 133.

[114] Ibid., p. 258. His examples of ciphers are using the names of planets to designate metals (e. g. the sun for gold and the moon for silver).

[115] Ibid., p. 256. Stapleton et al. translated this part of the text as "The name of this Art is *Al-Kīmiyāʾ* and the word is Arabic, being derived from '*Kamā Yakmī*', which means 'to hide' or 'to conceal': as in the phrase *Kama'sh shahādata yakmihā*, meaning 'he concealed his evidence.'" Stapleton et al., "Chemistry in Iraq and Persia," p. 362.

[116] Abū Naṣr Muḥammad al-Fārābī (4/10c), *Iḥṣāʾ al-ʿulūm*, ed. ʿAlī Bū Malḥam (Beirut: Dār wa-Maktabat al-Ḥilāl,

*lisān*); 2) logic (*ʿilm al-manṭiq*); 3) mathematics (*ʿilm al-taʿlīm*); 4) natural science (*al-ʿilm al-ṭabīʿī*) and theology or metaphysics (*al-ʿilm al-ilāhī*); and 5) political science (*al-ʿilm al-madanī*), jurisprudence (*ʿilm al-fiqh*), and speculative theology (*ʿilm al-kalām*). In fact, he does not list alchemy anywhere in this work. Furthermore, in the section of natural science, al-Fārābī does not intend to list any specific disciplines belonging to it. He says that it is divided into eight major parts: 1) a study on combination in natural bodies,[117] all of which are simple or compound; 2) a study on simple bodies; 3) a study on generation and corruption of natural bodies; 4) a study on the origin of accidents; 5) an examination of compound bodies; 6) an examination of what the bodies that are compounded and uniform in their parts have in common; 7) an examination of what various types of plants have in common; and 8) an examination of what various types of animals have in common.[118] It looks like al-Fārābī does not categorize alchemy as a natural science. However, in another work of his, an epistle on alchemy,[119] he says that alchemy is "a part of the natural science made of the parts whose comprehension is difficult in the beginning."[120] Furthermore, he also says that the comprehension of alchemy is impossible "until the observer learns the part of natural science concerning the compound bodies that are uniform in their parts, namely, minerals."[121] In other words, al-Fārābī considers that alchemy involves the observation of compound bodies, which is identical to the sixth part of natural science in the *Iḥṣāʾ*. It is true that al-Fārābī does not list alchemy in the *Iḥṣāʾ* as Forster states,[122] but we can also say that he just did not list specific names of disciplines, and alchemy was categorized as a part of natural science in a non-evident way.

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1996). Hereafter *Iḥṣāʾ*.

117 Al-Fārābī divided corporeal objects into natural (*ṭabīʿī*) and artificial (*ṣanāʿī*). Ibid., p.67. Peripatetic philosophy usually distinguishes them in this way. *The Stanford Encyclopedia of Philosophy*, Winter 2011 ed., s.v. "Artifact," by Risto Hilpinen.

118 al-Fārābī, *Iḥṣāʾ*, pp. 72-74.

119 Abū Naṣr Muḥammad al-Fārābī (4/10c), *Risālat al-Ḥakīm al-Fāḍil al-Muṭqān al-Muḥaqqiq Abī Naṣr al-Fārābī fī wujūb ṣināʿt al-kīmiyā*, ed. Aydin Sayılı, in *Türk tarih kurumu belleten* 15 (1951): 75-79. Hereafter *Wujūb*.

120 Ibid., p. 76.

121 Ibid.

122 *Encyclopaedia of Islam*, 3rd ed., s.v. "Alchemy," by Regula Forster.

On the other hand, al-Fārābī, in his epistle on alchemy, also discusses alchemy's secrecy and esoteric nature. He says that "the intention of people who record this craft [i.e. alchemy] is to conceal it and not to make anyone learn it from them except someone who is wise in the same society of theirs."[123] He mentions that poetic expressions (*aqāwīl shiʿriyya*), ciphers (*rumūz*), riddles and puzzles (*lughz* or *muʿammā*) are employed to make alchemical theories difficult to understand. Furthermore, al-Fārābī explains why alchemical theories have to be secret. According to him, if everyone can learn alchemy, the values of gold, silver and precious stones will be nothing, which is crucial for business as currencies. Because it is harmful to the community and civilization, alchemists have to keep their knowledge secret.[124]

He also tries to answer questions such as whether alchemists, who keep secrets, intend to monopolize the benefits of their secret craft. He takes the position that one should practice alchemy for the pursuit of knowledge, the goal of philosophers, rather than for gaining profit. He states, "Complete understanding and happiness happens to a possessor of the excellent skill [of alchemy] without being aware. Then, he will be satisfied with what is attained from philosophy, which is stronger than the satisfaction with his profit from this craft."[125] Furthermore, he adds, "If anyone but a philosopher acquired this craft, there would occur a big corruption in the world."[126] This is how al-Fārābī argues that alchemy should be a discipline of philosophy.

Just like the *Mafātīḥ* of al-Khwārizmī, who was his contemporary, al-Fārābī regards alchemy as a discipline of philosophy, a part of natural science. However, he strongly recognizes the esoteric aspect of alchemy while *Mafātīḥ* just looks at its exoteric aspect. Why was there such a gap between them? Further studies are necessary to clarify this. We do not even know al-Fārābī's sources of alchemical knowledge. Was it possible that he was influenced by his elder contemporary, al-Rāzī, whose alchemy was far from

[123] al-Fārābī, *Wujūb*, p. 75.
[124] Ibid., pp. 76-77.
[125] Ibid., p. 77.
[126] Ibid.

esoteric? If not, what were al-Fārābī's sources for alchemy?

- Ibn Sīnā's *Aqsām al-ʿulūm*

Like al-Fārābī, Ibn Sīnā (d. 428/1037) also wrote an epistle on the classification of disciplines, entitled *Risālat aqsām al-ʿulūm al-ʿaqliyya*.[127] The classification method of the *Aqsām*, just as the *Mafātīḥ* and the *Iḥṣāʾ*, is Aristotelian. Fundamental disciplines of natural science that he lists are: 1) physics; 2) astronomy; 3) generation and corruption; 4) meteorology; 5) mineralogy; 6) botany; 7) zoology; and 8) psychology. These are almost the same as the division in his *Kitāb al-shifāʾ*. In addition to this, he lists the disciplines of applied natural science (*ḥikma ṭabīʿiyya farʿiyya*): 1) medicine (*ṭibb*); 2) astrology (*aḥkām al-nujūm*); 3) physiognomy (*ʿilm al-firāsa*); 4) dream interpretation (*ʿilm al-taʿbīr*); 5) talismanic science (*ʿilm al-ṭilasmāt*); 6) science of incantation (*ʿilm al-nayrunjiyāt*); and 7) alchemy (*ʿilm al-kīmiyāʾ*).[128] Al-Ghazālī (d. 505/1111) in his *Tahāfut al-falāsifa* also shows the same classification of applied natural science.[129]

In addition to the classification, Ibn Sīnā gives a definition of alchemy:

> Among these (classifications) is alchemy (*ʿilm al-kīmiyāʾ*). Its aim is taking away from mineral substances their properties (*khawāṣṣ*), giving other properties to them and giving some properties to some of them, in order to achieve making gold and silver from metals (*ajsām*)[130] that are neither of the two.[131]

Ibn Sīnā seems to be interested in a theoretical explanation of transmutation. He states that alchemists try to acquire transmutation by exchanging properties which a metal possesses. This has been one of the basic theories of alchemy since the time of Alexandrian alchemists such as Zosimus, who claims that a metal

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[127] Ibn Sīnā(5/11c), *Risālat aqsām al-ʿulūm al-ʿaqlīya*, ed. Mohsen Kadivar, in *The Journal of Sapiential Wisdom and Philosophy (Sophia Perennis)* 5, no. 1 (2009): 106-137. Hereafter *Aqsām*.

[128] Ibid., pp. 109-111.

[129] Ibn Rushd(6/12c), *Tahāfut al-tahāfut*, trans. Simon van den Bergh (London: Oxford University Press, 1969), pp. 311-312.

[130] Ibn Sīnā, *Aqsām*, p. 128, note 228 indicates that some witnesses for the text say *ajsād*, so it should mean "metals" rather than just "bodies." For the meaning of *ajsād*, see note 105 of this thesis.

[131] Ibn Sīnā, *Aqsām*, p. 111.

consists of "body" and "soul," as described before. On the other hand, he appears indifferent to other alchemical traditions such as Hermeticism and ciphers. Although Ibn Sīnā tries to prove the impossibility of metallic transmutation and criticizes alchemists in the meteorology and mineralogy section of his *Kitāb al-shifāʾ*, his discussion is always on theoretical issues. More precisely, Ibn Sīnā is concerned with proving that change of properties of a metal (e. g. colors) does not mean the transmutation of the metal. His criticism does not reach to the esoteric aspect of alchemy, ciphering or motivation for making gold. A detailed examination of Ibn Sīnā's criticism of alchemy will follow later in the second chapter.

What is "applied natural science (*ḥikma ṭabīʿiyya farʿiyya*)" in the *Aqsām*? Is it a different classification from that of *Mafātīḥ* or *Iḥṣāʾ*? The word *farʿī* is sometimes translated as secondary or subdivisional, but in this case, it should not be just secondary. Rather, we should interpret it as practical or applied. When we look at other disciplines in this group, every discipline utilizes the theories of natural science for the satisfaction of human demands. Medicine is "to remove illness and maintain health."[132] Astrology is to demonstrate "from the shape of stars (…) the current position in the phases of the world, community, empires, cities, births, offshoots, dispatches, choices and issues."[133] Physiognomy is for "demonstrating characters of a person from the physical constitution."[134] Dream interpretation is to demonstrate "what a soul witnessed."[135] Talismanic science is "to combine the heavenly powers with the earthy bodies so that, in that manner, one can form a power which has a strange effect on the earth."[136] Incantation is "to combine the powers in substances of the earth to create from them a power from which strange effects are produced."[137] Judging from these purposes, Ibn Sīnā does not consider alchemy as al-Khwārizmī and al-Fārābī do. While alchemy in the *Mafātīḥ* and the *Iḥṣāʾ* is one of the disciplines for

[132] Ibid., p. 110.
[133] Ibid.
[134] Ibid., p. 111.
[135] Ibid.
[136] Ibid.
[137] Ibid.

pursuing wisdom, in the *Aqsām* it appears to be introduced as a discipline for practical purposes related to philosophy. Besides, from our modern point of view, those applied natural sciences can be occult or pseudo-scientific subjects, so we tend to view them as "less" scientific or philosophical subjects. This view may be reinforced if we translated *farʿī* as "subdivisional." Ibn Sīnā does not seem to regard them as "subdivisonal" in this meaning, but his meaning of "subdivision" lies in the difference of objectives from the fundamental subjects of natural science. Judging from his description of the subjects, both divisions share theoretical foundations. Therefore, we have to be careful when considering alchemy in Ibn Sīnā's classification. It cannot simply be a discipline of natural science or natural philosophy or an "occult" subject.

- Ibn Khaldūn's *Muqaddima*

Ibn Khaldūn (d. 784/1382) describes the classification of disciplines in his *Muqaddima*.[138] He divides disciplines into two parts: philosophical sciences (*al-ʿulūm al-ḥikmiyya al-falsafiyya*) and transmitted sciences (*al-ʿulūm al-naqliyya*).[139] He also calls philosophical sciences rational sciences (*al-ʿulūm al-ʿaqliyya*) and gives their four divisions: 1) logic; 2) natural science; 3) theology or metaphysics; and 4) mathematics. Mathematics has four disciplines: geometry, arithmetic, music, and astronomy. The objects of study for natural science are "minerals, plants, animals, celestial bodies, natural motions or soul from which the motions emanate, and so forth."[140] Medicine and agriculture are disciplines of applied natural science (*furūʿ al-ṭabīʿiyyāt*).[141]

After the chapters on each of the transmitted and rational sciences, his description moves on to

[138] Ibn Khaldūn (8/14c), *Muqaddima*, ed. M. Quatremère, 3 vols. (Paris: Libraire de l'Institute Impérial de France, 1858; repr., Beirut: Maktabat Lubnān, 1970); Ibn Khaldūn, *Muqaddima*, trans. Franz Rosenthal, 2nd ed., 3 vols. (London: Routledge & Kegan Paul, 1967).
[139] M. Quatremère, ed., *Muqaddima*, 2: 385.
[140] Ibid., 3: 86-88.
[141] Ibid., 3: 88; ibid., 3: 120.

three disciplines: 1) the sciences of sorcery and talismans; 2) the science of cipher; and 3) the science of alchemy. Do these sciences belong to any of the classifications or are they a special division? Ibn Khaldūn says that "many people are content with borrowing mathematical [theories] and [the knowledge] related to them in sciences of astrology, sorcery, and talismans. Of the people of the *Mashriq*, Jābir b. Ḥayyān and of the people of *Andalus*, Maslama b. Aḥmad al-Majrīṭī were famous for this."[142] Judging from this passage, Ibn Khaldūn does not seem to include the science of sorcery and talisman in mathematics or even rational science though they are partly related. At the same time, we have to keep in mind that al-Majrīṭī is more known as an alchemist than as an author of talismanic science, and Jābir is not usually known for talismanic science. Why did Ibn Khaldūn identify them as the specialists of these subjects? He stated in the section on alchemy that "since [alchemy] is the creation of gold in a substance completely different from gold, it is one of the types of sorcery. Discussions on alchemy belong to teachings of the scholars such as Jābir, Maslama and preceding philosophers of various countries who are similar to this style."[143] This implies that Ibn Khaldūn includes alchemy in the same group as sorcery and that Jābir and al-Majrīṭī are regarded as important figures in this category. Furthermore, he says in another section that if alchemy is like what Jābir and al-Majrīṭī discuss, it is not in the field of natural sciences (*tabīʿiyyāt*) but of sorcery and other supernatural subjects.[144] Therefore, he excludes alchemy, especially the alchemy studied by these two authors, from the subjects of natural science. For Ibn Khaldūn, unlike Ibn Sīnā, alchemy is not a philosophical subject, but more like an occult or pseudo-scientific subject.

One of the reasons for this view on alchemy is the secrecy of alchemy, that is, the application of ciphers and riddles. He even knows the existence of Jābir's *tabdīd al-ʿilm* (dispersion of knowledge),[145] which we mentioned in the first section of this chapter. In addition, Ibn Khaldūn considers that alchemists

[142] Ibid., 3: 92; Franz Rosenthal, trans., *Muqaddima*, 3: 116.
[143] M. Quatremère, ed., *Muqaddima*, 3: 209; Franz Rosenthal, trans., *Muqaddima* 3: 245-246.
[144] M. Quatremère, ed., *Muqaddima*, 3: 239.
[145] Ibid., 3: 192

enigmatize their discussions because they would be legally accused of practicing sorcery if the contents of the discussions were clearly known.[146]

Although Ibn Khaldūn does not consider alchemy a philosophical discipline, he recognizes that alchemy and transmutation of metal can also be discussed as philosophical issues, especially as natural science. Ibn Khaldūn shows, in the section on his refutation of alchemy, various stances on alchemy, no matter whether one believes in transmutation or not. He first distinguishes those who discuss transmutation as a key component of alchemy from those who are indifferent to transmutation. The latter group just intends to forge gold, knowing the impossibility of transmutation. With respect to the former, he presents two different theories that discuss transmutation. One is sorcery. As previously mentioned, according to Ibn Khaldūn, this kind of theory is claimed by Jābir and al-Majrīṭī with enigmatic expressions. The other is natural science. Ibn Khaldūn introduces several camps. One is al-Fārābī's explanation, which claims that all metals are the same species, so transmutation is possible. Another is that of Ibn Sīnā, who claims every metal belongs to a different species, so transmutation is impossible. The other is that of al-Ṭughrāʾī, who follows Ibn Sīnā on the species of metals, but who claims that transmutation is still possible. Each of the explanations is examined in detail in the second chapter.

[146] Ibn Khaldūn says, "[T]hey used puzzling expressions. They wanted to protect alchemy from the disapproval that religious laws express for the various kinds of sorcery." Franz Rosenthal, trans., *Muqaddima*, 3: 246.

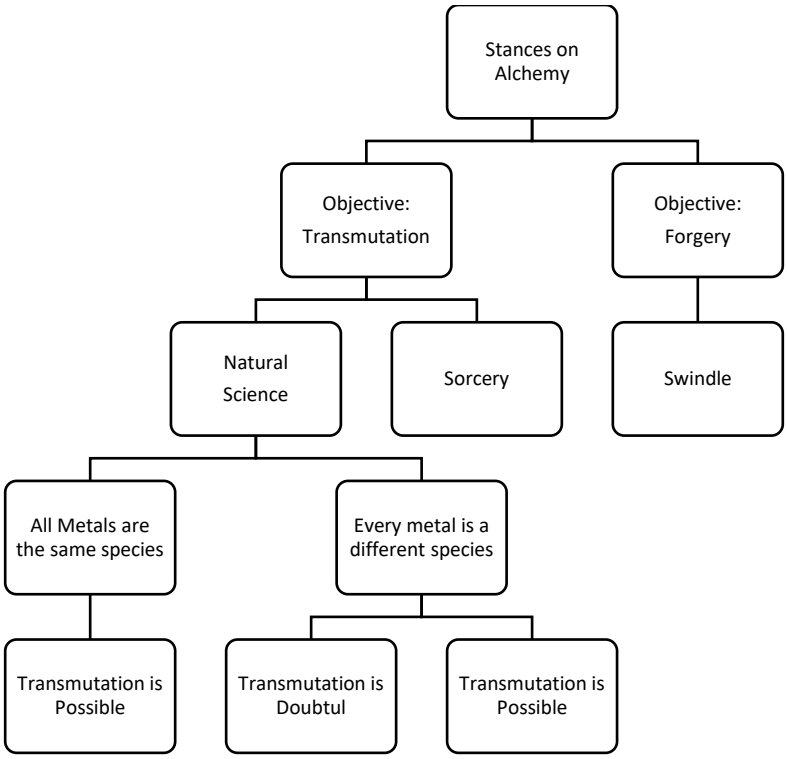


**Figure 1: Ibn Khaldūn's distinction of discussions on alchemy**

## iii. Problems faced when researching alchemy in medieval Islam

We have looked at major alchemists before the age of al-Ṭughrāʾī and their accomplishments and examined how alchemy was understood and classified by non-alchemists. It was found that alchemists, whether Alexandrian or Muslim, do not all share a common stance and theoretical background. It is also difficult to extract a concensus on alchemy among non-alchemists, whose classifications and descriptions also vary. It is true that we can reach a certain level of understanding of each alchemist's accomplishment from previous studies, but many points remain unclarified when we examine the connection between alchemists and what kind of tradition was transmitted among them. This situation is probably due to the diversity and incoherence among primary sources as found in the previous sections. In this section, we discuss this issue in detail and examine why the study of alchemy in medieval Islam has not progressed sufficiently and what are the obstacles to its study.

- What are authoritative texts in alchemy?

We might expect there to be a source that every alchemist refers to such as Ptolemy's *Almagest* in astronomy. We can find a commonality in terms of the names of alchemists listed in the works and treatises concerning alchemy, either by alchemists or non-alchemists. However, we can find no specific sources that can be regarded as authoritative among alchemists. The authoritative figures themselves are rather clear, but which text would every alchemist have read is a difficult problem to solve. One of the reasons for the difficulty is that translations and commentaries of ancient works on alchemy had not much been done by Muslims. There are not many commentaries of Muslim alchemists aside from those of al-Jildakī, who has yet to be studied extensively. Another reason is that many of the authoritative figures or their accomplishments are legendary. This produces a confusing picture when attempting to identify the original sources that alchemists would have referred to.

For example, it is uncertain how alchemists knew about Hermes Trismegistus, even though every alchemist mentions him as one of the authorities. Aside from the *Emerald Tablet*, it is rare that specific sources attributed to Hermes are mentioned. Besides, numerous works were written under the name of Hermes between the tenth and eleventh century, and they were not influenced by Greek and Coptic Hermetic literature. Stapleton examined Hermes' words in the book called *al-Māʾ al-waraqī wa-'l-arḍ al-najmiyya* by Ibn Umayl, and he raised the possibility that Ibn Umayl directly translated texts from the Greek attributed to Hermes.[147] Al-Ṭughrāʾī also often cite Hermes' words in his *Ḥaqāʾiq*, but he does not mention specific sources. This issue is investigated in the third chapter. Moreover, we also have to keep in mind that the Hermetic idea employed in Zosimus' works and that which appeared in the *Emerald Tablet* have different theoretical foundations. As mentioned in the previous section, Zosimus uses Hermes' authority for the spiritual aspect of alchemy, while the *Emerald Tablet* and citations of it by Muslims tend to deal with more natural philosophical issues. Thus, we cannot easily assume that Hermeticism in alchemy has a single comprehensive framework. It might be more like a multi-layered structure, which is confusing when we are trying to identify what alchemists had read of the Hermetic literature.

The story of Khālid and Morienus is not usually regarded as a historical fact as mentioned before. Even Khālid's commitment to alchemy is suspicious. Nevertheless, not only do most alchemical works but also bibliographical works mention Khālid and Morienus as important earlier alchemists, and they often state that Khālid was the first alchemist in the Islamic world.[148] Why did most of these authors reach a kind of consensus about him? Even if Khālid actually studied and wrote on alchemy, Khālid's works must not have been so popular that every alchemist was able to access them, for even Ibn al-Nadīm states

[147] H. E. Stapleton, G. L. Lewis and F. Sherwood Taylor, "The Saying of Hermes Quoted in the *Māʾ al-waraqī* of Ibn Umail," *Ambix* 3, nos. 3 and 4 (1949): 69-90. The Greek alchemical fragments attributed to Hermes that Stapleton investigated are considered to be separate works from the *Emerald Tablet*. Ibid., p. 85.

[148] On the other hand, Ibn Khaldūn was suspicious of Khālid's commitment to alchemy. Ibn Khaldūn, *Muqaddima*, p. 193.

that he only "saw" his works.[149] Thus, there must be another source that made Khālid and Morienus authoritative, though it might not be an original work.

Jābir ibn Ḥayyān could be the most authoritative alchemist among Muslims. Al-Rāzī calls him his master, and the *Fihrist* and the *Kashf* say that he is the best known alchemist. Nevertheless, every alchemist does not necessarily cite or comment on Jābir. In addition, although we may find the mention of some important works in the Jabirian corpus in many alchemical treatises, every treatise does not necessarily choose the same work of Jābir. Al-Ṭughrāʾī introduces his *Kitāb al-raḥma*[150] in the *Haqāʾiq*. Ibn Khaldūn says, "He has seventy epistles in alchemy,"[151] which probably means the *Seventy Books*[152] from the Jabirian corpus. Al-Jildakī, according to *Kashf*, chooses *Five-hundred* (*Khamsumiʾa*).[153] As we discussed, the works in the Jabirian corpus are not necessarily consistent. Thus, similarly to Hermes, we cannot identify the core idea or the most influential work of the corpus that every alchemist actually referred to, even if Jābir is the most well-known and influential alchemist in the Islamic world.

Because of this, we cannot specify the idea or work that every alchemist must have read even of the authoritative alchemists. Muslim alchemists tend not to discuss and comment on some common specific sources, but rather they choose the sources that interest them. Also, many of the important authorities in alchemy in the Islamic world were legendary persons. As a result, identifying the original sources that alchemists would have referred to is very difficult. Previous studies have been mainly focused on the examination of the historicity of the legendary figures or their attribution. However, we should also shed light on the sources that might have had an influence on alchemical literature in the later period, regardless of their historicity.

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149 Ibn al-Nadīm, *Fihrist*, 2: 449.
150 No. 5 in Kraus' catalogue of the Jabirian corpus. Kraus, *Jābir ibn Ḥayyān*, 1: 5-9.
151 Ibn Khaldūn, *Muqaddima*, 3: 192.
152 No. 6-122 in Kraus' catalogue of the Jabirian corpus. Kraus, *Jābir ibn Ḥayyān*, 1: 10-40.
153 No. 447-946 in Kraus' catalogue of the Jabirian corpus. Ibid., 1: 100-110.

One of the few possible influential sources among Muslim alchemists that modern research has revealed is *The Convention of Philosophers*,[154] which played an important role in medieval Latin alchemy. In this text, nine ancient Greek philosophers[155] take part in a discussion on alchemy. The origin of this text has been investigated by modern researchers since it was unclear if the original text had been written in ancient times or medieval Islam. The Latin text shows some signs of translation from Arabic, but at the same time, some of the contents are cited from Greek texts.[156] It is known that *The Convention of Philosophers* already had an influence on Muslim alchemists. A similar text exists in the Jabirian corpus.[157] Furthermore, Stapleton et al. have also proven that a citation from it is found in Ibn Umayl's *Māʾ al-waraqī* and al-Rāzī's *Kitāb al-shawāhid*.[158] After the research of Stapleton et al., Plessner provided evidence that the original text is dated around 900 AD, though it remains unknown whether it was written in Arabic or Greek.[159] *The Convention of Philosophers* can provide clues to answer the question of why many Muslim alchemists did not directly study Alexandrian alchemists, but did show some specific reference to the names of Greek philosophers and interest in Greek philosophy. Further research on the relationship between this text and Arabic alchemical texts is needed to solve this problem.

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[154] The participants in *The Convention of Philosophers* or *Turba philosophorum* in Latin are, according to the text, Iximidrus, Exumdrus, Anaxagras, Pandulfus, Arisleus, Lucas, Locuster, Pitagoras and Eximenus. In the discussion, ancient Greek philosophers, such as Socrates, Plato, Democritus and Hermes Trismegistus, are sometimes cited. The English translation from a Latin text is *Turba philosophorum*, trans. Arthur Edward Waite (London: George Redway, 1896; repr., New York: S. Weiser, 1970).

[155] Plessner points out that the names of the philosophers were misspelled because of Arabic transliteration. The nine philosophers should be Anaximander (d. ca. 547 BC), Anaximenes (d. ca. 6c BC), Anaxagoras (d. ca. 428 BC), Empedocles (d. ca. 432 BC), Archelaus (d. ca. 5c BC), Leucippus (d. ca. 5c BC), Ecphantus (d. ca. 4c BC), Pythagoras (d. 496 BC), and Xenophanes (d. ca. 6c BC). M. Plessner, "The Place of the *Turba philosophorum* in the Development of Alchemy," *Isis* 45, no. 4 (1954): 33.

[156] Holmyard. *Alchemy*, p. 82.

[157] Kraus, *Jābir ibn Ḥayyān*, 1: 30; Ibid., 2: 59. Kraus indicates that a similar text to *Turba philosophorum* occurs in *Kitāb al-mujarradāt* (No. 63-64 in his catalogue) in *The Book of One Hundred and Twenty*.

[158] H. E. Stapleton and M. Hidāyat Ḥusain, "Three Arabic Treatises on Alchemy," *Memoirs of the Asiatic Society of Bengal* 12 (1933): 1-212.

[159] See Plessner, "The Place of the *Turba*," pp. 331-338. In this article, one of Plessner's assumptions is that *Kitāb munāẓarāt al-ʿulamāʾ wa-mufāwaḍātuhum*, written by ʿUthmān ibn Suwayd al-Ikhmīmī, which has been lost, is identical to *Turba philosophorum*. Al-Ikhmīmī and the name of his works are mentioned in the *Fihrist*. Ibn al-Nadīm, *Fihrist*, 2: 461-462.

- No consensus on how to depict alchemy by non-alchemists

**Table 1: Definitions of alchemy by the non-alchemists examined in the previous section**

| Author | Date | Origin of Alchemy | Is Alchemy part of Philosophy? | Is Alchemy part of Natural Science? | Mention of Hermes? | Mention of Cypher? | Esoteric? |
|---|---|---|---|---|---|---|---|
| **al-Fārābī** | 10c | No mention | Yes | Yes | No | Yes | Yes |
| **Al-Khwārizmī** | 10c | No mention | Yes | Yes | No | Yes, but not as a crucial matter | No |
| **Ibn al-Nadīm** | 10c | Egypt | Unlikely | Unlikely | Yes | Yes | Not necessarily |
| **Ibn Sīnā** | 11c | No mention | Yes | "Applied." | No | No | No |
| **Ibn Khaldūn** | 14c | No mention | No, a kind of sorcery | Unlikely | No | Yes | Yes |
| **Ḥājjī Khalīfa** | 17c | Egypt | "Similar" to philosophy | Unlikely | Yes (just the name) | Yes, but not as a crucial matter | Not necessarily |

As this table shows, each author has a different image of alchemy. Furthermore, this difference does not seem to arise from the age the work was written. While Ibn al-Nadīm and Ḥājjī Khalīfa regard the origin as Egyptian, other authors do not mention it. Al-Khwārizmī implies that alchemy originated in Greek philosophy judging from his classification. There is divided opinion about whether alchemy is included in philosophy. However, among the three authors who do not include alchemy in philosophy, Ibn al-Nadīm and Ḥājjī Khalīfa do not actually deny the relationship with philosophy. Of course, the authors who do not regard alchemy as part of philosophy also do not include it in natural science. On the other hand, those who include alchemy in natural science still vary in classification. Al-Khwārizmī simply categorizes alchemy as a discipline of natural science. Al-Fārābī thinks that alchemy belongs to the part of the natural science that is difficult to understand. Ibn Sīnā includes it in "applied" natural science. As for Hermeticism, while most alchemists mention Hermes, non-alchemist authors do not, except for Ibn al-Nadīm and Ḥājjī Khalīfa, who claim that Egypt is the origin of alchemy. Ibn Sīnā does not mention cipher in alchemy and al-Khwārizmī also seems not to consider it as an important component in alchemy though he mentions it. This is probably because Ibn Sīnā was interested primarily in the theoretical issue, and al-Khwārizmī was under the influence of al-Rāzī's exoteric approach. Those non-alchemists who have an esoteric image of alchemy tend to mention cipher.

As a result, each non-alchemist defines alchemy differently. In addition, the authors do not necessarily reflect the views of alchemists. Rather, each author tends to make a subjective judgment. There might not have been mutual understanding between them. Al-Fārābī emphasizes the esotericism in alchemy. Ibn Sīnā denies alchemy and transmutation because he could not apply his natural philosophical theory to them. Ibn Khaldūn pays much attention to the relationship between transmutation and God's miracles. Their different understandings of alchemy stem from their philosophical or religious stances. In the next chapter, we examine in more detail how those non-alchemists understand alchemy, especially from a theoretical perspective. Then, we investigate al-Ṭughrāʾī's *Ḥaqāʾiq*, in order to understand how he tried to fill the gap between the views of alchemists and non-alchemists. *Ḥaqāʾiq* is one of the few sources available that addresses this particular issue.

# Chapter 2: Criticism of Alchemy

Ibn Sīnā's refutation of alchemy was a well-known fact throughout medieval Islam. Not only al-Ṭughrāʾī's *Ḥaqāʾiq* but also many other works in the later period, such as *Muqaddima* and *Kashf*, deal with it. In the same way, we often encounter other criticisms and reassessments of alchemy by non-alchemists. These non-alchemists had discussed alchemy since the beginning of the translation movement. In other words, since the period of the formation of systems of learning in the Islamic world, there were arguments over the validity of alchemy. Therefore, the influence of these criticisms should not be ignored when we are trying to understand alchemy in medieval Islam. In fact, the entry of alchemy in Ḥājjī Khalīfa's *Kashf* begins with a summary of the debate between those who believed alchemy and those who did not.[160] This chapter investigates the criticisms and extracts the main arguments of the non-alchemists. In order to properly discuss al-Ṭughrāʾī's argument against Ibn Sīnā's criticism in the next chapter, we include, in this chapter, an examination of Ibn Sīnā's argument. For comparison, this chapter also includes some arguments by non-alchemists before and after Ibn Sīnā.

## i. Criticisms before Ibn Sīnā

- al-Kindī

Al-Kindī (d. 873) has been recognized as a central figure in the reception of Greek philosophy and the establishment of a system of learning for Muslims in the early period of the translation movement.[161] The *Fihrist* lists 242 titles of al-Kindī's works. Ibn al-Nadīm categorized them into seventeen categories,[162]

[160] Ḥājjī Khalīfa, *Kashf*, 5: 270-276.

[161] For further discussion on the accomplishments of al-Kindī, see A. I. Sabra, "Some Remarks on Al-Kindi as a Founder of Arabic Science and Philosophy," in *Dr. Mohammad Abdulhadi Abu Ridah festschrift*, ed. A. O. Al-Omar (Kuwait, 1993), pp. 601-7.

[162] Philosophy (*falsafiyya*); logic (*manṭiqiyya*); arithmetic (*ḥisābiyyāt*); spherics (*kurriyyāt*); music (*mūsīqiyyāt*); astronomy (*nujūmiyyāt*); geometrics (*handasiyyāt*); cosmology, (*falakiyyāt*); medicine (*ṭibbiyyāt*); astrology (*aḥkāmiyyāt*); disputations (*jadaliyyāt*); psychology (*nafsiyyāt*); politics (*siyāsiyyāt*); ontological occurrences

but there is no specific category for alchemy. Among the titles of his works, there are two works whose titles include the word alchemy (*kīmiyāʾ*) in the category of miscellaneous topics. One of them, the *Fihrist* says, is "his epistle on the alchemy of perfume (*risālatuhu fī kīmiyāʾ al-ʿitr*),"[163] which is probably known as *Kitāb kīmiyāʾ al-ʿiṭr wa-'l-taṣʿīdāt* which deals with 107 perfume recipes, some of which utilize distillation and sublimation apparatuses.[164] However, this work does not employ any alchemical theoretical foundations and deals simply with the technical issues for the processes of perfume making.[165] In fact, al-Kindī's works are considered to be divided into two types: on every discipline existing in his time and on "technical subjects of particular interest to the ruling classes with whom he was associated."[166] If we apply this distinction, *Kitāb kīmiyāʾ al-ʿiṭr wa-'l-taṣʿīdāt* should be included in the latter.

The other work in the *Fihrist* is "his epistle on the warning against the cheating of the alchemists, (*risālatuhu fi al-tanbīh ʿalā khidaʿ al-kīmiyāʾīn*)."[167] This work is also mentioned in the *Kashf*,[168] and both the *Fihrist* and *Kashf* also indicate the existence of Muḥammad ibn Zakariyyāʾ al-Rāzī's counterargument against al-Kindī's refutation of alchemy. Unfortunately, both al-Kindī's and al-Rāzī's works have been lost. However, Ḥājjī Khalīfa cites al-Kindī's argument in the *Kashf*, and we can extract his main points from it.

> Yaʿqūb al-Kindī mentioned in his epistle: [1.] the impossibility of men's work because nature is independent of their work; [2.] the cheating of the people of this craft; and [3.] their ignorance. He invalidates the claim of those who claim tincturing gold and silver.[169] The deniers [of al-Kindī] said that if artificial gold was

(*aḥdāthiyyāt*); distances (*abʿādiyyāt*); premonitions (*taqaddumiyyāt*); and miscellaneous topics (*anwāʿiyyāt*). Ibn al-Nadīm, *Fihrist*, 2: 185-194; Dodge, trans., *Fihrist of al-Nadīm*, pp. 615-626.

163 Ibn al-Nadīm, *Fihrist*, 2: 193.

164 Arabic edition and German translation are available in Karl Garbers, *Kitāb kīmiyāʾ al-ʿiṭr wat-taṣʿīdāt: Buch über die Chemie des Parfüms und Destillationen*, Abhandlungen für die Kunde des Morgenlandes 30 (1948; repr., Nendeln: Kraus Reprint, 1966).

165 For further discussion on irrelevancy of alchemical theory in al-Kindī's *Kitāb kīmiyāʾ al-ʿiṭr wa-'l-taṣʿīdāt*, see Takatomo Inoue, "Al-Kindī's Attack on Alchemy and His Perfume Making," *ORIENT* 52 (2017): 79-82.

166 *Encyclopaedia of Islam*, 2nd ed., s.v. "al-Kindī," by J. Jolivet and R. Rashed.

167 Ibn al-Nadīm, *Fihrist*, 2: 193.

168 The *Kashf* says, "Yaʿqūb al-Kindī also wrote an epistle on its (alchemy's) refutation which consists of two treatises." Ḥājjī Khalīfa, *Kashf*, 5: 271.

169 Al-Kindī seems to refer to a theory found in Alexandrian alchemy, such as that of Bolos-Democritus and Zosimus.

> the same as natural gold, then what was made through the craft is the same as what is made through nature. If one permitted the possibility that what was made naturally is the same as what was made artificially, we would find a naturally-made sword, throne, or ring. That is not true. They also said of tincturing (*ṣābigh*) gems: either that it is more enduring against fire than the tinctured (*maṣbūgh*), or that the tinctured is more enduring, or that both are equal. If the tincturing is more enduring, the tinctured has to perish before the tincturing. If the tinctured is more enduring, the tincturing has to perish, and the tinctured remains in its first state free from the color (*ṣibgh*). If they are equal in endurance against fire, they are made from the same single genus in order for them to be equal in the endurance against fire. Thus, each of them is not the tincturing nor the tinctured.[170]

Al-Kindī tries to prove the invalidity of alchemy by two arguments. One of them is a distinction between natural and artificial objects. Al-Kindī seems to employ a basic thesis of Aristotelian natural philosophy. Aristotelian natural philosophy usually divides all physical matters into natural and artificial.[171] In this view, the two are not interchangeable.

The other argument involves the components of metal. As discussed in the first chapter, many alchemical theories suppose that metal consists of base matters, which do not volatilize, and property definers such as color, which can volatilize. Based on this principle, alchemists heat metal in apparatuses to separate them. In this argument, al-Kindī seems to deny the existence of those two components of metal. The basis of his argument is the nonflammability of metal, which al-Fārābī also asserted when he cites Aristotle: "gold, silver, and every gem, which fire does not burn up."[172] Al-Kindī argues that if we suppose inequality in the endurability against fire between the two components of metal, either of them will perish when a metal is cast into fire. This contradicts nonflammability of metal. On the other hand, if we suppose equal endurability of those two, they cannot be different matters since, in his idea, they belong to the same

See the first section of the first chapter.

[170] The translation is cited from Inoue, "Al-Kindī's Attack on Alchemy," p. 82 with some modifications. The translation is based on Ḥājjī Khalīfa, *Kashf*, 5: 274-275.

[171] *The Stanford Encyclopedia of Philosophy*, Winter 2011 ed., s.v. "Artifact."

[172] al-Fārābī, *Wujūb*, p. 78.

genus. Therefore, he came to the conclusion that there are no separable components in metal.

The *Kashf* also adds al-Kindī's comments against the counterarguments of those who believe in the possibility of alchemy. This shows that the possibility of alchemy had been debated since the time of al-Kindī.

> The answer of those who test the validity of the first [proof]: we obtain fire occurring from an arrow (*qidḥ*) and the crushing of mass bodies (*iṣṭikāk al-ajrām*), and [we obtain] scent occurring from a fan, glasses of beer and sal-ammoniac, which are sometimes made from barley, and in that way, many kinds of mixed things (*mizājāt*). Thus, [al-Kindī's] denial does not force us to accept the estimation that what is generated artificially cannot be generated naturally. Also, we are not forced to accept the possibility of obtaining a natural matter through the artificial processes by the possibility of the opposite. However, the issue is denied by the proof.
>
> For the second [evidence]: the equality of the tincturing and tinctured in respect of the quiddity (*māhiyya*) is not necessary for the equality between them against fire. On the contrary: you know that the two differences are associated with some of the properties (*ṣifāt*).[173]

How much influence did al-Kindī's arguments exert in the later period? It is uncertain, but we can find some similarities in the later discussions. As for the first issue, Ibn Khaldūn argues the impossibility of artificial reproduction of natural substances in the section refuting alchemy in the *Muqaddima*. Ibn Sīnā also claims in *Kitāb al-shifāʾ* that alchemists' practice cannot reach the quality of naturally produced metals though they try to imitate the natural processes. As for the second issue, separating the color of metal from the metal itself had been one of the main issues for non-alchemists' discussions of alchemy. Al-Fārābī and Ibn Sīnā also discuss the meaning of extracting and adding color of metal, though they have different approaches to it than al-Kindī. Ibn Khaldūn's argument concerning the reproduction of natural objects and al-Fārābī and Ibn Sīnā's discussion on change of metal's color are further discussed in the later part of this chapter.

[173] Ḥājjī Khalīfa, *Kashf*, 5: 275-276.

- al-Fārābī

Al-Fārābī (d. 330/950) was another influential philosopher in the early medieval period. On alchemical issues, he is often known as a philosopher who believes in the transmutation of metal. Ibn Khaldūn contrasts him with Ibn Sīnā to indicate the debate between philosophers for and against alchemy.[174] Also, the *Kashf* introduces and quotes the part which shows his understanding of the possibility of alchemy and transmutation in his epistle on alchemy, which is mentioned in the first chapter.[175] Judging from these parts, we can assume that al-Fārābī did not criticize alchemy and he even seems to be supportive of alchemy. However, the whole passage of his epistle shows us that he does not simply claim its possibility. Actually, he does not claim that alchemy is possible for everyone and does not seem to encourage the practice of alchemy in the epistle taken as a whole. Indeed, al-Fārābī assumes the theoretical possibility of alchemy from his philosophical framework but implies that the practice of alchemy is almost unachievable.

The epistle is called *al-Risāla* (or *al-Maqāla*) *fī wujūb ṣināʿat al-kīmiyā* (or *al-kīmiyāʾ*).[176] In this epistle, al-Fārābī firstly points out the misunderstandings among both those who claim the invalidity of alchemy and those who believe its possibility. In order to correct their misunderstanding, he claims that the goal of this epistle is to indicate the obligation of the craft (*wujūb al-ṣināʿa*) and identify the reasons why such misunderstandings have arisen.[177] What then is the obligation, and what is the misunderstanding? According to al-Fārābī, some of those who deny alchemy do not concern themselves with the enigmatic aspects of alchemical writings. In al-Fārābī's view, they claim that alchemy is

[174] M. Quatremère, ed., *Muqaddima*, 3: 234. Ibn Khaldūn assumes that Ibn Sīnā was against alchemy because he was a wealthy person, while al-Fārābī was a poor person. Ibid., 3: 241.
[175] Ḥājjī Khalīfa, *Kashf*, 5: 272-273.
[176] Sayılı's edition: *Risāla al-Ḥakīm al-Fāḍil al-Mutqin al-Muḥaqqiq Abī Naṣr al-Fārābī fī wujūb ṣināʿat al-kīmiyā*. Wujūb, p. 75. Rescher's bibliography: *Maqāla fī wujūb ṣināʿat al-kīmiyāʾ*. Nicholas Rescher, *Al-Fārābī: An Annotated Bibliography* (Pittsburg: University of Pittsburg Press, 1962), p. 46.
[177] al-Fārābī, *Wujūb*, p. 75.

impossible solely on the basis of a superficial reading of these texts. On the other extreme, some of those who claim the validity of alchemy think that anyone can master alchemy without any conditions. Al-Fārābī, however, thinks that mastery of alchemy, which is protected by ciphers, is not open to everyone. Judging from his view on the two sides, the misunderstanding that al-Fārābī is considering seems to concern the cryptic expression of alchemical writings. For the obligation which he considers, it seems to concern how to master alchemy. What specifically are the misunderstanding and obligation? Let us examine the content of the *Wujūb*.

The *Wujūb* mainly discusses four issues: 1) an explanation of the enigmatic expressions of alchemical writings; 2) the harm that would occur if many people were able to master alchemy; 3) the ultimate goal of alchemical practice; and 4) a natural philosophical explanation of alchemy and transmutation. The quotation in the *Kashf*, which is cited from a commentary of Ibn Bājja, a philosopher in twelfth-century Muslim Spain, only includes the fourth part. Ibn Khaldūn also introduced al-Fārābī's natural philosophical discussion in his *Muqaddima*, but it is just in order to contrast him with Ibn Sīnā's view on transmutation. As a result, the *Muqaddima* never mentions the other discussions of al-Fārābī in the *Wujūb*. Thus, it is only the fourth issue that has often been highlighted by other authors. However, if we properly understand the objective of this epistle, we find that al-Fārābī's main argument regarding alchemy does not necessarily lie in this part.

The first issue, which is briefly mentioned in the first chapter, discusses the use of ciphers and enigmatic expressions in alchemical writing. Al-Fārābī explains that alchemical authors obscure their intentions so that people outside their own school cannot understand it. They employ poetic expressions, some of which contain their true meaning and some of which do not contain it. The true meaning exists amidst plenty of meaningless words. Thus, he says, it is impossible to understand it from reading its superficial meaning. Al-Fārābī adds that the confusion of understanding usually occurs in conceptual

discussions. These discussions sometimes make use of things familiar to ordinary people, which look far from conceptual, but they can also be ciphered expressions. In this way, he remarks, alchemy is totally obscure, because we cannot even understand what is being written.[178]

Nevertheless, al-Fārābī states that we can translate the enigmatic expression into more common ones. According to his view, as quoted in the first chapter, alchemy is "a part of natural science within its parts whose comprehension is difficult in the beginning,"[179] and the comprehension of these parts of natural science is impossible "until the observer learns the part of natural science concerning the compound bodies that are uniform in their parts, that is, minerals."[180] Al-Fārābī indicates that it is impossible to study alchemy without a perfect understanding of logic and the basic parts of natural science.[181]

The second issue, which is also mentioned in the first chapter, explains the reason for the obscurity of alchemical writings. Al-Fārābī supposes that if alchemists do not enigmatize their writing, it would do serious harm to a community and civilization. This is because if ordinary people can learn how to produce gold or silver through alchemical processes, this would eliminate their value as currencies. Al-Fārābī argues that the enigmatic way of writing alchemical works is to prevent this kind of situation from happening.[182]

Next, al-Fārābī discusses the purpose of practicing alchemy. He insists that learning the craft of alchemy should be regarded as a philosophical endeavor, that is, one should learn philosophical truths from the skills acquired in alchemical practice. He suggests that just by itself the craft of alchemy is a despised subject. It could provide some satisfaction, but if it is performed as a philosophical pursuit, it

[178] Ibid., pp. 75-76.
[179] Ibid., p. 76.
[180] Ibid.
[181] Ibid.
[182] Ibid., pp. 76-77.

will provide greater happiness. Thus, al-Fārābī states that "no one but a philosopher can deal with alchemy, and if anyone but a philosopher acquired this craft, there would occur a big corruption in the world."[183]

To summarize, those who deny alchemy misunderstand alchemists' theory because they disregard ciphers and other enigmatic ways of writing and cannot read alchemical writings properly. Also, those who validate alchemy misunderstand its possibility because they disregard philosophical knowledge, which is required to understand alchemical theories and whose mastery is far from easy. As for the obligation of alchemy, that is *wujūb al-ṣinā'a*, alchemists have to conceal their writings so that it would not be accessible to people outside of their group. Furthermore, it is important to practice alchemy as a philosophical pursuit, not for personal profit. This will give the practitioner a greater kind of happiness.

Once we understand the main argument of the epistle, we realize that the fourth issue does not necessarily intend to prove the possibility of alchemy. It is true that al-Fārābī shows that transmutation is theoretically possible, but he is not certain how to realize it. In other words, he could not conclude whether alchemy is a feasible practice. The fourth issue merely shows his understanding at the time of his writing this epistle.

> When you examine books by the authors of this craft [alchemy], you will find them saying that one should get acquainted with its observation through mathematical and natural philosophical observation.[184] As for the thing in the mind (*nafs*),[185] which corresponds to the finding of an event outside, Aristotle explained in his book on minerals that it [the craft] is more or less possible, though [its possibility] is probably difficult to realize through the effect (*fi'l*)[186] unless events by which its [the craft's] existence becomes facile happen.[187] That is, that luck and plenty of happiness occur to the seeker of the craft and that all natural sciences with continuous experiments and the solving of the sage's ciphers in it [the craft] are made available to him.
>
> Aristotle formerly examined it [the craft] in this book in a dialectic way and validated it by syllogism

[183] Ibid., p. 77.
[184] The quotation in the *Kashf* begins after here.
[185] Most likely, this indicates the craft of alchemy or transmutation of metal.
[186] In the *Iḥṣā'*, al-Fārābī discusses that the power (*quwwa*) of a thing itself is not perceivable but it becomes perceivable only when it has an effect (*fi'l*). al-Fārābī, *Iḥṣā'*, p. 70.
[187] In the *Kashf*, the sentence after here is omitted.

and invalidated it by another syllogism with its custom in the writings (*awḍāʿ*) which its opposition multiplies. Again, he validated it, latterly, by syllogism whose composition is of two premises, which is given in the first part of his book.

One of the two [premises] asserts that gold and silver and every gem, which fire does not burn, are one with regard to the species (*nawʿ*) and that the difference between them is not in respect of their configurations (*hayʾāt*) but their accidents (*ʿawāriḍ*). Some of the difference is caused from their essential (*dhātī*) accidents, and some of it is caused from their accidental (*ʿaraḍī*) accidents.

The second premise asserts that every two things under one species are different in virtue of an accident. That is, it is possible for one of the two to transmute (*intiqāl*) into the other. If the accident is essential, the transmutation is difficult. If [it is] separated [from the essence], the transmutation is easy. The hardship and difficulty of this craft are only in the difference of most of these gems in their essential accidents and their accidental accidents. It is uncertain (*yushabbahu*) that the difference between gold and silver is slight enough.[188]

This exposition suggests the theoretical possibility of transmutation and uncertainty of how to realize it. He concludes the epistle with a restatement of al-Fārābī's thesis in the introduction of the epistle.

The reason why most people claim the error in its [the craft's] validity and [claim] the disregard for the rebuttal to it [the craft] concerning its possibility has been clarified from what we have indicated. Also, I can say that those who do not practice science (*ʿilm*) are counterfaiting it and ruin it. Both arguments are outside the truth.[189]

The whole content of the epistle tells us that al-Fārābī criticizes alchemy to some extent. He never says that alchemy is possible for anyone who wants to practice it. Rather, he outlines the difficult conditions for the mastery of the craft of alchemy. Very few people would be able to accomplish it. This is very far from Ibn Khaldūn's statement that al-Fārābī thinks that "the craft of alchemy is possible and easy to approach."[190] Also, the *Kashf* omits a part of the sentence which claims that it is difficult to accomplish alchemical practice. Al-Fārābī says that "luck and plenty of happiness occur to the seeker of

[188] al-Fārābī, *Wujūb*, pp. 77-79.
[189] Ibid., p. 79.
[190] M. Quatremère, ed., *Muqaddima*, 3: 234.

the craft, and that all natural sciences with continuous experiments and the solving of the sage's ciphers in it [the craft] are made available to him." Those are the conditions which he gave for the realization of alchemy. By omitting these conditions, the passage of the fourth issue appears to claim that alchemy is not a difficult craft.

Moreover, al-Fārābī appears to think that alchemy is a despised subject unless it is practiced as part of philosophy. In other words, al-Fārābī does not regard gold-making as an encouraged practice. This also contradicts Ibn Khaldūn's statement: "al-Fârâbî, who states that it is possible, was one of those poor persons who have not the slightest success in making a living by any means. This is an obvious suspicion as to the attitude of people who are eager to try (alchemy) out and practice it."[191] From these facts, al-Fārābī's view of alchemy may have been seriously misunderstood by other authors in the later period.

Nevertheless, it is certain that al-Fārābī asserts the theoretical possibility of transmutation in this epistle. Al-Fārābī thinks that all metals belong to the same species, and that the differences between metals are accidents. The accidents are divided into essential accidents and accidental accidents. Al-Fārābī claims that transmutation is possible if the accidents of a substance change into accidents of another substance. However, he says, each substance has a specific proportion of essential and accidental accidents, but this proportion cannot be known. Thus, it is not certain whether transmutation is practically possible or not. As Ibn Khaldūn states in the *Muqaddima*, al-Fārābī's idea is fundamentally opposed to Ibn Sīnā's. Al-Fārābī considers that all metals belong to one species, which leads to the conclusion that changes of accidents mean transmuting one metal to another. Actually, Ibn Sīnā also considers that alchemical processes try to change accidents of substances, but because he regards every metal as belonging to different species, change of accident does not lead to transmutation. More detail on Ibn Sīnā's view of alchemy is discussed in the next section. Al-Kindī, as quoted in the *Kashf* , does not discuss the species of

[191] Franz Rosenthal, trans., *Muqaddima*, 3: 280; M. Quatremère, ed., *Muqaddima*, 3: 241

metal, but unlike al-Fārābī and Ibn Sīnā, he does not seem to think that an accident, such as color, can be separated from a metal because he denies the "tincturing" and "tinctured" in metal. He considers that the "tincturing" and "tinctured" are merely properties (*ṣifāt*) to describe the quiddity of metal.

Another reason why al-Kindī denies alchemy is that natural objects cannot be reproduced artificially. What would be al-Fārābī's view on this issue? Even though he does not mention the issue of natural and artificial objects in the *Wujūb*, the section on natural science in the *Iḥṣāʾ* gives the definition of them.

> Bodies: one [type] of them are artificial (*ṣināʿī*), and the others are natural (*ṭabīʿī*). Artificial [bodies] are such as glass, sword, and bed. In general, it is anything whose existence is by craft and human will. Natural [bodies] are things whose existence are not by craft nor human will, such as sky, earth, what is between them, plants and animals.[192]

Just like al-Kindī, al-Fārābī also makes a clear distinction between natural and artificial objects. To summarize, his definition of a natural object is "not being an artificial object." This would lead to the same conclusion as al-Kindī's, but in the *Wujūb* he actually suggests the theoretical possibility of alchemy. Although al-Fārābī's intention is uncertain, it is possible to assume that the transmutation of metal in al-Fārabī's thought does not necessarily mean artificial reproduction of a natural substance. If he considered the transmutation as a natural process, he would not seriously consider that there was a practical way to make gold or silver.

[192] al-Fārābī, *Iḥṣāʾ*, p. 67.

## ii. The criticism by Ibn Sīnā

Ibn Sīnā's criticism of alchemy in *Kitāb al-shifāʾ*[193] is the primary target in al-Ṭughrāʾīʾs *Ḥaqāʾiq*. The *Shifāʾ* is an encyclopedic work of his philosophy, which had a great influence on later Muslim philosophy and science as well as those in the Latin world. The *Shifāʾ* consists of the clusters (*jumla*) of logic (*manṭiq*), mathematics (*riyāḍiyyāt*), natural sciences (*ṭabīʿiyyāt*), and metaphysics (*ilāhiyyāt*). Book Five of natural sciences consists of two treatises (*maqāla*), one concerning the earth (i.e. mineralogy) and the other concerning what is above the earth (i.e. meteorology). In the first treatise,[194] the fifth section describes minerals and metals, including his criticism of alchemy.[195] The text of this section can be found in the book called *De Mineralibus* (On Minerals) ascribed to Aristotle in the Latin world. *De Mineralibus* is sometimes found to be attached to fourth book[196] of the Latin *Meteorology* of Aristotle. However, Holmyard and Mandeville proved that this text was a translation and summary of the relevant parts in the *Shifāʾ*.[197] In fact, no treatises on minerals by Aristotle exist.[198] Thus, the whole discussion of minerals in the *Shifāʾ* is probably Ibn Sīnā's own idea.

In the fifth section, Ibn Sīnā classifies various kinds of minerals. He firstly distinguishes mineral bodies into four major groups: 1) stones; 2) fusible substances; 3) sulfurs; and 4) salts. Then, he describes

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193 Ibn Sīnā (5/11c), *Kitāb al-shifāʾ*, eds. Ibrāhīm Madkūr et al., 4 vols. (Qom: Maktabat Āyatullāh al-ʿUẓmā al-Marʿashī al-Najafī, 1983-84). (Hereafter *Shifāʾ*)

194 The first treatise has the following sections: 1) mountains and its formation, 2) the benefits of mountains and formation of clouds and dampness, 3) springs, 4) earthquakes, 5) formation of minerals, 6) the conditions of a habitable region.

195 The edition and English translation of the section on minerals in Book Five of natural sciences is in E. J. Holmyard and D. C. Mandeville, *Congelatione et conglutinatione lapidum: Being Sections of the Kitāb al-shifāʾ* (Paris: Paul Geuthner, 1927). English translation: ibid., pp. 33-42. Arabic edition: ibid., pp. 82-86. (Hereafter *al-Maʿādin*)

196 The fourth book of Aristotle's meteorology is controversial. Most modern scholars agree that it is by Aristotle, but it is not considered to be a continuous work from the third book because of its distinct content. Some ancient and medieval scholars, such as Alexander of Aphrodisias, Ibn Sīnā, and Ibn Rushd, consider that it belongs to *On Generation and Corruption*. Paul Lettinck, *Aristotle's Meteorology and Its Reception in the Arab World: With an Edition and Translation of Ibn Suwār's Treatise on Meteorological Phenomena and Ibn Bājja's Commentary on the Meteorology* (Leiden, Boston and Köln: Brill, 1999), pp. 3-4, 29.

197 Holmyard and Mandeville, *Congelatione et conglutinatione lapidum*, p. 4-8; Holmyard, *Alchemy*, p. 94.

198 Lettinck, *Aristotle's Meteorology*, p. 4. Contrary to what is extant, Aristotle announced a projected further discussion of minerals and metals at the end of the third book of the *Meteorology*. Ibid., pp. 4, 29.

several criteria for the classification. Each mineral is either strong or weak, that is, easy or difficult for the body to keep its form. A weak mineral has either salty (*milḥī*) or oily (*duhnī*) nature. The salty nature means easiness of being dissolved by moisture. Alum (*shabb*), vitriol (*zāj*), sal-ammoniac (*nūshādar*), and *qalqand*[199] belong to this group. The oily nature means non-easiness of being dissolved by moisture. Sulfur (*kubrīt*), arsenic (*zarnīkh*), and mercury (*zaybaq*) belong to this group. Also, each mineral is either malleable (*munṭariq*) or non-malleable. Malleable bodies are fusible (*dhāʾib*) with other bodies, while non-malleable bodies are not. He describes the matter of malleable bodies as being an aqueous substance (*jawhar māʾī*) united with an earthly substance (*jawhar arḍī*). Some malleable bodies are congealed, but other malleable bodies are still quick because of their oily nature.[200]

Next, Ibn Sīnā describes three groups of minerals: stone, salt, and sulfur. Stones (*ḥajariyyāt*) are a naturally formed substance made from an aqueous substance. Their congelation (*jumūd*) occurs by coldness and dryness, which turn their water into earth. It causes their non-malleability. Their solidification (*inʿiqād*) occurs by dryness, which causes their infusibility. Salts include alum and sal-ammoniac. Sal-ammoniac especially consists of water united with hot smoke and solidified by dryness. Because of this, sal-ammoniac has fieriness (*nāriyya*) more than earthliness, which causes its sublimation. Sulfur has an oily nature because its aqueousness suppresses the growth of earthiness and aeriness (*hawāʾiyya*) when it is heated. It solidifies when it is cooled.[201]

Vitriols consist of salt, sulfur, and stone and contain the power of some of the fusible bodies, namely metals. The power of the metals has an effect on the color of vitriol. When a vitriol acquires the power of iron, it will become red or yellow. When it acquires the power of copper, it will become green. Mercury consists of water united with subtle and sulfurous earth, which causes its smoothness and

[199] According to Holmyard and Mandeville, *qalqand* is green vitriol. See the notes in ibid., p. 34.
[200] Holmyard and Mandeville, eds. and trans., *al-Maʾādin*, pp. 82, 33-35.
[201] Ibid., pp. 82-83, 36.

quickness. The whiteness of mercury comes from the purity of the water and whiteness of the subtle earth caused by admixture of air (*mumāzajat al-hawāʾiyya*).[202]

Ibn Sīnā then moves onto the description of fusible bodies, that is, metallic substances. He mentions solidification of mercury by the vapor of a sulfurous substance such as lead and sulfur itself.[203] Because of this characteristic of mercury, he assumed that mercury is a component of all the fusible bodies. In other words, fusible bodies are solidified mercury, since they become quick like original mercury and can fuse with other bodies in a high temperature.[204]

With this understanding, Ibn Sīnā claims that the difference of fusible bodies comes from the variation of mercury and what is united with mercury. This leads to the following conclusion:

> If the mercury be pure, and if it be commingled with and solidified by the virtue[205] of a white sulphur which neither induces combustion nor is impure, but on the contrary is more excellent than that prepared by the adepts, then the product is silver. If the sulphur besides being pure is even better than that just described, and whiter, and if in addition it possesses a tinctorial, fiery, subtle and non-combustive virtue – in short, if it is superior to that which the adepts can prepare – it will solidify the mercury into gold.
>
> Then again, if the mercury is of good substance, but the sulphur which solidifies it is impure, possessing on the contrary a property of compustibility, the product will be copper. If the mercury is corrupt, unclean, lacking in cohesion and earthy, and the sulphur is also impure, the product will be iron. As for tin, it is probable that its mercury is good, but that its sulphur is corrupt; and that the commingling [of the two][206] is not firm, but has taken place, so to speak, layer by layer, for which reason the metal shrieks.[207] Lead, it seems likely, is formed from an impure heavy, clayey mercury and an impure, fetid and feeble sulphur, for which reason its solidification has not been thorough.[208]

After this conclusion on the differences of metals, his criticism of alchemy begins, which is

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202 Ibid., pp. 83, 36-38.
203 It appears to be a kind of amalgamation.
204 Ibid., pp. 84, 38-39.
205 *Quwwa* in Arabic.
206 This is an original complement of the quoted source.
207 Tin makes a sound if one tries to bend it or puts a force to it. It is called "tin cry." See Holmyard, *Alchemy*, p. 94.
208 Holmyard and Mandeville, trans. *al-Maʿādin*, pp. 39-40.

identical to the part which al-Ṭughrāʾī references. He claims that metals composed in a natural process are not identical with the products created by alchemists. Ibn Sīnā does not think that alchemists' attempts to reproduce natural gold can reach the quality of natural metallic formation. Unlike al-Kindī, Ibn Sīnā does not indicate here the difference between natural and artificial objects. Rather, he points out the shortcomings of the alchemical practices, which try to reproduce the formation of a natural object. His main argument is that the change of species cannot occur if we follow alchemical methods. Although alchemists can change the color of a metal into that of another, he argues, the substance (*jawhar*) of the metal would still be preserved. The change of the color just means predominance of the added qualities (*kayfiyyāt*). In this way, Ibn Sīnā proved the insufficiency of the alchemical craft but did not necessarily prove the impossibility of transmutation. On the impossibility, he only provided an assumption. He assumes that even if alchemists can alter the perceivable differences of metal, they cannot change the unperceivable differences. Those perceivable differences are just accidental[209] and not those which separate metals into species; unperceivable differences relating to the species of metal remain unknown. Because we cannot manipulate an unknown object, he states, it is impossible to realize the transmutation.[210]

Ibn Sīnā gives a tentative evaluation on the issue of the possibility of the transmutation. He said that "the possibility of eliminating or imparting the specific difference has never been clear to me."[211] Instead of denying the possibility, he gives a hypothesis on transmutation. He supposes that the difference between metals stems from the proportion of the compounded[212] (four) elements (*ʿanāsir*) in a metal, though it is uncertain. He says, however, that the fusion which alchemists practice does not have the effect of altering the proportion since it is necessary to break the compound of elements in a metal and to make

[209] In the text, it appears as a noun, *ʿawāriḍ*, translated as accidents.
[210] Holmyard and Mandeville, eds. and trans., *al-Maʿādin*, pp. 85-86, 41-42.
[211] Holmyard and Mandeville, trans., *al-Maʿādin*, p. 41.
[212] In the text, it appears as a noun, *tarkīb*, translated as compound.

another compound.[213]

This is the content found in the mineralogy and meteorology part of the *Shifāʾ*. Just as al-Fārābī's discussion, Ibn Sīnā also separates the issue of the possibility into theoretical and practical. He definitely denies transmutation through the alchemical practice based on the alchemists' theory but does not discuss whether it is possible in his natural philosophical theory. Therefore, we can say that Ibn Sīnā's conclusion on the possibility of alchemy and the transmutation is much closer to that of al-Fārābī than that described in the *Muqaddima*, in which their two positions are contrasted. As mentioned above, both of them consider alchemical transmutation as an alternation of the accidents of metal.

The major difference between them, aside from the issue of the species of metal, is ciphers in alchemical texts. Al-Fārābī considers that the truth cannot be obtained until the cipher is solved, thus he avoids judging if alchemists are actually capable of transmutation. On the other hand, Ibn Sīnā does not mention ciphers in alchemy, which suggests that he was only dependent on his own theory, without carefully assessing alchemical writings.

His description of the components of metals, whose translation was previously quoted, is not likely to be derived from Peripatetic theories, but from alchemical theory. The so-called "mercury-sulfur theory" is one of the major theories of transmutation. The Jabirian corpus also deals with this theory. Although Jābir does not regard mercury and sulfur as actual matter but conceptual, he thinks that all metals basically consist of the same components. Gold has the perfect proportion of them, whose purity is also perfect. For other metals, the purity and proportion are not perfect.[214] Ibn Sīnā's "mercury-sulfur theory" does not seem consistent with the latter part of his discussion, namely the criticism of alchemy. However, to know why he described metals in this way and whom/what he referred to still needs further research.

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[213] Holmyard and Mandeville, eds. and trans., *al-Maʿādin*, pp. 86, 42.

[214] Holmyard, *Alchemy*, p. 75. See also the classification of transmutation theories in *Encyclopaedia of Islam*, 2nd ed., s.v. "al-Kīmiyāʾ."

As mentioned before, there is no treatise on minerals by Aristotle, and its supposed Latin version was in fact a translation from the *Shifāʾ*. If this is the case, what did al-Fārābī refer to in his discussion on alchemy (see the first chapter)? He says in the *Wujūb* that "Aristotle explained in his book on minerals (*bayyana Arisṭāṭālīs fī kitābihi fī al-maʿādīn*)"[215] Did he really read a genuine work of Aristotle? Or did he cite a wrongly attributed work? Or it is also possible that he referred to the citation and commentary of Aristotle in the Jabirian corpus or other alchemical works, which might have made him believe that Aristotle discussed alchemy.[216] There is no clue to solve this problem yet. Further study is necessary for this issue also.

[215] al-Fārābī, *Wujūb*, p. 78.

[216] Kraus points out that *Kitāb al-sahl* in the Jabirian corpus (No. 497 in Kraus' catalogue) contains the fourth book of Aristotle's *Meteorology*. Kraus, *Jābir ibn Ḥayyān*, 1: 104.

## iii. Criticisms after Ibn Sīnā, especially Ibn Khaldūn's

In Ibn Khaldūn's *Muqaddima*, there is a section specifically on the denial of alchemy.[217] In this section, Ibn Khaldūn summarizes the discussions on the possibility of alchemy by several scholars and states his own position. The scholars to whom he mainly refers are al-Fārābī and Ibn Sīnā, both of whom we discussed in the previous sections, and al-Ṭughrāʾī, whom we will discuss in the third chapter.

As previously mentioned, in Ibn Khaldūn's view, the main question between al-Fārābī and Ibn Sīnā is whether all metals belong to the same species (*nawʿ*) or to different species. Specifically, Ibn Khaldūn says that "all of them [i.e. metals] are independent species or different in the characteristics (*khawāṣṣ*) of the qualities (*kayfiyyāt*), that is, all of them are sorted as one species, and their difference lies in the qualities: moisture, dryness, color, solidity."[218] Al-Fārābī suggests one species of metals and Ibn Sīnā suggests different species of metals. This is identical with the facts we read from the *Wujūb* and the *Shifāʾ*.

After that, Ibn Khaldūn summarizes al-Ṭughrāʾī's counterargument against Ibn Sīnā, that is, he cites it from the *Ḥaqāʾiq*. His summary covers al-Ṭughrāʾī's reaction to Ibn Sīnā's statement that the differences which separate metals into species are unperceivable and unmanageable. Al-Ṭughrāʾī's argument, as formulated by Ibn Khaldūn, is that even if the differences are not perceivable, transmutation of metals can occur. This is because it is not necessary to create a new difference for a substance to transmute into gold. Rather, it is enough just to re-arrange (*iʿdād*) it to accept the difference, and the transmutation would then occur.

In the *Ḥaqāʾiq*, al-Ṭughrāʾī's argument which Ibn Khaldūn cited is in fact a reaction to Ibn Sīnā's statements in the section on minerals in the *Shifāʾ*, "The possibility of eliminating or imparting the

[217] M. Quatremère, ed., *Muqaddima*, 3: 229-241.
[218] Ibid., 3: 233.

difference dividing into species has never been clear to me" and "The specific differences are unknown. If a thing is unknown, how is it possible for anyone to endeavor to produce it or to destroy it?"[219] Ibn Khaldūn's summarization makes al-Ṭughrāʾī appear to assert his own position against this statement of Ibn Sīnā. However, al-Ṭughrāʾī's answer is a comment on another part of *Shifāʾ*. Before the citation from the section on minerals, al-Ṭughrāʾī cites from the fourteenth section of Book Three of the *Ṭabīʿiyyāt* of the *Shifāʾ*, on *Generation and Corruption*, which is on "the reaction of the elements to some of them from some other and their change in terms of the condition of simplicity and that of compounding, and the quality of their behavior under the influence of celestial bodies."[220] Al-Ṭughrāʾī cites a sentence from this section, which says that "it is in the nature of matter that when it is completely prepared for a certain form, that form from the 'giver of forms (*wāhib al-ṣuwar*)' overflows into it [the matter]."[221] Based on this citation, al-Ṭughrāʾī proceeds to comment on Ibn Sīnā's statement cited from the section on minerals to point out that this part shows his ignorance of alchemical knowledge. However, al-Ṭughrāʾī thinks that other parts of the *Shifāʾ* which do not directly discuss alchemy, are compatible with the alchemical theories. Thus, al-Ṭughrāʾī does not exactly refute Ibn Sīnā on this issue as Ibn Khaldūn says; rather he thinks that the statements in the *Shifāʾ* which are in his view relevant to alchemy are basically correct unless he discusses alchemy directly. We will further discuss al-Ṭughrāʾī's attitude toward the *Shifāʾ* in the third chapter.

Ibn Khaldūn, in fact, considers that al-Ṭughrāʾī's argument is so reasonable that it can refute Ibn Sīnā's denial. However, Ibn Khaldūn further refutes al-Ṭughrāʾī to prove the impossibility of alchemy. His refutation pertains to the generation of natural objects and their artificial reproduction.

Firstly, he gives two important points of generation. One is that innate heat (*ḥarāra gharīziyya*) is

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219 al-Ṭughrāʾī, *Ḥaqāʾiq*, p. 60; Holmyard and Mandeville, eds., *al-Maʾādin*, p. 86.
220 Ibn Sīnā, *Shifāʾ*, vol. 2, bk. 3, pp. 189-194.
221 Ibid., p. 190; al-Ṭughrāʾī, *Ḥaqāʾiq*, p. 59.

necessary for every mixture (*mumtazij*) caused by generations of the four elements. Innate heat is, according to him, an agent of its existence and keeper of its form (*ṣūra*). The other point is that every created thing with a certain duration must go through different stages and transitions during the formation from one stage to another until it reaches the final stage.[222]

One of his refutations is that if we make gold, we have to imitate every stage of natural generation of gold in a lode, which must be impossible for human beings. Ibn Khaldūn says that one must perceive each of the conditions of gold in all the stages, that is, to know the proportion of the elements, the difference of innate heat, the duration spent in the stage, and the amount of the powers (*quwā*) needed for altering to another stage. Because the stages for the generation are too numerous to comprehend perfectly for human beings, he considers alchemical practice as unachievable except by the hands of God.[223]

Ibn Khaldūn also points out the time to generate gold. He considers that natural generation of gold takes 1080 years, a period of the great revolution of the sun.[224] Then, he asserts that artificial creation of gold cannot be faster than that of nature because nature always takes the fastest way.[225]

He adds other arguments to that of the natural generation of gold. He considers that God planned for gold and silver to be valuable so that they can function as currencies. If alchemy is possible, it would be an intervention of God's plan and their value would be lost.[226] A similar discussion is found in al-Fārābī's *Wujūb*. However, while Ibn Khaldūn thinks that the values of gold and silver are decided by God, al-Fārābī explains that alchemists have to cipher their writing in order to prevent harming their values (see the first section of this chapter).

Ibn Khaldūn also refutes alchemists who practice sorcery, such as Jābir and al-Majrīṭī. According

[222] M. Quatremère, ed., *Muqaddima*, 3: 236.
[223] Ibid., 3: 236-237.
[224] Ibid., 3: 235.
[225] Ibid., 3: 238.
[226] Ibid.

to Ibn Khaldūn, they are not trying to imitate the natural process of gold's generation, but their intention is to break the ordinary course of nature. He thinks that the alchemists attempt to make miracles happen or perform magic. Either way, he asserts, they cannot obtain gold because breaking the rules of nature is much too complicated to comprehend.[227]

We now consider the sources of Ibn Khaldūn's understanding of other scholars' discussions on alchemy, as well as his own refutation of this science. It is probable that he picked up information from al-Fārābī's *Wujūb*, the section on minerals of Ibn Sīnā's *Shifāʾ*, and al-Ṭughrāʾī's *Ḥaqāʾiq*. Some believe the possibility of alchemy and others do not. Although he tries to refute alchemy, he does not support any of the previous evaluations and, rather, offers his own original position on this issue. His main argument is the impossibility of reproduction of natural products. This argument has something in common with that of al-Kindī. However, while al-Kindī claims a fundamental distinction between natural and artificial objects, Ibn Khaldūn appears to accept the theoretical possibility of artificial reproduction of a natural object. His point is that this would be unmanageable for human beings because of its overly complicated processes.

This conclusion is derived from his understanding of the generation of natural objects. He considers "innate heat" and multiple "stages" as integral parts of the generation. This concept is more like the theory of fetal development than that of an inanimate natural object. In fact, he refers to the Qurʾanic explanation of fetal development to provide an example of this issue.[228] He assumes that the generation of gold also has stages like semen, blood clot, lump of flesh, and embryo. Innate heat is a concept that stems from Greek medicine; it is "an energy source powering the vital function of the body."[229]

Ibn Khaldūn also gives an opinion from the perspective of breaking natural law. It is interesting to

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[227] Ibid., 3: 240-241.
[228] See Qurʾān 74: 37-38.
[229] Peter E. Pormann and Emilie Savage-Smith, *Medieval Islamic Medicine* (Washington D. C.: Georgetown University Press, 2007), p. 23.

know that he considers not only God's miracles but also magical performances as a method to break natural law. This can be contrasted with Ibn Sīnā's classification of magic. As mentioned in the first chapter, Ibn Sīnā includes magic in the applied natural sciences, to which alchemy also belongs, and defines it as creation of power by combining substances on the earth. We can understand Ibn Sīnā's magic as one of the methods in applying natural law, while Ibn Khaldūn's magic is understood as something that breaks it. Thus, we have to be sensitive to this kind of difference when we discuss magic. This is important in order to understand the relationship between alchemy and magic, which modern researchers have not clarified well.

## iv. Summary

| *Author* | *Theoretically Possible* | *Practically Possible* | *Theories Employed (Natural Science)* | *Theories Employed (Others)* | *Alchemy as Artificial Reproduction of Nature* |
|---|---|---|---|---|---|
| ***al-Kindī (Citation in Kashf)*** | No | No | - Distinction between natural and artificial object<br>- Unity of metal | No (at least in this citation) | Yes |
| ***al-Fārābī*** | Yes | Difficult | - Alchemy is one of the studies of uniformity of compound bodies<br>- Metals belong to one species<br>- The difference between metals is the accidents of metal.<br>- Essential and accidental accidents | - Value of gold, silver, and precious stones<br>- Enigmatizing of writing<br>- Alchemy as a philosophical pursuit | No mention |
| ***Ibn Sīnā*** | Uncertain | No | - Metals belong to different species<br>- The specific difference (*faṣl*) separating metal into species cannot be known<br>- Alchemical process is merely operating on the accidents of metal | Mercury-Sulfur theory | Yes |
| ***Ibn Khaldūn*** | Yes | No | - Application of fetal development theory to generation of metals | - Value of gold (and silver)<br>- Break of natural law<br>- Alchemy is what poor people do | Yes |

We have now observed the arguments of four non-alchemist authors. Each author argues differently, and they do not agree with each other. However, the three authors except al-Kindī do not deny the theoretical possibility of transmutation. As for the practical possibility of transmutation, they all regard it as completely impossible or unachievable for ordinary people. Al-Fārābī, of course, does not deny the practical possibility, but he assumes that alchemy is not open to everyone, and there are difficult or almost impossible requirements for its accomplishment.

Each of the authors refers to different theories. Al-Kindī's starting point is from the definition of a natural and artificial object. Al-Fārābī claims that alchemical knowledge can be described by the study of the uniformity of compound bodies. Ibn Sīnā refers to an alchemical theory to describe the composition of metals. Ibn Khaldūn borrowed fetal development theory for generation of gold in nature. He also

regards some alchemical practices as breaking natural laws. These facts make clear that there was no specific manner to assess or criticize alchemy by non-alchemists. This suggests that no specific statements were widely convincing. Thus, there was room for al-Ṭughrāʾī to make a counterargument against Ibn Sīnā. In fact, al-Ṭughrāʾī points out Ibn Sīnā's inconsistencies, referring to seven different sections from the book on *Generation and Corruption* (Book Three of section on natural science of the *Shifāʾ*), on *Actions and Passions* (Book Four), and on minerals in the book on *Mineralogy and Meteorology* (Book Five).

Al-Fārābī and Ibn Khaldūn both mention the value of gold and silver. Both say that if people made gold and silver easily, their value would be lost, which would be harmful to society. However, al-Fārābī further claims that alchemists cipher their own writings and only a very few people who master philosophy can accomplish alchemical practice. On the other hand, Ibn Khaldūn considers that the value of gold and silver is God's plan, which cannot be violated. In addition, they also consider the figure of the alchemist in contrasting ways. Al-Fārābī thinks that the alchemist should pursue philosophical accomplishment rather than material profit. Ibn Khaldūn regards those who practice alchemy as being poor persons. In fact, Ibn Khaldūn assumes that al-Fārābī originates from a poor family.[230]

Three of the authors say that alchemists try to reproduce the natural generation of gold artificially. This seems to be a general understanding of alchemy by non-alchemists. Did, however, alchemists actually regard alchemical operation as imitating the natural process of generating gold? If we look back at the alchemists introduced in the first chapter, some of them would practice something similar to this, but others do not seem to try to imitate the natural process. Then, how did al-Ṭughrāʾī react to Ibn Sīnā, who claimed that alchemists attempt to imitate gold's natural generation? This question is to be pursued in the next chapter.

[230] M. Quatremère, ed., *Muqaddima*, 3: 241.

# Chapter 3: Al-Ṭughrāʾī, the *Ḥaqāʾiq*, and His Response to the Criticisms of Ibn Sīnā

## i. Al-Ṭughrāʾī's biographical background

His full name is Muʿayyid al-Dīn Abū Ismāʿīl al-Ḥusayn b. ʿAbd al-Ṣamad al-Duʾalī al-Iṣfahānī al-Munshiʾ al-Ṭughrāʾī. He also has titles such as al-Amīd, Fakhr al-kuttāb, al-Shaykh, al-Ḥakīm, al-Ustādh, and al-Faylasūf.[231] He was born in 453/1061 in the city of Jayy in the district of Iṣfahān. He was from a respected family, which is said to have Abū al-Aswad al-Duʾalī, the founder of the Baṣra school of grammar, as an ancestor.[232] In his youth, al-Ṭughrāʾī himself said that he studied both Islamic and philosophical sciences. However, he also said he did not regard himself as a high ranked scholar because he was too busy with his service to the Seljūq monarchs.[233]

In fact, he was involved in the Seljūq governmental circle early in his youth. In the reign of Alp Arslān, the second Seljūqid sultan (455/1063-465/1073), Muʿīn al-Mulk Muḥammad b. Faḍl Allah, the child of a chief secretary of Alp Arslān, became a patron of al-Ṭughrāʾī. Muʿīn al-Mulk introduced him to Niẓām al-Mulk (d. 485/1092), the vizier, and he was appointed as a secretary (*kātib*). However, he lost his position when Muʿīn al-Mulk fell out of favour with Alp Arslān and Niẓām al-Mulk and was imprisoned.[234]

After Malik Shāh (465/1073-485/1092) succeeded his father Alp Arslān, al-Ṭughrāʾī returned to service.[235] Just after the assassination of Niẓām al-Mulk, Malik Shāh also died young. These events brought the struggle for power by princes and relatives into the open. This resulted in the succession of Muḥammad Tapar, who managed in 498/1105 to wrest back control of a large part of the domain which

[231] Razook Faraj Razook, "Studies on the Works of al-Ṭughrāʾī" (PhD diss., University of London, 1963), pp. 25-26.
[232] Ibid., p. 29.
[233] Ibid., pp. 29-30, 155.
[234] Ibid., p. 30
[235] Ibid., pp. 30-31

had been divided among his brothers.[236]

In the reign of Muḥammad, al-Ṭughrāʾī was appointed chief secretary with the title of *munshiʾ* and *ṭughrāʾī* in 509/1115-16.[237] One of the manuscripts tells us that the *Ḥaqāʾiq* was written in 505/1112,[238] that is, between the succession of Muḥammad and al-Ṭughrāʾī's appointment. His service for the sultan did not last long, and he was dismissed in 511/1118. He was accused of using magic on the sultan that led to his illness.[239]

After Muḥammad's death in 511/1118, Maḥmūd succeeded him, and al-Ṭughrāʾī returned to service once again. He was sent to Maḥmūd's brother Masʿūd, the king of Mawṣil (modern English: Mosul). There he was appointed as vizier in 513/1119-20. However, it was not long before he lost his position, then even his life. In 515/1121-22, a conspiracy led by Juyūsh-beg, Masʿūdʾs *atabeg*, which is usually the title for guardian-tutor of a young prince,[240] and Dubays b. Ṣadaqa, the Mazyadid monarch, resulted in the outbreak of war between Masʿūd and Maḥmūd. The war ended in the defeat of Masʿūd after a day-long fight. Masʿūd and his men were captured, including Juyūsh Beg and al-Ṭughrāʾī. Masʾūd and Juyūsh Beg fled away, but they were pardoned afterward. On the other hand, al-Ṭughrāʾī was kept imprisoned and was executed in 515/1121.[241]

The official reason for the execution is not for the rebellion but for being an unbeliever (*zandīq*) and an apostate (*mulḥid*).[242] As Razook argues, the charges of unbelief and apostasy were probably used to cover up what was basically political murder.[243] However, what aspect of al-Ṭughrāʾī would make him

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[236] *Encyclopaedia of Islam*, 2nd ed., s.v. "Saldjūkids," by C. E. Bosworth, R. Hillenbrand, J. M. Rogers, F. C. de Blois and R. E. Darley-Doran.
[237] Razook, "Studies on the Works of al-Ṭughrāʾī," p. 31.
[238] al-Ṭughrāʾī, *Ḥaqāʾiq al-istishhād*, Dublin, Chester Beatty Library, MS. 3231(9), fol. 204b.
[239] Razook, "Studies on the Works of al-Ṭughrāʾī," p. 31.
[240] *Encyclopaedia of Islam*, 2nd ed., s.v. "Atābak," by Amalia Levanoni.
[241] Ibid., pp. 31-33.
[242] Razook, "Studies on the Works of al-Ṭughrāʾī," p. 31; *Encyclopaedia of Islam*, 2nd ed., s.v. "al-Ṭughrāʾī," by F. C. de Blois.
[243] Razook, "Studies on the Works of al-Ṭughrāʾī," p. 37.

vulnerable to such an accusation? Razook assumes that the grounds for the charge of his unbelief or apostacy was his devotion to alchemy, which could be threatening for laymen.[244] Razook's assumption could partly be true, but the impression of alchemy's dangerousness does not seem to be the critical reason for the judgment. No person was executed because of the practice of alchemy in medieval Islam as far as we know. Rather, it seems that Seljūqid hostility to the Ismāʿīlīs was the driving force behind the execution. According to Madelung, the term *mulḥid* began to indicate Ismāʿīlīs in eastern Persian territory, and by the second half of the twelfth century, it had this meaning everywhere in the Islamic world.[245] Thus, it is quite possible that the charge of being a *mulḥid* directed at al-Ṭughrāʾī implies that he was considered as an Ismāʿīlī. In addition, al-Ṭughrāʾī emphasized the importance of ciphers in alchemical writings (see the following sections), which would highlight the esotericism of alchemy. Esotericism is one of the most noticeable characteristics of Ismāʿīlī doctrine. Also, he often quotes Jābir, part of whose corpus contains Ismāʿīlī doctrine. From these facts, it can be assumed that al-Ṭughrāʾī's opponents were not threatened by alchemy itself, but they sensed an aura of Ismāʿīlism from what al-Ṭughrāʾī pursued.

Razook also relates the execution of al-Ṭughrāʾī with the past allegation that he caused the illness of the sultan through magic.[246] However, there are few pieces of evidence to prove the close relationship between alchemy and magic in al-Ṭughrāʾī's age. As discussed in the first chapter, it is true that Ibn Khaldūn, in the fourteenth century, pointed out this relationship. On the other hand, the *Mafātīḥ* of al-Khwārizmī, written in the late tenth century, indicates that alchemy was one of the disciplines which government officials should know. We have to be more cautious when we discuss the public image of alchemy in each period and place.

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244 Ibid., pp. 35-36.
245 *Encyclopaedia of Islam*, 2nd ed., s.v. "Mulḥid," by W. Madelung.
246 Razook, "Studies on the Works of al-Ṭughrāʾī," p. 35.

## ii. Al-Ṭughrāʾī's Alchemical works

According to Razook, fourteen alchemical works are attributed to al-Ṭughrāʾī. For some the authorship is certain, for others, there is some doubt. In every work, he cites pre-Islamic and Muslim alchemists, and he adds comments on them. Razook states, "it can be said that he added nothing essential to alchemical knowledge."[247] This assessment could be true if we judge solely from this style of writing. However, we also should reconsider his accomplishment from another perspective. This is discussed in the following section.

Al-Tughrāʾī was actually more famous as a poet than an alchemist.[248] We might imagine a relationship between his poem and alchemy. However, according to Razook's comprehensive study of al-Ṭughrāʾī's works, al-Tughrāʾī's poetry and alchemy are mainly independent of one another. Although there is a collection of alchemical poems by him, called *al-Maqāṭīʿ fī al-ṣanʿa*, in which the entirety of his alchemical poems are gathered,[249] his we can find that his alchemical and other poems have different objectives, and his alchemical poems are simply in pursuit of alchemical knowledge (details below). Thus, we can safely consider his alchemical works in order to understand his ideas on this science.

- <u>*Mafātīh al-rahma*</u>

*Mafātīḥ al-raḥma* is one of the earliest works of al-Ṭughrāʾī. The main content of this work consists of quotations of alchemists and his comments on them, which is his basic writing style. Among Muslim alchemists, Jābir was mentioned most often.[250] Al-Ṭughrāʾī quotes from twenty-six works of Jābir.[251]

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[247] Razook, "Studies on the Works of al-Ṭughrāʾī," p. 143.
[248] Ibid., p. 138
[249] Ibid., p. 67.
[250] According to Razook, other than Jābir, he mentions Ibn Waḥshiyya, al-Rāzī, Abū Saʿīd al-Naddāf, Dhū al-Nūn, and Aḥmad b. Shāmardān. Ibid., p. 157.
[251] These are the list of Jābir's works that al-Ṭughrāʾī quoted (*Kitāb* or *Kutub* is omitted. The numbers in the parenthesizes are the catalog numbers in Kraus, *Jābir ibn Ḥayyān*, vol. 1): *al-Riyāḍ* (al-kabīr: 960; al-ṣaghīr: 962); *al-Tajrīd* (399); *al-Mulk* (454); *al-Raḥma* (al-kabīr: 5 al-ṣaghīr: 969); *al-Ustuquṣṣ* (6-8 = *Ustuquṣṣ al-uss*); *al-*

However, according to Razook, the most significant alchemist in this work is Apollonius of Tyana (Balīnās) judging from the frequency of quotation and al-Ṭughrāʾī's admiration for him.[252] In *Mafātīḥ al-raḥma*, not only alchemical concepts but also alchemical apparatuses are described.[253] *Mafātīḥ al-raḥma* is often mentioned in the *Ḥaqāʾiq*. Al-Ṭughrāʾī introduces it as a further reference for the theories he explains in the *Ḥaqāʾiq*.

As for the works of Jābir to which al-Ṭughrāʾī refers, they cover a wide range of the Jabirian corpus. Each of the twenty-six works belongs to *Kitāb al-raḥma* (*Book of Mercy*), *Kutub al-miʾa wa-'l-ithna ʿashara* (*500 books*), *Kutub al-sabʾīn* (*70 books*), *Kutub al-mawāzīn* (*Books of Balances*), *Kutub al-khams miʾa* (*500 books*), and *Kutub al-ajsād al-sabʿa* (*Books of Seven Metals*). Some of them are dated earliest in the corpus; others are dated later.[254] This variety of the works of Jābir shows that al-Ṭughrāʾī struggled to find the alchemical truth from *tabdīd al-ʿilm*, which means "dispersion of knowledge" (See Chapter 1), alone.

- <u>*Maṣābīḥ al-ḥikma*</u>

*Maṣābīḥ al-ḥikma* is usually attached with *Mafātīḥ al-raḥma*. Sometimes they are regarded as one book, but, according to Razook, they are in fact independent works, each of which has a complete book format. *Maṣābīḥ al-ḥikma* consists of two treatises (*maqāla*). The writing style is similar to the commentarial approach of *Mafātīḥ al-raḥma*. Al-Ṭughrāʾī gives a list of sixty alchemists whom he refers to and

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*Mabādiʾ al-ʿashara* or *Aghrāḍ al-mabādiʾ al-ʿashara* (1064); *al-Manfaʿa* (973); *al-Taṣrīf* (104; 404); *al-Rāḥa* (971); *al-Sirr al-maknūn* (389-391); *al-Tajmīʿ* (398); *Sirr al-asrār* (1072); *al-Ajsād al-sabʿa* (947-953); *al-Sabʿīn* (123-192); *al-Jumal al-ʿishrīn* (338-357); *al-ʿAshr* (129 In Kraus' catalog, *al-ʿAshara*); *al-Istimām* (83); *al-Thalāthīn kalima* (125); *al-Uss* (5 = *al-Raḥma*); *Muhaj al-nufūs* (371); *al-Mujarradāt* (63-64); *al-Ṣufwa* (384 In Kraus' catalog, *al-Ṣafwa*); *al-Waṣiyya* (1076); *al-Ittiḥād* (1058); *Ghāyat al-tajwīd* (399 In Kraus' catalog, *Ghāyat al-tajrīd*); *Ikhrāj mā fī al-quwwa ilā al-fiʿl* or *al-Ikhrāj* (331). Razook, "Studies on the Works of al-Ṭughrāʾī," pp. 156-157.

[252] Ibid., p. 157. Other pre-Islamic alchemists mentioned are al-Iskandar (Alexander), Hermes, Ostanes, Hiraql (Herakleios), Democritus, and Galen. Ibid., pp. 157-158.

[253] Ibid., pp.154-158.

[254] See Kraus, *Jābir ibn Ḥayyān*, vol. 1; Holmyard, *Alchemy*, p.74.

comments upon in those two works, including pre-Islamic and Muslim figures.[255] In addition to the citations and comments, this work contains some alchemical poems. Those poems are also found in *al-Maqāṭiʿ fī al-ṣanʾa*, his alchemical poem collection.[256]

In the *Ḥaqāʾiq*, the *Maṣābīḥ al-ḥikma* is not mentioned, but al-Ṭughrāʾī mentions a certain work entitled *Kalām sittīn ḥakīman min ḥukmāʾi-nā* (the discussion of sixteen of our sages),[257] which is most likely *Maṣābīḥ al-ḥikma*.

*Mafātīḥ al-raḥma* and *Maṣābīḥ al-ḥikma* are rich in quotations of old alchemical works and sayings.[258] Further study of these sources will contribute to knowing what kind of sources were available to Muslim alchemists and even to clarifying the transmission of alchemy to the Islamic world.

- *Jāmiʿ al-asrār*

*Jāmiʿ al-asrār* also contains two volumes. The objective of this work is a defense of alchemy. Al-Ṭughrāʾī first quotes the arguments of the opponents of alchemy. Then, he explains the reason for using ciphers in alchemical writings, which is the main reason why the opponents criticize alchemy. This has a similar

[255] Pre-Islamic: Mūsā, Dāʾūd, Sulaymān, Shīt (these four names are prophets), Harmas (Hermes), Usṭānas (Ostanes), Dhūmuqrāṭ (Democritus), Māriya (Maria the Jewess), Asīdā, Barasṭals, Farṭas (these three names are unidentified), Zūsīmūs (Zosimus), Balīnās (Apollonius of Tyana), Hiraql (The Emperor Herakleios), Aras (or Āras. See the following section.), Asfīdūs (Asclepius), al-Wuzarāʾ al-Khamsa ("The Five Ministers," to which Asclepius belongs), Mihrārīs (See Ibn Nadīm, *Fihrist*, 2: 447.), Jāmāshaf (Jamasp), Asṭarīk (unidentified), Aflāṭun (Plato), Suqraṭ (Socrates), Jālīnūs (Galen), al-Iskandar (Alexander of Aphrodisias), al-Rāhib (Morienus?), Miryānus (Morienus), Saghūras (or Saʾūras, or Saqūras), Baṣlāyil (unidentified), Gharghūriūs (Anaxagoras?), Fīthāghūras (Pythagoras), Aghādhīmūn (Agathodaemon), Tūfīl (Theophilos), Asṭūnas (Asṭūs? See Ibn Nadīm, *Fihrist*, 2: 447.), Asṭush (unidentified), Tūtālis (Aristotle?), Badūfaṭas (Baraqṭūs of Alexandria?), Usādiras (unidentified), Farfūriūs (Porphyry), Andariyya (See Sezgin, *GAS*, 4: 291), Umīras (Homer), Sarjis al-Raʾs-ʿaynī (Sergius of Resaena). Medieval Islamic: Jābir b. Ḥayyān al-Ṣūfī, Khālid b. Yazīd, Sālim al-Ḥarrānī (See Sezgin, *GAS*, 4: 271-272), Ḍhū al-Nūn al-Miṣrī (See Ibn Nadīm, *Fihrist*, 2: 459.), Abū Bakr b. Waḥshiyya, Muḥammad Zakariyyāʾ al-Rāzī, Ḥafīf al-Ḥarmī al-Ṭarsūsī (unidentified), Abū Saʿīd al-Naddāf (mentioned in al-Ṭughrāʾī's *Tarākīb al-Anwār*), Aḥmad b. Sāhimdān al-Iṣfahānī (mentioned in al-Ṭughrāʾī's *Tarākīb al-Anwār*), Wahab b. Jāmiʾ (See Sezgin, *GAS*, 4: 294), ʿAwn b. al-Mundhir (See Sezgin, *GAS*, 4: 89), Abū Mūsā al-Rahāwī (Job of Ededssa), Sabʾī Qudāma al-Shīʿī (probably Ḥasan b. Qudāma). Razook, "Studies on the Works of al-Ṭughrāʾī," pp. 248-264. The information in parentheses is based on Razook's identifications, but additional references are also included.

[256] Razook, "Studies on the Works of al-Ṭughrāʾī," pp. 248-264.

[257] al-Ṭughrāʾī, *Ḥaqāʾiq*, p. 76.

[258] Razook, "Studies on the Works of al-Ṭughrāʾī," p. 162.

style to the *Ḥaqāʾiq*, which contains Ibn Sīnā's denial of alchemy in the introduction. In the second chapter of *Jāmiʿ al-asrār*, al-Ṭughrāʾī further explains the nature of alchemical ciphers.[259]

Razook says that *Jāmiʿ al-asrār* was written after the *Ḥaqāʾiq* since al-Ṭughrāʾī mentions the *Ḥaqāʾiq* in *Jāmiʿ al-asrār*.[260] However, the *Ḥaqāʾiq* also mentions *Jāmiʿ al-asrār* several times. He mentions it when he describes ciphers and introduces further information on them. Judging from these facts, it is possible that either of them has multiple versions. For example, it can be said that before the second version of *Jāmiʿ al-asrār*, the *Ḥaqāʾiq* was written, and then, the second version of *Jāmiʿ al-asrār* was written. Razook found five different manuscripts but consulted just one,[261] which suggests that further philological study on this text is necessary.

- *Tarākīb al-anwār*

*Tarākīb al-anwār* is usually attached with *Jāmiʿ al-asrār*.[262] The term *tarkīb*, the singular of *tarākīb*, here means the compounding of the four elements. In this work, the theories of *tarkīb* using numbers are introduced. Al-Ṭughrāʾī here says that "the science of *tarākīb*" is known as "the science of *mawāzīn*." The term *mawāzīn*, which means balance, is one of the major concepts in the Jabirian corpus.[263] In *Tarākīb al-anwār*, al-Ṭughrāʾī refers not only to Jābir but also Ibn Waḥshiyya and ancient sages.[264]

This issue, compounding through numbers, is also mentioned in the *Ḥaqāʾiq*, and there al-Ṭughrāʾī mentions names similar to those appearing in *Tarākīb al-anwār*. However, in the *Ḥaqāʾiq*, he gives *Jāmiʿ al-asrār* as a further reference for this issue. This suggests that the author himself regards *Tarākīb al-*

[259] Ibid., pp. 172-175.
[260] Ibid., p. 167.
[261] Ibid., pp. 167-169.
[262] Ibid., p. 177.
[263] For the concept of "balance," see Holmyard, *Alchemy*, p. 76-79.
[264] Razook, "Studies on the Works of al-Ṭughrāʾī," p. 179. The ancient sages mentioned are Herakleios, Pythagoras, Zosimus, Hermes, Aras, Gregorius, Democritus, Apollonius, Stephanus, and Alexandros.

*anwār* as a part of *Jāmiʿ al-asrār*. Furthermore, *Tarākīb al-anwār* contains al-Ṭughrāʾī's explanation of why alchemical writings were widely misunderstood, even by Ibn Sīnā.[265] This is a common issue discussed in *Jāmiʿ al-asrār*.

- *al-Maqāṭīʿ fī al-ṣanʿa*

*Al-Maqāṭīʿ fī al-ṣanʿa* is, as mentioned before, a collection of alchemical poems. It has ninety-four poems and fragments. In its introduction, al-Ṭughrāʾī states his motive for composing poems and compiling the collection. Having criticized the poetry by Khālid b. Yazīd, Jābir, and Dhū al-Nūn for misinterpretation of meaning and incomplete versification, he endeavors to compose better ones. The topics of his poetry are diverse: he touches on alchemical theories, practices, and ancient alchemical myths.[266]

As mentioned, Al-Ṭughrāʾī himself has more of a reputation as a poet than as an alchemist. *Al-Maqāṭīʿ fī al-ṣanʿa* appears to show how his two specialties collaborated. However, according to Razook, al-Ṭughrāʾī "does not mix together his two main intellectual personalities."[267] If one accepts this, *al-Maqāṭīʿ fī al-ṣanʿa* was not written for a purely poetical pursuit but was a part of his study and research on alchemy.

- *Ḥaqāʾiq al-istishḥād*

*Ḥaqāʾiq al-istishḥād* is the main work consulted in this thesis. It is discussed in the next section.

- *Sirr al-ḥikma fī sharḥ kitāb al-raḥma*

*Sirr al-ḥikma fī sharḥ kitāb al-raḥma* is a commentary on Jābir's *Kitāb al-raḥma*. This work is not

[265] Ibid., pp. 180-181.
[266] Ibid., pp. 184-185.
[267] Ibid., p. 67.

specifically mentioned in al-Ṭughrāʾī's other works.[268] Only Ḥājjī Khalīfā's *Kashf* cites it, doing so under two names, *Sirr al-ḥikma fī sharḥ kitāb al-raḥma* and *Sirr al-ḥikma*.[269] According to Razook, the only existing manuscript titled *Sirr al-ḥikma fī sharḥ kitāb al-raḥma* is in Paris, Bibliothèque Nationale, MS. Arabe 2067. However, Razook reaches the conclusion that the text in the manuscript can be divided into two parts, one of which seems to be written by al-Ṭughrāʾī, while the other is by an author from a later period.[270] Razook also found a manuscript attributed to al-Ṭughrāʾī titled *Sharḥ kitāb al-raḥma*, in Cairo, Dār al-Kutub, Ṭabīʿiyyāt 169,[271] which he has not consulted. Again, we will need more philological research to clarify the question of authorship.

- *Dhāt al-fawāʾid*

*Dhāt al-fawāʾid* is mentioned as al-Ṭughrāʾī's work in various historical sources. This work is a short treatise whose length is around 100 lines. The subject of this work is on *awzān*, which has the same root (*w-z-n*) as *mawāzīn*. According to Razook, *Dhāt al-fawāʾid* discusses a part of the science of *mawāzīn* or balances. (See *Tarākīb al-anwār*). This work also consists of quotations of ancient and Muslim alchemists with commentary.[272]

- Other works attributed to al-Ṭughrāʾī

The rest of the works attributed to al-Ṭughrāʾī whose manuscripts exist and which Razook listed are not mentioned in any historical sources. Some of them are attributed to al-Ṭughrāʾī through philological researches.[273] However, there remains much room for discussion, so we should leave them for a future

[268] Ibid., p. 202.
[269] Ḥājjī Khalīfa, *Kashf*, 3:593; Razook, "Studies on the Works of al-Ṭughrāʾī," p. 179.
[270] Razook, "Studies on the Works of al-Ṭughrāʾī," pp. 202-204.
[271] Ibid., p.149.
[272] Ibid., pp. 210-213.
[273] Ibid., pp. 214-231.

study. The following are the works that Razook lists:[274]

- *al-Irshād ilā al-awlād*

- *Asrār al-ḥikma*

- *al-Jawhar al-nadīr fī ṣinā ʿat al-iksīr*

- *al-Risāla al-khātima*

- *Kitāb al-asrār fī ṣiḥḥat ṣinā ʿat al-kīmiyā*

- *Risāla fī al-ṭabī ʿa*

[274] Ibid., p.149.

## iii. The *Ḥaqāʾiq* and al-Ṭughrāʾī's argument

- The *Ḥaqāʾiq*'s content

Al-Tughrāʾī wrote the *Ḥaqāʾiq* in a commentary format. For each topic, a passage from Ibn Sīnā's *Shifāʾ* is quoted first, and then al-Ṭughrāʾī compares it with his and other alchemists' views on the same issue. Sometimes al-Ṭughrāʾī gives some further comments on the alchemists' statements. The quoted passages are from three books (*fann*) in the section (*jumla*) on natural science of the *Shifāʾ*: 1) Book Three on *Generation and Corruption* (*al-kawn wa-'l-fasād*); 2) Book Four on *Actions and Passions* (*fī al-afʿāl wa-'l-infiʿālāt*); 3) Book Five on *Minerals and Metereology* (*al-maʿādin wa-'l-āthār ʿulwiyya*).

The introduction of the *Ḥaqāʾiq* contains: the view of those who criticize alchemy (al-Ṭughrāʾī's interlocutor in this work), the definition of the discipline of alchemy, and the reason why he cites and comments on Ibn Sīnā's writing.

First, al-Ṭughrāʾī highlights non-alchemists' understanding of alchemy. In the *Ḥaqāʾiq*, he supposes an interlocutor who represents the position of non-alchemists. Al-Ṭughrāʾī shows that the interlocutor thinks that the philosophers who established the foundation of the sciences like Plato, Aristotle, al-Fārābī, and Ibn Sīnā, have tended to deny its validity. Those philosophers regard it as a discipline but claim alchemy's unsuitability for the purpose and methodology of philosophy and believe that it is a useless and fraudulent practice. Also, the interlocutor regards the books on alchemy by ancient sages as incorrect since they only have obscure explanations. He thinks that the books of Muslim alchemists are even more misleading since those books are merely disguised with the style of ancient alchemical writings.[275]

Then, al-Ṭughrāʾī quotes Ibn Sīnā's statement as an example of the criticisms by the interlocutor, that is, non-alchemists. After that, he gives another quotation from the *Shifāʾ* in order to clarify what Ibn

[275] al-Ṭughrāʾī, *Ḥaqāʾiq*, pp. 49-50.

Sīnā specifically considers as objectionable.[276] This quotation is from the chapter on minerals in Book Five of the natural science section of the *Shifāʾ*. Ibn Sīnā's argument has been discussed in detail in the second chapter of this thesis.

Al-Ṭughrāʾī also provides some definitions of alchemy and outlines the main components of this discipline. First of all, cipher is the most crucial component. The ciphered secret must not be disclosed outside of the group of alchemists. In order to solve the ciphers, a long patient study and gift from God are needed. The ciphers should not be obscure in an essential part, and each cipher must indicate one meaning, that is, it does not allow multiple interpretations. If one understands ciphers only from their superficial meaning, he will be unsuccessful.[277]

Al-Ṭughrāʾī says that alchemy always returns to one method and operates one thing. Alchemical operation deals with the specificity (*khāṣṣiyya*). The true method in the operation, which alters capability or power (*quwwa*) into actuality or effect (*fiʿl*), extracts the specificity.[278] This issue is discussed in detail in the main part of the *Ḥaqāʾīq*. Furthermore, he says that in order to master both theory and methodology, the alchemist should not carry out an experiment before completely understanding what is written in the books. Despite this, experimentation is also indispensable.[279]

Al-Ṭughrāʾī shows the difference between alchemy and natural science as a discipline of philosophy. He declares that alchemists are not required to demonstrate the principles of natural philosophy. Like the discipline of medicine, alchemy simply borrows these principles and applies them for its own purposes. Thus, there is no proof (*burhān*) in alchemy.[280]

In the introduction, al-Ṭughrāʾī also explains the reason why he decided to comment on Ibn Sīnā's

[276] Ibid., pp. 50-51.
[277] Ibid., p. 52.
[278] Ibid.
[279] Ibid.
[280] Ibid., p.53.

work. He argues that Ibn Sīnā is indifferent to alchemy and does not really understand how the discipline works. On the other hand, he thinks that Ibn Sīnā's natural philosophical theories are basically consistent with those of alchemy. Thus, he tries to show how the *Shifāʾ* contains the principles of alchemical theory.[281] This is the main purpose of the *Ḥaqāʾiq*.

The main part of the *Ḥaqāʾiq* begins with a quotation of a passage from the fourteenth chapter of Book Three on *Generation and Corruption*. Here, he introduces the four elements, that is, earth, water, air, fire, and describes their characteristics. Al-Ṭughrāʾī considers that Ibn Sīnā's theory of the four elements is identical to the alchemists'. He cites Hermes, an unnamed figure referred to as the "monk (*al-rāhib*)," and Apollonius to show the alchemical ideas on the four elements.

The following are the major points in these citations. First, a thing that consists of the four elements can be altered by these four elements. This indicates that compounding (*tarkīb*) of the four elements, that is, the proportion of the four elements in a compound, is related to the change of an object. Second, there is a "close relationship (*qarāba wāshija*)" between two different elements. The "close relationship" means that a characteristic of an element and that of another have a relationship of "doing" and "being done." Al-Ṭughrāʾī gives an example between earth and water, citing the "monk." According to the "monk," the moisture of water adheres to the dryness of earth, which means that water becomes the "adhering," and earth becomes the "adhered."[282] Third, there are two groups in the four elements: earth and water; air and fire. The "monk" explains that water and earth have ten opposite accidents to air and fire.[283] Fourth is how the four elements exist in the compound. Al-Ṭughrāʾī says that earth and water exist in a compound "as a concrete individual (*bi-'l-ʿayni*)" while air and fire exist "as an effect (*bi-'l-athari*)." He explains that the difference between them lies in their relationship with "spiritual powers (*quwā rūḥāniyya*)."

[281] Ibid., pp. 51-53.
[282] Ibid., p. 54.
[283] Ibid.

"Spiritual powers," he says, occur when an element transforms into another and is used for the transmission of the transformation from one element to another. These powers cannot be separated from any elements, but the air and fire can be recognized by their effects, while earth and water are indistinguishable from the powers because there is a "close relationship" between the elements and powers.[284] Fifth is how to operate the four elements, that is, the way of compounding elements. Referring to the opinion of Apollonius of Tyana, Al-Ṭughrāʾī writes that this can be learned from what occurs in nature.[285] Sixth is how to learn about the mechanism of the four elements or how the elements are compounded. Al-Ṭughrāʾī says that this issue is one of concealed knowledge. Despite this, he cites some explanations which are not ciphered. He quotes from Apollonius, Hermes, the "monk," and Stephanus. In addition to this, he introduces the explanation of compounding the elements by numbers. According to al-Ṭughrāʾī, this is a doctrine that was initiated by Pythagoras and later followed by Stephanus, Jābir, and Ibn Waḥshiyya.[286] As mentioned in the previous section, this theory can also be called *mawāzīn* (balances). In addition to this, al-Ṭughrāʾī also mentions the atomic theory of Democritus.[287]

The Arabic word for "elements" differs between Ibn Sīnā and the alchemists. Al-Ṭughrāʾī uses *ʿanāṣir* when quoting Ibn Sīnā's passage, whereas he uses *ṭabāʾiʿ* in the quotations of alchemists and his own statements. The term *ṭabāʾiʿ* literally means natures or qualities, which might appear to indicate the two "natures" of an element (e. g. dryness and coldness of earth), but he does not use it in this meaning in the *Ḥaqāʾiq*. In addition to *ṭabāʾiʿ*, al-Ṭughrāʾī also uses *arkān* to indicate the four elements.

Al-Ṭughrāʾī tends to inform the readers whether a theory or idea appears in a ciphered expression in alchemical writings. Some are basic concepts, which do not have to be ciphered. Others are advanced ones, which must be ciphered. In this regard, he says, for example, that the four elements that exist in the

[284] Ibid., p. 55.
[285] Ibid., p. 56.
[286] Ibid., pp. 56-58.
[287] Ibid., p. 58.

compound (the fourth point) have been explained without cipher, whereas information on the two groups of the four elements and their accidents (the third point) and the mechanism of the four elements (the sixth point) are ciphered. This style continues in the rest of the parts of the *Ḥaqāʾiq*. Also, he often mentions his *Jāmiʿ al-asrār* and *Mafātīḥ al-raḥma* for further reference on the ciphered expressions.

The second citation of the *Shifāʾ* is on the transformation of the elements, which is also from the fourteenth chapter of Book Three on *Generation and Corruption*. Al-Ṭughrāʾī elaborates on the alternation of the four elements. He says Ibn Sīnā's statement on this issue is also consistent with the alchemists' theory. To summarize Ibn Sīnā's theory, he states that an element can increase and decrease its properties, but there are certain limits on the quantity of properties which an element can hold. If the element exceeds the limit, the environment for the current form will be void, and that for a new form will be prepared. When the new environment is prepared, the new form will overflow into the element from the "giver of forms (*wāhib al-ṣuwar*)." This can be applied not just to elements but also to creatures.[288]

Al-Ṭughrāʾī explains how this relates to alchemical theory. According to him, compounding elements triggers the reception of a form (*ṣūra*) and the acquisition of a specificity (*khāṣṣiyya*) in the elements. Simple elements do not have any form and specificity, but after compounding them, he says, a form overflows into them from the "giver of forms." Once the form is received in the elements, a specificity occurs to it.[289] This means that by compounding elements, the elements can transform into a specific thing.

Al-Ṭughrāʾī then discusses the issue of the change of species, the possibility of which Ibn Sīnā opposes. This is what Ibn Khaldūn mentioned in the *Muqaddima*.[290] Ibn Sīnā argues that we cannot change the species of a thing because what speciates a thing is unknown. Al-Ṭughrāʾī in response asserts

[288] Ibid., p. 58.
[289] Ibid., pp. 59-60.
[290] See Franz Rosenthal, trans., *Muqaddima*, 3: 273-274.

that we do not have to know it in order to deal with the difference of species. Ibn Khaldūn describes al-Ṭughrāʾī's opinion as arguing that we just have to prepare the thing for receiving the difference.[291] However, in the *Ḥaqāʾiq*, there is a more detailed explanation of this issue. Al-Ṭughrāʾī says that the form which determines the species of a thing overflows from a "knower" (*ʿālim*) of the form. Because of the knower, we do not have to know the difference between the species. The operation of an alchemist is to remove the obstacle for the overflow of the form. His example is that water does not become air because of the coldness, which is the obstacle. Thus, if the water is heated, the obstacle will be removed, and the water will become air.[292]

The third citation from the *Shifāʾ* is on combination (*mizāj*), which is from the eighth chapter of the first treatise of Book Four on *Actions and Passions*. In al-Ṭughrāʾī's view, a combination of a compound with another brings about increase or decrease of its properties. This might cause a transformation of elements and a change of species.[293] Ibn Sīnā's explanation of combination is that when different bodies which consist of elements join each other, each of the bodies affects the form of the joined body. We can call it a combination in the case that one of the bodies does not dominate the other and the action of one body is balanced with the passion (or being affected) of another. This balance brings about a new integrated property.[294]

Al-Ṭughrāʾī says that the passage of the *Shifāʾ* is consistent with alchemists' statements on this issue. However, further discussion is needed to understand how to manage a combination in an actual situation. In his view, alchemists intend decomposition (*tahbiya*) and cancellation (*taṣghīr*) in order to combine bodies. He explains this issue by an abstract example, which is the combination of "bodies" (*ajsād*) and "spirits" (*arwāḥ*), and he refrains from explaining more specifically because this is one of

[291] For details on Ibn Khaldūn's argument, see the third section of the second chapter.
[292] al-Ṭughrāʾī, *Ḥaqāʾiq*, p. 60.
[293] Ibid., p. 61.
[294] Ibid.

concealed knowledge.[295] If we give a simple interpretation of it, we can say: Alchemists perform dissolution in water. Dissolution causes decomposition of the dissolved bodies, which means that they break up into particles which cannot be divided any further. After decomposition, cancellation occurs. Cancellation means that the particles of the bodies lose their property. Then, the dissolved bodies are ready to acquire a new property, which is the goal of combination.

This combination is applicable only when the bodies to be combined can be harmonized, that is, the action of a body is balanced out with the passion of another. In this case, how can we combine conflicting bodies, that is, the bodies whose specificity cannot be removed by dissolution? Al-Ṭughrāʾī quotes, also from the eighth chapter of the first treatise in the book on *Actions and Passions*, a passage which indicates that Ibn Sīnā also recognizes dissolution in this case, giving salt and sugar as examples. After the quotation, al-Ṭughrāʾī introduces "sharp waters" (*miyāh al-ḥādd*).[296] Regarding "sharp waters," al-Ṭughrāʾī does not quote any specific passage in the *Shifāʾ*, but he points out that Ibn Sīnā mentions them.[297] However, he thinks that Ibn Sīnā does not consider that "sharp waters" are related to the operation regarding combination.[298] In al-Ṭughrāʾī's view, "sharp waters" are a solution in which a drug that has a power of cancellation is dissolved. If a body is dissolved in "sharp water," the particles of the "sharp water" force the decomposition, cancellation, and deprivation of the specificity of the dissolved body. That is, "sharp water" plays a part in removing the obstacle to combination in a body.

The fifth cited passage, which is from the sixth chapter of the book on *Generation and Corruption*, is on coloring bodies by the effect of a small body. Ibn Sīnā describes it as "just as the specialist claiming elixir [i.e. alchemist] performs."[299] However, al-Ṭughrāʾī says that the coloring which Ibn Sīnā considers

[295] Ibid., pp. 62-65.
[296] Ibid., pp.65-66.
[297] Ibid., p. 68.
[298] Ibid., p. 66.
[299] Ibid., p. 70.

is a method for ordinary people, and that of alchemists is different. He does not discuss coloring any further and mentions *Jāmiʿ al-asrār* as further reference.[300] However, we can find some relationship of the coloring with the following two concepts that al-Ṭughrāʾī explains.

The sixth cited passage, which is from the sixth and seventh chapter of the first treatise in the book on *Actions and Passions*, is on maturation (*naḍj*), putrefaction (*ʿufūna*), and roasting (*ṭabkh*). Al-Ṭughrāʾī says that the explanation in the *Shifāʾ* on these issues is close to alchemists' ideas and these three are all concerning heat and moisture. He describes these concepts in alchemy, comparing and applying them to Ibn Sīnā's statement. He does this while referring to several alchemists such as Āras (discussed later), Agathodaemon (also discussed later), and Hermes. As for maturation and putrefaction, Ibn Sīnā classifies maturation into three types and explains how one of them can bring about putrefaction. He calls this maturation "maturation of excess (*faḍl*)," which means the transmission of moisture to a body. When the composition of the body is bad, putrefaction occurs and brings it to a certain condition. On the other hand, al-Ṭughrāʾī defines putrefaction more broadly. He implies that putrefaction also has a relationship with another of Ibn Sīnā's classifications, which is "maturation of nutrition." According to Ibn Sīnā, maturation of nutrition means that a nutritious body transforms into the nourished body, which he calls digestion (*haḍm*). Putrefaction in al-Ṭughrāʾī's discussion appears to mean this digestion, in addition to the putrefaction which Ibn Sīnā defines. In short, al-Ṭughrāʾī's putrefaction indicates any processes to make a thing ready to accept a new form caused by moisture and heat. Furthermore, al-Ṭughrāʾī thinks that color can be obtained through putrefaction. Referring to Hermes, he explains that putrefaction with moisture could take out the tincture hidden in the deepest part in the natures of a thing.[301]

As for roasting, both Ibn Sīnā and al-Ṭughrāʾī regard it as removal of moisture by external heat. However, al-Ṭughrāʾī points out that Ibn Sīnā's roasting means just removing moisture on the surface, but

[300] Ibid.
[301] Ibid., pp. 70-72.

alchemists try to remove the interior moisture. Although he does not explain in detail about roasting because this knowledge is ciphered, he mentions that this kind of roasting produces simple earth, which is one of the four elements.[302] Probably, the purpose of roasting is to stop maturation and putrefaction, which is caused by moisture.

The seventh passage from the *Shifāʾ* is on vaporization (*tabkhīr*), smoking (*tadkhīn*) and sublimation (*taṣʿīd*), which is from the seventh chapter of the first treatise in the book on *Actions and Passions*. As for vaporization and smoking, al-Ṭughrāʾī thinks Ibn Sīnā's statement basically agrees with the alchemists'. Vapor is made of water which is dissociated (*mutaḥallil*) in Ibn Sīnā's word or decomposed (*bi-'l-tahbiya*). Smoke is made of dissociated/decomposed earth. Suppose that a body contains water and earth: if water is predominant in the body, earth will be smoked, otherwise, water will be vaporized. In addition, al-Ṭughrāʾī, quoting Hermes, mentions that vapor and smoke contain colors and that tinctures for coloring are generated with these two.[303]

Al-Ṭughrāʾī says that Ibn Sīnā's explanation of sublimation is not wrong, but the sublimation discussed by alchemists is different from this meaning. Ibn Sīnā's sublimation simply means producing vapor and smoke. According to al-Ṭughrāʾī, the sublimation which alchemists perform intends to pull out a thing hidden inside to the outside.[304] This kind of idea is also explained in the discussion on combination. In his view, pulling out what is inside to the outside and what is outside to the inside is an important operation to generate a "close relationship."[305]

Ibn Sīnā says that if a thing has a strong combination, it will not sublimate but melt. Al-Ṭughrāʾī comments on this, suggesting that alchemists call it ceration (*tashmīʿ*) or melting (*tadhwīb*). He does not

[302] Ibid., p. 73.
[303] Ibid., p. 74-75.
[304] Ibid., p. 75.
[305] Ibid., p. 63-64.

give a clear explanation on this issue and just indicates the titles of his books for further explanations.[306]

The last two passages in the *Shifāʾ*, which are from the first and second chapters of the second treatise in the book on *Actions and Passions*, are cited in order to confirm that the basic concept of combination used by the alchemists can be found in Ibn Sīnā's statements. The first passage says that a combined thing does not have any properties which its constituents used to have before its combination, but it acquires new properties.[307] By quoting the second passage, al-Ṭughrāʾī tries to point out that Ibn Sīnā actually discusses the form which produces a species[308] though he denies the change of species in the section on minerals.

Finally, he concludes the *Ḥaqāʾiq* by saying that he intended to show the commonalities between the alchemists' sayings and theories with Ibn Sīnā's ideas. He also points out that Ibn Sīnā's ideas are excellent but deal only with the superficial side of true alchemical knowledge. He says that in order to understand alchemy truly, it is necessary to know the truth concealed behind the ciphers instead of relying on superficial understanding.[309]

- Is the *Ḥaqāʾiq* just a counter-argument against Ibn Sīnā's criticism?

It is true that al-Ṭughrāʾī criticizes Ibn Sīnā's denial of alchemy, but al-Ṭughrāʾī only points out Ibn Sīnā's ignorance of alchemical knowledge and does not deny his accomplishments in natural philosophy. In other words, al-Ṭughrāʾī does not think that alchemy contradicts Avicennian philosophy. Then, does al-Ṭughrāʾī regard alchemy as a philosophical discipline? How is alchemy related to the philosophical subjects?

Al-Ṭughrāʾī says in the introduction of the *Ḥaqāʾiq* that alchemy is a particular (*juzʾī*) science, i.e. as opposed to a universal (*kullī*) science. He means by this that alchemists are just applying the natural

306 Ibid., p. 75-76.
307 Ibid., p. 76.
308 Ibid., pp. 76-77.
309 Ibid., p. 78.

philosophical principles and rules whose rationale is established by "a specialist of natural science (*ṣāḥib al-ʿilm al-ṭabīʿī*)." Thus, he does not consider that it is the job of alchemists to prove the principles of natural philosophy, just as a doctor practices medicine but does not prove its theory.[310]

Who is the "specialist of natural science?" It could indicate those who study Avicennian philosophy, but can we say that alchemy is a discipline that applies Avicennian philosophy? It could sound true, but it would be more precise to consider who is the "specialist" more broadly and include the authorities of alchemical theories such as Hermes. In the *Ḥaqāʾiq*, the people involved in the issue can be divided into three groups: 1) I, we, our colleagues, the group (*qawm*), and the members (*ahl*); 2) you, your friend (i.e. Ibn Sīnā), and a learned layperson (*ʿālim min al-nās*); 3) sages (*ḥukamāʾ*). The first group should be considered as people who practice alchemy in general. The second group is those who follow Avicennian philosophy and are non-devotees of alchemy. The third group indicates those who established the principles of science, and they could be the authorities for either the first or second group. That is, the alchemical authorities whom al-Ṭughrāʾī quotes are the sages for the first group, and philosophers such as Aristotle, al-Fārābī, and Ibn Sīnā are the sages for the second group. Of course, we can regard the sages for the second group as the specialists of natural science. How does al-Ṭughrāʾī regard the sages for the first group, that is, for alchemists? Judging from the entire discussion in the *Ḥaqāʾiq*, these sages also establish the principles of natural science through showing proofs though the approach and methodology are distinct from those of the sages for the second group. Thus, we can say that these sages are also included in the specialists of natural science, rather than just practitioners of alchemy.

Does he mean that alchemy is just a discipline that applies natural philosophical knowledge just as Ibn Sīnā explains in the *Aqsām* (see the first chapter)? The answer will be partly yes. Al-Ṭughrāʾī thinks that the natural philosophical discussions by ancient sages are the theoretical foundation of alchemy.

[310] Ibid., p. 53.

However, the relevant sources for it are distinct from those of Avicennian philosophy. Al-Ṭughrāʾī might be suggesting that there exist two paradigms for the discipline of natural science that developed from ancient times to the present moment. Thus, the *Ḥaqāʾiq*, which contrasts the views of Ibn Sīnā with that of the ancient sages who contributed to the theoretical foundation of alchemy, could also be interpreted as a comparative study of two different paradigms on the same issue.

Al-Ṭughrāʾī clarifies in the *Ḥaqāʾiq* that the two approaches basically do not contradict each other. The major difference is esotericism and exotericism. While Avicennian philosophy requires demonstration, the theoretical foundation of alchemy relies on ciphers as its essential component. Unless one solves the ciphers in alchemical writings, one cannot master alchemy. Even if one masters how to solve them, one should not disclose them to people outside the group.[311]

He indicated that alchemical writings are ciphered by different methods. Some alchemists use a method like *decknamen*,[312] others use numbers.[313] Al-Ṭughrāʾī refrains from explaining with specificity and exemplifies the process of combination in matter by using the terms "spirit (*rūḥ*)," "body (*jasad*)," and "soul (*nafs*)" in order to keep the process secret.[314] This can be one of the methods of ciphering. Some modern researchers claim the existence of a "spiritual side" of alchemy, which pursues human perfection.[315] However, if we consider al-Ṭughrāʾī's way of concealing, the existence of this spiritual side of alchemy becomes doubtful. We would say instead that statements appearing to indicate the intention toward human perfection are merely ciphered expressions. Even if the superficial or literal meaning of the text appears deep in thought, we have to consider the possibility that it is one of the ways of ciphering and the true meaning is concealed behind the literal meaning.

311 See ibid., pp. 52, 55.
312 See ibid., p. 53.
313 See ibid., pp. 57-58.
314 See ibid., p. 63-64
315 For example, Abt et al., introduction to *Kitāb ḥall al-rumūz*, pp. XI-XV.

- al-Ṭughrāʾī's sources

What are al-Ṭughrāʾī's most reliable sources? Is one of his sources more relevant than the others? He indicates that his interlocutor, who represents the non-alchemists' position, regards the works of Muslims as worse than pre-Islamic authors, criticizing that they merely imitate the writings of pre-Islamic alchemical literature, borrowing its expressions and ideas.[316] Al-Ṭughrāʾī seems partly to agree with the statement since most of the passages that al-Ṭughrāʾī quotes in the *Ḥaqāʾiq*, which are used to compare with Ibn Sīnā's views, are taken from the works ascribed to pre-Islamic authors. His sources are Hermes, the "monk," Apollonius, Stephanus, Jamasp,[317] Āras, and Agathodaemon. However, he also refers to *Kitāb al-raḥma* of Jābir several times. It is true that the works of pre-Islamic authors are more important than those of Muslims for al-Ṭughrāʾī, but it does not necessarily mean they are irrelevant. In fact, as discussed in the previous section of this chapter, al-Ṭughrāʾī often refers to Jābir in his other works. In order to clarify how he regards the difference between pre-Islamic and Muslim authors, we need further research.

As mentioned in the first chapter, al-Ṭughrāʾī does not give any specific sources for Hermes in the *Ḥaqāʾiq* though he quotes him most frequently. However, we can find quotations very similar to those attributed to Hermes by al-Ṭughrāʾī in the *Ḥaqāʾiq* in Ibn Umayl's *Māʾ al-waraqī*. For example, the passages in the *Ḥaqāʾiq*, "In water, there is a gorgeous transition. It becomes wine from a grapevine, oil from olive, glue from a palm tree, and various fruits from the rest of the trees,"[318] and "When the lowest vapor appears and flows into the source of fineness, the highest vapor made of the air descends to it"[319]

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316 al-Ṭughrāʾī, *Ḥaqāʾiq*, p. 50.

317 He is considered to be an alchemist in the third century AD in the Sassanid Empire. One of his works is written for the first Sassanid emperor, Ardashīr. See Sezgin, *GAS*, 4: 59; Stapleton, "The Sayings of Hermes," p. 88.

318 Ibid., p. 54. In the *Māʾ al-waraqī* one finds, "This is the Water which becomes in Wheat, Ferment; and in the Vine, Wine; and in the Olive, Olive Oil; and in the Turpentine Tree, Resin; and in the Sesame, Oil and in all the trees, different kinds of fruits." Stapleton et al., "The Sayings of Hermes," p. 76. The Arabic text is in Stapleton and Hidāyat Ḥusain, "Three Arabic Treatises on Alchemy," p. 40.

319 Ibid., p. 75. In the *Māʾ al-waraqī*: "The Higher Vapour descends towards the Lower Vapour, so that one vapour is impregnated by the other." Stapleton et al., "The Sayings of Hermes," p. 77. The Arabic text is in Stapleton and

are quite similar to passages in *Māʾ al-waraqī*. Stapleton asserts that the quotations of Hermes in the *Māʾ al-waraqī* are directly translated from some Greek works attributed to Hermes. This suggests the existence of an authoritative Greek alchemical work common to Muslim alchemists.

Between al-Ṭughrāʾī and Ibn Umayl, there is another commonality. According to Stapleton et al., the passages of Āras[320] found both in the *Ḥaqāʾiq* and *Māʾ al-waraqī* are passages from the same work called *Muṣḥaf al-ḥayāt* (*The Book of Life*). The name of Āras is also mentioned in the *Fihrist*. Also, several manuscripts of *Muṣḥaf al-ḥayāt* exist.[321] These facts indicate that this work was one of the well-circulated alchemical writings among Muslims.

The sayings of Hermes and Āras are quoted in the *Convention of Philosophers* (*Turba philosophorum*; see the first chapter). Although their quotations do not correspond to passages in the *Ḥaqāʾiq*, al-Ṭughrāʾī's quotation of Agathodaemon[322] is somewhat similar to one of his quotations in *The Convention of Philosophers*. In the *Ḥaqāʾiq*, al-Ṭughrāʾī quotes the passage, "After 'clapping (*taṣdiya*)' of copper, its putrefying, its crushing, and removing its blackness, finally, its whiteness becomes disappeared redness (*ḥumra murtafiʿ*)."[323] Al-Ṭughrāʾī explains "clapping" as a cipher of roasting.[324] In the *Convention of Philosophers*, it states: "Cook the copper until it become a gentle and impalpable body."[325] Did al-Ṭughrāʾī have access to a text of the *Convention of Philosophers*? We cannot judge just from this one passage. However, if we consider that the *Ḥaqāʾiq* has many similarities to Ibn Umayl's *Māʾ al-waraqī*, which contains, according to Stapleton et al., many passages from the *Convention of*

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Hidāyat Ḥusain, "Three Arabic Treatises on Alchemy," p. 45.

320 He is an obscure alchemist. His passage cited in the *Māʾ al-waraqī* is a discussion between him and a Byzantine Emperor (*qayṣar*) called Theodorus (Tiyūdaras). Stapleton et al. "The Sayings of Hermes," p. 73. However, an Emperor Theodorus does not exist historically, so we cannot know what is actually being referred to.

321 See Sezgin, *GAS*, 4: 68.

322 He has many different descriptions, such as a philosopher in ancient Egypt and the co-founder of alchemy with Hermes in the Harranian tradition. Lindsay, *The Origin of Alchemy*, pp. 301, 318-319. Thus, although there exists a work ascribed to him in the second century AD, it is difficult to determine its actual date and historicity.

323 al-Ṭughrāʾī, *Ḥaqāʾiq*, pp. 72-73.

324 Ibid., p. 71.

325 Waite, trans., *Turba philosophorum*, p. 116. "until it become" is as the text appears.

*Philosophers* (see the first chapter), it seems likely that al-Ṭughrāʾī had the text. Furthermore, among the ten alchemists who are listed in the introduction of the *Ḥaqāʾiq*, Pythagoras, Socrates, Plato, Agathodaemon, Hermes, and Democritus are mentioned in *The Convention of Philosophers*. Although this cannot be a proof of the *Ḥaqāʾiq's* relationship with this work, at least it suggests that both of them had common sources for alchemical knowledge.

# Conclusion

The primary task of this thesis is to understand how alchemy was regarded in the intellectual tradition in medieval Islam. In the first chapter, we examined well-known alchemists who are found in historical sources, and the descriptions of alchemy in bio-bibliographical works and the works which classify intellectual disciplines. We found that Muslim alchemists did not indicate any specific work as a main authority. This is one of the difficulties for identifying Muslim alchemists' theoretical background. Although they often list the names of the authors of alchemical writings whom they studied, many of them are not historical figures but pseudonyms. Thus, it tends to be difficult to find consistency in the corpus. For example, Hermetic literature covers not only alchemy but also theology, philosophy, astrology, medicine, and so forth, but all topics were not necessarily written under one doctrine. Furthermore, we found the possibility that Alexandrian alchemists and Muslim alchemists refer to a different type of knowledge in the Hermetic literature. In the case of the historical alchemists, such as Zosimus, their works that were translated into Arabic do not survive, and it is even doubtful that translating alchemical works was one of the objectives of the translation movement. Also, Muslim alchemists themselves claim different approaches. The Jabirian corpus is not consistent within itself; its way of enigmatizing, *tabdīd al-ʿilm,* is different from other alchemical writings. On the other hand, al-Rāzī avoids enigmatizing and employs direct expression. Ibn Umayl uses spiritual expressions, though whether he intends by this a pursuit of human perfection or is simply applying ciphers is uncertain. We also found differences among non-alchemists in the categorization of alchemy. Al-Khwārizmī regards alchemy as a discipline of natural science; Ibn Sīnā considers it an applied subject of natural science; Ḥājjī Khalīfa sees it as a subject originated in Egypt, which is similar to philosophy; and Ibn Khaldūn takes it to be a sort of magical craft. Because of these varying opinions, it is difficult to understand how alchemical knowledge was developed in medieval Islam.

The second chapter examines the arguments regarding alchemy by non-alchemists, which was largely influential in the Muslim intellectual tradition, possibly more influential than the statements by alchemists. In fact, al-Ṭughrāʾī's *Ḥaqāʾiq* attempts to correct the understanding of those who believe in non-alchemists' statements on alchemy. They mostly criticize alchemy, but in doing so, they scarcely refer to the works by alchemists, that is, they merely discuss it within their own theoretical foundations. Al-Kindī denies transmutation of metal from two points. One is the distinction between a naturally and an artificially created thing. The other is metal's inseparability into components. He seems to try to prove both through Aristotelian philosophy. Al-Fārābī understands that cipher is a crucial component of alchemical writing, which suggests the possibility that he read some alchemical treatises. However, when he discusses the possibility of transmutation, he refers to Aristotle though his source of the citation is uncertain. Unlike other non-alchemists, al-Fārābī considers that transmutation is possible. However, he only shows the theoretical possibility but cannot prove its practical possibility. He thinks that the master of the craft requires solving the ciphers and a perfect understanding of natural science, which means that alchemy is an almost impossible job for most people. Ibn Sīnā, who claims that metals are the same species, differs from al-Fārābī, who claims that metals belong to different species. These two positions are contrasted in the *Muqaddima*, and their original writings do not disagree with Ibn Khaldūn's understanding. However, from another perspective, their claims are not that different. They both believe that an alchemists' intention is to alter the accident of a metal to allow transmutation. Ibn Sīnā merely says that the transmutation cannot happen through the way that alchemists claim, but he could not prove the theoretical impossibility of the transmutation. The more significant difference between them is their view on ciphers in alchemy. Al-Fārābī shows some interest in alchemists' ciphered writings, while Ibn Sīnā does not. Ibn Sīnā judges alchemy within his own theoretical foundation and does not much recognize that cipher and hidden meaning are essential components of alchemy. They could have a completely

different picture of what alchemists really practiced. Ibn Khaldūn denies alchemy, supporting neither Ibn Sīnā nor al-Fārābī. He even refers to the counterargument against Ibn Sīnā's denial in al-Ṭughrāʾī's *Ḥaqāʾiq* and accepts its validity, but he adds further counterarguments against al-Ṭughrāʾī's view. His argument has two main perspectives: 1) If one pursues transmutation, he has to reproduce every process of the event in the natural generation of gold, which is impossible for a human being; 2) If one pursues transmutation by breaking natural laws, he would need to break too many natural laws to manage. These discussions of non-alchemists are as diverse as the alchemical theories of Muslim alchemists. They also do not have a specific theoretical foundation to refute alchemy.

These two chapters have shown that there is almost no intersection between what non-alchemists consider to be alchemy and what alchemists actually study and practice. Although Ibn Khaldūn mentioned al-Ṭughrāʾī's discussion in the *Ḥaqāʾiq*, he only referred to al-Ṭughrāʾī's comments on the *Shifāʾ*, which is not exactly an alchemical doctrine itself. Thus, in the third chapter, we examined the *Ḥaqāʾiq*, where al-Ṭughrāʾī contrasts authoritative statements of the alchemists directly with passages from Ibn Sīnā. Through comparison of the two sides, al-Ṭughrāʾī only criticizes Ibn Sīnā's ignorance of the issues specific to alchemy, but he considers that Ibn Sīnā's natural philosophical theories are basically harmonizable with the statements of alchemists. On the other hand, his arguments indicate that the sources to study alchemy were completely different from those used to study Avicennian philosophy; that is, the tradition from which alchemy originated and developed is independent of the Avicennian one, even though they both discuss the same issues. The sources that al-Ṭughrāʾī relies on are mostly by pre-Islamic alchemists. We found that his citations of these sources can provide a useful hint to understanding what Muslim alchemists studied from ancient sources. These kinds of citations exist in other works of al-Ṭughrāʾī, so further research will clarify the relationship between Muslim alchemists and ancient sources.

Through the whole thesis, we have tried to figure out how alchemy was studied and discussed in

medieval Islam. We found that in order to understand this, it is important to be cautious about the relationship between the view of alchemists and that of non-alchemists. The details of many issues still need to be studied, such as a critical analysis of the theories and ciphers, and philological research on the relationship between Arabic and ancient sources, but we hope that this thesis will contribute to these future studies.

# Appendix: Translation of Selected Parts in *Ḥaqāʾiq al-istishhād*

- Preface to the translation

Sources for the Translation are:

**A**: al-Ṭughrāʾī, *Ḥaqāʾiq al-istishhād*, ed. Razūq Faraj Razūq (Baghdād: Dar al-Rashīd, 1982).

**B**: al-Ṭughrāʾī, *Ḥaqāʾiq al-istishhād*, Dublin, Chester Beatty Library, MS. 3231(9), fols. 179-204.

**GC**: Ibn Sīnā, *Kitāb al-shifāʾ*, eds. Ibrāhīm Madkūr et al., vol. 2, bk. 3 (Qom: Maktabat Āyatullāh al-ʿUẓmā al-Marʿashī al-Najafī, 1983-84), pp. 77-200.

**AP**: Ibn Sīnā, *Kitāb al-shifāʾ*, eds. Ibrāhīm Madkūr et al., vol. 2, bk. 4 (Qom: Maktabat Āyatullāh al-ʿUẓmā al-Marʿashī al-Najafī, 1983-84), pp. 202-267.

**Colophon of A (Based on Leiden Or. 2846, fol. 19a)**:[i]

> The book, *Ḥaqāʾiq al-istishhād* has been finished with the help of the Sagacious, the Magnanimous. The completion of its writing is at the time of Monday, which falls on the beginning of the blessed month (29 of Ṣafar?), of the year 1296, by the hand of the most needy of servants of the mercy of his lord, ʿAbd al-Ghanī Fikrī b. Luṭfallāh b. Ḥusayn. May God give him and them the happiness of the two worlds. Amen. May God bless and grant salvation to our master Muḥammad and his companions.

**Colophon of B**:

> The book, *Ḥaqāʾiq al-istishhād* has been done with the help of God, the Wise, the Magnanimous in the months of the Hijri lunar Muḥammadan year of 907. It was found thus in the handwriting of the author: "The completion of its compilation and redaction (*taʾlīfihi wa-taḥrīrihi*) was in the first part of the blessed month of Ramaḍān, in the year 505." By the hand of the needy servant, Aḥmad b. ʿAlī, may he be forgiven.

According to the editor, the edition in A is based on two manuscripts: 1) Leiden, Leiden University,

[i] Razūq, ed., *Ḥaqāʾiq al-istishhād*, p. 78. According to the editor, this colophon is found in the Leiden manuscript. Ibid, p. 94, note 151.

Or. 2846 and 2) Cairo, Dār al-Kutub, Ṭabīʿa 170.[ii]

According to the colophon of B, it was transcribed from al-Ṭughrāʾī's autograph. Furthermore, it was copied during the author's lifetime, thus making it a critical witness to the text. In order to reflect the author's meaning as much as possible, the text is translated based on B. Occasionally, A is consulted where B is unclear or incorrect.

For the passages quoted from the *Shifāʾ*, the edited versions of the *Shifāʾ* (GC, AP) are also used when A and B are ambiguous or unclear. GC is Book Three on *Generation and Corruption* (*al-fann al-thālith fī al-kawn wa-'l-fasād*). AP is Book Four on *Actions and Passions* (*al-fann al-rābiʿ fī al-afʿāl wa-'l-infiʿālāt*). In footnotes, al-Ṭughrāʾī's quotations from the *Shifāʾ* are indicated with the chapter and treatise number (e. g. GC 14 means the fourteenth chapter of the book on *Generation and Corruption*; AP (1)7 means the seventh chapter of the first treatise of the book on *Actions and Passions*).

Transliterated Arabic terms are given within parentheses as are other major technical terms. Complementary words and phrases for clarification have been provided in brackets. The page numbers of A and folio numbers of B are given in parentheses in the translation.

[ii] Razūq, introduction to *Ḥaqāʾiq al-istishhād*, ed. idem, pp. 46-47.

- Translation of the passages

**<A: p. 59 l. 10 - p. 60 l. 3; B: fol. 188a l. 12 – fol. 189a l. 1>**

His [Ibn Sīnā's] statement: "It is in the nature of matter that when it is completely prepared for a certain form,[1] that form from the 'giver of forms (*wāhib al-ṣuwar*)' overflows into it [the matter]."[2] Thusly, the group [of alchemists] claims about the elements of their operation.[3] That is, they are pure, simple bases (*arkān*), and the true preparation concerning them reverts them[4] from compounds (*tarākīb*)[5] to pure simplicity. Then, the sage compounds them through the true preparation in a stable **(f.188b)** and reliable (*wathīq*) way [so] as not to disunite them and to prepare them to receive the speciating form and specificity (*khāṣṣiyya*), which come from the "giver of forms." At this time, in any of the existing simple elements (*basā'iṭ*), we cannot find the specificity, which occurs in them [simple elements] after the preparation, just as there is no [specificity] in the elements of the world. It [the specificity] is free from reception of life, speech,[6] specific qualities, and the differences of minerals, plants, and animals except through combinations (*amzija*) and transformations. In this manner, the simple elements of our operation are transformed with regard to their properties and are prepared by it [our operation][7] for the reception of a new form that overflows from the "giver of forms" into them. A specificity occurs in it [the new form] that did not exist previously in a thing made of their [simple elements'] particles. Whoever understands the manner in which simple elements are prepared by the transformation within them [simple elements] for reception of the form of sperm and sperm's reception of the transformations within it due to the speciating form, he will understand[8] that the way of our compounding is not the way of compound pastes nor a drug compounded from simple drugs (*mufradāt*) since the compound from simple drugs are mixed and not truly combined. The power that accrues[9] to it does not deprive the single drugs from any [part] of it [the compound], but this is not the condition of our compound that is analogous to its simple elements, because it is compounded of the simplest elements that we can deal with, which are devoid of the form

[1] A, GC: استعدادا تاما لصورة B: استعدادا تاما
[2] The identical part in the *Shifā'* is in GC 14: 190.
[3] A: علمهم B: عملهم
[4] A: فردها B: فرددها
[5] A: التركيب B: التراكيب
[6] A: الفطن B: النطق
[7] A: واستضيء بها B: واستعد به
[8] A: علی ان B: علم ان
[9] A: الحاطة B: الحاصلة

which speciates it [compound], through the destruction[10] [of the elements] by the compounding literally, not **(p.60)** metaphorically (*ʿalā al-majāz*). Then, it is compounded in another way and combined again in accordance with the purpose of the practitioner. The compounding produces in it a specificity, which does not exist in a thing made of its [compound's] simples **(f.189a)** nor in the first substance (*jawhar*) before the destruction by its compounding.

**<A: p. 76 l. 21 - p. 78 l. 3; B: fol. 202b l. 13 – fol. 204a l. 3>**

Your friend [i.e. Ibn Sīnā] said:

> When the bodies are united and combined, sometimes nothing occurs by the combination (*mizāj*) but the combination itself. Thus, every combination is not necessarily suitable enough for receiving the species (**f.203a**) and its specificity so the combination does not refuse that [receiving the species and its specificity]. That is, from what I have determined, the most dominant [idea]. Among the combined things that acquire an increase by combination, a certain case whereby what is acquired by that is an increase (**p.77**) of simple[11] property in which natural action and passion do not occur, such as color, shape, and others. Among them,[12] there are [combined things] that acquire an increase of the action and passion or form of the species, and there is that [increase] which acquire a soulful power (*quwwa nafsāniyya*). Among them,[13] there are [combined things] that acquire a power that has an effect by means of the soulful power. This [power] is called specific qualities (*khawāṣṣ*). These specific qualities follow the species of the compounds in creatures, or they are their differentiae (*fuṣūl*) themselves.
>
> When it is said that there is a drug that has a similar effect on its [compound's] substance (*jawhar*), we mean that[14] it has an effect on the form by which it [the substance] is speciated. When it is said [that] it has an effect on a property, we mean that[15] it [the substance] is speciated by it [the property][16] through elements and their combination which it [the substance] has acquired. For example, scammony[17] on the one hand heats by fiery substance which is in it but it does not purge yellow bile because of that but rather by the acquired power in its [scammony's] species which is

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[10] A: بنقض B: بنقص
[11] A, AP: ساذجة B: سادجة
[12] A, AP: ومنها ما B: منهما ما
[13] A, AP: ومنها ما B: ومنهما ما
[14] A: فانه يعني انه B: فانه نعني انه AP: فيعني انه
[15] A, AP: فيعني انه B: نعني انه
[16] A: فيعني انه ينوع بها B: فنعني انه ينوع بهما AP: فيعني انه يفعل
[17] A, AP: فالسقمونيا B: كالسقمونيا

ready for its [species'] acceptance of the combination. These powers often become a differentia of the species and often become a specificity. It is difficult for us to present a distinguishing mark between these two.[18]

We have said before that the statement on the specificity, the existence of combination preparing the reception of the two [form and specificity], and the reception of the speciating form is compatible with the view of our colleagues.[19] Thus, they have frequently mentioned specific qualities and written books on them. (**f.203b**) We have said that the breeder (inseminator) and farmer in depositing the seed in the wombs of the earths and animals are only for causing motion (*taḥrīk*) and preparation (*iʿdād*) by removing obstacles in some situations. We said that putrefaction is due to mild heat and a similar-type of moisture in a determined quantity. As for the speciating form and the specific qualities, it is a gift from the All-knowing Creator. The likeness of these things occurs in our compound. As for the specificity that is due to the effect of [divine] inspiration (*waḥī*), it is similar to the effect of poisons in the transformation of the silver's nature into gold's [nature] in respect of color, firmness, and weight. A small amount functions in a large amount because of it [the effect], just as strong poisons have an effect on the bodies of animals. However, that tincture, which they call "permanent (*khālid*)" on account of its permanence (*li-khulūdi-hi*), is in the body on which the [tincture] is casted as long as the essence (*dhāt*) is present. Then, if gold or silver acquires a pure[20] property by the combination such as color and shape, it will have[21] an aversion to a return to the [previous] colors and to a condensation of the rarefied [color]. Our colleagues have clear operations that lead to that, which are mentioned in their writings. If[22] a species is obtained by the combination, and the elixir is not prevented from preparing the body upon which it is cast, its compounding and change (*taghyīr*) is invalidated because of the reception of another form, just as what is said regarding furs, snakes, flesh of calves and horses, wasps, and bees.[23] As for the effects in it attributed to the primary properties existing in simples of the principles (*arkān*), it [one of the effects] has from the earth permanence, firmness, (**p.78**) endurance against fire, and stability (*razāna*). (**f.204a**) From water it has fixity, clearness, cultivation, infiltration, and diffusion. From air it has fineness (*laṭāfa*), spirituality

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[18] The identical part in the *Shifāʾ* is in AP 2(2): 261-262.

[19] This passage located just before the conclusion of the *Ḥaqāʾiq*. These three topics are discussed in the parts before this passage. See the third chapter of this thesis.

[20] A: ساذجة B: سادجة

[21] A: فغير B: ففيه

[22] A: وان كان مما B: وان كانا مما

[23] Al-Ṭughrāʾī discussed this issue in detail in A, p. 60; B, fol. 189a. This is also the issue that Ibn Khaldūn mentioned in the *Muqaddima*. See Rosenthal, trans., *Muqaddima*, p. 273.

and penetration (*ghawṣ*) into pores. From fire it has delicateness (*riqqa*), exhausting (*nafād*),[24] the ripening of unripe (*fijj*) moist things, and the acquisition of color.

[24] A: النفاذ B: النفاد

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