

Ordinary Inks and Incredible Tricks in al-‘Irāqī’s *‘Uyūn al-ḥaḡā’iq*

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Abstract

The *Kitāb ‘uyūn al-ḥaḡā’iq wa-īdāḡ al-ṭarā’iq* (‘The best of true facts and the explanation of their ways’) was composed in the 13th century by Abū al-Qāsim al-‘Irāqī, best known for his alchemical works. This peculiar handbook counts 30 chapters and includes many different streams of tradition: pseudo-Platonic magic, medicine, pharmacology, sleight of hand, and crafts. This chapter focuses on the recipes for coloured metallic inks and invisible ones (chapters 18 and 23) and provides an edition and a commented English translation of these sections. The kind of edition proposed here — a ‘laboratory-edition’ — is devised as a specific tool for interdisciplinary research on premodern science and technology and as preparatory work for the replication of these recipes.

Keywords

metallic inks – invisible inks – fluid traditions – technical literature – al-‘Irāqī – replication – ‘laboratory-edition’

1 The Author, the Text and Its Transmission

The 13th-century alchemist Abū al-Qāsim al-‘Irāqī (7th/13th century)* — also known as al-Sīmāwī (‘the practitioner of natural magic’) — composed a peculiar collection of 30 chapters, entitled *Kitāb ‘uyūn al-ḥaḡā’iq wa-īdāḡ al-ṭarā’iq*

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(‘The best of true facts and the explanation of their ways’), dealing with all sorts of tricks, deceptions, wonders, and the specialists in these fields.¹ Different scholars have pointed out the role of this text in the history of magic and its importance as an indirect witness to the pseudo-Platonic *Kitāb al-nawāmīs* (‘Book of natural laws,’ the *Liber Anequeminis* in the Western tradition).² The magical components also include the preparation of talismans and the invocation of spiritual entities. Magic, however, is only one of the streams of tradition that converge in the ‘*Uyūn al-ḥaqā’iq*.’

This work also includes a technical component often expressed in the explanation of many illusionistic tricks and in the instructions for different preparations. Some materials are connected to specific groups of specialized tricksters and have a parallel attestation in al-Ġawbarī’s *Kitāb al-muḥtār fī kašf al-asrār* (‘Anthology on the unveiling of secrets’), a 13th-century handbook that unveils the tricks of street frauds.³ In the *Kašf al-asrār*, the dupes are arranged on the

- 1 See Eric J. Holmyard, “Abu’ l-Qāsim al-‘Irāqī,” *Isis*, 1926, 3:403–426. For the alchemical works of al-‘Irāqī, see also *Kitāb al-‘ilm al-muktasab fī zir‘at adh-dhab* (*Book of Knowledge Acquired Concerning the Cultivation of Gold*), ed. and trans. Eric J. Holmyard (Paris: Librairie Orientaliste Paul Geuthner, 1923); and the *Book of the Seven Climes* (*Kitāb al-aqālim al-ṣab‘ah*), focusing on alchemical illustrations. A digital copy has been made available by the British Library (MS London BL Add. 23390, ff. 50v–87v), <http://www.qdl.qa/en/archive/81055/vdc_100023587816.0x000002> (last accessed 9 April 2020); this manuscript is also described and discussed in a post in the British Museum blog by Bink Hallum and Marcel Marée, see <<https://blog.britishmuseum.org/a-medieval-alchemical-book-reveals-new-secrets/>> (last accessed 9 April 2020).
- 2 See Liana Saif, “The Cows and the Bees: Arabic Sources and Parallels for Pseudo-Plato’s *Liber Vaccae* (*Kitāb al-nawāmīs*),” *Journal of the Warburg and Courtauld Institute*, 2016, 79:1–48; for the Mediaeval Western tradition of the text, see Maaïke van der Lugt, “Abominable Mixtures: The *Liber Vaccae* in the Medieval West, or the Dangers and Attractions of Natural Magic,” *Traditio*, 2009, 64:229–277; Paolo Scopelliti and Abdelsattar Chaouech, *Liber Anequeminis. “Il libro della vacca” dello pseudo-Abū Zayd Hunayn ibn Iṣḥāq ibn Sulaymān ibn Ayyūb al-‘Ibādī* (Milano: Mimesis, 2006); and Manuela Höglmeier, *Al-Ġawbarī und sein Kašf al-asrār — ein Sittenbild des Gauners im arabisch-islamischen Mittelalter (7./13. Jahrhundert)* (Berlin: Klaus Schwarz Verlag, 2006), p. 396.
- 3 For the Arabic text and a thorough commentary, see Höglmeier, *Al-Ġawbarī und sein Kašf al-asrār* (cit. note 1); for the French translation, see ‘Abd al-Rahmāne al-Djawbarī, *Le Voile arraché. L’autre visage de l’Islam*, 2 vols, translated by René R. Khawam (Paris: Phébus, 1979). On the one hand, the two authors might have tapped into the same sources to produce independent works that partially overlap. On the other, it is possible that al-‘Irāqī used the *Kašf al-asrār* as source, which, at that time, must have been a very recent addition to technical literature in Arabic. Although al-Ġawbarī arranged the materials differently, he treated subjects that also found a place in the ‘*Uyūn al-ḥaqā’iq*’: soporifics, tricks of the conjurers (with writing) and of the astrologers, stratagems to discover thieves. For the parallel attestations in the ‘*Uyūn al-ḥaqā’iq*’, see Appendix 11 and Höglmeier, *Al-Ġawbarī und sein Kašf al-asrār* (cit. note 1), pp. 346, 233, 214 and 245–250. Tricks contemplating

basis of the different professional groups (alchemists, pharmacists, food merchants) who perpetrate them. In the *Uyūn al-ḥaqā'iq*, however, this approach is limited to a few chapters and many other examples of technical expertise are detached from a specific professional context. They are presented rather as amusing technical tricks of dexterity (from magic boxes to bent swords to simulate stabbing). Another stream of technical traditions is represented by the medical components, dealing with simple drugs, occult properties of natural objects and the constitution of man. The result of this complex merging of sources is a handbook that exists in the intersection between natural magic, technical knowledge, and sleight of hand.

The author added a brief introduction to the text, in which he declares the reasons that brought him to the composition of the book and a general recapitulation of its contents. The last remark of the introduction seems to refer to an encoding of the text carried out by the author himself, although the terminology usually refers to writing and calligraphic styles.⁴

Abū al-Qāsim ibn Aḥmad ibn Muḥammad known as al-'Irāqī said: "When I saw that the stratagems of the greater part of the natural things had been made manifest among many groups of tricksters, but they could not achieve anything from the true facts without any claim or science, I decided to write this book and to entitle it 'The best of true facts and the explanation of their ways'.

different writing practices are included in the section devoted to the conjurers, the section on the secrets of writing (*asrār al-kitāba*) exclusively deals with ways to erase writing from different supports, see Höglmeier, *Al-Ġawbarī und sein Kašf al-asrār* (cit. note 1), pp. 303–307. The 13th century also saw the composition of al-Iskandari's (fl. 640 H/1243 CE) *Al-ḥiyal al-bābilyya*. Chapter 14 of this text treats several procedures to encode writing with different cryptographic techniques, invisible inks arranged by the substance that makes them appear, the erasure of writing from papyrus and parchment, and how to dye leaves in different colours. See al-Ḥasan ibn Muḥammad al-Iskandari, *Al-ḥiyal al-bābilyya li-l-ḥizāna al-kāmīliyya* (Al-Iskandariyya: Maktabat al-Iskandariyya, Markaz Dirāsāt al-Ḥiḍārat al-Islāmiyya, 1439/Alexandria: Islamic Civilization Studies Center, 2018). Later, al-Zarḥūrī wrote a handbook to instruct the tricksters, see Lucia Raggetti, "Cum Grano Salis. Arabic Ink Recipes in their Historical and Literary context," *Journal of Islamic Manuscripts*, 2016, 7/3:294–338, pp. 328–329. This text is also divided into 30 chapters and its author, though the chronology is not certain, was contemporary to al-'Irāqī, possibly one generation older. For an anthology of translated passages from these works, see also Lucia Raggetti, *Un coniglio nel turbante. Intrattenimento e inganno nella scienza arabo-islamica* (Milano: Editrice Bibliografica, 2021).

4 The textual tradition of the introduction is very stable, with only minor variants that do not affect the meaning, which allowed me to give a single translation. For the variety and use of secret alphabets, see, for instance, the *Kitāb mabāhiḡ al-a'lām fī manāhiḡ al-aqlām* ('Book of the delights of the signs in the methods of the pens') by al-Biṣṭāmī (d. 858 H/1454 CE) as attested in MS Leiden Or. 14.121. See pp. 48–49 of Jan Just Witkam's *Inventory of the Oriental Manuscripts of the Library of the University of Leiden*, <<http://www.islamicmanuscripts.info/inventories/leiden/or15000.pdf>> (last accessed 1 March 2020).

It deals with some of the stratagems (*hiyal*) from the *nawāmīs* (lit., '[natural] laws'), incendiary preparations (*maḥārīq*), fumigations (*al-daḥan*), fermentations (*al-ta'āfīn*), soporifics (*al-marāqid*), astrological incantations (*al-nāringāt*), concealments (*al-aḥfā'*), illusionistic tricks (*al-dakk*), stratagems (*al-ḥīla*), the occult properties of stones, minerals, plant and animals (*ḥawāṣṣ al-ma'dan wa-l-nabāt wa-l-ḥayawān*), and the natural composition of man (*tarkīb al-insān*) and what is specific for it at every moment.

So, I divided it into 30 chapters, each dealing with a witty artifice for the one who wishes to understand its explanation and meaning, and among these there are also the secrets that should not be unveiled. We noted it down in *rayḥānī* [writing] style (and adorned it in *Trāqī* [writing] style, MS Princeton Garrett 544H) so that only the competent one can access to them".

The introduction is followed by a list of the 30 chapters and their respective titles with a summary of their contents.⁵

Eight different witnesses to the text were collected for this study — seven manuscripts and a lithographic edition — and represent the basis for the critical work on the text. An introduction by the author is attested in all the witnesses and is regularly followed by a list of the 30 chapter headings. Some of them make use of a secret alphabet to encode key technical information (for instance, the name of an ingredient or its precise quantity) and in two of them one can even find a *legenda* to interpret these signs. Curiously, in the two copies that sport a *legenda*, the secret alphabet is not specifically used to encode significant bits of the text.

1.1 (P) MS Princeton Garrett 544H (150 ff.)⁶

A date written at the end of the text by the copyist who produced the whole manuscript indicates that the copy was completed on the 7th Dū al-Ḥiġġa 1274 H / 19th July 1858 CE. The manuscript is written in a cursive *nash*, chapter headings and the incipits of their subdivisions are rubricated. A secret alphabet is used to encode the technical details of different procedures. If we consider, however, the instances in which the corresponding letters of the Arabic alphabet are given in *inter lineam* — by what seems to be the same hand as that of the copyist, using the same ink of the main text — the association

⁵ See Appendix 1.

⁶ A digital copy of the manuscript is available at <<http://publ.princeton.edu/objects/qz2oss55t#page/297/mode/1up>> (last accessed 9 April 2019).

between the letters and the signs of the secret alphabet is not consistent. This manuscript also features a few drawings of magical signs, diagrams, and tables that summarize the text.

1.2 (B) *MS Berlin Wetzstein II 1375 (70 ff.)*⁷

The manuscript is written in a cursive *nash*, the chapter headings and the incipits of their subdivisions are rubricated. Along with a few drawings of magical signs, this copy includes vivid illustrations of some spontaneously generated creatures described in the fourth chapter and the schematic but detailed drawings of some tools to perform tricks (magical boxes, bent swords, etc.) that illustrate an additional section on the sleight-of-hand (*ša'baḍa*), wedged between Ch. 8 and Ch. 9. Some specific technical information is not encoded with a secret alphabet, however in the relevant passages the letters are written in their isolated form. Here, the list of chapters is given a layout usually reserved for poetry, with a clear division between the two halves of the line. Some folia are annotated in the margins by the hand of a reader who added parallel recipes and procedures, either collated from a different copy or collected from other materials at his disposal.

1.3 (D) *MS Dublin Chester Beatty Ar. 409 (68 ff.)*⁸

This undated manuscript is written by two different hands, a main one responsible for the greater part of the text, along with a second one that intervenes in a few instances between Ch. 23 and Ch. 25. The chapter and paragraph headings are rubricated in the parts written by the main hand, while they remain black for the second one, usually in bold and sometimes marked by a super linear stroke. Like the Berlin manuscript and in the same position, this witness includes an additional section on different tricks of legerdemain (*ša'wada*) accompanied by illustrations of the different devices involved in the tricks, though depicted in a different order. Crucial portions of the procedures are, in some cases, encoded in a secret alphabet, for which the manuscript does not provide a *legenda*.

1.4 (T) *MS Toronto Fischer Library 142 (122 ff.)*⁹

The manuscript is written in a cursive *nash*, the chapter headings and the incipits of their subdivisions are rubricated. The manuscript features a few

7 Wilhelm Ahlwardt, *Verzeichniss der arabischen Handschriften der Königlichen Bibliothek zu Berlin*, vol. 5 (Berlin: Asher, 1893), p. 99 No. 5567.

8 A digital copy of the manuscript is available at <https://viewer.cbl.ie/viewer/object/Ar_409/1/> (last accessed 15 April 2020).

9 A digital copy of the manuscript is available at <<https://archive.org/details/uyunalhaqaiqwaidoounse>> (last accessed 9 April 2020).

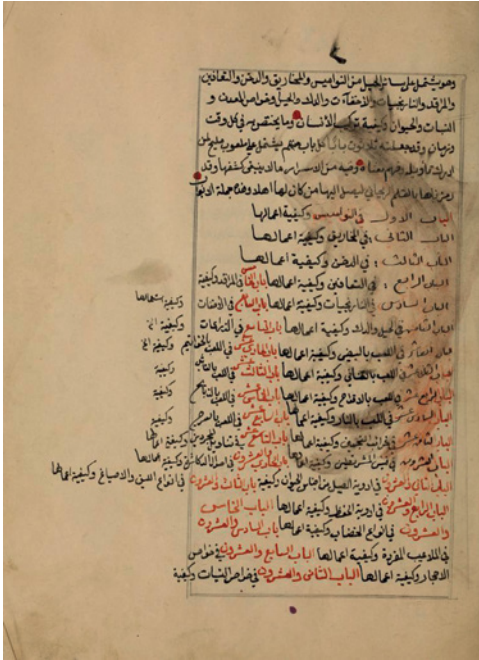


FIGURE 8.1

List of chapters following the incipit of the *‘Uyūn al-ḥaqā’iq*, MS Toronto Fischer Library 142, p. 2

drawings of magical signs, diagrams, and tables that summarize the text. It is paginated with Arabic numbers and the same hand added another table of contents with page numbers on one of the blank leaves at the end of the manuscript. The same hand also added a *legenda* for the secret alphabet used in the manuscript — again, on a blank leaf after the end of the text; here, the rubrications are made with a different ink, purple rather than red — although no part of the text is actually encoded. The colophon tells that the copy was completed in the month of Ramaḍān 1285 H / December 1868 CE (Fig. 8.1).

1.5 (K) Ms Jeddah King Saud Library 6230 (72 ff.)¹⁰

The manuscript is written in a very cursive *nash*, the chapter headings and the incipits of their subdivisions are rubricated. The manuscript features a few drawings of magical signs, diagrams, and tables that summarize the text. The copyist occasionally annotated the margins with corrections and additions to the text, though some marginal annotations could also be ascribed to a different hand. Before the colophon, there is a *legenda* for the secret alphabet used in a number of cases to encode specific technical information. The colophon tells that the copy was completed in the year 1272 H / 1855–56 CE.

¹⁰ A digital copy of the manuscript is available at <<https://al-mostafa.info/data/arabic/depot/gap.php?file=mo17532.pdf>> (last accessed 9 April 2020).

1.6 (L) *MS London British Library Add. 23390* (ff. 50v–87v)¹¹

This is a multiple-text manuscript matching the *Mechanics* by Hero of Alexandria (*Kitāb fī rāfʿ al-ašiyāʿ al-taqīla*, ‘On the lifting of heavy things’)¹² with the *ʿUyūn al-ḥaqāʾiq*, which produces an interesting combination of different technical texts. The text of the *Mechanics* is enriched with numerous diagrams representing the various machines; these are associated with rubricated progressive numbers expressed by the numerical value of Arabic letters. Other rubrications added to the diagrams indicate their different components. The text of the *ʿUyūn al-ḥaqāʾiq* does not contain any diagrams, but several blank spaces suggest that they were part of the initial plan. The original colophon has been erased and replaced with a 19th-century version (f. 87v). An ownership note on f. 1r, however, marks a *terminus ante quem* at the year 1020 H/ 1611 CE. The manuscript was copied by an expert *nashī* hand, the rubrications in the diagrams might have been added by a different one.

1.7 (La) *MS London British Library Or. 3751* (ff. 1v–28r)

The first part of this multiple-text manuscript contains an abridgement of al-ʿIrāqī’s *ʿUyūn al-ḥaqāʾiq* (*Fawāʾid min kitāb ʿUyūn al-ḥaqāʾiq*), also the other two texts in the collection are abridgements of medical and alchemical works. The title page is missing, a blank leaf at the beginning has the *legenda* of a secret alphabet and the title of the work written upside down, probably from a different hand. The text is written in a regular *nashī*, the chapter and paragraph headings are rubricated, the margins are ample and often filled with annotations and corrections, probably from the same hand.

1.8 (C) *Cairo lithographic edition* (48 pp.)¹³

The title page of the lithographic copy of the *ʿUyūn al-ḥaqāʾiq* sports a frame divided into two rectangular areas. In the upper one, there is a circular medalion containing a long version of the title and the name of the author with the eulogies of the case. The lower one contains four lines informing us that this edition was printed at the expense of Mister ʿAlī ʿAbd al-Ḥamīd al-Kutubī and

11 A digital copy of the manuscript is available at <https://www.qdl.qa/en/archive/81055/vdc_100022551545.0X000001> (last accessed 23 April 2020).

12 For this text, see Carra de Vaux, *Les Mécaniques ou l’Élévateur de Héron d’Alexandrie, publiées pour la première fois sur la version arabe de Qostā ibn Lūqā et traduites en français* (Paris: Leroux, 1894).

13 A digital copy of the lithograph is available at <<https://gallica.bnf.fr/ark:/12148/bpt6k9106144f/f5.item.zoom>> (last accessed 9 April 2020).

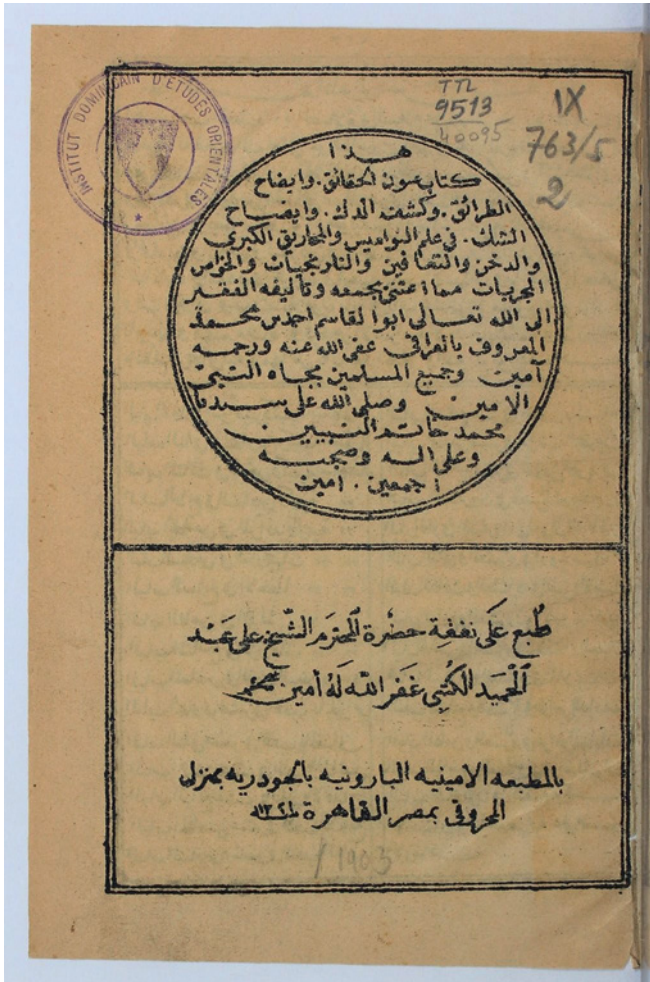


FIGURE 8.2 Title page from the lithographic edition of the *Uyūn al-ḥaqā'iq* (Cairo, 1321 H/1903 CE)

printed at the *Maṭba'ā Bārūniyya* in Cairo,¹⁴ in the year 1321 H/1903 CE. On the following page, the frame is divided into an upper rectangular area including the introduction, and two columns underneath with the list of chapters. On all remaining pages, the text is framed in a rectangle defined by a double line. The incipit of the different chapters is marked by flowered brackets (Fig. 8.2).

14 For this printing press, see Martin H. Custers, *Ibadi publishing activities in the east and in the west c. 1880–1960s, An attempt to an inventory, with references to related recent publications* (Maastricht: Custers, 2006).

2 Ordinary Inks and Incredible Tricks

Writing plays a role in different practices described in al-ʿIrāqī’s work and writing, along with inks, stands out as an example of the technical vein in the *ʿUyūn al-ḥaqāʾiq*. Not all ink types are represented in the text, which devotes an entire chapter (Ch. 23) to coloured metallic inks and paints, and part of another one to invisible inks (Ch. 18). Compared to technical handbooks on ink making, the selection of the materials included in this treatise is limited and peculiar.¹⁵

For the edition of the text — with a practical approach to the fluidity of the tradition — the more inclusive version has been chosen for the main text — i.e. MS Princeton Garrett 544H — and Appendix II gives an overview of the attestation of the recipes in the different witnesses of the manuscript tradition.¹⁶ Although it is not possible to define stemmatic relations among the manuscript witnesses, it is still possible to detect some proximity between some of them. The manuscripts T and K, for instance, share a mechanical mistake: recipe nos. 8–10 and 28 are matched with the wrong rubric; these recipes carry in fact the title of the following entry.

The edition presented here is a small philological experiment that I will call a ‘laboratory-edition’; that is to say, it is an edition devised for interdisciplinary use and for collaboration between philologist and chemist. This edition is oriented by its prospective readership and is designed to make the text and its variants accessible, especially to those without direct access to primary sources. Thus, the variant readings are translated and, whenever necessary, commented upon.¹⁷ Regarding the variants to be included in the apparatus: the ‘laboratory-edition’ operates a selection and only those focused on the technical aspects of the text are included in the apparatus, leaving aside small orthographical and linguistic variants that do not imply a technical difference. This kind of edition is the first step towards the replication of recipes and provides the material information for setting the research questions that replication may find an

15 Following the order of technical treatises on ink making, metallic inks will be dealt with before the invisible ones, although the *ʿUyūn al-ḥaqāʾiq* treats them, respectively, in Ch. 23 and Ch. 18. The title of Ch. 23 mentions metallic inks and dyes (*al-liyaq wa-l-aṣḥāḡ*) but also includes instructions for preparing paints (*dihān* or *adhān*) from the same mixtures meant for inks; whereas Ch. 25 is entirely devoted to dyestuffs (*al-ḥiḏābāt*) for hair and beard.

16 The summary of the contents has been prepared taking into account the complete manuscript tradition.

17 Every edition is the result of a compromise between three parties: the text, the editor, and the imagined readership. See Francisco Rico, “Los Quizotes de Hartzenbusch,” in *Juan Eugenio Hartzenbusch, 1806/2006*, edited by M. Amores (Madrid: Centro para la edición de los clásicos españoles), pp. 199–220, in particular pp. 203 and 209.

answer to.¹⁸ The apparatus also includes a section on parallel attestations of the recipe (*loci similes*) in different treatises on ink making.¹⁹

2.1 Coloured Metallic Inks

This broad approach to the collection of sources leads the author to include an entire chapter on metallic inks and coloured paints obtained from the same mineral or metallic compound.²⁰ For other research, there had already been occasion to establish the fluidity of the text and its contents in the relative stable frame of the 30 chapters that compose the book, and the chapter on inks confirms the impression.²¹ The attestation and distribution of the recipes in the different witnesses shows significant variations (Appendix 11). The chapter structure, however, remains constant: opened with a recipe for preparing

18 See Lucia Raggetti, "Inks as Instruments of Writing: Ibn al-Ġazarī's *Book on the Art of Penmanship*," *Journal of Islamic Manuscripts*, 2019, 10/2:201–239.

19 In the section of the apparatus reserved for parallel attestations of a recipe (*loci similes*), the references to handbooks on ink making and other relevant texts are referred to in an abbreviated form: 'al-Marrākuṣī' for Muḥammad ibn Maymūn ibn 'Imrān al-Marrākuṣī, "Kitāb al-azhār fī 'amal al-aḥbār li-Muḥammad ibn Maymūn ibn 'Imrān al-Marrākuṣī," *Zeitschrift für Geschichte der Arabisch-Islamischen Wissenschaften*, 2001, 14:103–106; 'Ibn Bādīs' for al-Mu'izz ibn Bādīs al-Tamīmī al-Ṣanhāġī, 'Umdat al-kuttāb wa-uddat dawī al-albāb. Fīhi ṣifat al-ḥaṭṭ wa-l-aqlām wa-l-midād wa-l-liyaq wa-l-ḥibr wa-l-asbāġ wa-ālat al-taġlīd, edited by Naġīb Mā'il al-Harawī and 'Iṣām Makkīya (Maṣhad: Maġma' al-Buḥūṭ al-Islāmiya, 1409 / 1988 H); 'al-Qalalūsī' for Abū Bakr Muḥammad ibn Muḥammad al-Qalalūsī al-Andalusī, *Tuḥaf Al-Jawāṣṣ Fī Turaf Al-Jawāṣṣ (Las galanduras de la nobleza en lo tocante a los conocimientos más delicados)*, edited by Hossam Ahmed Mokhtar El-Abbady (Alexandria: Maktabat al-Iskandariya, 2007); 'al-Rāzī' for Muḥammad ibn Zakariyyā' al-Rāzī, *Zīnat al-kataba*, ed. Luṭf Allāh al-Qārī, *Ālam al-Maḥṭūṭāt wa-l-Navādir*, 1432/2011, 16/2:211–242; 'Fani' for Sara Fani, *Le arti del libro secondo le fonti arabe originali. I ricettari arabi per la fabbricazione degli inchiostri (sec. ix–xiii): loro importanza per una corretta valutazione e conservazione del patrimonio manoscritto* (PhD Diss., Università degli Studi di Napoli "L'Orientale," 2013); 'Cum Grano Salis' for Raggetti, *Cum Grano Salis* (cit. note 2), in particular for al-Zarḥūrī's *Zahr al-basātīn*; and 'Siggel, Decknamen' for Alfred Siggel, *Arabisch-Deutsches Wörterbuch der Stoffe* (Berlin: Akademie Verlag, 1950); and 'al-Iskandarī' for al-Iskandarī, *Al-ḥiyal al-bābiliyya* (cit. note 3).

20 The themes of colours and writing are also present in other sections of the book. Invisible inks are treated in Chapter 18 among the tricks of those who dupe people with written messages that suddenly appear or disappear, while Chapter 25 deals with dyeing substances. See Appendix 1. The name *liqa* refers to inks by extension, being this a wad of unspun silk, wool or cotton placed in the inkwell's neck to prevent the ink from being spilled when the pen is dipped in it, see Adam Gacek, *Arabic Manuscripts. A Vademecum for Readers* (Leiden/Boston: Brill, 2009).

21 In particular, the reading of the fourth chapter on wondrous fermentations in the different witnesses reveals a high degree of variance in the wording and contents of the various witnesses to the 'Uyūn al-ḥaqā'iq.

the gum arabic that is needed for the preparations of all the inks; a number of coloured metallic inks followed by a technical consideration on the composition of colours; and a final part with recipes dealing with chrysography. Manuscript P is the more inclusive version chosen for the main text: the recipes for metallic inks are understandably more numerous and this is the only text to include a procedure for cutting and applying gold leaves (no. 34). This cluster of recipes for coloured metallic inks (nos. 12–27) was probably inserted before the recipe preceding the remark on the composition of colours ('wood ink,' here recipe no. 28). The idea that this insertion and its position are deliberate is supported by the fact that the recipe for the 'wood ink' is first partially copied before this additional cluster of recipes, and then copied in its entirety after it. The concise style of this particular cluster of recipes, suggests that it represents an addition in this specific copy rather than an omission from the others. The order of the recipes, however, does not apparently follow the one adopted by any other treatise on ink making in particular. Once the position of this additional cluster of recipe has been defined in the frame of the textual tradition of the *'Uyūn al-ḥaqā'iq*, this material remains relevant from the technical point of view and therefore finds its way in the main text of the 'laboratory-edition.'

Chapter 23: on [metallic] inks (*liyaq*) الباب الثالث والعشرون في انواع الليق
and the manner of their operations وكيفية اعمالها

الليق والاصباغ [الليق] '[metallic] inks and dyes,' *add.* K C

[1]

The Wise said: for the one who wishes to prepare [metallic] inks and paints, it is necessary to begin first with the preparation of chips of white gum arabic.

Take the preferred quantity of it, crush it finely, soak it in pure water in a glass vessel.

Then, add three parts of water for each part it, close the opening of the vessel and hang it in the sun for a whole day.

قال الحكيم ينبغي لمن اراد عمل الليق
والاصباغ ان يتبدئ اولاً بتدبير الصمغ
العربي الابيض المعرب

يأخذ منه ما اختار فيدقه ناعماً ويبله
بالماء الصافي في اناء زجاج

ثم يعطي لكل جزء منه ٣ اجزاء من
الماء ويسد رأس الاناء ويعلقه في الشمس
يوماً كاملاً

Then, shake it until [the components] blend one with the other, and agitate it until it has settled.

Then, take the required quantity needed to fix metallic inks, dyes, and paints.

When it dries and melted sandarac is applied over it, then this paint will not be removed, even if washed with water.

ثم يحرك حتى يختلط بعضه ببعض
ويترك حتى يركد
ثم يأخذ منه بقدر ما يحتاج لاصلاح
الليق والاصباغ والادهان
فان جف ودهن من فوقه السندروس
المحلول فانه لا يعود يزول ذلك الدهن
ولو غسله بالماء

المفيد [الحكيم] (Wise → Instructive), K C

علم [عمل] (to prepare, lit. 'making' → science) P D

الايض المحلول [الايض] (white → white and dissolved), *add.* B T K C

العربي الابيض المعقرب [المعقرب] (*add.* (in chips → that is white gum arabic in chips), B T K C

ويخل ثم ينقع في الماء [ويبله بالماء الصافي] (soak it in pure water → dissolved and then soaked in water), B; *تديف الى الماء* (→ sifted and then boiled in water), T K; *تدفعه بالماء* (→ diluted with water), L; *وتنقع بالماء* (→ immersed in water), C

بعد ان تغليه على النار في اناء نظيف الى ان يصلب في الاناء [بالماء الصافي] (in pure water → after having been boiled on the fire in a clean vessel until it has hardened in the vessel), *add.* C
واناء (vessel → receptacle, either a different kind of recipient or a different name for the same one) B D T K L La

ثم ينقع به الصمغ في اناء زجاج او من مرنج [ثم يعطي] (Then, add → then let the gum arabic macerate with it in a glass vessel or in a glazed one) C

يركض [يركد] (it has settled → has mixed) C

الصندروس [السندروس] P

علقه [غسله] (washed → suspended) La

واذا جف اقلب عليه الماء [فان...بالماء] (When it dries and melted sandarac is applied over it, then this pain will not be removed, even if washed with water → Once it has dried, pour some water on it) D

Loci similes: Cum Grano Salis, p. 335.

[2] Cinnabar ink

Take some red cinnabar, grind it finely, then rinse it with the water of sour pomegranate seeds, pour water over it and rinse well, and purify it after leaving it for one hour, until [the suspension] has settled.

Then, grind it either in an impermeable or on a polished permeable stone slab, add water gradually and grind it until it cannot absorb any more water and is similar to *ḥarīra* soup.

Then, add the dissolved gum arabic and pound it vigorously until it is absorbed into the substance.

If you wish to make it into an ink, pour this on a washed silk wad inside a glass jar and write with it. If, instead, you want to use this for paints, use a hair brush to spread it onto the images you wish and then the leaf will be coloured in a precious red, and you should know this.

ليقة زنجفر

يؤخذ من الزنجفر الاحمر ويسحق ناعما ثم يصول بماء حب الرمان الحامض وتقلب عليه ماء وتغسله غسلا جيدا وتصفيه بعد ان تركه ساعة حتى يركد

ثم يسحق على صلاية مانع او صلاية ناعمة ملسا واسقيه بالماء قليلا قليلا وانت تسحقه الى ان لا يعود يشرب ماء ويبقى كالحريرة

فحينئذ تلقي عليه الصمغ المحلول واسحقه به قويا حتى انه يدخل في جسمه

فان اردته ليقة تزلته على ليقة حرير مغسولة في حق زجاج واكتب ما اردت وان اردته للدهان فمشيه بقلم الشعر على ما اخترت من الصور فانه يصبغ الورق احمرًا ثمانيا فاعلمه

LC صفة ليقة زنجفورية; TK صفة ليقة زنجفر [ليقة زنجفر

om. B] الاحمر

La (→ wood) خشب; BC om. (grain) حب

C (has settled → sinks to the bottom) يرسب [يركد

om. D] غسلا... ثم يسحق

om. TKLC (impermeable [...] stone slab) صلاية مانع

(levigated and permeable stone slab → levigated and permeable marble) B; صلاية ملسا; C (→ levigated stone slab)

LC (→ with a bit of water) بالماء قليلا; C om. (add water gradually) بالماء قليلا قليلا

C om. (grind it until it cannot absorb any more water) وانت تسحقه الى ان لا يعود يشرب ماء

كالخرزة [كالخريرة] (similar to *ḥarīra* soup → like a bid) B T; الحديد الناعمة (→ fine iron) L; كانه
الاسفداج (→ as if it were white lead) C; مثل الحرير (→ like silk) D Ba. *Ḥarīra* is a soup of flour
cooked with grease, gravy, or milk; *ḥarīra* may also mean silk cloth.

[تلقني عليه الصمغ المحلول واسحقه به قويا حتى
vigorously until) *om.* K T; فخر يدخل خمسة في بعض (→ So that five times as much is absorbed?)
C

[قويا] (vigorously) *om.* B

ان اردته كالدهن ليقة فان اردته ليقة (If you wish to make it into an ink → If you want it to be like
a paint [in the form of] ink) L C

ليقة احمر [ليقة حرير] (silk wad → red wad) B

في جرة [في حق] (jar → vase) B

نظيف [زجاج] (glass → clean glass) *add.* C

[انه يصغ الورق احمرًا ثمانية] (then the leaf will be coloured in a precious red → then the leaf will
be coloured red) *om.* B T K L C

[فانه...فاعلمه] *om.* D

Loci similes: several similar recipes for a cinnabar red ink can be found in the treatises on ink making, though not in such a detailed form. In these recipes, usually pomegranate water is substituted with gall nut water. See Fani, pp. 64, 66, and 127 (cinnabar ground in a stone pounder) and 104–106.

[3] Arsenic ink

Take some golden yellow arsenic (orpiment), pulverize it, sift it, and grind it with water on an impermeable stone slab until it does not absorb any more water; pour the dissolved gum arabic onto it until you are satisfied with it and store it away for the moment when you may need it, either for writing or for the paints, it will be excellent.

ليقة زرنج
يؤخذ زرنج اصفر ذهبي يطحن وينخل ثم
يسحق على صلابة مانع بالماء حتى لا يعود
يشرب شيئًا والى عليه الصمغ المحلول
الى حين يرضيك وارفعه لحاجتك اما
للكتابة واما للدهان بلاغه

[واما للدهان فاعلم ذلك] (or for the paints, it will be excellent → or for the paints,
and you should know this) T K L La; او للدهان (→ or for the paints) C

Loci similes: see Fani, p. 108 (yellow ink); al-Marrākuṣī, p. 98.

[4] [Another ink]

If yellow arsenic (orpiment) is not available, grind Iraqi white lead, pour freshly plucked saffron and gum water over it, then do with it whatever you wish.

[ليقة اخرى]

إذا اعدم الزرنج الاصفر اسحق الاسفيداج
العراقي والى عليه الزعفران الجنوبي والى
عليه ماء الصمغ وافعل به ما شئت

ليقة اخرى صفراء [ليقة اخرى (another ink → another yellow ink) B; om. P

الجنوي *al-ġannawī*. This adjective can be interpreted as the *nisba* for the city of Genoa. The 'saffron of Genoa' is not attested as a label for a certain product that is associated with this place of origin (such as the vitriol of Cyprus or the *terra sigillata* from Lemnos). The only other occurrence I could find is in a 14th-century treatise on the art of writing, mainly calligraphy. The editor specifies in a footnote that this variety of saffron comes from Italy (*Ītāliyā*) and it is renowned for its abundant juice and the beauty of its colour. He also suggests checking Ibn al-Bayṭār in the Cairo lithographic edition. A perusal of the relevant entry on saffron does not reveal the use of this adjective. The only passage with relevant information is at the beginning, when Ibn al-Bayṭār reports Dioscorides' description of the different geographical varieties of the plant with their specific names and properties. One of the varieties mentioned is said to be typical of a country called *Aṭūliyā*, while another variety from Sicily is said to have a lot of juice and a beautiful colour and is used as a dye by the people of *Anṭāliyā*. This lexicographical direction is not particularly productive or reliable, so the other option may be an adjective from the participial form (*ġannā*) of the verb *ġanā* ('to pluck fruits and flowers from a plant'). See Ibn al-Bayṭār, *Kitāb al-ġāmi' li-mufradāt al-adwiya wa-l-aḡdiya* (Cairo: Maktabat al-Mutanabbī), p. 126; and Ḥusayn ibn Yāsīn ibn Muḥammad al-Kātib, *Laḥmat al-muḥtaṭif fi šinā'at al-ḥaṭṭ al-šalaf* (Kuwayt: Mu'assasat al-Kuwayt li-l-taqaddum al-'ilmī, 1992), p. 73, note 232.

Loci similes: Cum Grano Salis, p. 331 (no. 124)

[5] Green ink

Take some well-ground yellow arsenic (orpiment), add a quarter dirham of indigo for each *miṭqāl* of it [yellow arsenic]; grind it until you like the green hue of its colour, pour the dissolved gum onto it and do with it whatever you wish, either for writing or for [the preparation of] paints.

ليقة خضراء

يؤخذ الزرنج الاصفر المسحوق ناعما ويلقى
على كل مثقال منه ربع درهم نيل هندي
واسحقه الى حين يعجبك لونه في الخضرة
ونزل عليه الصمغ المحلول وافعل به ما
اردت للكاتب وللدهان

TKC صفة ليقة خضراء [ليقة خضراء

دهان وغير ذلك] وللدهان (for [the preparation of] paints → for paints and other than this) *add. C*
Here K adds a recipe for preparing 'gold water' (صفة ماء الذهب):

تأخذ كبريت وشبا ايضا اجزاء اسواء اسحقهما حتى يمتلطا ثم اجعلهما في قدرة واغليهما على النار
غلوتين واتركه حتى يبرد واعمله مثل الفلوس وجففه في الظل ثم اسحق منه قدر الحاجة بمخل عتيق
وصمغ عربي واكتب به ما شئت فانه يكون على لون الذهب

'Take some sulphur and an equal quantity of white alum, grind them until they mix; then put it in a pan and boil it twice on the fire, leave it until it has cooled, give it the shape of small coins and let it dry in the shade. Then, grind the amount you need with old vinegar and gum arabic and write whatever you wish with it and it will have the colour of gold.'

Loci similes: see Fani, p. 130; al-Marrākuṣī, p. 128.

[6] Verdigris ink

Grind Iraqi verdigris with wine vinegar well, then pour the gum onto it and do with it what you wish.

ليقة زنجاري
يسحق الزنجار العراقي بخل الخمر سحقا
ناعما ثم يلقي عليه الصمغ وافعل به ما
اردت

ماء الصمغ [الصمغ] (gum arabic → water of gum arabic) B D T K L La C

ما شئت من كتابة او دهان فانه يأتي كما تحب وتختار [ما اردت
either for writing or for paints, and it will be as you like and prefer) *add.* D T K L; ما تريد فانه يأتي
(what you wish → what you wish, either for writing or for paints, and it will be as you like and prefer) *add.* D T K L; ما تريد فانه يأتي
(what you want and it will go as you like) *add.* C

[7] Pistachio ink

This is when you take the verdigris ink and pour on it two *dāniq* of freshly plucked saffron, and this will improve its colour and satisfy you.

ليقة فستقية
وهوان تأخذ الليقة الزنجاري ويلقي عليها
قدر دانقين زعفران جنوي فانه يحسن
لونه ويرضيك

D دانق [دانقين] (two *dāniq* → one *dāniq*)

Loci similes: although several recipes for a pistachio ink are preserved in the technical literature, none is based on the same ingredients, see Fani, pp. 65, 67, 109 and 131; and al-Marrākuṣī, pp. 100 and 129.

[8] White ink

Take some Iraqi white lead, grind it finely with the water of white gum arabic until it [the product] pleases you and its whiteness has improved, then do with it whatever you wish, either an ink or a paint.

ليقة بيضاء
تأخذ الاسفيداج العراقي وتسحقه ناعما
بماء الصمغ الابيض الى حين يعجبك
ويجود بياضه فاصنع به ما شئت اما ليقة
واما دهان

[فاصنع به ما شئت اما ليقة واما دهان
(then do with it whatever you wish, either an ink or a paint) *om.* B

[9] Lapis lazuli ink

This is when a quarter dirham of indigo must be added for every dirham of white lead, then grind it well in a thin impermeable mortar until something similar to lapis lazuli remains; then use it as an ink, or for the basic preparation (*biṭāna*) for paints with lapis lazuli.

ليقة لازوردي
وهو ان يلقي على كل درهم اسفيداج ربع
درهم نيله هندي واسحقه جيدا في صلاية
ناعم مانع حين يبقي شبيهه اللازورد واعمل
منه ليقة او بطانة للدهان باللازورد

ناعم (thin) *om.* D

ويعمل عليه الصمغ المحلول [اللازورد] (*lapis lazuli* → and add to it the dissolved gum arabic) *add.*
L; واعمل منه ليقة او بطانة للدهان باللازورد; (then use it as an ink, or for the core preparation of paints with lapis lazuli) *om.* B

[10] Wine ink

Grind the red lac, add to it a piece of indigo and prepare an ink or a paint.

ليقة خمري
يسحق اللك الحمراء واطرح عليها قطعة
نيلة هندية واجعله ليقة او دهن

(→ red lac) T; الملكة الحمراء (→ red lac) B; الحمرة [اللك الحمراء] (red lac → red dye) B; ك; اللك الاحمر (→ red lac, with a different spelling) L

Locis similes: Ibn Bādīs includes a recipe with the same label in his treatise, but the ingredients are very different (gall nuts water and arsenic), see Ibn Bādīs, p. 49.

[11] Turtle-dove ink

Add a drop of ink (*ḥibr*) for every dirham of sericon or a little bit of dissolved indigo.

ليقة فاختي
الق قطرة من الحبر على كل درهم من
السيلقون او شيئا يسيرا من النيلة الهندية
المحلولة

المحلولة (dissolved → moistened) D

B, the transliteration of the Greek name for the alchemical red tincture (σῆρικόν, 'sērikón') could be written in Arabic in both ways; it may indicate 'cinnabar' or refer to other red substances (see recipe No. 13), Siggel, *Decknamen*, p. 82.

[12] Rosy ink

Take some cinnabar and white lead, grind them in a vessel and add the gum; if you wish to obtain an intense pink, add more of the red [component], whereas if you want a lighter [pink], add more of the white [component].

ليقة وردية
يؤخذ من الزنجفر والاسفيداج واسحقهما
في اناء وصمغهما فان اردت الوردي عميق
فاجعل الاحمر اكثر وان اردته صافي اعلم
الابيض اكثر

Loci similes: al-Marrākušī, p. 92; Fani, pp. 106–107; Ibn Bādīs, p. 59.

[13] Orange ink

Take some sericon and grind it. Dissolved gum must be added to it, then one can write with it and it will be nice; if you want a lighter hue, take some yellow arsenic (orpiment) and add it to the red cinnabar.

ليقة نارنجي
يؤخذ السيلقون يسحق ويعمل عليه الصمغ
المحلول ويكتب به ينجى ملىح وان اردته
صافي خذ من الزرنج الاصفر ويعمل عليه
الزنجفر الاحمر

السيرقون [السيلقون] B (see recipe no. 11).

Loci similes: Ibn Bādīs, p. 64.

[14] Honey ink

Take one part of [carbon] ink (*midād*), one part of cinnabar, add the gum and write what you wish.

ليقة عسلي
يؤخذ جزء من المداد وجزء من الزنجفر
ويصمغ ويكتب ما اراد

[15] Silver ink

Take common silver leaves; do with them the same as you would do with gold — as it will come later — and add gum to them.

صفة ليقة الفضية
يؤخذ اوراق الفضة المتاع الطلي افعل
بهم كما تفعل بالذهب كما سيأتي واعمل
عليهم الصمغ

[16] Black vitriolic ink

Take some gall nuts, crush them, macerate them in water, write with this on a leaf and leave it until it fades away. Then, take some good vitriol from Cyprus, grind it well, mix it with water and wash the leaf in it, and the writing will appear black.

الليقة السوداء الزاجية
يؤخذ العفص يسحق وينقع بالماء ويكتب
به في الورق وتركه الى ان يشق
ثم تأخذ الزاج القبرصي المليح تستحقه
ناعم وتذوبه في الماء وتغمس الورقة فيه
فتظهر الكتابة سوداء

Loci similes: see recipe no. 39 in ch. 18 of the *Uyūn al-ḥaḡāʾiq*; Fani, p. 152; al-Qalalūsī, p. 36.

[17] Golden ink

Take some copper filings and golden marcasite, grind the filings and wash the marcasite white; then grind them on a stone slab, and mix it with gum arabic and then one can write with it.

ليقة ذهبية
يؤخذ برادة النحاس ومرقشيتا ذهبية
تسحق البرادة وتغسل المرقشيتا ايضا
ويسحقوا على صلابة ويضاف لهم صمغ
عربي ويكتب به

[18] Ashen ink

White lead, cinnabar, a bit of Egyptian ink (*midād miṣrī*), and it will be excellent.

ليقة رمادية
اسفيداج وزنجفر وقليل مداد مصري
فانه غاية

[19] Violet ink

Take — one or more pieces [?] — white lead, indigo, and cinnabar. They must be ground finely and the gum has to be mixed with them.

ليقة بنفسجية
يؤخذ الاسفيداج والنيلة والزنجفر جزء
وجزؤن [?] يسحقوا ناعما ويضاف اليهم
الصمغ

Loci similes: although recipes for violet ink are attested in the technical literature, none enumerates these same ingredients, see Fani, pp. 132 and 146; al-Marrākuṣī, p. 130.

[20] Turquoise ink

Iraqi verdigris, white lead and a bit of saffron, prepare as described before.

ليقة فيروزجية
زنجار عراقي واسفيداج وقليل زعفران
ويعمل كما تقدم

[21] Peony ink

Verdigris and saffron.

ليقة شقائقي
زنجار وزعفران

[22] Clay ink

It is made from the mentioned red ochre together with [egg?] white, and the colours will result from increasing [the proportion of one ingredient].

ليقة سيجي
يقوم من المغرة المذكورة مع البياض وعلى
قدر الزيادة تكون الالوان

Loci similes: Cum Grano Salis, p. 330 (no. 118)

[23] Lentil ink

From saffron and white [egg? lead?].

ليقة عدسي
من زعفران والبياض

[24] Abbasid ink

From black [dye], red ochre in flakes.

ليقة عباسي
من السواد المغرة السطيحة

[25] Ivory ink

From arsenic with [egg? lead?] white.

ليقة عاجي
من الزرنج مع البياض

[26] Golden ink

From arsenic and lac.

ليقة ذهبي
من الزرنج واللك

[27] Preparation of the golden, silver, copper, and lead ink and of every metal with the splendour of the two [gold and silver?], then it will take its colour

Its preparation: take a fine [powder of] touchstone, mix it with gum arabic, and write with it; once it has dried, rub and burnish with gold and the writing will appear golden — or, if you do it with silver, [the writing] will become silver, or, apart from these two, any metal you wish, and you should know this.

صفة الليقة الفضية والذهبية والنحاسية
والرصاصية وكل معدن مجليتهما فتصير
على لونه

وصفتها ان تأخذ المحك ناعم وتخلطه
بالصمغ العربي وتكتب به فاذا جف
ونشف صقلته بالذهب تطلع الكتابة
ذهبية او بالفضة تصير فضية او منهما
شئت من المعادن فافهم ذلك

Loci similes: see Cum Grano Salis, p. 330 (no. 117); *Art of Penmanship*, recipe no. 21.

[28] Wood ink

Grind some red arsenic (realgar) finely, pour the closest thing to the most suitable/closest/lowest quality ink (*hibr*) that there is onto it; or take the red [arsenic], add the yellow [one] and the [carbon] ink (*midād*), and all this after the addition of gum.

You should know that the colours are produced from each other, when you add one to the other, depending on the difference of the colours, so be aware of this.

ليقة عودية
اسحق الزرنج الاحمر سحقا ناعما والقي عليه
ادني ما يكون من الحبر او خذ الاحمر
والق عليه الاصفر والمداد وذلك جميعة
بعد التصميغ

واعلم ان جميع الالوان تتولد بعضها من
بعض اذا القيت على بعضها بعض
باختلاف الالوان فاعلمه

او اجمع بين الاحمر والاصفر [او خذ الاحمر والق عليه الاصفر والمداد وذلك جميعة بعد التصميغ
(or take the red [vitriol], add the yellow [one] and the [carbon] ink, and all this after the addition of gum → or mix the red, the yellow and the minerals, grind it, mix the gum water mentioned before and use it) B; om. L
الصمغ [التصميغ] (addition of gum → gum) D

[اذا القيت على بعضها بعض باختلاف الالوان (when you add one to the other, depending on the difference of the colours) om. B C;

(depending on the difference of the colours → depending on the difference of weights) K; باختلاف الالوان وذلك كله بعد التصميغ (→ depending on of the difference of weight and all of this after the addition of gum) L

[29] Section on the melting of gold

When you wish this, take a blue Chinese bowl, smooth and fine, throw ten leaves of the finest quality Egyptian gold into it; pour half a dirham of bee honey onto this, gradually make everything into a single leaf, until it melts; then wash the sweetness of the honey from it with water, leave it to sink to the bottom, filter it from the water, pour a *harrūba* [dry measure] of gum arabic moistened with water onto it and write with it.

فصل في حل الذهب
اذا اردت ذلك فخذ زبدية صيني زرقاء
ملسا ناعمة واطرح في وسطها عشرة
اوراق ذهب مصري عال والق عليه
وزن نصف درهم عسل نحل وتمرس
الجميع في ورقة قليلة قليلة حتى ينجل
واغسل عنه حلاوة العسل بالماء واتركه
يرسب وصفني عنه الماء والق عليه وزن
خروبة صمغ عربي مبلول بماء واكتب به

When it dries, leave it for one hour and then burnish it with hematite or with onyx, from which a burnisher is made, and its colour will appear and will be as you like and as it pleases you.

فاذا جف فاتركه ساعة واصقله بحجر
الصراف او بجمع يكون قد عمل منه مصقلة
فانه يظهر لونه ويأتي كما تحب وترضي

[فصل في حل الذهب] (Section on the melting of gold) *om. D*

[زرقاء] (blue) *om. L C*

[مصري] (Egyptian) *om. D*

[نصف درهم ورقة ورقة] (half dirham → half dirham leaf by leaf) *add. D*

[وزن خروبة] (half dirham → the weight one *ḥarrūba*) T K C; [وزن ورق] (→ the weight of leaves/a leaf?) L

[جزء] (sweetness → part) L; *om. C*

[واتركه يرسب وصفني عنه الماء والقي عليه وزن خروبة] (leave it to sink to the bottom, filter it from the water, pour a *ḥarrūba* onto it) *om. L*

[محلول] (moistened → dissolved) D

Loci similes: see Fani, p. 71; *Art of Penmanship*, recipe no. 19.

[30] Melting of all the metals

If you want this, take a whetstone, rub it on any stone available or any metal you wish, then this will gradually dissolve [by filing] until nothing of this substance is left.

Then add gum arabic in drops, burnish it when it has dried and the colour will appear.

حل جميع المعادن
اذا اردت ذلك فخذ حجر المحك وحك
عليه اي حجر كان واي معدن شئت فانه
ينحل اولاً باول حتى لا يبقى من ذلك
الجسم شيء
ثم قطر عليه الصمغ واكتب به فاذا جف
اصقله فانه يظهر لون

[اي حجر كان] (any stone available) *om. D T K L*

[الجسد] (substance → metal, lit. 'body') D

[الصمغ] (gum arabic → water of gum arabic) D T K L

Loci similes: *Art of Penmanship*, recipe no. 20.

[31] Preparation of an adhesive for gold

Take some fish glue, spread it, put it into water with saffron, put it on a low fire until it has reached a certain consistency and rises from the bottom [in ebullition]. Once it has dried, moisten it with your saliva, spread the glue on top of the gold; once it has dried, burnish it with onyx or with hematite and it will be beautiful.

صفة لصاق الذهب

تأخذ غراء السمك ينشر وتجعله في الماء ويكون بالزعفران ويرفع على نار لينة حتى يأخذ له قوام ويمشي من تحت فاذا جف تنديه بريقك وتلصق من فوقه الذهب فاذا جف فالصقله بالجرجع او بحجر الصفر فانه يحسن

[burnish it with onyx or with hematite] *om. T K*; in Ba the title is matched with the following recipe too. (moisten it with your saliva, spread the glue on top of the gold) *om. D*.

Loci similes: Ibn Bādīs, p. 85

[32] Another one like this

Take some white gum ammoniac, dilute it with sublimated wine vinegar, leave it for one hour until they melt; then write whatever you wish with it, on a bow or on a book, and glue the gold or silver leaves on top of it: this will be a good [alternative] to fish glue

اخر مثله

تأخذ الكلخ الابيض ويحل بجمل الخمر المصاعد وتركه ساعة حتى يدوبه ثم اكتب به ما شئت على قوس او كتاب والصق عليه اوراق الذهب او الفضة فانه جيد عن غراء السمك

(white gum ammoniac → white gum ammoniac that is [also called] *al-waššaq*) *add. L*; *al-kalḥ* may mean 'giant fennel,' while *al-kalaḥ* can be interpreted as 'gum ammoniac,' a resin that is extracted from the family of plants to which the giant fennel belongs (*Apiaceae*). In L, the copyist felt the need to provide a more common synonym for the gum ammoniac, i.e. *al-waššaq*.

[sublimated] *om. B*

على قوس (on a bow or on a book → on anything you wish) *B*; على قوس او كتاب (→ on a bow or a sword with an inscription) *K T La*; considering this last variant, this might be a recipe for inscribing weapons and possibly other objects. (glue → place down) *T*; واطبق (→ superpose) *L*

[33] Dyeing of the leaves²²

If you want this, take the leaves you want, soak them in water with alum (*mušabbab*), throw logwood water, or saffron water or indigo flower water, or whatever water you prefer onto this; then spread [the leaves] in the shade on a thick Persian cane until they have dried; when it has dried, burnish it and write on it whatever you want and it will be good.

صباغ الورق
ان اردت ذلك فخذ ما شئت من الورق
وبله في ماء مشبب والقه على ماء البقم
او في ماء الرعفران او في ماء زهر النيلة
الهندية او ما اخترت ثم انشره على قصبة
فارسي غليظة في الظل حتى يجف فاذا
جف اصقله واكتب عليه ما شئت فانه
مليح

ماء مشبب (water with alum → whatever you want) T K L C; the passive participle *mušabbab* is not attested in dictionaries, but I would opt for reading it as a technical 'neologism' that describes a solution of alum in water, considering also that alum has been used as a fixative in dyeing processes already in premodern times.
وعد القه والقه (throw → dipping it) T K L C

Locis similes: see *Cum Grano Salis*, p. 333 (no. 130.); al-Iskandarī, pp. 182–184 (nos. 210–217).

[34] Cutting the gold leaves

Take a piece of white skin, sew it into the shape of a pillow, stuff it with cotton, with the point of a knife take a gold leaf, spread it onto the pillow, cut the size you need with the knife. Then, take a piece [of gold] and moisten it with your saliva — but only lightly — and apply it onto the sheet, this may be lifted with a cotton cloth; apply fish glue or gum ammoniac on top of it, smooth it with a dry cotton cloth, let it dry, burnish it and this will be amazing. The cutting of silver is done in the same way, and so be aware of this.

قطع اوراق الذهب
يوخذ قطعة جلدة حور تحيطها شبه
المخدة وتحشي قطن وتأخذ ورقة الذهب
بطرف سكين وتحل على المخدة وتقطع
منها بالسكين على قدر حاجتك ثم تأخذ
قطعة وتبلها بريقك بل خفيف واعملها
على الورقة فانها تشال في القطنه اعلمها
على الغراء او الكلخ ودكدها بالقطنه
الناشفة وخليها تجف واصقلها تجي غاية
وكذلك تفصيل الفضة فاعلمه

Locis similes: see Fani, p. 77

22 For other procedures to obtain coloured leaves, see Raggetti, *Cum Grano Salis*, p. 333 (No. 130).

2.2 *Invisible and Wondrous Writings*

The 18th chapter of the *Uyūn al-ḥaqā'iq*, among other things, deals with the preparation of invisible inks, whose impression on paper requires a specific trick or stratagem (*hīla*) to become visible. The different procedures are defined as different kinds of writings (*kitāba*), which focuses attention on the result rather than on the writing medium. The last preparation is not an invisible ink, but a stimulant for hair growth and it is used to write on the body and to produce an inscription made of hair on the skin.

Chapter eighteen on the deceptions of the 'astrologers' and the manner of their operations

الباب الثامن عشر في غدائر المنجمين وكيفية اعمالها

deceptions of the 'astrologers' → playful tricks with strange and curious things of the conjurers) B; عزائم المنجمين (→ incantations of the 'astrologers') D; غرائب المنجمين (→ strange and curious things of the astrologers) T K C
[في غدائر المنجمين وكيفية اعمالها] (on the deceptions of the 'astrologers' and the manner of their operations) *om. La*

[35] Another trick, concerning [different] kinds of writing

If one writes with it on a plank of wood (?), it will not appear until quenched coal is poured onto it, and then the writing will appear black, as if it were written with [carbon] ink (*midād*).

It is said that this is the jinns' way of writing (*ḥaṭṭ al-jinn*) and the writing on a piece of wood is produced only by filtering the water.

حيلة اخرى في انواع الكتابة

من كتب بها على ساعدة لا يبان حتى
يدر عليها الفحم المطفئ فتظهر الكتابة
سوداء كأنها بالمداد

فيقول ان هذه الكتابة خط الجن والكتابة
على ساعدة اما ان يكون باراقة الماء

المسحوق [المطفئ] (quenched → ground) T K

P, the copyist might have read 'in the very moment, on the spot' in this instance, while he reads *sā'ida* in the following sentence. The word *sā'ida* seems to indicate the piece of wood that holds the pulley (see Lane's Lexicon).

[الفحم المطفئ] (quenched coal) *om. B*; الفحم المسحوق (→ ground coal) T K

[36] Another [way of] writing

If you write it during the day, you will not see it, while it will appear during the night, as if it were written with gold.

When you want to obtain this, take the gall of a cheetah, the gall of a black dog, and the gall of a hawk; mix them, write with them on thick parchment, and then you will see it during the night as if it were gold, you should know this.

كتابة اخرى
اذ كتبتها بالنهار لا ترى وفي الليل تبان
كانها قد كتبت بالذهب

اذا اردت ذلك فلتأخذ مرارة نمر ومرارة
كلب اسود ومرارة بازي تخلطها وتكتب
بهم في رق غليظ فانه يراها بالليل كأنها
بالذهب فاعلم

مثل الذهب الابرين [بالذهب (with gold → like red gold) B

[يخلطها] (mix them) om. D

في ورق غليظ بقلم غليظ (on thick parchment → on a thick sheet [of paper] with a thick pen) B; في ورق بقلم غليظ (→ on a sheet [of paper] with a thick pen) D; في رق بقلم غليظ (→ on parchment with a thick pen) T K C; بقلم غليظ (→ with a thick pen) L

يكون ذلك [بالليل كأنها بالذهب (during the night as if it were gold → it will become this) B; في الليل كأنه الذهب الابرين (→ in the night as if it were pure gold) D

Locī similes: in terms of different kinds of gall, several recipe describe gall-based inks that become visible and shine like gold at night, see Fani, pp. 48, 49 and 153; al-Rāzī, pp. 226–227 (nos. 40 and 44); al-Qalalūsī, p. 36; al-Iskandarī, p. 180 (no. 208)

[37] Another [way of] writing

Write on the sheet and it will not appear until you place it near to the fire, and then it will appear.

This is that you write using onion water.

كتابة اخرى
تكتب على الورق فلا تبان حتى تقربها
من النار فتبان
وهوان تكتبها بماء البصل

(with onion water → and you place it near to the fire, then its writing will appear red, you should know this) *add. L*

Locī similes: Fani, pp. 47 and 152; al-Qalalūsī, p. 36.

[38] Another [way of] writing that does not appear without a stratagem

Take some sour milk and sal ammoniac, write a message with it, send it to whomever you want, and nothing will appear in it.

When you place it near to the fire, the writing will appear.

كتابة اخرى لا تبان الا بالحيلة

تأخذ لبن حليب ونشادر وتكتب به في كتاب وترسله الى من تريد فانه لا يبان فيه شيء

فتمت ما تقرب من النار ظهرت الكتابة

كتابة اخرى لا تبان الا بالحيلة (that does not appear without a stratagem) om. B T L

لبن طيب [لبن حليب] (sour milk → good milk) T; حليب (→ milk) L

والعقاب [ونشادر] (sal ammoniac → the eagle) B, this is a possible code name (*Deckname*) for sal ammoniac, see Siggel, *Decknamen*, pp. 18 and 45.

(write [...] appear in it → and show it to whoever you want) B

Locis similes: al-Iskandarī, p. 180 (no. 206), the recipe here suggests to pour water on the writing.

[39] Another [way of] writing

Write with vitriol water on any leaf you want; when you want it to appear, throw it into gall nut water, and then a black writing will appear.

كتابة اخرى

تكتب بماء الزاج على ما اردت من الاوراق فاذا اردت اظهاره فالتقى في ماء العفص فانها تظهر كتابة سوداء

في ماء مذاب فيه عفص منقوع فانها تظهر سوداء [في ماء العفص] (in gall nut water → in the water that has been mixed with macerated gall nuts) C, this variant gives a more precise indication for understanding what, more in general, 'the water of (any ingredient)' might be.

Locis similes: see recipe no. 16 in Ch. 23 of the *Uyūn al-ḥaqā'iq*; Fani, p. 152; al-Qalalūsī, p. 36; *Cum Grano Salis*, p. 331 (no. 120), al-Zarḥūrī mentions only 'white water' that the editor interprets as 'transparent water'; 'white vitriol water,' the editor identifies it with 'the sulphur of the spear makers,' this recipes seems to mention two different vitriols, one to write the other to make the writing appear, see al-Rāzī, p. 225 (no. 26); al-Iskandarī, p. 179 (no. 205). Often, the process is inverted: one has to write with gall nut water and make it appear with vitriol.

[40] Another [way of] writing

If you wish to write on a red leaf or on a blue one with a writing that appears as if it were made with silver, then take some quicksilver, pour some tin over it, and calcinate it with this; its blackness will be extracted from it; make it into a powder. Add gum arabic water to it and write with it what you wish.

When the writing has dried, polish it with onyx, and then it will appear as if it had been written with silver.

كتابة اخرى
اذا اردت ان تكتب على ورقة حمراء او
زرقاء كتابة تظهر كأنها كتابة بالفضة فتأخذ
من الزينق وتلقي على المشتري وتكلس به
ويخرج سواده عنه واجعل تربة وتسقيها
بماء الصمغ واكتب به ما شئت

فاذا جفت الكتابة فاصقلها بالجرع فانها
تظهر كأنها قد كتبت بالفضة

حمرء او صفراء او زرقاء [حمرء او زرقاء (on a red leaf or on a blue one → on a red, yellow, or blue leaf) *add. La.*

القصدير [المشتري (Jupiter → tin) B T K L C, Jupiter' is a common code name (*Deckname*) for tin, see Siggel, *Decknamen*, pp. 18 and 45.

واجعله توتية [واجعل تربة (make it into a powder → make it into zinc) B; برده (→ file it) C

بمجر الصقل [بالجرع (with onyx → with a burnishing stone) C

[41] Another [way of] writing

Write it on a leaf not treated with starch and it will not appear; when you throw it in water, then a white writing will appear.

When you wish this, take some Yemeni alum dissolved in wine vinegar, and write with it what you want.

When it has dried, throw it in water and what we have mentioned will appear from it.

كتابة اخرى
تكتبها على الورق غير المنشاء فلا تبان
فاذا القيتها في الماء فانها تبان كتابة بيضاء
فاذا اردت ذلك فخذ الشب اليماني
المحلول بمخل الخمر واكتب به ما شئت
فاذا جف تلقي في الماء فانه يبان منه
ما ذكرناه

مشى [المنشاء (treated with starch → walking, going?) B, perhaps the simplification of a technical term.

بمخل المقطر [بمخل الخمر (with wine vinegar → with distilled wine vinegar) B; بالمخل المقطر (→ with distilled vinegar) D T K C

[42] Another [way of] writing

Take some black cumin, egg yolk, and the peelings of colocynth roots fried in good oil; when you write with it on any area of the body, then hair will grow on the spot, so you should know this and hide it from the ignorant ones.

كتابة اخرى
تأخذ كمون اسود وصفار البيض وقشور
عروق حنظل المقلية بالزيت الطيب اذا
كُتبت به على مكان في جسد فانه ينبت
مكانه الشعر فاعلم واكتم عن الجهال

ودهن صفار البيض [وصفار البيض] (egg yolk → oil of egg yolk) *add.* B D T L K C La

المقلي [المقلي] (fried → boiled) B

واكتم عن الجهال (hide it from the ignorant ones) *om.* B T K La; فانه من الاسرار واكتمه (→ in fact this belongs to the secrets and you must hide it) L

3 Concluding Remarks

The 13th century was a time of literary interest in the explanation or unveiling of technical tricks, frauds, and dupes. Al-ʿIrāqī's *Uyūn al-ḥaqāʾiq* represents an interesting case in the genre and collects many different streams of tradition: pseudo-Platonic magic, Galenic medicine, occult properties, talismans, sleight of hand, and different crafts. The preparation of metallic inks and invisible writing media can be accounted for in this last component.

Although no direct source is unequivocally identified, the recipes here have many parallels in technical handbooks and texts on ink making. The distribution in two different chapters, however, and the order of the recipes within them seems original, possibly determined by the different kinds of composition and textual genre. The lack of parallel attestations for some recipes may indicate that they might be procedures of al-ʿIrāqī's own invention, or, alternatively, of other sources still to be identified.

The overall structure of the text — introduction, division into 30 chapters — remains constant throughout the tradition, while the contents of the single chapters and their wording are transmitted in a fluid way with a high degree of variance. The distribution of the recipes displayed in Appendix II and the variance highlighted by the edition shows the fundamental importance of a *recensio* that aims at completeness, even more in the case of fluid traditions. Preferring a single witness over a number of others would result in a significant loss of information.

The interdisciplinary collaboration for the study of premodern science and technology requires the support of specific tools. The contribution of the philologist may consist of an edition that highlights the technical aspects of the

text — a 'laboratory-edition' meant for interdisciplinary use — and makes technical variants available to a larger readership.

Appendix 1: Descriptive Table of Contents of the *Kitāb 'uyūn al-ḥaqā'iq*

Chapter 1: on the *nawāmīs* (lit. 'laws' [of nature]) and the manner of their operations.

الباب الاول في النواميس وكيفية اعمالها

Plato is indicated as a source; there are two kinds of *nawāmīs*, a high and a low one. As for the former, God has given it to high-ranking people (*ahl al-darağāt*) who produce wonders, such as making the moon appear during the day and the sun during the night, who can affect lightning, thunder, wind, and the sea, trees and fruits.

Food *nawāmīs*: a small quantity of this food makes one grow a lot.

Pills that allow someone to live for one month without drinking or sleeping; make a camel able to travel for one month (attributed to Aristotle); a preparation for walking on water (attributed to al-Rāzī), sometimes, the preparations may include the writing of magical signs and names.

'The people of the alteration' (*Ahl al-taṣrīf*): open doors; disappear; levitate; the occult properties of letters (*ḥawāṣṣ al-ḥurūf*).

Chapter 2: on incendiary preparations (*maḥārīq*) and the manner of their operations.

الباب الثاني في المحارق وكيفية اعمالها

Incendiary preparations that, once kindled, give the impression that the house or the place is shining like gold or some other colour, or that the angels are descending in the house, or that the light gathers around someone at night; for eating all kinds of fruits and vegetables out of season.

Chapter 3: on fumigations (*al-daḥan*) and the manner of their operations.

الباب الثالث في الدخن وكيفية اعمالها

Fumigations, often attributed to Plato, which create the effect that darkness has fallen on earth; that make an army appear to the eye of the beholder; that make appear stars and huge birds in the sky; that will make a tree bend towards the person sitting underneath it (one specific for the palm tree); that create the impression among a group of people that they have turned into elephants or large beasts; that summon mice; that create the impression that a crocodile is coming out of the water; that summon jinns

and evil spirits; and powerful fumigations that wise men from India and from Babylon used to affect the luminaires and atmospheric phenomena.

Chapter 4: on fermentations (*al-ta'āfin*) and the manner of their operations. الباب الرابع في التعافين وكيفية اعمالها

After a concise theoretical explanation of spontaneous generation, different operations that involve the putrefaction of animal substances that produce strange creatures whose properties are to be exploited.

Chapter 5: on soporifics (*al-marāqid*) and the manner of their operations. الباب الخامس في المراقد وكيفية اعمالها

Different preparations (potions, lanterns, apples, drinks) with an immediate soporiferous effect; at the end of the chapter there is a description of two powerful poisons, one of them attributed to Aristotle (*iksīr li-halāk*, 'elixir of annihilation').

Chapter 6: on astrological incantations (*al-nārinjāt*) and the manner of their operations. الباب السادس في النارنجات وكيفية اعمالها

Different potions and preparations to provoke love and hatred (attributed to Hermes and Sāsān); to make clothes become infested with lice; to extract a tooth; to provoke a disease; to cause tears.

Chapter 7: on concealments (*al-ihfāt*) and the manner of their operations. الباب السابع في الاخفات وكيفية اعمالها

Different procedures for becoming invisible during the day and at night, usually implying the use of specific animals (cat, hoopoe, frog)

Chapter 8: on illusions and tricks (*al-dakk wa-l-ḥiyal*) and the manner of their operations. الباب الثامن في الدك والحيل وكيفية اعمالها

Procedures involving ritual prescriptions (such as sitting in a hoopoe cage for 40 days) and the use of secret names and magical figures in order to obtain various things, or to create an illusion, for instance how appear to levitate in the sky or to walk in the fire without burning.

Chapter 9: on cultivations (*zirā'āt*) and the manner of their operations. الباب التاسع في الزراعات وكيفية اعمالها

Procedure for the instant germination of seeds and plants.

Chapter 10: on amusing tricks (*la'b*) with eggs and the manner of their operations. الباب العاشر في اللعب بالبيض وكيفية اعمالها

A number of amusing tricks performed with eggs, for instance to peel it and make some writing appear underneath the shell, or to give the impression that the egg is flying.

Chapter 11: on amusing tricks with bottles (*qanānin*) and the manner of their operations. الباب الحادي عشر في اللعب بالقناني وكيفية اعمالها

A number of amusing tricks performed with bottles, for instance a bottle whose opening is lit like a candle, or a bottle whose contents can boil without any fire.

Chapter 12: on amusing tricks with seals (*ḥawātīm*) and the manner of their operations. الباب الثاني عشر في اللعب بالخواتيم وكيفية اعمالها

A number of amusing tricks performed with seals, for instance a seal that moves on a hard surface like a tile or a stone.

Chapter 13: on amusing tricks with effigies (*tamātīl*) and the manner of their operations. الباب الثالث عشر في اللعب بالتماثيل وكيفية اعمالها

A number of amusing tricks performed using wax figurines with animal or human shape, which, for instance, do not melt in the fire or are able to keep flies away, or that may take on a specific colour when exposed to heat.

Chapter 14: on amusing tricks with arrows (*aqdāḥ*) and the manner of their operations. الباب الرابع عشر في اللعب بالاقداح وكيفية اعمالها

A number of amusing tricks performed with arrows, for instance an arrow that bends without breaking, or arrows filled with different liquids.

Chapter 15: on amusing tricks related to slaughterings (*dabā'ih*) and the manner of their operations. الباب الخامس عشر في اللعب بالذبائح وكيفية اعمالها

A number of amusing tricks performed with wax figurines that twitch or bleed when cut.

Chapter 16: on amusing tricks with fire and the manner of their operations. الباب السادس عشر في اللعب بالنار وكيفية اعمالها

A number of amusing tricks performed with fire in order, for instance, to hold it in one's mouth or to set clothes ablaze without burning them, prepare incendiary figurines, or enter a burning furnace.

Chapter 17: on amusing tricks with lanterns (*suruġ*) and the manner of their operations. الباب السابع عشر في اللعب بالسرج وكيفية اعمالها

A number of amusing tricks performed with lamps and lanterns that, for instance, give the impression that the house is full of snakes or scorpions, or make green birds appear, or a naked woman who starts dancing, or that have the power to make people appear like statues or like all sorts of animals to others in the same room.

Chapter 18: on the deceptions of the 'astrologers' and the manner of their operations.²³ الباب الثامن عشر في غدائر المنجمين وكيفية اعمالها

Different procedures focused on the use of inscriptions on paper or papyrus, wax figurines and invisible inks; the purpose is achieved also thanks to the recitation of pious formulae. Written names can be used, for instance to get known thieves out of hiding, invisible inks and wondrous ways of writing.

Chapter 19: on tricks of dexterity by those 'who play tricks with the stick' (*tanābīl al-muġarridīn*) and the manner of their operations. الباب التاسع عشر في تنايل المجردين وكيفية اعمالها

²³ See Höglmeier, *Al-Ġawbarī* (cit. note 2), p. 214; for the variant readings attested in this chapter heading, see the edition in this chapter.

Tricks by this category of tricksters, whose aim is ultimately to gain from every situation, to dupe naïve bystanders by pretending, for instance, to be able to drink normal water and spit rose water (by means of a compress hidden under the tongue); there are many techniques for approaching potential victims and these involve expressing words of appreciation for a seal ring, a warning against scorpions and snakes, a round of three-shell game, etc.

Chapter 20: on those who play tricks with slips of paper (*qays al-mušarmiṭīn*) and the manner of their operations. الباب العشرون في قيس المشرمطين وكيفية اعمالها

Tricks to make a certain name appear on paper, sometimes based on the knowledge of secret written names or signs; to prepare a shirt inscribed with amulets that protects against any wound, etc.

Chapter 21: on the conditions of the cattle (*aḥwāl al-dakāšira*) and the manner of their operations. الباب الحادي والعشرون في احوال الدكاشرة وكيفية اعمالها

Tricks played on animals (for instance to provoke an epileptic seizure) to lower their price; or the use of animal ingredients, and animal-based hair dyes.

Chapter 22: on remedies for hunting different kinds of animals (*adwiya ṣayd aḡnās al-ḥayawān*) and the manner of their operations. الباب الثاني والعشرون في ادوية صيد اجناس الحيوان وكيفية اعمالها

Remedies and preparations to propitiate and ease the hunting of wild animals, such as the lion, and the crocodile; for fishing; for the preparation of deadly poisons.

Chapter 23: on kinds of metallic inks and dyes (*al-liyaq wa-l-asbaḡ*) and the manner of their operations. الباب الثالث والعشرون في انواع الليق والاصباغ وكيفية اعمالها

Recipes for coloured metallic preparations that can be used to write or paint.

Chapter 24: on simple drugs (*al-adwiya al-mufrada*) and the manner of their operations. الباب الرابع والعشرون في الادوية المفردة وكيفية اعمالها

Useful properties derived from the practical experiences (*tağārib*) of ancient men, grouped by the purpose they serve or by the kind of preparation (pills, powder, ointment, etc.)

Chapter 25: on dyestuffs and dyes (*al-ḥidābāt wa-l-ṣibāgāt*) and the manner of their operations. الباب الخامس والعشرون في الخضابات وكيفية اعمالها

Recipes to prepare dyes of different colours (black, gold, green, blue) for different materials and black dyes for the hair.

Chapter 26: on simple artifices (*al-malā'ib al-mufrada*) and the manner of their operations. الباب السادس والعشرون في الملاعب المفردة وكيفية اعمالها

Procedure to produce an illusion using an image painted on a wall; to make a severed head of an animal emit a cry; to gather birds in a certain place; to make a dog dance, etc.

Chapter 27: on the occult properties of metals and stones (*ḥawāṣṣ ma'ādin wa-l-aḥjār*) and the manner of their operations. الباب السابع والعشرون في خواص المعادن والاحجار وكيفية اعمالها

Association of stones with the seven planets and explanation of their alchemical and medical occult properties; Hermes is presented as the source for this material.

Chapter 28: on the occult properties of plants (*ḥawāṣṣ al-nabāt*) and the manner of their operations. الباب الثامن والعشرون في خواص النبات وكيفية اعمالها

Various properties of plants applied to practical jokes and healing.

Chapter 29: on the occult properties of animals (*ḥawāṣṣ al-ḥayawān*) and the manner of their operations. الباب التاسع والعشرون في خواص الحيوان وكيفية اعمالها

On the useful and occult properties of animal parts, a selection that does not seem to be arranged in a particular order.

Chapter 30: on the manner of the composition of man (*tarkīb al-insān*) and the peculiarities that come with the passing of time (turning of the seasons).

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The contents are presented as al-'Irāqī's, who states the superiority of men over all the other beings and the correspondence between macrocosmos and microcosmos, the special regimen required by the different seasons based on the theory of the four qualities.

Appendix II: Synoptic Table of the Recipes as Attested in the Different Manuscript Witnesses

TABLE 8.1 Metallic inks (*liyaq*)

Chapter 23	P ff. 94r– 99r	B ff. 52v– 54r	D ff. 52r– 54r	T pp. 84– 82	K ff. 52r– 53v	L ff. 74v– 76r	C pp. 38– 40	La ff. 23r– 24v
1. Preparation of gum arabic	✓	✓	✓	✓	✓	✓	✓	✓
2. Cinnabar ink	✓	✓	✓	✓	✓	✓	✓	✓
3. Arsenic ink	✓	✓	✓	✓	✓	✓	✓	✓
4. Another [arsenic] ink	✓	✓	✓	✓	✓	✓	✗	✓
5. Green ink	✓	✓	✓	✓	✓	✓	✓	✓
					+ Gold water			
6. Verdigris ink	✓	✓	✓	✓	✓	✓	✓	✓
7. Pistachio ink	✓	✗	✓	✓	✓	✗	✓	✗
8. White ink	✓	✓	✓	✓	✓	✓	✓	✗
9. Lapis lazuli ink	✓	✓	✓	✓	✓	✓	✓	✗
10. Wine ink	✓	✓	✓	✓	✓	✓	✗	✗
11. Turtle-dove ink	✓	✓	✓	✓	✓	✓	✗	✗

TABLE 8.1 Metallic inks (*liyaq*) (*cont.*)

Chapter 23	P ff. 94r– 99r	B ff. 52v– 54r	D ff. 52r– 54r	T pp. 84– 82	K ff. 52r– 53v	L ff. 74v– 76r	C pp. 38– 40	La ff. 23r– 24v
12. Rosy ink	✓	X	X	X	X	X	X	X
13. Orange ink	✓	X	X	X	X	X	X	X
14. Honey ink	✓	X	X	X	X	X	X	X
15. Silver ink	✓	X	X	X	X	X	X	X
16. Black vit- riolic ink	✓	X	X	X	X	X	X	X
17. Golden ink	✓	X	X	X	X	X	X	X
18. Ashen ink	✓	X	X	X	X	X	X	X
19. Violet ink	✓	X	X	X	X	X	X	X
20. Turquoise ink	✓	X	X	X	X	X	X	X
21. Peony ink	✓	X	X	X	X	X	X	X
22. Clay ink	✓	X	X	X	X	X	X	X
23. Lentil ink	✓	X	X	X	X	X	X	X
24. Abbasid ink	✓	X	X	X	X	X	X	X
25. Ivory ink	✓	X	X	X	X	X	X	X
26. Golden ink	✓	X	X	X	X	X	X	X
27. Preparation for golden, silver, copper, and lead ink	✓	X	X	X	X	X	X	X
28. Wood ink	✓	✓	✓	✓	✓	✓	X	X
29. Section on the melting of gold	✓	✓	✓	✓	✓	✓	✓	X
30. Melting of all the metals	✓	X	✓	✓	✓	✓	X	X
31. Preparation of an adhe- sive for gold	✓	X	✓	✓	✓	✓	X	X

Chapter 23	P ff. 94r– 99r	B ff. 52v– 54r	D ff. 52r– 54r	T pp. 84– 82	K ff. 52r– 53v	L ff. 74v– 76r	C pp. 38– 40	La ff. 23r– 24v
32. Another one like this	✓	✓	✓	✓	✓	✓	✗	✓
33. Dyeing of the leaves	✓	✓	✓	✓	✓	✓	✓	✗
34. Cutting of the gold leaves	✓	✗	✗	✗	✗	✗	✗	✗

TABLE 8.2 Invisible writing (*kitāba*)

Chapter 18	P ff. 63r– 72r	B ff. 40v– 42v	D ff. 41r– 41v	T pp. 58– 66	K ff. 37v– 42v	L ff. 66v– 68r	C pp. 32– 34	La f. 18r
35. [Black coal writing]	✓	✓	✓	✓	✓	✗	✗	✗
36. [Night writing]	✓	✓	✓	✓	✓	✓	✓	✗
37. [Onion writing]	✓	✓	✓	✓	✓	✓	✗	✓
38. [Sal ammoniac writing]	✓	✓	✓	✓	✓	✓	✗	✗
39. [Vitriol writing]	✓	✓	✓	✓	✓	✓	✓	✗
40. [Silver writing on coloured inks]	✓	✓	✓	✓	✓	✗	✓	✓
41. [Yemeni alum writing]	✓	✓	✓	✓	✓	✗	✓	✗
42. [Hair growth writing]	✓	✓	✓	✓	✓	✓	✗	✓