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Ink Making by the Book: Learning a Craft in the Arabic World

Abstract: The arts of the book have a great relevance in Islamic culture, not only from a religious perspective, but in literature as well. The proliferation of treatises about bookmaking and calligraphy demonstrates the great interest in the topic. But if we take into consideration the artisanal world revolving around these manuscripts, is there any obvious correspondence between the literary texts and the crafts employed to produce them? What were the treatises used for? Were they studied by apprentices to learn a particular craft or were they ultimately meant to decorate a shelf in an erudite library? This paper focuses specifically on treatises and collections of recipes about the making of inks. The introductions of the treatises in my corpus were studied in order to understand the intentions of the authors and their aims, and the recipes were reproduced to grasp their feasibility. Finally, the manuscripts were examined in terms of their codicological and material aspects to learn about their production and use.

1 Introduction

The daily work of an archaeometrist involves identifying and studying the materials used in archaeological items, historical artefacts and works of art by employing several analytical techniques. The aim of such studies is to reconstruct the history of the technologies used to produce those artefacts and map the diffusion and development of production techniques and materials. For this reason, the observation and analysis of such artefacts is combined with the study of written sources: documents, reports made by travellers, and especially technical literature, such as treatises on scientific and technological matters, alchemical and magical texts, handbooks and recipe books.

When manuscripts are the focus of study, one key material that needs to be analysed is the ink. Recipes for making different kinds of ink can be found in a wide range of texts in Arab-Islamic culture: texts about religion, natural sciences, magic and the occult, alchemy, astrology and the arts. The role of the ink recipe varies greatly in each case: it is nothing more than a curiosity in some texts, while

in others it is an integral, albeit minor, part of the work. The majority of ink recipes can be found in treatises concerned with book production, in which the recipes are arranged in terms of their typology and take up several sections of the text.¹

In this paper, I have approached these recipes from the point of view of a scientist who wishes to know who wrote these texts and for whom, what their aim was and what use was made of the manuscripts in which the recipes can be found. In the first part, I focus on five treatises dealing specifically with ink-making (although not exclusively with it) to investigate whether these treatises were composed to teach students how to prepare inks and therefore if they were manuals used to learn the craft. The selected texts are the best-known treatises on the topic and are well suited for this kind of research as they provide information on their authors, the intended audience of the books and their possible use in the context of teaching and learning the craft of ink-making.² Information of this kind can particularly be found in prefaces, but it can also be gleaned by analysing the way in which the chapters are ordered or the recipes are written and explained. These works have the advantage of having been partially or even completely translated into modern European languages by specialists, which is how I mainly accessed them.³ The Arabic treatises I examined are the following:

- *Zīnat al-kataba* by Abū Bakr Muḥammad b. Zakariyyā' al-Rāzī (d. 313 or 323 AH / 925 or 935 CE);⁴
- *'Umdat al-kuttāb wa-'uddat dawī al-albāb* by al-Mu'izz b. Bādīs al-Tamīmī al-Ṣanhāgī (d. 454 AH / 1062 CE);⁵

¹ The variety of genres can be appreciated in the list of sources collected by Armin Schopen (Schopen 2004, 19–32) and in the overview given by Sara Fani in the chapter concerning her sources (Fani 2013, 5–9).

² The concept of authorship has recently been re-addressed (see Behzadi and Hämeen-Anttila 2015) and its ambiguity is particularly evident in this context. In fact, these treatises can be compared to anthologies since they are mostly characterised by being a compilation of recipes preceded by a general introduction, a summary of the chapters and possibly some subchapters for clarification. Although the recipes normally have different historical authorships, the authors of the treatises felt entitled to modify them, sometimes even when the recipes were clearly attributed. This was often the case for recipes with pseudo-epigraphic attributions (Raggetti 2015, 165–166). Even the scribes, who normally just copied the texts, often took it upon themselves to rearrange the recipes, increase or reduce their number or add comments and changes to them.

³ The main sources of my study were Raggetti 2016, Fani 2013, Schopen 2004 and Levey 1962. Only passages that were unclear or uncertain were compared to the editions or manuscripts.

⁴ *EP*², s.v. 'al-Rāzī'; *GAL*, vol. 1, 233–235; *GAL S*, vol. 1, 417–421.

⁵ *EP*², s.v. 'al-Mu'izz b. Bādīs'; *GAL*, vol. 1, 268; *GAL S*, vol. 1, 473.

- *al-Muḥtaraʿ fī funūn min aṣ-ṣunaʿ* by al-Malik al-Muẓaffar Šams al-Dīn Yūsuf b. ʿUmar al-Ġassānī (d. 694 AH / 1294–1295 CE);⁶
- *Kitāb al-azhār fī ʿamal al-aḥbār* by Muḥammad b. Maymūn b. ʿImrān al-Marrākuṣī al-Ḥimyarī (seventh c. AH / thirteenth c. CE);⁷
- *Tuḥaf al-ḥawāṣṣ fī ṭuraf al-ḥawāṣṣ* by Abū Bakr Muḥammad b. Muḥammad al-Qalālūsī al-Andalusī (d. 707 AH / 1308 CE).⁸

I also compared these texts to some magical treatises including ink recipes – such as the *Kitāb ʿuyūn al-ḥaqāʾiq wa-īdāḥ al-ṭarāʾiq* by Abū l-Qāsim Aḥmad b. Muḥammad al-ʿIrāqī, known as al-Sīmāwī,⁹ and *Durrat al-ġawwāṣ wa-kanz al-iḥtiṣāṣ fī ʿilm al-ḥawāṣṣ* by ʿIzz al-Dīn Aydamir b. ʿAlī b. Aydamir al-Ġildakī (d. 743 AH / 1342 CE)¹⁰ – and technical handbooks with a broader scope, such as the *Kitāb al-nuġūm al-šāriqāt* by Muḥammad b. Abī al-Ḥayr al-Ḥasanī al-Dimašqī (tenth c. AH / sixteenth c. CE)¹¹ and the *Kitāb zahr al-basātin* by Muḥammad b. Abī Bakr al-Zarḥūrī (ninth c. AH / fifteenth c. CE)¹², the latter focusing on tricks used by con-artists and street performers.

In a second stage, manuscripts containing ink recipes were analysed with the aim of answering further questions related to their usage and consequently the use of the transmitted texts: in particular, whether the manuscripts containing these works were used to learn how to make inks and, in case of an affirmative answer, if they were self-learning tools or part of a teaching framework. In this case, the corpus was not chosen exclusively among the manuscripts presenting works on book production, but essays meant for alchemists, calligraphers and secretaries were included, too, along with collections of recipes, lists extracted from the treatises on the arts of the book and even individual recipes added at the end of other texts or on flyleaves. This selection did not intend to be an exhaustive list of manuscripts containing ink recipes, but rather an overview of the variety of characteristics I observed in my specific corpus.

⁶ *EP*, s.v. ‘Rasūlids’.

⁷ Al-Marrākuṣī, *Kitāb al-Azhār*, ed. Šabbūḥ 2001, 41–54.

⁸ *GAL*², vol. 2, 336 (although his name is given as al-Qallūsī).

⁹ See Ullman 1972, 235; Ullman 1970, 391; Holmyard 1926, 403–426; the chapters about inks have been edited by Raggetti (Raggetti 2021).

¹⁰ *EP*², s.v. ‘al-Ḍjildakī’; Ullmann 1972, 237; Ullmann 1970, 413.

¹¹ *GAL* S, vol. 2, 485; Raggetti 2016, 327–337.

¹² *GAL*, vol. 2, 174; Raggetti 2016, 327–337.

2 Authors as teachers, and readers as students

The oldest surviving text about ink-making, entitled *Zīnat al-kataba*, was written by al-Rāzī, a renowned physician, philosopher and alchemist born in Rayy (now in Iran) around 250 AH / 854 CE. He ran the hospitals in Rayy and Baghdad and died in his hometown in 313 AH / 925 CE or in 323 AH / 935 CE.¹³ Al-Rāzī was also a scholar, teacher and courtier who was knowledgeable about a wide range of subjects, including philosophy and mathematics. Significantly, he was also a prolific writer; more than 200 texts have been attributed to him.¹⁴ His treatise about ink-making is only preserved in one surviving manuscript, which was discovered by Mahmud Zaki in the National Library and Archive of Egypt (*Dār al-Kutub*) in 2010.¹⁵ Nonetheless his recipes had great fortune since at least one of them is reported in almost every ink treatise and his authorship is often acknowledged.

Al-Marrākuṣī was also a scholar and an alchemist, although not a famous one. The only information we now have about this Moroccan intellectual was provided by the author himself in two of his autographs: we know that he lived in Baghdad around 649–650 AH / 1251–1253 CE when he was in his 50's and that he frequented both the Mustanṣiriya and al-Niẓāmiya madrasahs.¹⁶ He interrupted the writing of his treatise on inks because of an emotional crisis, as he stated at the end of the text.¹⁷ Despite the importance of its content, his work did not circulate much, possibly because it was incomplete. The high technical level may also have hindered its diffusion.

The authorship of the *ʿUmdat al-kuttāb* is attributed to al-Muʿizz b. Bādīs, the fourth ruler of the Zirid dynasty of Ifriqiya. He ruled from 407 AH / 1016 CE, when he was eight years old, until his death in 454 AH / 1061 CE. In some of the manuscripts, the text is attributed to his son Tamīm (d. 501 AH / 1108 CE), who was appointed ruler of Mahdiyya – the capital city – in 445 AH / 1053 CE while his

¹³ *EF*, s.v. 'al-Rāzī'; Fani 2013, 39.

¹⁴ Fani 2013, 39.

¹⁵ Zaki 2011.

¹⁶ Al-Marrākuṣī, *Kitāb al-Azhār*, ed. Šabbūḥ 2001, 41–54; Fani 2013, 80–82; Schopen 2004, 19–21; the autographs are the manuscript that I call 'facsimile AM' with the aforementioned *Kitāb al-azhār*, owned by an anonymous private collector and reproduced by Šabbūḥ in his edition (al-Marrākuṣī, *Kitāb al-Azhār*, ed. Šabbūḥ 2001); and Paris, BnF, Arabe 6915, a collection of extracts and summaries from ʿĠābir ibn Ḥayyān and two original works by al-Marrākuṣī about alchemy and astrology.

¹⁷ Fani 2013, 81; Schopen 2004, 20.

father was still alive.¹⁸ Despite having ruled in a time of constant wars and rebellions, they were both literate and patrons of scholars, poets and artists, who were part of their courts.¹⁹ It is still being debated whether one of them was the real author of the treatise or a scholar from their entourage composed the text and then dedicated or attributed it to one or both of the rulers as a form of gratitude or ennoblement.²⁰ This treatise saw an incredible distribution, being by far the most copied text about the arts of the book – it was still being copied in the twentieth century, in fact. It has three main recensions and the recipes recorded in them can be found in many other treatises, such as in *al-Muḥtaraʿ fī funūn*, in which the source is clearly stated.²¹

Al-Muḥtaraʿ fī funūn is also attributed to a highly literate ruler, al-Malik al-Muẓaffar, who governed the Rasulid state in Yemen from 647 AH / 1249 CE to 695 AH / 1295 CE. The Rasulid territory reached its maximum size during his reign, although overall this was a period of peace and stability. Many books on different subjects have been attributed to him, covering medicine, astronomy, theology, entertainment, and crafts and craftsmanship, of which *al-Muḥtaraʿ fī funūn* is an example. A large part of this treatise is dedicated to making books. Interestingly, the author's own skills are not reflected directly in this particular work; in fact, it is explicitly said in the introduction that he ordered every craftsman and expert to explain the techniques and secrets of their profession in their own words, which he then recorded.²²

The author of *Tuḥaf al-ḥawāṣṣ*, al-Qalalūsī, had connections with the Nasrid court of Granada, especially to the secretary and later vizier Abū ʿAbd Allāh Muḥammad b. al-Ḥakīm al-Laḥmī al-Rundī (660–708 AH / 1261–1308 CE). Al-Qalalūsī was born in Estepona, close to Malaga in al-Andalus, in 607 AH / 1210 CE and died in the same place in 707 AH / 1308 CE. He was a renowned scholar of the Arabic language and an expert on grammar and philology in particular.²³

Although al-Rāzī was a teacher among other things, he did not openly dedicate his work to students. It is unclear whether al-Qalalūsī and al-Marrākuṣī were teachers, but their social position and ties make this seem very likely. In their texts, they made use of formulaic expressions suggesting they had a teaching

18 *EP*², s.v. 'Rasūlids'; the fact that father and son were both alive and ruling over the country, or part of it, when the text was composed may have created some confusion about the attribution of the work; Fani 2013, 50–53.

19 Fani 2013, 51–52.

20 Fani 2013, 52.

21 The author of *ʿUmdat* is referred to as the *ʿṣāḥib al-Mahdiyya*; Fani 2013, 53.

22 Fani 2013, 54–55.

23 Fani 2013, 133–134.

role, such as ‘learn it from us’ (al-Marrākuši), and al-Qalalūsī called a subchapter ‘Teachings about gall nuts’, for instance. These may simply have been rhetorical expedients, however. Similar formulaic expressions like ‘so learn this’ and ‘so understand this’ were used by al-Zarḥūrī in his *Kitāb zahr al-basātīn*.²⁴ Although the context is completely different, this being a handbook about tricks used by con-artists and street performers, he probably saw himself as a knowledgeable person entitled to teach his ‘colleagues’ some of the artifices he had already mastered himself.

Looking at the introductions of their respective texts, only al-Qalalūsī and al-Malik al-Muẓaffar specifically mentioned students (sg. *ṭālib*, pl. *ṭullāb*) among their intended readers. Al-Marrākuši’s position is probably the most interesting. He clearly stated how his work was not meant for those who are still learning, but then the formulaic expressions and terms he employed (e.g. ‘we used the tight mesh sieve of the chemists, to use the language of common people and of those who give familiar names to science’),²⁵ the extreme clarity and didactic description of the recipes, their structure and the way in which they were arranged make his work and his recipes the easiest to read, understand and replicate. This ease is not due to the intrinsic simplicity of the recipes, which can actually be quite complex, but to the description of every single passage and the amount of suggestions and tips he provides. This suggests the intention of teaching, but he was probably addressing an audience that was already erudite, fitting in with the intentions of the group of scholars that possibly commissioned this piece of writing from al-Marrākuši.²⁶ His target group was to be found among alchemists with various degrees of experience, probably the same audience of *manāfi*‘ and *ḥawāṣṣ*, such as the works of al-Sīmāwī, al-Ġildakī and al-Maġribī.

In contrast, the designated reader mentioned in *Zīnat al-kataba*, *‘Umdat al-kuttāb* and *Tuḥaf al-ḥawāṣṣ* belonged to the category of secretaries and scribes (sg. *kātib*, pl. *kuttāb*). The topics covered in the treatises seems to confirm this, as they would have been useful to members of the aforementioned category: *Zīnat*

²⁴ Raggetti 2016, 329–334.

²⁵ Recipe MH IV.2.d; Fani 2013, 114.

²⁶ The story that the author composed a certain work because others (friends, scholars, students, etc.) asked him to do so often appears in the introductions; it is a topos in Islamic literature. The possibility of it being genuine cannot be ruled out completely, however. The group is described by al-Marrākuši as ‘my brothers, who can be distinguished by the purity of their intellect and erudition’ (al-Marrākuši, *Kitāb al-Azhār*, ed. Šabbūḥ 2001, 64, lines 4–5). It was possibly inspired by the Brethren of Purity, a secret society of philosophers formed in Basra in the eighth or tenth century and particularly connected to an esoteric dimension of knowledge and its transmission; Fani 2013, 157–158.

al-kataba contains recipes for black inks, invisible inks and paper treatments, methods to sharpen knives, erase writing and remove stains from clothes, and even some guides to performing rather unorthodox acts such as making forgeries, reading sealed documents and playing pranks on fellow scribes. Recipes about the dying of hair, which are not directly connected with the work of a secretary, are also part of the treatise. *Umdat al-kuttāb* also focuses on the tools and materials needed to make a book, from the description of the pens, to recipes for making coloured and metallic inks, to papermaking and bookbinding, while the removal of stains is not treated. *Tuḥaf al-ḥawāṣṣ*, in contrast, has a clear focus on ink, describing black, coloured, metallic and invisible inks along with inks for different kinds of supports, some very specific ways to erase writing (for minor corrections, not whole palimpsests) and even preparing clay for children to use as writing surface. This last section suggests that al-Qalalūsī may also have had preceptors in mind as part of his intended audience in addition to the categories of students and *kuttāb* he mentioned specifically.

Students/apprentices (*ṭullāb*) and craftsmen (sg. *ṣānī*, pl. *ṣunnāʿ*) were the readers that al-Malik al-Muẓaffar had in mind.²⁷ Most of his treatise deals with arts and crafts concerned with bookmaking, such as making black, coloured, metallic and invisible inks, pens, erasure methods, glues, bookbinding and, in one recension, papermaking, with a few chapters dedicated to metallurgy and goldsmithing (possibly connected with gilding, tooling and bookbinding). Other subjects he covers are soap-making (used in the removal of stains), dying of clothes, and the engineering of siege weapons and war camps.²⁸ *Kātib* apprentices, and especially those intended to work as attachés to military figures, may have been the possible beneficiaries of such a wide range of technical skills.

3 Prerequisites for learning and teaching strategies

How the ink recipes are presented and arranged in the treatises can tell us more about the learning and teaching practises reflected in the text. The language, the ingredients and the equipment used can also reveal the prerequisites needed to understand the recipes and produce inks from them.

²⁷ Craftsmen are only mentioned in the introduction of the manuscript preserved in Hyderabad, which is also the extended recension (15 chapters); Fani 2013, 161.

²⁸ Fani 2013, 56–57; Gacek 2002.

As already mentioned, al-Marrākušī's text is highly structured: the inks are divided into chapters and subchapters according to their typology, their physical state, their colour and the techniques employed to obtain them. As an example, the iron gall inks (black *ḥibr*) are listed in Chapter 1 if they are in liquid form and in Chapter 2 if they are solid. Chapter 1 is divided into sections based on the technique used to obtain the tannins: 'sun inks' use maceration and fermentation, 'fire inks' use decoction, and 'shade inks' just use maceration. Most recipes assume that gall nuts are used. In view of this, the text describes some practical ways to produce tannin from alternative sources, giving a didactic cut to the exposition. Yet besides being very practical, the work is also of an experimental nature; as its contents come from previous sources, the author of the treatise takes time to identify the recipes by the name of the person who invented, used or transmitted them and then to verify their effectiveness empirically (or modify or recreate them in some cases). The text is full of tips, suggestions and warnings, all of which are helpful to someone unfamiliar with the materials and the processes involved, knowledge usually provided orally by a teacher.

Experimentation and didactical explanations can also be found in al-Qalalūsī's work, albeit to a lesser extent. Black inks are not differentiated as iron gall (*ḥibr*), carbon (*midād*) or mixed (*midād murakkab*), but are all called *midād* and are arranged according to their physical state (either liquid or solid) and then by the technique used to prepare them (by cooking, macerating or squeezing the ingredients). Al-Qalalūsī only mentions his sources occasionally.

A completely different situation can be observed in *Umdat al-kuttāb*, where the introduction outlines a logical division of the recipes into chapters based on typology and colour, which is not completely followed. For example, according to their titles, Chapters 4 should include exclusively coloured *ḥibr*, Chapter 5 *liqa* and Chapter 6 inks obtained by blending other inks together, but a mix of recipes from these categories can be found in all three chapters. No sources are ever mentioned. The didactic explanations are few and far between, and although the author of the treatise claims to have tested all the recipes himself, no additional suggestions, warnings or tips about them are provided.

Since the section of *al-Muḥtara' fī funūn* that is about ink is based on *Umdat al-kuttāb*, the same characteristics can be found in the treatise by al-Malik al-Muẓaffar.²⁹ Some extra recipes were added, however. They have all been put in the correct section and were probably part of a local tradition. It is worth noting, though, that every section was 'inspired' by a different artisan and craft, and that

²⁹ Fani 2013, 53.

the sections are not all of the same quality or detail; a local procedure for making paper is described much more precisely than the section on inks, for example.³⁰

The work by al-Rāzī stands out from the previous ink treatises as it consists of an extremely disordered text. This is surprising as the other works by this author are well structured, obviously following a clear methodological approach. This particular ink treatise, in contrast, seems to consist of two parts in which the same categories are repeated, and this, together with the absence of red ink recipes, may suggest that the only manuscript discovered does not reflect the original version. The recipes themselves are very succinct and, although they are quite simple, the inks require a considerable degree of skill to make.

Another relevant aspect of the recipes is the description of what equipment is needed to make ink. The authors of the treatises are consistent in this point: the more orderly and didactical texts, such as *Kitāb al-azhār* and *Tuḥaf al-ḥawāṣṣ*, offer precise and exhaustive descriptions and explanations, while the less detailed ones, such as *Zīnat al-kataba* and *ʿUmdat al-kuttāb*, mention the equipment by name, thereby assuming that the reader knows what the item is and how it is used. *Al-Muḥtaraʿ fī funūn* varies, though, depending on the section and recipe under examination.

According to my research, almost no memorisation aids can be found in these treatises: so far, only one recipe in verse form has been found, which is in two late manuscripts of *ʿUmdat al-kuttāb*.³¹ The recipe is especially relevant since it is also the only one to include the ink's price, which, in my opinion, links it more to the environment of ink artisans and sellers (*ḥabbārūn*) than to that of secretaries and copyists. The use of didactic poems in a teaching context is well attested in Arabic literature, and a fair number of medical and alchemical recipes in verse form have survived.³² The extreme scarcity of written records of didactic poems about ink-making, however, does not rule out the possibility that they were employed orally by teachers and students in a learning environment.

³⁰ Gacek 2002.

³¹ Berlin, Staatsbibliothek, Lbg 637, fol. 14v and Gotha, Forschungsbibliothek, Ms. orient. A 1355, fols 16^v–17^r. Considering the recipes and their order, and even some of the annotations in the margin, the manuscripts seems to share part of the transmission line.

³² Sobieroj 2016, 3–4.

4 Production and use of the manuscripts

The manuscripts studied (see Table in Appendix) have different characteristics due to them being produced in different areas and at various times, but they do have some common traits that may suggest a similar context of production and usage.

Despite the treatises covering different subjects (religion, natural sciences, magic, alchemy, astrology, arts, etc.), the manuscripts share similar aspects: none of them are lavishly decorated and usually only two colours are used in the text: black or brown for the main text, and red or purple for the titles, important words and highlights (which are marked by a line above the text). Whenever only one colour is used, a pen with a bigger nib was employed to emphasise the sections of the text. The same goes for the decoration: if present, it is simple, consisting of dots, circles, drop-shaped drawings, rarely flowers, and it is mostly used to mark the end of sections or sentences, fill the lines left partially empty by the end of the text, or embellish the titles of a new chapter and make them stand out more. In a few cases, i.e. in Or. 326, DaK 46 and We II 1375, some functional illustrations and diagrams are present, most likely drawn by the copyist of the main text, as suggested by the use of the same inks.³³ Since the majority of the preserved manuscripts are late productions, they have mostly been written on European paper. Their size range is 180–220 mm × 120–170 mm, and judging by the position of the laid and chain lines, they are mostly in quarto.³⁴ The combination of these characteristics precludes the possibility that these books were copied for representative reasons, such as making gifts and donations or showing off one's power and prestige. In actual fact, they were personal manuscripts, most likely copied by the very same people who needed to use them, as it says in the colophon of Arabe 6844 (fol. 131).³⁵

They also share a reasonably standardised appearance: the one-column text block is mostly regular – with some exceptions, as can be seen in the indented

³³ The manuscripts mentioned are a copy of *al-Muhtara' fī funūn* by al-Malik al-Muẓaffar (Or. 326), of *Tanwīr al-ġayāhib fī aḥkām dawāt al-dawā'ib*, a treatise attributed to al-Qalālūsī (DaK 46) and of *Kitāb 'Uyūn al-ḥaqā'iq wa-īdāḥ al-ṭarā'iq* by Abū l-Qāsim Aḥmad b. Muḥammad al-'Irāqī, also known as al-Sīmāwī (We II 1375). Spaces were left in Arabe 2776, possibly for diagrams or drawings that were to be added later.

³⁴ It should not be forgotten, however, that trimming the margins can change the size drastically, especially if it happens more than once due to new bindings.

³⁵ The manuscript, a copy of *Tuḥaf al-ḥawāṣṣ* by al-Qalālūsī, was donated later, according to the marks of *waqf* visible in the margins: 'ḥubisa' on fols 112^v–113^r and 'ḥabūs' on fol. 122^v.

frame in fol. 3^v of Or. 326 (Fig. 1). The lines tend to be straight and some attention is paid to the aesthetical value of the page (in Or. 326, some calligraphic titles are present; in We II 1375, some decorative drawings can be found at the end of some lines, and in Dak 46, red, green and yellow inks were used to highlight the titles and important words in the text). There are only a few corrections and marginal notes, most of which are in the hand of the same copyist of the main text.

As for the aggregation of texts, single-text manuscripts (STM), such as Lbg 157, We II 1375 and DaK 6, and composite manuscripts can mainly be found.³⁶ The latter are often characterised by texts added to a core consisting of one codicological unit in which several texts have been copied together, such as Arabe 2776 and Arabe 6844. The subject of the texts found in multiple texts and composite manuscripts built around a central core reinforces the idea of customers who possessed great technical skill themselves since the ink treatises were mostly joined to texts on scientific subjects to do with alchemy: for example, the astronomical pages placed at the end of *al-Muḥtaraʿ fī funūn* in Or. 326, the mineralogical and medical texts surrounding another version of the same text in Arabe 2776, and the medical ones accompanying a copy of *Tuḥaf al-ḥawāṣṣ* in Arabe 6844.³⁷ The fact that the original ink treatises are incomplete or have been summarised suggests a selection aimed at satisfying the specific needs of the commissioner. In Or. 326, for example, only the parts pertaining to books and writing have been copied, while Chapter 6 (on glue and gilding), 8 (on dying silk) and 10 (on metallurgy and goldsmithing) are missing.³⁸ In other cases – e.g. Pm II 30 – the grouping of the texts seems to be more arbitrary.

Some manuscripts are slightly different, however, being more personalised and showing traces of practical use. One of them is Lbg 637, a single-text manuscript of *ʿUmdat al-kuttāb* by Ibn Bādīs copied in 1228 AH / 1813 CE, probably in Ottoman Syria or Egypt. Its size is 215 × 160 mm, like the more standardised

³⁶ I am well aware that any recipe book can be considered a multiple-text manuscript (MTM) since the individual recipes often come from different sources and have been grouped together to form a treatise or a simple list. In this paper, however, I decided to focus on the organic structure of the treatises and therefore regarded them as complete units or single texts.

³⁷ The text in Arab 2776 is mentioned as an excerpt of *al-Muḥtaraʿ fī funūn* by both Schopen and Fani (Schopen 2004, 24; Fani 2013, 53), while it is indexed in Gallica as a collection of medical recipes by Ibn Rasūl al-Ġassānī. The titles of the chapters and their order do not correspond to those in the edition or other manuscripts, but some ink recipes are included. The title and author have been added by a different hand in the upper margin of fol. 72^v where the text begins. It is debatable whether it is a heavily modified recension of *al-Muḥtaraʿ fī funūn* or this is simply an erroneous attribution.

³⁸ The recension referred to is the one in ten chapters; see Fani 2013, 56–57.

manuscripts previously mentioned. It stands out because of some notes written in the margins in the same hand and ink as the main text: most of them are additional recipes copied from different sources. The recipe in the margin of fol. 13^v (Fig. 2) is one such text, for example: it says that the note in the antigraph was written in the hand of the painter (illuminator) and that he got the recipe from a scribe called Ṣadr al-Dīn who, in turn, received it from his own father.³⁹ The scribe who produced Lbg 637 also copied the comments of the painter, who had tried it out and found that there was nothing better.

What is also noticeable here is the lack of consistency in the density of the text, which starts with neat, regular rows, but changes towards the end, as some pages are overcrowded; perhaps the copyist was running out of paper at this point and decided he had to condense the rest of the writing by doubling the number of lines on the pre-ruled pages. Another odd feature is the presence of two encrypted notes added at the end of the text (on fol. 39^{rv}) after the book's production, followed by two ciphered alphabets which use other symbols than those in the notes. Although the code has not been decrypted yet, the second note is only partially encrypted and seems to contain a recipe (Fig. 3): the readable words are common ones in such texts, such as *ṣifa* ('description'/'recipe') and *zulāl al-bayḍ* ('egg white'). Interestingly, many treatises include recipes for invisible inks and ciphered alphabets (e.g. Lbg 157 and We II 1375); the latter were often added at the end if they were not already part of the treatise. It is possible that secretaries (people required to write correspondence, sometimes of a secret nature) could have been the main beneficiaries of such knowledge. In any case, the finding of encrypted notes is rare compared to ciphered alphabets. In this respect, the notes in Lbg 637 attest that this technique was actually employed.

Finally, the presence of some greenish fingerprints in the margins – a colour not used in the book – suggests practical use (Fig. 4). The fingerprints can be found in the margins of some of the folios and on the fore-edge, as if somebody leafed through the pages with dirty hands. Material analyses of the colour have identified orpiment and indigo as the main components of the more visible stain left on fol. 17^r and a recipe of a green *liqa* mentioning the ingredients detected has

³⁹ The scribe transmitting the recipe could have been Ṣadr al-Dīn Mūsā al-Kātib, who is mentioned as the author of the marginal note concerning vitriol solution found on fol. 8^r of the same manuscript. He is also mentioned by al-Kindī concerning a recipe about falsification, but nothing more is known about him; Schopen 2004, 205. There are even fewer clues to help us identify 'the painter'.

been found on its verso, thus suggesting that the user was searching for that corresponding passage while working.⁴⁰

Another peculiar manuscript is Spr 1918, a single-text manuscript with the text of *Kitāb al-Iṣāba fī lawāzim al-kitāba* attributed to Šams al-Dīn Abu 'l-Ḥair Muḥammad b. Muḥammad b. al-Ġazarī (751 AH / 1350 CE–833 AH / 1429 CE).⁴¹ It was probably copied in the eighteenth century, although the first and last folios were replaced later, and it stands out because of its compact size, 155 × 107 mm. It also shows ample traces of use: the pages were so worn and torn, even in the written part, that they needed to be repaired and rewritten. Greyish flakes can be found over the entire page of fol. 27^v and have been identified as an amalgam of mercury, sulphur, silver and zinc by scientific analysis. In the *Kitāb al-Iṣāba*, there are two recipes that describe how to obtain a silver-like ink by using mercury and how to dissolve silver in order to write with it.⁴² The flakes could be traces of the production of those metallic inks or even the residue of an alchemical test, suggesting that the handbook was lying close to where such work was being performed.

On a different note, Pm II 30 is a composite manuscript, which may have been used for teaching purposes. The dimensions of this manuscript are different to the ones seen so far, being 170 × 130 mm, possibly due to the paper that was employed; in fact, it was not copied on European paper, but on various types of Islamic paper. The manuscript consists of several codicological units dating to between the eleventh and sixteenth century. The older codicological units, found in the manuscript from fol. 30^r, are mainly lectures about *ḥadīṭ* together with their certificates of attendance (sg. *samā'*, pl. *samā'āt*). The codicological unit placed at the beginning of the volume is the youngest and was probably copied around the end of the sixteenth century or somewhat earlier, since the paper employed – the Islamic type with chain lines grouped in threes, produced and used mostly in Egypt and the Mediterranean Middle East – was rarely used after 1550.⁴³ This

⁴⁰ I analysed the inks and paper used in this manuscript in September 2017 together with Dr Olivier Bonnerot and under the supervision of Prof. Oliver Hahn. We also examined the inks and paper in Spr 1918, Pm II 30 and Pet 637 using X-Ray Fluorescence (XRF), Raman Spectroscopy, Visible Spectroscopy and Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS). The results are discussed in Colini 2018, 124–131.

⁴¹ According to Ahlwardt, the text is incomplete (Ahlwardt 1887, vol.1, 6, nr 6). Since it is the only copy of this text that has survived, it is hard to say if and what is missing. For more information about this text, see Raggetti 2019, 201–206.

⁴² Recipe 13 and 18 respectively; Raggetti 2019, 223 and 226.

⁴³ Ahlwardt suggests the unit was copied around 1000 AH / 1591 CE (Ahlwardt 1887, vol. 1, 5, n. 2); Déroche claims that 'after 1550, non-watermark papers with chain-lines grouped in twos or

codicological unit consists of a work about writing techniques, including a few ink recipes (*Lamḥat al-muḥtaṭif fī šināʿat al-ḥaṭṭ al-ṣalif*), and a collection of passages in prose and poetry about the arts of the book. At the end of the first text (fol. 17^v), the scribe reported the note found in the exemplar he used, stating that the copyist of that manuscript, ʿImād al-Dīn Ismāʿil b. ʿAlī b. Muḥammad al-Buqāʿī al-Šāfiʿī, and his friend, Burhān al-Dīn Ibrāhīm b. ʿAlī al-Ḥumsī al-Ḥanbalī, heard the work from the author, Ḥusain b. Yāsīn b. Muḥammad al-Kātib, in the Šālīḥiyyah district of Damascus in 781 AH / 1379 CE.⁴⁴ This suggests that the work was taught orally and written down by one of the pupils or attendants at the lecture, although it is unclear whether it was a public or private lesson. To my knowledge, this manuscript is the only one containing ink recipes that clearly refers to the most typical transmission method used in Arab-Islamic culture. Moreover, in the introduction of the work, the author pointed out that he had composed it because his students had asked him to.⁴⁵ If the antigraph was most likely produced in a teaching context, there is no evidence about the use of this part of Pm II 30 in lessons or public hearings. It is possible, however, that the codex itself was a textbook that belonged to a student or teacher, since the other texts in the manuscript were compiled during lectures and that they were read aloud multiple times through decades, according to the dates of the certificates of attendance. It is also possible that combining a treatise about writing with a collection of religious texts would not be accidental, as all the arts related to writing have a strong connection with the divine in Islamic culture.

Ink recipes also appear in the form of collections, which have different textual and codicological characteristics than the treatises. The collections are lists of recipes and are of different lengths, ranging from one page to several leaves, but they normally fit on a single quire. No title and author are mentioned, and they have no introductions or chapter divisions either, although the individual recipes they contain are introduced by a title, which is highlighted most of the time. They seem to be the result of the compiler collecting and selecting texts and deciding that a certain number of recipes were worth being copied and kept as unbound leaves or as part of a multiple-text manuscript, with or without any

three are no longer found' (Déroche 2006, 57), but at least one other manuscript dating to 1001 AH / 1592 CE has been copied on this type of paper (Rome, Biblioteca dell'Accademia Nazionale dei Lincei e Corsiniana, Or. 114 bis); Colini 2008, 94.

⁴⁴ Ahlwardt 1887, vol. 1, 5, n. 2. The author of the text is recorded as Ḥusain b. Yāsīn b. Muḥammad ad-Dimašqī in *GAL S*, vol. 2, 1033.

⁴⁵ See note 26 in this paper.

close connection to the other texts that are part of the manuscript.⁴⁶ The collections copied on unbound leaves or single quires often ended up in composite manuscripts later in their lives.

An example of a collection with a functional relationship to the other texts in the manuscript can be found on pp. 188–194 of BAU 248.⁴⁷ In this manuscript, recipes for making luxury inks have been copied at the end of a treatise about Qur’anic orthography, all written down by the same scribe as the one who copied the main text in 743 AH / 1342 CE. It is possible that the recipes were added for the practical benefit of the intended reader, as the subject matter of the treatise is congruous with the act of copying the Qur’an itself, often a lavish manuscript. It is impossible to know if the association between the two texts existed previously or how long they were copied together. The fact that the scribe was unfamiliar with the terminology used in the recipes – many of the technical words have been misspelt – and that some of the recipes are incomplete suggests that he did not edit the recipes himself, but copied them incorrectly from an antigraph or wrote from dictation (hence the spelling mistakes).

A collection of recipes inserted in a codex with an unclear connection to the other texts in it can be found on fol. 183^v of Pet 684. This big personal composite manuscript (193 folios of 260 × 165 mm) was put together in the first half of the eighteenth century by somebody with a wide range of interests. This person collected texts from many older manuscripts, supplemented those that were in a fragmentary state, filled margins and empty spaces with passages he (or she) considered to be related, and tried to give the book the shape and appearance of a unified editorial project by trimming the margins or adding paper leftovers of (almost) matching colour in order to have pages of the same dimensions. The list of recipes predates the eighteenth-century intervention – the hand and the codicological characteristics of the paper are clearly different to those of the eighteenth-century editor – but no watermark is present that could help us date it. It consists of the two sides of a single leaf and seems to be an extract from *al-Muhtara’ fi funūn*. On the recto there are descriptions of three black inks (two types of *midād* and one *hibr*) as well as a ‘golden’ one; on the verso there are recipes for *liqa* (two reds and a golden ink, a yellow one, a green one and a white ink), the description of a solution of gum arabic to add to the aforementioned

⁴⁶ See Baroni and Travaglio 2016, 33–51 on methods of forming recipes books. They describe methods of aggregation and reduction of texts. In the case of the collection of recipes I dealt with, reduction methods are applied more often, while both typologies can be observed in the formation of the treatises.

⁴⁷ Raggetti 2016, 306–320.

preparation and a last black instant ink (*hibr*). The latter was probably added by the copyist shortly after he finished the list. In fact, the layout is slightly different, but the ink coincides with the one used in the main text according to scientific analysis and the hand seems to be the same one as well (Fig. 5). The selected recipes are simple and require relatively inexpensive, readily available ingredients; the golden inks are prepared by using gold surrogates, such as saffron, safflower and realgar, for example. They seem to represent a very personal selection of favourites, organised in a subjective order which completely disregards the original one in *al-Muḥtaraʿ fi funūn*.

In We 221 the collection was added at the end of a composite manuscript with a variety of texts: the dimensions of the leaves (fols 110^v–112^r) are smaller and the hand compiling the list is clearly a different one to those appearing in the codex. In this case, however, there are no clues about who added those leaves to the book and when. The list seems to be a selection and synthesis of the coloured ink recipes recorded in the *Kitāb ʿUyūn al-ḥaqāʾiq* by al-ʿIrāqī, known as al-Simāwī, but this time the order is kept, although with some omissions. This extract is also an exception since the titles of the recipes are written in coloured inks other than red (a blue and a greyish ink which may originally have been silver), although they do not correspond with the colours mentioned in the recipes (Fig. 6). The same red and greyish inks are present on the following pages along with a green one, highlighting and embellishing the secret alphabets and the magical squares written there.

The pages clearly have a horizontal fold in the middle of them, as if they were reduced in size in order to fit the dimensions of a smaller book or a pocket or sleeve.⁴⁸ The portable size might indicate practical usage, but it is speculative to suggest this merely on the basis of such a fold.⁴⁹

Recipes can also be found as single entries on flyleaves or at the end of different texts, with or without a connection to the texts they follow. For example, a recipe for an iron gall ink was added on fol. 18^v of Pm II 30 (Fig. 7), the verso of the last folio of the treatise about calligraphy and right before the beginning of the text collecting literary passages about writing that were described before. Since both the hand and the ink used for writing the recipe for the iron gall ink

⁴⁸ The same traces of folding appear in manuscript A 1388. In this case, however, it is impossible to say whether the text in these leaves was a selection of recipes, only a part of which is left today, if some pages (or a quire) were removed deliberately from a codex and then stored folded, or if the fate of being folded followed when the manuscript was already fragmented.

⁴⁹ The circulation of recipe books and collections of recipes in unbound quires has been demonstrated by Baroni and Travaglio; see Baroni and Travaglio 2016, 51–57.

on fol. 18^v are the same as those used for the texts from fols 1^r–18^v and fols 19^r–29^r, the recipe may already have been present in the model that the scribe copied and was added by aggregation.⁵⁰ Alternatively, the scribe may have decided to add a recipe he already knew, differing from the one for a mixed ink he copied on fols 15^v–16^r, as he had some space left at the end of the first treatise. The schematic layout used in this text to list the ingredients and their amounts is unusual, but not unique. In a recipe added in the margin of fol. 14^r in Lbg 637, for example, they are listed in violet after the title in a way such that each entry forms a triangle with the name of the ingredient highlighted by a line above it at the top and the amount – in ciphers – at the bottom.

A case of recipes with no obvious relation to the main text can be exemplified by the two recipes of *ḥibr* written at the end of an anonymous commentary on a treatise about astrology and astronomy found in Add 7840. The recipes on fol. 48^r were probably written by the same scribe as the one who copied the main text, that is Yaḥyā al-Mawṣili ibn Ḥusayn ibn Muṣṭafā ibn Ḥasan.⁵¹

5 Conclusions

After making a close study of all the recipes mentioned and having experimented with the practical replication of some of them, I can say that the recipes do, indeed, offer all the information required to produce inks, albeit with varying degrees of clarity and feasibility.⁵² In *Kitāb al-azhār* and *Tuḥaf al-ḥawāṣṣ*, for example, the procedures for preparing them are clearly described and tips and recommendations are often given, while *Zīnat al-kataba* simply provides a list of procedures for more experienced users.

I rarely encountered recipes whose chemistry was incorrect; whenever I came across mistakes, it was usually in the case of invisible inks or when errors occurred during the stage of copying.⁵³ Lack of information was a more common

50 This mode of aggregation in which a recipe book is enlarged by adding progressively individual entries at the beginning or end is described as ‘per teste e code’ in Baroni and Travaglio 2016, 57–58.

51 See Raggetti 2016, 298–300 for an analysis of the texts.

52 Details about the replication of these specific recipes can be found in Colini 2018, 59–95. On the use of replication in the study of ink recipes, see Colini 2021, Raggetti 2021, 162 and 182–183, Raggetti 2019, 228–238, Zekrgoo 2014, 134–145, Fani 2013, 285–296 and Biddle 2011, 18–24.

53 Details on how replication can help in finding and amending these errors can be found in Colini 2021, 134–141.

problem, however, either because it was assumed that the reader would refer to other parts of the same treatise or that they were already familiar with the missing data; omissions of the second kind often occurred in the description of utensils and other workshop equipment. In general, it seems that information that was considered obvious tended to be omitted or was only mentioned a few times. The recipes for carbon inks are possibly less detailed than others for this reason, especially when it comes to the procedure for mixing carbon with the binder, unlike recipes for iron gall and mixed (carbon-iron gall) inks. Another possibility is that carbon inks were readily available to buy.

Regardless of the practical usability of the treatises, my analysis of the texts indicates that teaching was the declared intent of at least some of their authors, such as al-Malik al-Muẓaffar and al-Qalalūsī. In al-Marrākuṣī's case, this can be inferred by his writing style and the recipes' structure. Only al-Rāzī and Ibn Bādīs appear to have written for experienced users.

Whatever the case, secretaries and scholars were the main intended audience, both trainees and professionals. This can be inferred by the absence of all the tips, tricks and know-how related to a craftsman's work, such as the correct posture that an ink-maker should adopt in order to speed up his work and suffer less fatigue. This kind of knowledge is likely to have been part of the oral tradition of education and training.

Despite the previous considerations, there are no clues in any of the examined manuscripts that indicate they were used for teaching, except for the copied note on fol. 17^r of Pm II 30. The more standard volumes may have been employed as self-instruction instruments, but the absence of any comments, corrections and variations of the recipes suggests they were only used occasionally. Lbg 637 and Spr 1918 were probably mnemonic aids consulted in difficult cases, but they were not manuals for learning. This theory is even more plausible for those manuscripts sporting a short selection of recipes, such as Pet 684: one possible scenario is that such shortlists were created as unbound leaves, personal notes for ready use that only became part of the manuscripts later on.

Although the more important and better-known treatises about ink production have been considered in this article, I analysed only a small number of manuscripts. For this reason, the results presented here should only be regarded as the beginning of a wider and deeper study that will need to be done in future. This would greatly benefit from the scholarly community focusing its attention more on the subject of technical literature.

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Abbreviations

- El*² P. Bearman, T. Bianquis, C. E. Bosworth, E. van Donzel and W. P. Heinrichs (eds), *Encyclopaedia of Islam*, second edition, online, Leiden: Brill
 <referenceworks.brillonline.com/browse/encyclopaedia-of-islam-2>.
- GAL* Carl Brockelmann (1898–1902), *Geschichte der arabischen Literatur*, 2 vols, Weimar: Emil Felber.
- GAL*² Carl Brockelmann (1943–1948), *Geschichte der arabischen Literatur*, second edition, 2 vols, Leiden: Brill.
- GAL S* Carl Brockelmann (1937–1942), *Geschichte der arabischen Literatur, Supplementbände*, 3 vols, Leiden: Brill.

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Table 1: List of manuscripts [MTM = Multiple-Text Manuscript; STM = Single-Text Manuscript; comp. = composite].

Siglum	Shelfmark	Author	Title	Type of MS	Type of work(s)	Date of copy	Place of copy
BAU 248	Beirut, American University, Hūrī 248	Abū 'Amr 'Uṭmān b. Sa'īd al-Dānī	<i>al-Muqni' fī rasm al-Qur'ān</i>	MTM	Main text: orthography of the Qur'an Collection of ink recipes (pp. 188–194)	743 AH / 1342 CE	unknown
Lbg 157	Berlin, Staatsbibliothek, Lbg 157	'Izz al-Dīn Aydamīr b. 'Alī b. Aydamīr al-Ġildakī	<i>Durrat al-ḡawwāṣ wa-kanz al-iḥtiṣāṣ fī 'ilm al-ḥawāṣṣ</i>	STM	Treatise on the property of substances	1763 CE	unknown
Lbg 637	Berlin, Staatsbibliothek, Lbg 637	al-Mu'izz b. Bādīs al-Tamīmī al-Ṣanhāġī	<i>'Umdat al-kuttāb wa-'uddat ḡawī al-albāb</i> (second recension)	STM	Treatise on the arts of the book	1228 AH / 1813 CE	Ottoman Syria or Egypt?
Pet 684	Berlin, Staatsbibliothek, Pet 684	al-Malik al-Muẓaffar Šams al-Dīn Yūsuf b. 'Umar al-Ġassānī	No title; extract from: <i>al-Muḥṭarā' fī funūn min al-ṣunā'</i>	comp.	Miscellany Collection of ink recipes (fol. 183 ^{rv})	undated; 18 th c. CE	unknown
Pm II 30	Berlin, Staatsbibliothek, Pm II 30	Ḥusain b. Yāsīn b. Muḥammād al-Kātib	<i>Lamḥat al-muḥṭaṭif fī ṣinā'at al-ḥaṭṭ al-ṣalīf</i>	MTM + comp.	Treatise on the art of writing (fols 1 ^r –18 ^r) + one additional ink recipe (fol. 18 ^v), possibly by the same hand Text on the arts of the book; hadith lectures	2 nd half or end of the 16 th c. CE	Syria?

Siglum	Shelfmark	Author	Title	Type of MS	Type of work(s)	Date of copy	Place of copy
Spr 1918	Berlin, Staatsbibliothek, Spr 1918	Muḥammad b. Muḥammad b. al-Ḡazarī	<i>Kiṭāb al-Aṣḥāba fī lawāzīm al-kitāba</i>	STM	Treatise on the art of writing	18 th c. CE	Persia?
We 221	Berlin, Staatsbibliothek, We 221	Abū l-Qāsim Aḥmad b. Muḥammad al-'Irāqī, <i>known as</i> al-Simāwī	No title; extract from: <i>Kiṭāb 'Uyūn al-ḥaqā'iq wa-īḡḏḥ al-ṭarā'iq</i>	comp.	Miscellany Collection of ink recipes (fols 110 ^v –112 ^v)	18 th c. CE	unknown
We II 1375	Berlin, Staatsbibliothek, We II 1375	Abū l-Qāsim Aḥmad b. Muḥammad al-'Irāqī <i>known as</i> al-Simāwī	<i>Kiṭāb 'Uyūn al-ḥaqā'iq wa-īḡḏḥ al-ṭarā'iq</i>	STM	Treatise on occult science	693 AH / 1556 CE	unknown
Sim 17 / DaK 6	Berlin, Staatsbibliothek, Ms. Or. Sim. 17 / Cairo, Dār al-Kutub, ṣinā'a Taimūr, 6	al-Mu'izz b. Bādīs al-Tamīmī al-Ṣanhāḡī	<i>'Umdat al-kutāb wa-'uddat ḡawī al-albāb</i> (third recension)	STM	Treatise on the arts of the book	undated	unknown
DaK 331	Cairo, Dār al-Kutub, Maḡāmī 'Tal'at 331	Abū Bakr Muḥammad b. Zakariyyā al-Rāzī	<i>Zīnat al-kataba</i>	MTM + comp.	Handbook for secretaries (fols 79 ^f –84 ^v)	907 AH / 1502 CE	Persia or Turkey?
DaK 46	Cairo, Dār al-Kutub, 'ulūm ma'āšiyya 46	unknown; attributed to Abū Bakr Muḥammad b. Muḥammad al-Qalalūsī al-Andalusī	<i>Tanwīr al-ḡayāhib fī aḥkām ḡawāt al-ḡawā'ib</i>	STM	Treatise on the arts of the book Addition of recipes (same hand?)	main text: 859 AH / 1455 CE; add.: 869 AH / 1465 CE	Maghreb / al-Andalus
A 1355	Gotha, Forschungsbibliothek, Ms. Orient. A 1355	al-Mu'izz b. Bādīs al-Tamīmī al-Ṣanhāḡī	<i>'Umdat al-kutāb wa-'uddat ḡawī al-albāb</i> (third recension)	STM	Treatise on the arts of the book	1167 AH / 1754 CE	Turkey?

Siglum	Shelfmark	Author	Title	Type of MS	Type of work(s)	Date of copy	Place of copy
A 1358	Gotha, Forschungsbibliothek, Ms. Orient. A 1358	al-Mu'izz b. Bādīs al-Tamīmī al-Šanhāğī	<i>Umdat al-kuttāb wa- 'uddat dawī al-albāb</i> (2nd recension)	STM	Treatise on the arts of the book	undated	unknown
Or.326	Leipzig, Universitätsbibliothek, Ms. Or. 326	al-Malik al-Muzaffar Šams al-Dīn Yūsuf b. 'Umar al-Ġassānī	<i>al-Muḥṭara' fī funūn min al-šunā'</i>	STM	Treatise on the arts of the book and other crafts	undated	unknown
Add 7840	London, British Library, Add. 7840	unknown	<i>Šarḥ al-muḥṭaṣar fī ma'rifat at-taqāwīm</i>	STM	Astronomy 2 ink recipes at the end (fol. 48 ^r)	1174 AH / 1761 CE	unknown
Arabe 2776	Paris, BnF, arabe 2776	al-Malik al-Muzaffar Šams al-Dīn Yūsuf b. 'Umar al-Ġassānī	<i>al-Muḥṭara' fī funūn min aṣ-šunā'</i>	MTM + comp.	Minerology and medicine Treatise on the arts of the book and other crafts (fols 72 ^v –103)	16 th c. CE	unknown
Arabe 6844	Paris, BnF, arabe 6844	Abū Bakr Muḥammad b. Muḥammad al-Qalalūsī al-Andalusī	<i>Tuḥaf al-ḥawāṣṣ fī ṭuraf al-ḥawāṣṣ</i>	MTM + comp.	Medicine Treatise on inks (fols 112–131)	986 AH / 1579 CE	Maghreb / al-Andalus
facsimile AM	private collection (published in al-Marrākuṣī, Kitāb al-Azhār, ed. Šabbūḥ 2001)	Muḥammad b. Maymūn b. 'Imrān al-Marrākuṣī al-Azhār, ed. Šabbūḥ 2001)	<i>Kitāb al-azhār fī 'amal al-aḥbār</i>	STM	Treatise on inks	649 AH / 1251 CE	Madrasa Mustanşiriya Baghdad

Fig. 1: Indented frame; Leipzig, Universitätsbibliothek, Or. 326, fol. 3v; © Universitätsbibliothek Leipzig.

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سنة تسعة وعشرين ومايقد والی /

Fig. 3: Partially encrypted recipe followed by ciphered alphabets; Berlin, Staatsbibliothek, Landberg 637 (Lbg 637), fol. 39^v; © Staatsbibliothek zu Berlin – Preussischer Kulturbesitz, Orientabteilung.

Fig. 4: Coloured fingerprint on the left margin; Berlin, Staatsbibliothek, Landberg 637 (Lbg 637), fol. 17'; © Staatsbibliothek zu Berlin – Preussischer Kulturbesitz, Orientabteilung.

Fig. 5: Recipes for coloured *liqāt* followed by a recipe for a black instant ink; Berlin, Staatsbibliothek, Petermann 684 (Pet 684), fol. 183^v; © Staatsbibliothek zu Berlin – Preussischer Kulturbesitz, Orientabteilung.

Fig. 6: Recipes with titles written in various coloured inks; Berlin, Staatsbibliothek, Wetzstein 221 (We 221), fol. 111r; © Staatsbibliothek zu Berlin – Preussischer Kulturbesitz, Orientabteilung.

Fig. 7: Recipe for an iron gall ink with a schematic layout added at the end of a treatise written by the same copyist; Berlin, Staatsbibliothek, Petermann II 30 (Pm II 30), fol. 18^r;
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