Measuring the perception of a civilization: Explicit reference to Ancient Greek Authors in Arabic literature

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ABSTRACT:

The influence of Ancient Greek culture on Arabic civilization is explored on the base of explicit references to Greek authors in Arabic texts in the period between the 7th and 20th centuries (as represented in the CLAUDia historical corpus of Arabic). Two sets of data are used, one based on the typical endings of Greek names (*-os, -us, -es*), the other consisting of a list of the most quoted Greek authors. The first set includes Greek science, drama and gods and heroes, while the other covers exclusively Greek science and philosophy. Both sets exhibit abundant evidence of references to Greek names in Arabic texts. The analysis of the first set reveals that while Greek science was referenced throughout the whole period, the representatives of Greek drama and gods and heroes appear almost exclusively in the 19th and 20th century and predominantly in the periodical literature. The second set shows that awareness of the Greek contribution in science, philosophy and medicine was constantly present in Arabic literature. Although there were a few Arabic authors who dealt with Greek cultural influence in greater detail, many others explicitly referenced Greek names in all the periods and relevant regions surveyed and not from science alone, but from a wide range of genres.

KEYWORDS:

Arabic civilization, ancient Greek civilization, explicit reference, history of science, drama, historical corpora

1. INTRODUCTION

The influence of the Ancient Greek culture on Arabic civilization is evident. Given the place and time where and when the Arabic civilization began to flourish, such an influence is only to be expected. Although one can point to the desert, oases and caravan routes as principal attributes of the early Arabs, together with camels and excellent knowledge of the desert, Greek influence on the Near East made itself felt immediately with the conquests of Alexander the Great and establishment of the Hellenistic kingdoms. The Greek language was used in the Near Eastern cities, old as well as newly founded, and the presence of Greek minorities in the area can be evidenced until the present.

This type of linguistic and cultural contact is reflected in the Hellenized forms of Arabic names in Greek sources (e.g., *Malikos* corresponds to Arabic *Malik* 'king'). Another type of reflection of this type of contact are the Greek loanwords in Arabic, e.g. *qamīṣ* < Gr. *kamision* 'shirt', *qirtās* < Gr. *kartos* — 'papyrus, sheet of paper', or *iblīs*

< Gr. *diabolos* 'devil'. A great number of such words are used already in the Quran (cf. Jeffery 1938 passim), which attests to Greek influence already in pre-Islamic times. Even some Arabic sources from the pre-Islamic period are written down in the Greek script (Westenholz 1990, but esp. al-Jallad 2017).

Even after the rise of Islam, in the times of the formation of the new empire, an important influence of Greeks can be traced down. Many of the first clerks and scribes in the newly formed state were of Greek origin, and although their influence on the writing of Arabic is not as significant as in the case of Aramaeans (speaking and writing Nabataean or Syriac), it was nevertheless present, cf. e.g. bilingual Arabic — Greek papyri (Grohman 1932: 40–42).

This type of influence can is also deeply established in the system of the Arabic language. Apart from that, there is another type of impact that Ancient Greek civilization left on Arabic culture, connected with the effort to learn the most important things from other cultures that began as early as the formational phases of the new empire. This process started already in the 8th century CE and is nowadays called the "translational movement" (Gutas 1998). It may be understood as a conscious and purposeful effort to take over the knowledge of the ancient Mediterranean world, in this case stemming mostly from Ancient Greek science.

In literature, this process is usually connected with the institution founded in Baghdad in the 8th century, the so-called *bayt al-ḥikma*, i.e. 'The House of Wisdom'. This House can be seen not only as the expression of an effort supported by individuals (e.g. medical doctors) as sponsors of translations, but as a wider movement backed by the elites of the Abbasid state, ranging from caliphs or princes, high clerks or soldiers to scholars or tradesmen. All these people were obviously interested in the content of the ancient manuscripts and the knowledge hidden in them. The movement lasted some two centuries, and brought about important stimuli for the development of Arabic civilization. The best description to our knowledge is provided by Gutas (1998).

2. APPROACH AND DATA

It is obvious that Greek science must have represented an important contribution to Arabic civilization in its formative stage. Of course, the influence of the Greek philosophy on its Arabic counterpart has been observed many times. On the other hand, it is probable that Greek influence will be traceable in the texts produced by Arabic civilization over the centuries.

Another question is what kind of influence should be followed. Should it be conceptual influence, such as the presence of e.g. Platonic concepts in Arabic philosophy, or even concepts that can be found in a more "popular" context?[1] Such "frames" are

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1 The case quoted in Leiser — Khaledy 2004: 29, comparing one of the hadiths (a story from the life of Muhammad) where Muhammad is reported to say that God created a remedy for every disease with the exception of old age, with a similar passage in the *Lysistrata* by *Aristophanes,* may serve as an example. The topic by itself is too proverbial,

hidden in varying types of expressions, and their correspondence is sometimes difficult to discovered, as many variables may occur in such concepts which can make them look very dissimilar. It is certainly possible to trace a certain type of influence, such as Aristotelian or Platonic, which has been done many times, e.g. in the works on Arabic medieval philosophy.[2] At the same time, it should be taken into consideration that such concepts may lose their "foreign" character after some time and be perceived as native by new users.

In this article, we are interested in the perception of Greek cultural influence by the Arabs themselves. As pointed above, philosophical concepts introduced by some author could be perceived by subsequent authors as being of Arabic origin, i.e. they were no longer aware of the foreign source. This subtle aspect of perception is difficult to trace, and interpretations can be misleading. That is why in this article, we will only deal with explicit references to Greek authors, in order to determine the extent of the phenomenon, both quantitative and chronological.

For this reason, we have chosen to examine the names of Greek authors (and other persons from the Greek culture) referenced by the Arabs in their texts, from the beginning of Arabic literature until the 20th century. Mentioning a Greek name in Arabic means using a form of a name clearly different from the form of Arabic personal names, which could possibly be accounted for as a reference to a source that is perceived as non-Arabic. At the same time, this practice attests to the importance of individual authors (and other persons) in the culture, as their contributions are connected with their names.

At the same time, it is clear that such references cannot be taken as a straightforward measure of the influence or importance of individual authors. It must be understood that the data collected in this article can be taken as signals for further study of the influence and importance of individual Greek authors in the Arabic literature, using a content-based approach. Contrary to current practice, full reference to the source was not common in older times. This means that an explicit reference to an author reflects the writer's feeling that it is necessary to mention the author, and does not stem from cultural pressure.

For the purpose of data excerption, the *CLAUDia* (*Corpus Linguae Arabicae Diachronicum*) database was used. This corpus represents a collection of Arabic texts from the beginning of the Arabic literature in the 7th century until the first half of the 20th century. It contains approximately 420 million words and more than 2,000 full-text titles, and covers most of the titles that were seen as important by the Arabs in the history of Arabic culture. An important part of the corpus is the periodical literature, i.e. texts that occurred in journals that started to be published in the Arabic world in the 19th century. Our corpus covers the period between 1881 and 1947, with most journals coming from Egypt, Mesopotamia and Algeria. In our considerations,

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and its occurrence in *Lysistrata* may be only the first attestation of an otherwise rather common concept.

2   Out of many titles, for *Aristotle* in Arabic cf. e.g. Alwishah — Hayes 2015 or Adamson 2012; for Platonic (or Neoplatonic) concepts, cf. e.g. the articles in Morewedge 1992 or Adamson 2007.

this part of the corpus represents an autonomous category, especially due to the different character of the texts in the periodical literature, but also due to the fact that a chronological categorization is not always straightforward. Another autonomous category in the corpus is the collection of the *Arabian Nights*, which emerged during several centuries and thus cannot be chronologically classified without difficulty, and represents a very different register when compared with the rest of the Arabic literature in the corpus due to its nature as pure entertainment.

The corpus has extensive metadata annotation, which will enable us to work with the chronological line, as well as information as to in which genres the references occur,[3] and finally indication of regional origin.[4] It must be admitted that the latter two categories must be taken as orientational only: regarding the genre, many of the titles represent multivolume works of considerable extent, which means that a single genre will not cover all the parts of such masterpieces; in the case of regional information, considerable variation may occur for some authors.

For the purpose of this study, two approaches were used. In the first, a corpus-driven approach was chosen, and in the second, a list of pre-selected names was checked against the corpus. Both datasets are available as supporting data for the article.

3. GREEK SCIENCE, GODS AND HEROES AND DRAMA: A CORPUS-DRIVEN APPROACH

In the corpus-driven approach, the following procedure was adopted for the construction of the dataset that was then checked against the corpus:

1. From the corpus itself, a list of words/strings ending with *-(w)s* was excerpted. This ending should reflect an Arabic version of the ending *-os*, *-us* or *-es* frequently occurring in Greek names, such as *Ptolemaios/Ptolemy, Zeus* or *Sophocles*. At the same time, tokenization took place and variant spellings were taken into account.[5]
2. The resulting list (including variant spellings) was checked against the corpus, and from the neighborhood of the names from the list, other names of obviously Greek origin were selected, such as *Plato, Aristophanes,* but even *Orpheus, Oedipus,* etc.

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3   The information on genres is derived from the catalogues of the Dār al-ʕUlūm library in Cairo.
4   The information covers data on the place of birth and death of an author. Other important places of residence during the author's lifetime are given as well.
5   Most of the names were found in variant spellings, e.g. *Ptolemy* has four variants, *Euclid* three variants, etc. Some of the forms are typical for certain authors, e.g. *Dioscurides* can be found in two forms, one of them almost exclusively in al-Rāzī's works in the 13th century, the other one in the lineage of Ibn Sīnā (Avicenna) and al-Bayṭar in the 11th and 13th centuries; the second version is also used in modern times. Such a criterion could be used as a supporting argument for the relevance of old titles for modern writers.

The list created by joining the two abovementioned lists was used as a basis for excerption from the corpus. The frequency of individual items (or groups of items, in case of variant writing of some names) was established, and all names with fewer than 15 occurrences were excluded from the list, as their frequency is obviously not high enough to draw conclusions. In the end, a number of Greek names had to be excluded, as they referred to e.g. Byzantine rulers or other contemporaries of the Arab authors, but the distribution was limited to a certain century or author. Such examples would skew the picture of the phenomenon to be mapped here, reference to the heritage of Ancient Greek civilization.

The resulting list consists of 26 names. It can be further divided into three groups, covering the representatives of 1) Greek science, 2) Greek gods and heroes (i.e., mythological figures) and 3) Greek drama. The representation of these groups is not equal, as we find only five authors within Greek drama; the other two groups, however, have similar numbers of members (10 for science, 11 for gods and heroes). The distribution is as follows:

— Greek science: *Dioscurides, Empedocles, Euclid, Galen, Plato, Plutarch, Porphyry, Ptolemy, Pythagoras, Socrates*;
— Greek gods and heros: *Bacchus, Dionysus, Gorgons, Cyclops, Medusa, Menelaus, Oedipus, Orpheus, Perseus, Prometheus, Zeus*;
— Greek drama: *Aeschylus, Aristophanes, Euripides, Homer, Sophocles*.

It should be noted that one of the Greek gods was excluded from the analysis. Asclepius, the Greek god of medicine and healing, exhibits characteristics that would group him rather with Greek science, and the passages in the text show accordingly that this figure was treated rather as a human in the Arabic texts.[6] This somewhat mixed character of this personality could skew the results.

It is clear that the list is not exhaustive, for it investigates only the most frequent endings of Greek (masculine) names. A great number of other names from Ancient Greek civilization are not included; at the same time, it can be expected that their share will not be as large as in the case of the abovementioned characters.

The data in Table 1 show that the representatives of Greek science were abundantly quoted in medieval Arabic literature, and although one can witness lower frequencies in some periods, it can be said that these authors were mentioned throughout the history of Arabic literature. There is a considerable peak in the 13th century, which is comparable only with the frequency of the search terms in the periodical literature, but in the other centuries the frequency is also relatively high. For instance, the ove-

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6   His distribution in the texts is mainly in tractates on medicine, where he behaves as a human and has pupils, stories from his life are mentioned, and the lineage of his followers is given (after his death, three pupils continued his work). He is mentioned mainly between the 11th and 14th centuries, when such authors as Ibn Sīnā, al-Rāzī, and Ibn al-Bayṭar mentioned his name in connection with actual medical instructions. In the 20th century and in the periodical literature, only six hits are present, one of them adducing the Latin version of his name.

Greek science	absolute frequency	frequency per million	average per 1 author	median per 1 author
9th ct.	151	6.75	0.61	0
10th ct.	528	13.72	1.23	0.31
11th ct.	1460	37.46	3.41	1.64
12th ct.	552	20.35	1.85	0.37
13th ct.	4641	103.95	9.43	3.68
14th ct.	815	14.49	1.32	0.39
15th ct.	513	9.61	0.87	0.15
16th ct.	84	2.56	0.23	0.15
17th ct.	380	21.63	1.94	0.79
18th ct.	75	8.2	0.75	0.11
19th ct.	308	10.5	0.95	0.78
20th ct.	368	18.99	1.73	0.41
Periodicals	2646	96.79	8.79	4.94

TABLE 1. Frequency of occurrences of names from Greek science. Both absolute figures and figures per million are given. The average and median of the occurrences related to the number of authors in a given century are calculated from the occurrences per million.

rall number of occurrences of Galen corresponds to such words as *masīḥī* 'Christian' or *mušīr* 'counselor, consultant; field marshal', Ptolemy is on the same level as *istiʔṣāl* 'removal' or *inḥirāf* 'deviation, declination', etc. Slightly less frequent are names like Plato, Dioscurides or Socrates.

The somewhat unexpected peak in the 13th century is caused especially by a sudden and unrepeated popularity of Dioscurides: the number of occurrences for this century reaches 1,367, of which 114 occurrences go back to al-Rāzī and an incredible 1,250 to Ibn al-Bayṭar. Another prominent figure in this century, Galen, reaches his referential peak in the 13th century with 2,011 occurrences altogether (including al-Rāzī: 279, Ibn al-Bayṭar: 843, Jamāl al-Dīn al-Qifṭī: 181, Ibn Abī Uṣaybaʕa: 537, Ibn al-Nafīs: 67), but the difference is not as dramatic as with Dioscurides.[7] It should also be noted that in this century, every author from our sample was mentioned, the lowest figures being associated with Plutarchos (5 occurrences) and Empedocles (8 occurrences), but seven authors exhibit frequencies higher than 100. In average and median, this century is also the "most Hellenistic" of all centuries in our sample, but it is at the same time clear that the distribution is very uneven.

The centuries with the smallest impact are the 15th, 16th, 18th and 19th, where both average and median show very low values. These centuries are generally described as the "Dark Ages" of Arabic literature, which makes the decrease more understandable. In this sense, the 17th century is an exception, as the popularity of Greek scientific authors was considerably greater in comparison with the preceding and following

7   Dioscurides reaches 147 occurrences in the 11th century due to Ibn Sīnā; otherwise the total for all the other centuries, including the periodical literature, is only 31 occurrences. On the other hand, Galen remains popular throughout Arabic literature.

centuries.[8] In any case, explicit mentions of figures from Ancient Greek science, be they positive or negative, have been present in the Arabic literature throughout its existence.

The data for the other two groups, namely Greek gods and heroes and Greek drama, are treated in the following tables.

Greek gods and heroes	absolute frequency	frequency per million	average per 1 author	median per 1 author
11th ct.	1	0.003	0	0
13th ct.	1	0.002	0	0
20th ct.	24	1.23	0.12	0
Periodicals	847	30.98	2.82	1.57

TABLE 2. Frequency of occurrences of names of Greek gods and heroes. Both absolute figures and figures per million are given. The average and median are calculated from the occurrences per million.

The data in Table 2 exhibit striking differences in the distribution of the frequencies compared to the data in Table 1. Generally, it can be said that mentions of mythological figures from Ancient Greek culture was minimal and very marginal in Arabic literature until the 20th century, and especially the rise of the periodical literature. In the 20th century, the most popular is the figure of Bacchus (16 occurrences), with the second position taken by Cyclops (5 occurrences). Within the category of periodicals, we find a completely different distribution, mainly due to Oedipus (250 occurrences) and Zeus (222 occurrences). This most probably refers to a different style and different topics that are treated in "high" literary style in contrast to periodicals. Even so, the number of Greek scientists mentioned in Arabic texts is much higher, at least three times higher even in the periodical literature.

Greek drama	absolute frequency	frequency per million	average per 1 author	median per 1 author
10th ct.	1	0.026	0.005	0
11th ct.	16	0.41	0.082	0
12th ct.	3	0.11	0.022	0
15th ct.	1	0.019	0.003	0
19th ct.	2	0.068	0.013	0
20th ct.	10	0.52	0.1	0
Periodicals	1006	36.80	7.36	5.04

TABLE 3. Frequency of occurrences of authors of Greek drama. Both absolute figures and figures per million are given. The average and median are calculated from the occurrences per million.

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8   The rise is caused by the interest of the following authors: al-ʕĀmilī (d. 1031), al-Maqarrī al-Tilimsānī (d. 1041), Kātib Ǧalabī (d. 1067) and several others. The most frequently quoted authors are Ptolemy, Galen and Euclid.

The authors of Ancient Greek drama (Table 3) are quoted in a similar pattern to Greek gods and heroes in medieval Arabic literature, i.e. they are practically present only in texts of the 20th century, especially in the periodical literature — the only exception being Homer,[9] who is occasionally mentioned earlier, especially in the 11th century. It is also worth mentioning that even in the 20th century, Homer is the only one to be mentioned in books; all other authors are mentioned exclusively in the periodical literature. The absolute figures as well as the counts per million are only slightly higher than for Greek gods and heroes, but the average and median for one author is more than three times as high. The most popular remains Homer (434 occurrences), followed by Euripides (221 occurrences); the rest can be found in the range of 104–139 occurrences.

The first possible conclusion to be drawn from the data above is that the influence of Ancient Greek civilization may be detected in all phases of Arabic civilization. However, the pattern of this influence is strikingly clear: Greek science had a direct impact on Arabic civilization from the beginning and lasted through all the subsequent centuries; the other groups, such as Greek mythological figures or authors of drama, are (with a couple of exceptions) present practically only in modern times, and the style in which they occur is primarily restricted to articles in periodicals. This is most easily explained by the influence of Western civilization on the Arabic world from the 19th century onward. But even in the periodical literature, the frequency of Greek scientists and philosophers shows that this category remained the most popular and influential in Arabic thought.

4. THE SIX MOST REFERENCED GREEKS

The following section is based on the dataset derived from a list of six Greek names most frequently occurring in Arabic literature. The scope of the survey is more detailed: it covers the occurrences of the Greek names, both individually and in aggregated sets, and in addition several other issues will be treated, such as the genres in which the Greek names occur, the chronological lines of their occurrences in the Arabic texts, as well as the regional distribution of the Arabic authors quoting them.

In this sample, the decisive criteria for inclusion in the set were the number of hits as well as the distribution of occurrences. For this reason, Dioscurides was not included, as most of "his" occurrences go back to only a few authors, most of them from the 13th century, which means that his popularity was limited to a small time span and his influence on Arabic culture did not last long. The final list contains Galen, Aristotle,[10] Ptolemy, Plato, Socrates, and Euclid. As expected from the discussion above in §3, we are dealing exclusively with representatives of Ancient Greek

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9   In the texts, often as *Umīrūs/Humīrūs al-šāʕir* 'Homer the Poet'.

10   This author did not appear in the preceding sample. This is due to the fact that in Arabic, his name does not end with *-s* and thus was not found with our corpus-driven approach. However, Aristotle is one of the figures whose impact is mentioned in every treatise on the influence of Greek civilization on Arabic, which makes his inclusion in this set reasonable.

science, as this genre is the only one represented throughout the entire history of Arabic writing.

The data will be organized into several tables. The presentation of the data is selective and aggregate, but the full data set is available as files supplementing the article.

	Galen				Aristotle			
	absolute	per million	No. of authors	% of authors	absolute	per million	No. of authors	% of authors
Overall frequency	3651	8.75	180	10.85	3051	7.31	120	7.23
9th ct	30	1.34	7	3.27	14	0.63	2	0.93
10th ct	135	3.51	23	7.88	21	0.55	4	1.37
11th ct	659	16.91	22	11.00	127	3.26	10	5.00
12th ct	103	3.80	15	15.31	123	4.53	9	9.18
13th ct	2011	45.08	26	16.05	495	11.10	15	9.26
14th ct	246	4.37	25	16.45	560	9.96	16	10.53
15th ct	83	1.56	16	14.55	138	2.59	16	14.55
16th ct	9	0.27	6	10.00	7	0.21	3	5.00
17th ct	68	3.87	12	21.43	146	8.31	6	10.71
18th ct	20	2.19	6	13.64	22	2.41	5	11.36
19th ct	57	1.94	7	10.00	105	3.58	6	8.57
20th ct	46	2.37	13	8.55	138	7.12	27	17.76
Periodicals	182	6.66	x	x	1155	42.25	x	x
1,000+1 nights	2	3.46	x	x	0	0.00	x	x

	Ptolemy				Plato			
	absolute	per million	No. of authors	% of authors	absolute	per million	No. of authors	% of authors
Overall frequency	2446	5.86	176	10.6	1872	4.49	118	7.11
9th ct	103	4.60	3	1.40	10	0.45	3	1.4
10th ct	220	5.72	13	4.45	54	1.4	9	3.08
11th ct	149	3.82	19	9.5	134	3.44	14	7
12th ct	211	7.78	14	14.29	77	2.84	9	9.18
13th ct	449	10.1	27	16.67	201	4.51	13	8.02
14th ct	298	5.3	29	19.08	93	1.65	12	7.89
15th ct	265	4.97	20	18.18	103	1.93	14	12.73
16th ct	41	1.25	5	8.33	10	0.3	5	8.33
17th ct	162	9.22	12	21.43	70	3.98	7	12.5
18th ct	38	4.16	5	11.36	6	0.65	1	2.27

	Ptolemy				Plato			
	absolute	per million	No. of authors	% of authors	absolute	per million	No. of authors	% of authors
19th ct	86	2.93	10	14.29	78	2.66	9	12.86
20th ct	122	6.3	19	12.5	58	2.99	21	13.82
Periodicals	302	11.04	x	x	978	35.78	x	x
1,000+1 nights	0	0	x	x	0	0	x	x

	Socrates				Euclid			
	absolute	per million	No. of authors	% of authors	absolute	per million	No. of authors	% of authors
Overall frequency	1045	2.5	83	5	761	1.82	110	6.63
9th ct	1	0.04	1	0.47	8	0.36	2	0.93
10th ct	25	0.65	7	2.4	19	0.49	8	2.74
11th ct	83	2.13	13	6.5	73	1.87	11	5.5
12th ct	52	1.92	8	8.16	10	0.37	6	6.12
13th ct	128	2.87	11	6.79	179	4.01	17	10.49
14th ct	17	0.3	10	6.58	103	1.83	15	9.87
15th ct	20	0.37	7	6.36	26	0.49	12	10.91
16th ct	6	0.18	2	3.33	9	0.27	3	5
17th ct	29	1.65	5	8.93	60	3.42	10	17.86
18th ct	3	0.33	2	4.55	3	0.33	2	4.55
19th ct	24	0.82	5	7.14	28	0.95	8	11.43
20th ct	27	1.39	10	6.58	88	4.54	15	9.87
Periodicals	630	23.05	x	x	155	5.67	x	x
1,000+1 nights	0	0	x	x	0	0	x	x

TABLE 4. List of occurrences of the six most commonly cited Greek scientists and philosophers in Arabic literature in chronological order. Absolute values of occurrences are supplemented with their occurrences per million.[11] The following two columns give the number of authors in a given century that referenced the names from our list, as well as their ratio to the overall number of authors in the corpus in the given century.

Table 4 gives an overview of the chronological distribution of occurrences of the individual authors from our list. It is obvious that the names appear relatively evenly distributed in Arabic texts during the whole period. The per million values show some variation, the biggest difference being observed in Galen in the 13th century, when

11   For counting the per million value of the total figures, the 7th and 8th centuries have been excluded, i.e., the value relates only to those centuries when the Greek authors have been referenced.

several authors (cf. Table 5) deal with this character with considerable frequency. However, the distribution holds for all the centuries, with the exception of the 16th and in some cases the 18th century, when the per million value drops under 1.00.[12]

Possibly more interesting is the number and percentage of authors that mention the Greek names in the individual centuries. From this perspective, lower values can be found at the onset, in the 9th and 10th centuries, but even in the 16th and 18th centuries the number of authors actively cited is still rather high, the overall numbers varying from 10.85% to 5%. In the median figures (counted from values for individual centuries), the variation ranges from 12.46% to 5.59%. The percentages of authors group together Galen and Ptolemy, while Aristotle is rather on the level of Plato and Euclid and, perhaps surprisingly, Socrates exhibits the most uneven distribution among these authors.

It can be expected that the information on the sources where the textual occurrences are found will not be distributed evenly. This is already suggested by the percentage of referencing authors.

Cent (CE)	Deceased (AH)	Author (Latin)	Galen	Aristotle	Ptolemy	Plato	Socrates	Euclid	TOTAL
		Periodicals	182	1155	302	978	630	155	3402
13	668	Ibn Abī Uṣaybaʕa	537	232	31	43	44	58	945
13	645	Ibn al-Bayṭar	842	31	0	0	0	0	873
13	646	Jamāl al-Dīn al-Qifṭī	181	157	59	113	55	66	631
11	428	Ibn Sīnā	446	51	10	20	24	11	562
14	728	Ibn Taymīya	18	371	10	46	4	1	450
13	606	Faḫr al-Dīn al-Rāzī	279	5	22	0	4	2	312
17	1067	Kātib Ǧalabī	31	116	43	25	11	39	265
14	764	al-Ṣafadī	40	60	39	8	1	46	194
15	808	Ibn Ḫaldūn	24	44	100	10	5	2	185
19	1307	al-Buḫārī al-Qannūjī	29	44	41	32	13	18	177
10	346	al-Masʕūdī	33	1	84	39	12	3	172
14	748	al-Dhahabī	30	35	88	0	0	16	169
13	626	Yāqūt al-Ḥamawī	23	1	106	5	0	17	152
19	1270	al-Ulūsī	14	44	32	25	7	2	124
11	438	Ibn al-Nadīm	68	2	16	0	4	31	121
14	732	Abū al-Fidā Ibn ʕAlī	12	18	60	10	4	14	118
9	207	al-Wāqidī	0	11	96	1	0	0	108
12	548	al-Shahrastānī	0	46	6	38	10	2	102
15	896	Ibn al-Azraq al-Andalusī	1	34	1	65	0	1	102

TABLE 5. List of Arabic authors with the most frequent occurrence of the selected Greek names.

12   In the 16th century, only Ptolemy appears more frequently (1.25 per million); in the 18th century, a frequency under 1.00 is found for Plato (0.65), Socrates and Euclid (both 0.33).

Table 5 lists the Arabic authors who have more than one hundred references to the six Greek authors. It is obvious that the distribution of the references is far from even. The peak of citation is in the 13th and 14th centuries, with 5 and 4 authors respectively (and 3.044 and 931 hits respectively), but in the 11th century the number of references still reaches 732 hits; the 16th and 18th centuries are not represented at all. For the remaining centuries, the overall distribution can be regarded as relatively even, between 302 (19th century) and 108 and 102 (in the 9th and 12th centuries). It can be said that for almost every period, there is an Arabic author who discusses Greek scientists and philosophers in detail.

On the other hand, the 19 authors (and the authors in the periodical literature, who remain anonymous for our purposes here) represent only a small portion of the 305 authors[13] (plus the authors in periodicals and the *Arabian Nights*) who reference the Greek names. Out of the total, 82 authors reference only one Greek scholar, 32 refer to two, 25 to three, 19 to four, 38 have five to nine references, 36 refer to between ten and nineteen, and 57 to between 20 and 100.

Another issue that is important for judging the impact of Greek authors on Arabic civilization is the chronological distribution of the occurrences of the selected Greek names. From the preceding table (Table 5) it is clear that a significant number of authors of all periods reference the Greek scholars selected, but it is also interesting to observe the distribution within the chronological axis.

Cent (CE)	Average span	Median span	Maximal value
9	9.44	3.00	33
10	3.45	2.00	14
11	3.18	2.00	15
12	4.22	2.00	17
13	2.36	2.00	13
14	2.32	1.00	10
15	3.60	2.00	13
16	9.90	8.00	31
17	6.06	4.50	17
18	11.33	6.00	34
19	5.41	5.00	17
20	1.58	1.00	6

TABLE 6. Time gaps between explicit reference. The values are counted based on the year of death of an Arabic writer.

Table 6 is intended to offer a picture of the time gaps between explicit references to the Greek authors. However, it is based on the year of death of the Arabic authors, as currently we have no reliable data on the date of composition of all the individual titles, which is why the year of death of an author is used as a substitute on which the chronological axis is constructed within the corpus. As such, the data available

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13   Which, by itself, is 18.4% of the authors within the whole corpus.

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are not directly usable for a precise measurement of the chronological density of the references to the Greek scholars, but they do allow a tentative judgment on the distribution of the references over the course of time. It may be expected that most of the literary activities of the Arabic authors took place one or two decades before their death, so the difference between our data and the actual figures will not be very large.

Even with such restrictions, the density is remarkable. The average values can be grouped together for the 10th to 15th centuries within a range from 2.32 to 4.22, and for the 9th, 16th and 18th centuries with values between 9.44 and 11.33. The 17th and 19th centuries have an average span of 6.06 and 5.41 respectively. The lowest figure is attested for the 20th century, where, however, it should be noted that the authors represented in the corpus cover only the first half of the century, which certainly helps the increased density, yet at the same time it most probably reflects the growing influence of Western civilization on Arabic culture.

The maximum span registered in a given century corresponds to the distribution of the average figures. The biggest values can be observed in the 9th, 16th and 17th centuries (31 to 34 years); in the remaining centuries, the span ranges between 10 and 17 (median 14.5).

Century	Arabian Peninsula	Mesopotamia	Persia	Central Asia	Levant	Egypt	Andalusia	Northern Africa	Anatolia	India
9	1	7	1	0	0	0	0	0	0	0
10	1	16	4	3	1	3	1	0	0	0
11	0	9	7	4	1	2	8	3	0	0
12	1	4	5	1	1	2	7	2	0	0
13	1	8	4	0	11	12	0	6	1	0
14	3	2	0	2	17	14	0	5	1	0
15	3	0	3	0	3	15	1	4	1	0
16	1	0	0	0	2	5	0	0	2	0
17	3	1	0	1	4	6	0	2	1	0
18	0	0	1	0	5	2	0	0	1	0
19	6	1	0	1	1	8	0	0	0	0
20	3	2	0	0	9	21	0	2	1	3

TABLE 7. Geographical distribution of Arabic authors referencing the selected Greek scholars.

In Table 7, the tentative data for the geographical distribution of the Arabic authors referencing the Greek scientists and philosophers are given. The data is not "exact" in the sense that many authors lived in several regions. In our choice, preference has been given to places where the authors lived at the end of their lives, with consideration of other places important for their lives. Again, the rather tentative character of the analysis must be taken into consideration here.

The geographical distribution derived from our data seems to confirm the expected path of evolution. The first centuries show a concentration of the authors in Mesopotamia, which can easily be related to the translation movement in Baghdad; the neighboring regions, especially Persia and Central Asia, exhibit high numbers especially in the times when Mesopotamia can be regarded as the center. This changes after the 13th century, which corresponds to the sack of Baghdad by the Mongol armies (1258), and it seems that, at least from the point of view of references to Greek scholars, Baghdad never really recovered from that blow. From the 13th century on, the central role of Baghdad was taken over by the Levant (at least until the 15th century) and especially by Egypt, where a high concentration can be observed from the 12th century and continues as the highest until the 20th century.

From the more peripheral regions, Andalusia shows a relatively high concentration of authors until the 12th century; afterwards, references to Greek authors may be traced in Northern Africa until the 15th century. Interestingly, from Anatolia we have references from the 13th century onwards, i.e. from times when most of the region was under Turkish control. Another interesting fact is that the Arabian Peninsula can be seen as marginal from our point of view, with a remarkable rise in the 19th century; this too seems to go against the expected trends, as the Wahhabis entered the region at that time.

Table 8 offers a tentative analysis of the genres in which references to the Greek authors appear. In case the Arabic author referenced the Greek authors in several titles, then the majority genre in which the Arabic author wrote was chosen as the typical one. Although the analysis must be regarded as tentative, it is still clear that the Greek authors were referenced in a wide range of genres, not at all restricted to science, logic, medicine, etc. In particular, the high numbers for *adab* (educational and popular scientific literature), encyclopaedias, and biography suggest that reference to those authors was very common in Arabic literature as a whole.

Genre	subgenre	frequency of subgenre	Total
Adab		1179	1179
Science	Astronomy	67	2326
	Medicine	945	
	Philosophy	186	
	Science	1128	
Islam	Belief	600	1083
	Fiqh	262	
	Hadeeth	130	
	Islamic law	35	
	Morals	5	
	Quran	8	
	Tafseer	43	

Genre	subgenre	frequency of subgenre	Total
Humanities	Biography	2571	4730
	Culture	6	
	Education	16	
	Encyclopaedias	466	
	Genealogy	1	
	Geography	200	
	History	1153	
	Linguistics	275	
	Politics	6	
	Poetry	36	
Periodicals		3402	3402
Catalogues		103	103
1,000+1 nights		2	2

TABLE 8. Tentative classification according to genre of Arabic texts with reference to Greek authors.

5. CONCLUSION

The enormous impact of Ancient Greek culture on Western civilization may be traced without any problems to the European Renaissance, and it has been long recognized that the Arab world played an important role in the transfer of Greek knowledge to Western Europe (cf. e.g. Hasse 2016 or Saliba 2007). Our data are based on the attestation of Greek names connected with Ancient Greek civilization within Arabic literature, from the 7th century until the first half of the 20th century. This study has demonstrated that familiarity with Greek antiquity was present throughout the history of Arabic writing.

When divided into genres, it is especially Greek science and philosophy that is most readily detectable throughout the history of Arabic civilization. Representatives of Ancient Greek drama or mythological figures (gods and heroes) can also be found in Arabic literature, but until the 19th century only to a very limited extent (namely Zeus and Homer). The rise in the numbers of these latter two groups may be ascribed to the beginning of the Arabic *nahḍa* (renaissance) in the 19th century, a process accompanied by increased cultural impact of Western European civilization. However, even in this period, a clear prevalence of Greek scholars and philosophers may be observed, both in book production and in periodical literature.

A detailed analysis of the six most referenced figures (Galen, Aristotle, Ptolemy, Plato, Socrates, Euclid) shows that the distribution of the references can be considered even, or at least running according to expected paths, in many aspects. Although just 19 authors supply some 40% of the references, there are still almost 300 other authors that reference these Greek scientists. Their distribution covers the chronological axis in a relatively dense manner; the references appear at rather short intervals, with some exceptions at the beginning of Arabic writing and during the so-called "Dark Ages" (16th to 18th centuries), when the intervals grow somewhat bigger, but

still the memory of the Greek authors is preserved. The geographical patterning can be seen as reflecting the overall evolution of Arabic civilization, changing over time according to the centrality of the respective regions.

In closing, it may be said that acquaintance with Ancient Greek knowledge was omnipresent in the history of Arabic civilization. The data in our samples show that the Arabs during all the phases of the evolution of their civilization were aware of the names associated with Greek culture, especially science and philosophy.

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