Shedding light on the matter

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Shedding light on the matter: evaluating changing patterns of object dedication in Ionian sanctuaries (7th/6th – 5th/4th centuries BC) with lexicometrical analysis

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Introduction¹

Reconstructing moments in ancient history is done most effectively when we draw together different types of evidence. Particularly given the fragmentary and random shape of our datasets, many scholars would agree that it is important to combine material — and sometimes patterns only become visible when we do so in new and experimental ways. As scholarship on ancient Greek religion has become increasingly interdisciplinary in recent years, many scholars have brought together datasets long studied separately—the material evidence by archaeologists and anthropologists, and the texts by philologists and philosophers—now is a prime-time to cross-pollenate different types of evidence on a much broader scale. This paper proposes that by bringing together types of evidence that might usually be kept apart and by applying new methodologies, we can shed further light on certain ancient socio-cultural phenomena.

In particular, this paper considers the religious activity of object dedication. The practice of depositing objects in special locations seems to have been widespread in the ancient Greek world, as it was in many other cultures.² The intentional deposition of many different classes and amounts of material culture for apparently ritual or dedicatory purposes is most recognisable at ‘sanctuary’ sites, namely temples and their surrounding precincts.³ Indeed, in ancient Ionia—the part of coastal Turkey that stretches roughly from modern-day Izmir down to Bodrum—myriad ritual depositions were made at major and rural sanctuary sites, and weapons, jewellery, figurines and vessels were offered to the gods; in particular, a vast number of ‘exotic’ or ‘foreign’ objects were deposited. However, around 500/499–494/3 BC—the watershed moment of the Ionian revolt when the city-states of the region mobilised themselves against Persian forces—⁴ the presence of objects dedicated in sanctuaries becomes somewhat inconspicuous in the archaeological record. Archaeologists and historians have long attempted to explain why these changes might take place; but the obscurity of these reasons remain a vexed problem both, generally, for the history of Greek religious practice including manifestations of belief and, more specifically, for the social history of Ionia.

¹ Ideas in this paper were first presented at the workshop ‘Shedding Light on the Matter: Ideascapes and Material Worlds in the Land of Thales’, at the University of Cambridge in March 2018. We are grateful to the Faculty of Classics, Cambridge and to Marie Skłodowska-Curie Actions for funding this symposium, and also to the other presenters and attendees for lively and stimulating discussion. Early drafts of this article were read by Robin Osborne, Julia Shear and Toby C. Wilkinson, and we are grateful for their comments and suggestions. This article presents results from a project that has received funding from the European Union Horizon 2020 research and innovation programme under grant agreement No. 700769.
² Osborne 2004.
³ Patera 2010.
⁴ Tozzi 1978; Kienast 2002; Greaves, Knight and Rutland 2020.
Although the patterns of votive deposition in ancient Ionia have not been comprehensively quantified, three main explanations have been offered for the perceived fall in dedications of imperishable objects through time:

1. a decrease in dedication numbers reflects a social and economic poverty in the region following the Ionian revolt;
2. dedication as a practice was consistent right from the 7th through to the 4th century BC but there is a problem in data visibility as the rate of looting and the removal of finds from their place of dedication increased progressively;\(^5\)
3. there was a much wider shift in social practice, and, whereas in earlier times it was common to dedicate in large public sanctuaries, in the 5th and 4th centuries, by contrast, those practising religious cults made offerings in small, rural, and less archaeologically visible sanctuaries.

These explanations will be discussed in more detail below. Generally, though, it is clear that scholars have relied on identifying economic or political factors for explaining changes in dedicatory practices. Even more crucially, though a pattern in changing votive deposition practices can be identified, there is little consensus on how this pattern should be explained. Comparatively less attention has been given to social or cultural factors.

To help to explore these alternative explanations for the archaeological pattern, in this paper we draw on lexical data from contemporary albeit fragmentary ancient texts. Textual fragments stand as proxies for discursive and mental concerns of particular periods and communities. Indeed the canon of Ionian texts from between the 7th and 4th centuries BC comprise mainly the philosophical and scientific works of the ‘Ionian Enlightenment’ that have been studied for their early place in the history of modern philosophy: but these same texts also form a historic-ethnographic source for contemporary responses to changing social worlds. The subjects on which such thinkers dwelt and the kinds of vocabulary which they used have the potential to offer insights into changing attitudes in this region, across time. In such a fashion, over the past twenty years linguists and contemporary social scientists have used corpus, vocabulary, and lexicometry studies to chart very broadly defined social patterns, taking the understanding that the shared sociolect of a community reflects to some extent its interests, concerns, and common issues of discussion. Although there are issues in applying methodologies created for contemporary datasets to ancient data and the analysis presented here is experimental and open to refinement, using new tools to uncover new patterns offers great potential.

Defining exactly which objects should be understood as explicitly for votive purposes, repurposed as gifts for gods or simply part of the discarded accoutrements of various forms of ritual performed within sanctuary grounds is difficult; moreover the motivation behind any particular act of dedication is usually lost. “Votives” are imperishable objects presented to a supernatural power in the hope for or in recognition of a favour granted thus establishing a reciprocal relationship between the human (individuals and larger entities such as cities) and the divine worlds.\(^6\) A differentiation between gratitude and/or expectation is rarely possible since inscriptions on objects are rare and if preserved they often simply indicated the name of the deity addressed

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\(^5\) The implication here is that object dedication is a rather ‘neutral’ activity that remains constant regardless of any changes in the cultural fabric of society. cf. Simon 1986:410: “It is far too ambitious to believe that votives will provide any major insights into ancient thoughts or beliefs. The making of offerings was something that most Greeks did regularly and without much thought.” ... “automatic part of Greek life.”

\(^6\) Parker 1998; Peels 2016. On the importance of the durability of the medium see for example Klöckner 2010, 108.
but no reasoning for the action. This said, the relationship between the (mortal) gift giver and the supernatural is not a simple “du ut des” but a continuing bond.\(^7\) The term “object dedication” on the other hand refers more broadly to imperishable objects that remain within the borders of a given sacred place regardless of their initial utilisation. And this, in turn, touches on another important fact, namely that any object present within the material culture of the time could have been turned into an offering to a supernatural power.\(^8\) Therefore the spatial location of its final deposition is the defining criterion when inscriptions are lacking. In the summary of archaeological and historical evidence that follows, a very wide definition of “votive” is applied in order to tract broad trends in behaviour rather than guess at the motives of individual acts of object dedication.\(^9\) While this paper focuses on contexts within Ionia, the observations and general trends described can be witnessed elsewhere in the contemporaneous Greek world, for example in Olympia and Delphi.\(^10\)

The first part of this paper collects and synthesises evidence for object dedication in ancient Ionia in the 7th to 4th centuries BC. The chronological patterns identified are evaluated in the second part of the paper, in which lexicometrical methods from corpus linguistics are brought to Ionian Greek literature for the first time. The principal focus of this paper is methodological, underscoring the potential for bringing literary and historical evidence in a holistic fashion to more ‘traditional’ object-centric studies of ancient religion. In doing so, we will place the pattern side-by-side with the archaeological pattern and so try to reach a clearer understanding of the social, cultural, economic, or political backdrop against which the practice of votive deposition changed between the 7th/6th and 5th/4th centuries BC. Specifically, we will argue that changes in the political organisation of communities between the Archaic and Classical periods had an impact on the way in which its members engaged with notions of power, figures of authority, and a need to placate invisible deities.

**Ancient Ionia**

Ancient Ionia, as defined by Herodotos of Halikarnassos,\(^11\) incorporated at least twelve poleis: Chios and Samos are islands but all the others are cities and territories situated along the coast of Asia Minor (modern Turkey) from Phokaia in the north to Miletos in the south. It is however important to realise that there were many other settlements, villages, farmsteads within this roughly defined geographical area and secondly that while the term implies a somewhat shared identity,\(^12\) Ionia never became a single unified administrative or political unit. Written and archaeological sources attest to the prosperity of the Ionian poleis during the archaic period. This can be particularly witnessed through the enlargement of sanctuaries: amongst the best known are the Heraion of Samos, the Artemision of Ephesos and the Apollo sanctuary at Didyma near Miletos.\(^13\) And very similar processes even though on a slightly smaller scale can be detected elsewhere in Ionia for example in Phokaia and Smyrna with the erection of monumental temples in stone for the goddess Athena.\(^14\)

Most of these places witnessed an extraordinary phase of large-scale excavation from the early twentieth century onwards when substantial remains of the architectural structures were uncovered and artifacts of all

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\(^1\) On charis as the “ideal relationship between man and god” see Parker 2011, x and 92 with note 82.

\(^2\) Osborne 2004:3.

\(^3\) Object dedication as evidenced through the archaeological and historical records presuppose an active selection and handling as part of group or personal activities all of which form and shape religious behaviour both as part of poleis and of personal religion. On these categories see Kindt 2015.

\(^4\) Braun-Holzinger and Rehm 2005; Kaplan 2006; Crielaard 2015.

\(^5\) Herodotos 1.141-143, 5.109.

\(^6\) Crielaard 2009.

\(^7\) Kerschner 2011; Gruben and Kienast 2012; Schulz 2012; Dirschedl 2018.

\(^8\) Özyiğit 2006; Akurgal 2007.
sizes, types, and materials from a diverse range of periods accumulated. Sadly, only a fraction of the uncovered finds have been published.\textsuperscript{15} The archaic period stands out with its enormous wealth of monuments and objects - a fact that has been repeatedly emphasised by ancient and modern authors respectively,\textsuperscript{16} and which is in stark contrast to the scarcity of material evidence datable to the following 5th century BC.\textsuperscript{17} The chronological dividing line seems to be the disastrous events surrounding the so-called Ionian revolt which ended in the defeat of the Greek cities and the destruction of Miletos in 494 BC.\textsuperscript{18} During the following fifty years or more imports of foreign objects into the sanctuaries fell dramatically or ceased to be recognisable.\textsuperscript{19} This scarcity of datable materials – be it imported or locally produced – applies as much to profane contexts as sanctuaries and can best be explained as confirming a substantial disruption of daily life in Ionia during this period, albeit to differing local degrees for different poleis and different sanctuaries.\textsuperscript{20}

**Dataset one: material evidence**

Much work has been put into the investigation of Ionian sanctuaries, their spatial development and the variety of objects found during the more than hundred years of archaeological investigation. Aside from a few exceptional synthetic works,\textsuperscript{21} publications on material from these sanctuaries have tended to concentrate on either a particular class of objects preferably organised by raw material (e.g. metal, clay, glass) or present the architectural development without including the finds. Therefore it is not possible to present any reliable quantitative or comparative statistics, or any certainty of where one specific item has been found within a particular sacred place. Similarly, neither is it possible to firmly decide on whether or not an object was considered a votive or part of a sacrifice or ritual activity more generally. Instead, working within these limitations we assemble the datable archaeological and historical evidence for object dedications to Ionian sanctuaries from the 7th/6th to the 5th/4th centuries BC,\textsuperscript{22} categorised broadly into exotic and local objects or dedicators.

**Dedications by foreign rulers recorded in historical texts**

For the archaic period Herodotos informs us about dedications made by foreign rulers.\textsuperscript{23} This includes the rebuilding of the temple of Athena in Assos near Miletos by the Lydian king Alyattes which according to Herodotos had been ordered by the oracle in Delphi.\textsuperscript{24} When accounting for the proposal Hekataios made on the eve of the Ionian revolt to use the Croesus' treasure housed in Didyma/Branchidai to build the fleet it is clear that this must have been a substantial donation as well.\textsuperscript{25} Independent evidence for Croesus' dedicating some of his wealth to the Ionian sanctuaries comes from inscriptions preserved on fragments from the marble

\textsuperscript{15} Panteleon 2015. The exploration of ancient Ionia started of course much earlier during the seventieth century with travellers from Europe. See for example the overview in Hill 2010.

\textsuperscript{16} Pausanias 7.5.4; Simon 1986; Arafat 2009; Günther 2012; Kowalleck 2019.

\textsuperscript{17} Cook 1961; Slawisch 2009.

\textsuperscript{18} Tozzi 1978; Murray 1988.

\textsuperscript{19} Slawisch 2009; Slawisch 2013.

\textsuperscript{20} There are clear differences between the Ionian poleis when it comes to the development after the end of the Ionian revolt: while building activities cease at many sites, work at the Artemision in Ephesos seems to have continued on a restricted level. cf. Ohnesorg 2007:128–32.

\textsuperscript{21} The last attempt to examine an exhaustive range of votive types from Ionia was undertaken by Simon 1986. Since then the material has multiplied through the investigation of - amongst others - the sanctuary of Aphrodite on Zeytinpe near Miletos.

\textsuperscript{22} There are objects that have been deposited during preceding centuries but contemporaneous literary or epigraphically relevant sources are lacking and dates are often disputed, e.g. Gimatzidis 2011.

\textsuperscript{23} Kaplan 2006; Crielaard 2015:353.

\textsuperscript{24} Herodotos 1.25.

\textsuperscript{25} Herodotos 5.36, 6.19.
base of columns that belonged to the Artemision in Ephesos and are now housed in the British Museum.²⁶ Herodotos furthermore mentions the Saite king Necho II who gave the sanctuary in Didyma/Branchidai the armour he had worn in battle and Pharaoh Amasis who dedicated two statues of himself to Hera on Samos.²⁷ Overall, it is not entirely clear what the intentions were or even to what extent these references are fact or fiction,²⁸ and if they are real whether these should be seen as an acknowledgment of the Greek gods and seeking their support and favour, intelligence gathering or as political statement by these non-Greek kings but it is remarkable that donations like temple buildings,²⁹ parts thereof or treasures are for kings to give. While we do not have information concerning the 5th century BC there is a noteworthy resumption of this tradition attested for the 4th century BC when Alexander III of Macedon financed the completion of the temple of Athena Polias for the Prieneans.³⁰

Dedications of 'exotic' and foreign objects found in archaeological contexts

Contemporaneous with the above-mentioned dedications by foreign rulers (regardless of whether this is in some cases only hearsay) a large number of non-local objects have found their way into the Ionian sanctuaries. Amongst them are metal items (e.g. figurines, parts of armour and harnesses, cauldrons) from Phrygia, Babylonia, Assyria, the Levant and Egypt. Examples are attested from the Heraion on Samos, the Artemision in Ephesos the temple of Athena in Miletos, Didyma/Branchidai and elsewhere,³¹ but not all of these groups appear in the same quantities in each of these sanctuaries. For example, there seem to be stronger links to Phrygia within the finds from the Ephesian Artemision and stronger links to Assyria and Egypt within the finds from the Samian Heraion.³² What the majority of the more 'exotic' metal objects have in common is that they appear primarily in sanctuaries with a supra-regional clientele in contexts of the late eight and throughout the 7th century BC but cease to be present after the mid-6th century. Explaining the appearance of 'exotic' metal objects in Greek sanctuaries is less straightforward as they circulated widely in the Near East and Greece embodying a range of meanings and functions.³³ However, as Crielaard convincingly argued these objects formed part of an aristocratic ideology at their respective places of origin and remained in the elite sphere throughout up to the point of their last deposition within the context of the Greek sanctuaries.³⁴

Another example of a rare, but reoccurring, item is the tridacnae squamosae. Salvaged from the Persian Gulf and the Red Sea the fluted giant clams were elaborately decorated somewhere in the Syro-Palestine region to be used as containers for makeup. Produced solely during the second half of the 7th century BC the vast majority of the known examples found in Greek contexts come from sanctuaries inter alia Smyrna, Samos, Milet and Ephesos in Ionia.³⁵ In comparison faience scarabs and perfume containers from Egypt, or Egyptian alabaster and glass vessels can be found more frequently and in higher numbers during 7th and 6th centuries BC in Ionian sanctuary contexts,³⁶ as are imports of fine wares especially small vessels like decorated

²⁶ British Museum Inv. 1872.0405.19–20. Dated to the years between 550 and 520 the inscriptions are restored as follows "King Croesus dedicated (this)".
²⁷ Herodotos 2.159.3, 2.182.
²⁸ On the latter see the example examined in Thonemann 2016.
²⁹ Kaplan 2006:140–52.
³³ There is a vast amount of literature on the subject (e.g. on the variety of interpretations around the 'exotic' metals found in the Samian Heraion see Kyrieleis 1979; Curtis 1994; Brize 1997; Bumke 2007.
³⁴ Crielaard 2015:363.
³⁵ Stucky 2007; Furtwängler 2011 with a list in note 12.
aryballoi and kotylai from Corinth.\(^{37}\) At the same time limestone statuettes and terracotta figurines from Cyprus occur in the assemblages of the Ionian sanctuaries.\(^{38}\) Far less abundant, but present, is Etruscan bucchero ceramic.\(^{39}\) From the early 6th century onwards until the 4th century Athenian pottery is frequently present in the Ionian sanctuaries but in varying quantities and styles. Starting with vessels in the black-figured and white ground style, pots decorated in the red-figure and black-glaze dominate from the second half of the 5th century.\(^{40}\) While the general appearance of a particular Athenian decorative style does simply reflect the stylistic developments in Athens through time, the fluctuations in quantity do not but we will come back to this point later.

*DEDICATIONS OF ‘LOCAL’-IONIAN OBJECTS FOUND IN ARCHAEOLOGICAL CONTEXTS*

‘Local’ objects are understood as those that are both manufactured within Ionia and circulate widespread throughout the region.\(^{41}\) Decorated pottery (i.e. painted fine wares or vessels with stamped surfaces) is omnipresent in the assemblages of the Ionian sanctuaries during the 7th and 6th centuries BC. Amongst those the best known are the so-called bird cups from north Ionia, relief and black-figured ware from Klazomenai, the kylifies on high foot from Chios or the jars and bowls in the so-called Wild Goat and Fikellura styles from Miletos.\(^{42}\)

Locally manufactured terracotta figurines were also widely used has dedicational objects throughout. Moreover it is possible to detect the introduction and abandonment of their usage as well as local preferences through time for the representation of particular types of animals and/or gods/goddesses.\(^{43}\) The variety of types and the overall quantity of examples decrease sharply in most of the Ionian sanctuaries after the end of the 6th century BC; this variety reappears after the mid-5th and throughout the 4th century.\(^{44}\) With the 4th century BC a new type of object dedications appears although in remarkably restricted numbers: the offering of terracotta objects resembling body parts that are often interpreted as thanking or hoping for medical help.\(^{45}\)

Metal objects like vessels, jewellery and weaponry are particularly common in sanctuaries with a supra-regional clientele. Here again one notes the issue of local preference: while Didyma/Branchidai is known for its abundance of weaponry (e.g. arrow- and spear heads, shields) the Ephesian Artemision is particularly rich in rings and belts.\(^{46}\) It is even possible that some of the workshops responsible for the creation and manufacturing of pottery, terracotta figurines, marble sculpture, and metal objects experimented in various ways to work with new ‘exotic’ materials, adapting materials, shapes, decorations that they encountered on non-local objects. This becomes clear when turning to the significant evidence for Ionian imitations of, amongst others,

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\(^{37}\) Gasser 1989; Dvir 2011.
\(^{41}\) This said, it is of course possible and even likely that, for example, black-figured pottery from Klazomenai was considered ‘special’ or ‘out-of the ordinary’ in south Ionia as the elaborately decorated Milesian Fikellura might have been for north Ionians but this specific question is not relevant for the issues addressed in this paper and will not be addressed in the overview.
\(^{45}\) Filges 2015, 96–99. Forsén 1996. The archaic ‘medical’ votives from the Ephesian Artemision listed by Simon (1986, 361) are miniatures made exclusively from precious materials such as gold, electrum and ivory but there is no evidence to suggest that they are related to the late Classical examples.
\(^{46}\) Kleeinder-Gauß 2007; Lubos 2009; Verčik 2018.
Corinthian and Athenian pottery, Egyptian faience and Cypriot terracotta figurines during the archaic period.\textsuperscript{47} All of which are evidence for the huge demand in these types of 'exotic' or foreign objects for dedication.\textsuperscript{48}

Another important group of dedicational objects was made from stone, often limestone or marble. Monumental statues, reliefs or items that are directly connected to rituals for example perirrhanteria are found in all of the Ionian sanctuaries in varying numbers, sizes and qualities.\textsuperscript{49} The vast majority were put up during the archaic period, in particular the second half of the 7th and throughout the 6th centuries BC and only very few examples can be attributed to the second and 3rd quarter of the following 5th century.\textsuperscript{50}

**Summary**

As this very brief but by no means complete overview demonstrates the variety of raw materials of objects, their types and their size differ enormously within the assemblages of any given sanctuary during the archaic period. Certain sanctuaries (the Artemision in Ephesos, the Samian Heraion, the Didymeion and the Sanctuary of Aphrodite on Zeytintepe near Miletos) can be characterised by their wealth of both their 'exotic' and local-Ionian dedications. Notable also is the abundance of metal objects, sometimes in the form of jewellery and costume related items as in the Artemision, sometimes in the form of weaponry as in the Apollo sanctuary in Didyma. The latter has often been explained by the fact that mercenaries from Ionia and elsewhere served in the Near Eastern and Egyptian armies,\textsuperscript{51} giving access to Near Eastern and Egyptian materials.\textsuperscript{52}

An enormous richness in numbers and diversity of origins best characterises the objects used for dedication in Greek sanctuaries during the archaic period. If the dating is correct, then all of this changes at some point after the middle of the 6th century and most abruptly at the beginning of the 5th century BC. At this point no 'exotic' and very few imported objects (limited to Athenian decorated pottery) are amongst the dramatically reduced assemblages. Athenian pottery is indeed the group where the reduction of object numbers and varieties can be witnessed very clearly, notably during the late 6th century and throughout the 1st half of the 5th century BC.\textsuperscript{53} No dedications in metal can be securely placed within sanctuary contexts of the 5th and 4th century and the overall quantity and variety of terracotta figurines is very limited; where we do find larger numbers they tend to be repetitions of one particular type.\textsuperscript{54}

**Dataset two: literary evidence**

Within the canon of Greek texts, there are 39 Ionian authors whose works date to the 7th through the 4th centuries BC (Figure 1, Figure 2). Of these texts, 41\% (i.e. 16 of them) are philosophical works, and philosophy represents the most frequent literary genre of Ionia in the period. Other genres of writing include elegy, epic, history, iambics, lyric, and rhetoric. At least one text was written by an author who came from nine of the Ionian city states (no evidence survives from Lebedos, Myous or Phokaia), and most of the textual evidence is concentrated around Miletos (12 texts), Samos (8 texts), Ephesos (6 texts), and Chios (5 texts).

\textsuperscript{47} Henke 2017; Webb 2019.

\textsuperscript{48} A second ‘wave’ of imitations, this time of Athenian black-glazed ceramic, can be traced from the late 5th century onwards in Ionia. However, these are more commonly found in profane contexts. cf. Cook 1965; Trinkl 2013.

\textsuperscript{49} Tuchelt 1970; Freyer-Schauenburg 1972; Baughan 2011; Rohau 2015.

\textsuperscript{50} Slawisch 2009.

\textsuperscript{51} Kaplan 2003; Verčík 2018.

\textsuperscript{52} Kaplan 2006:150-1; Crielaard 2009:61.


\textsuperscript{54} Kowalleck 2019.
Texts survive either in more substantial (Hekataios, Anaxagoras, Heraklitos) or fragmentary form (Anaximenes, Anakreon, Hipponax), sometimes via verbatim or indirect quotations by later authors. Herodotos, originating in the Doric city of Halkarnassos, is excluded from the analysis. The *Thesaurus Linguae Graecae (TLG)* online was used to access the texts analysed in this study, and statistical analysis was conducted via the native tools on this website.

Inscriptions are not analysed in this study. Although their inclusion would enrich and enlarge the dataset of words, the authors consider that inscriptions should be analysed in a slightly different way. In some places, the epigraphic dataset allows one to see the overlap between votives and written evidence, with texts relating directly to votive practice, or texts written on objects that have actually been dedicated. This paper, by contrast, is about looking very broadly at two completely different datasets (i.e. archaeological and literary evidence) and assessing the similarity or difference in the patterns that they reveal. One would need to use a different set of tools to look—at this ‘big data’ level—at the overlap between archaeology and text. This is a topic that the authors hope to return to in a follow-up study.

**Methodology: lexicometry**

Lexicometry concerns measuring the frequency with which words occur in a text or collection of texts. Lexicometrical methods might variously count the total number of occurrences for a given lexeme across a whole corpus, or they might be used to identify the distribution of certain items in different parts of a text. Moreover, this sort of corpus linguistic analysis can also be used to identify inflected or compound forms of target lexemes, to find commonly co-occurring words, and to locate the position within an utterance or semantic unit that the lexeme most frequently takes.\(^{55}\) Developments in the digital humanities—namely, the digitisation of text corpora now available in big data text repositories, and the production of computational text mining and lexical statistical analysis packages—\(^{56}\) have led to an increase over the past twenty years in the number of studies employing these methods. The general priority, though, remains the same: to conduct semi-automatic analysis on word frequency data, such that one obtains a ‘bird’s eye’ view of distribution patterns across a given corpus.\(^{57}\)

Frequency analysis does not just involve the generating of data for data’s sake. In the first instance, lexicometry can be used as a preliminary and heuristic form of analysis, used somewhat ‘neutrally’ to identify and hone sets of questions about a text that might then be answered by a different sort of (closer) analysis. On the other hand, corpus analysis can be used—as it will be in this paper—to explore certain sociological patterns. An example of this sort is given in the study of Amelie Kutter, conducted as part of the project ‘Cultural political economy of crisis and crisis management’.\(^{58}\) One objective of this project involved exploring how journalists reported the financial crisis between 2006–2010, and taking the vocabulary which they used as representative of wider socio-cultural reactions to various economic policies. Kutter analysed the language of thousands of columns in the financial pages of various newspapers, identifying lexemes frequently used at key moments of the crisis: she was able to suggest on the basis of her data that a ‘crisis narrative’ began as early as 2007 and persisted largely unchanged until 2010.\(^{59}\) Such a model could then be tested with closer-reading of the corpus used. This does, of course, imply a particular relationship between language (specifically *written* language) and society. Namely, that there is a direct link between the interests of a society with

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\(^{55}\) McEnery and Gabrielatos 2006; Miner et al. 2012:esp. 43–51.

\(^{56}\) Wiedemann 2013.


\(^{58}\) Jessop 2013.

the words that they use, and that these social vocabularies become somewhat standardised and cemented in the sociolect over time. By extension, when the concerns of a community shift, it is implied that the common vocabulary used will change at the same rate, a point which linguists and sociologists might more readily wish to contest.

Clearly, there is a large interpretative jump between frequency analysis and sociological patterns, and a methodology is required that blends pure quantitative analysis together with a critical qualitative review of the data. Critical is the issue of reducing lexemes — vehicles of semantic meaning — to ‘numbers’, whose total count can be measured. Here the decisions which the researcher takes impact most directly the story on which the analysis actually sheds light. Namely, the researcher must define the scale and extent of the corpus to be investigated: will only one text be analysed? If multiple texts are collected, are these selected because the researcher deems they might yield interesting results, or is the dataset assembled more ‘neutrally’? What tools will be used to conduct the analysis, and how much impact does the researcher have in manipulating these tools and re-running the analysis? Crucially, what hypothesis is posited before the analysis is conducted, and how precisely can frequency data engage with this model?

One solution to this challenge is to carefully select target lexemes and measure how their distribution changes over time. This might reveal not only how ideas or concepts were more or less popular at certain times in the general sociolect, but it could also reveal patterns concerning the broadening or narrowing of meaning in a general semantic field. In particular owing in recent years to the digitisation and open-access hosting of a great number of texts by Google (explorable via the ‘N-grams’ tool, https://books.google.com/ngrams/info), there have been a number of recent studies that have explored lexical and sociological changes in this way. Case studies have measured the changing distribution of items in the English language over time, but have also evaluated critically the weighting of lexeme counts vs the size of the corpus analysed, and the issues involved in analysing only a ‘partial’ dataset (i.e. only a sample of the entirety of English literature, being a small percentage currently digitised and freely available). Moreover, some scholars have warned against giving too much interpretative weight to (red herring) ‘patterns’ if neither they nor the nature of the evidence are contextualised properly.

Undoubtedly it is problematic to apply directly a method designed for contemporary datasets to a quite different ancient dataset. The contemporary world is awash with new text created and consumed every day, with statistics suggesting that 86% of the worldwide adult population is literate; in the ancient world, by contrast, text was written (for the most part) by elite males for elite males. Furthermore, ancient text was written within a literary register within a literary language, and it is much more difficult to find behind these

60 Brown 1958; Pyloes 1964:16; Eastman 1975.
62 Drouin 2014; Lemke et al. 2015.
63 cf. Fairclough 2014.
64 The nature of each language must also be considered. In the case of the ancient Greek language, apart from instances where words of importance are moved to the start of a clause for emphasis or where poets might juxtapose certain items for effect, the position of a lexeme within an utterance is not necessarily central to overall meaning, owing to the nature of Greek as an inflected language. By contrast, inflection is an important factor to consider, as is the nature of Greek to compound words.
66 Michel et al. 2011.
67 Risi.
69 Pechenick et al. 2015.
texts the sort of everyday and lower-register language that we might be able to find more simply today in, for example, newspapers, text messages, or social media posts. Can a corpus-based study of the ancient world really show us the general mood across society, or does it merely show the range of words used by and selected for this particular audience? Moreover, there is the issue of dataset size. The volume of contemporary written information is growing exponentially, while the amount off text available from the ancient world (and particularly from just one region, i.e. Ionia) is a corpusule by comparison. This relates, of course, not only to the rate of production of ancient text, but also to the fact that the ancient literature that survives to us has been selected: it is by no means an unbiased dataset. Should all of these mitigating factors deter us completely from analysing ancient literature through a lexicometrical lens? Not necessarily. Corpus-based linguistics studies conducted on modern-day datasets are certainly ‘Big Data’ in size; for ancient literature, we can use ‘Big Data’ tools and methods, even if the size of the dataset itself is on a much smaller scale. These tools will help to reveal broad patterns in the data; even if we cannot place as much confidence on the statistical output of lexicometry modelling as one would with a contemporary study, we can still use the results of analysis to inform further discussion.

Assessing the broad-scale distributions of words over time is not an entirely new idea to studying the ancient world. In the 1960s and 1970s, Arthur Adkins first in *Merit and Responsibility: A Study in Greek Values* (1960) and subsequently in *Moral Values and Political Behaviour in Ancient Greece: From Homer to the End of the 5th century* (1972) analysed the ancient Greek language from Homer (c. 8th century BC) down to the end of the 5th century. His purpose was to explore how language reflected changing social patterns among Greek speakers, namely with regard to their (changing) notions regarding certain moral values. He concentrated in particular on the concepts of ἄγαθος (good), ἀσχημόν (shameful), δίκαιος (righteous), κακός (bad), and καλός (fair); and εὔνομα (good order), νόμος (custom, convention), and φό̂σις (nature, quality). He concluded that, on the basis of lexemes’ co-occurrence with other moral indicators and on the contexts in which words were used in both law-court speeches and moralising choral odes, there was indeed a semantic shift in the use of moral vocabulary towards the end of the 5th century. Specifically, his analysis revealed that there was a shift away from combative virtues to individual and social responsibility: he notes that even though flavours of the ideology from the time of Homer persisted into the 5th century, a lesser focus on retribution as served by the gods and a greater presence in society of the law courts was a driver of these changes. Essentially, his study was one of lexicometry, employing a middle-range approach that looked both at the pure distribution of words, but also at their meanings in context. And his methodology, far from it being automated or computational, was purely analogue.

Two other keys studies of the mid twentieth century are worth mention here. First the work of Bruno Snell, *Die Entdeckung des Geistes*, published first in 1946 and collecting together essays of Snell that had previously appeared elsewhere. Snell traced the development of ‘rational’ thought in Greek literature, arguing in particular that the predominance of first epic, then lyric poetry, then drama marked clear stages in the history of intellectual thought. This narrative is most clearly defined in the 7th chapter of the book, ‘Mahnung zur Tugend. Ein kurzes Kapitel aus der griechischen Ethik’, taking one from Homer to Socrates. Snell particularly focuses in this chapter on the words that encapsulated these shifting concepts, namely ἀρετή and σωφροσύνη, while the subsequent two chapters trace the development of vocabularies of poetry and science. The two main points of this thesis are in agreement with Adkins: Greek thought was changing between the

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71 Definitions given here and used throughout the rest of this paper are taken from Liddell and Scott 1889.


73 Also Adkins 1972:46–57.

74 Also Adkins 1972:103–11.
7th and 4th centuries BC with a lean towards personal morality and virtue; and the vocabulary of Greek changed in response to this sea change in thought.

The second additional study is the landmark work of Eric Dodds, *The Greeks and the Irrational*, published in 1957 and both collecting and expanding on a series of lectures delivered at Berkeley University in 1949. Although he argued that ancient Greek thought went through similar changes to these that Adkins would describe a few years later, his methodology was the reverse of Adkins’. He identified first broad-level social patterns, and then refined these by looking at the semantic meaning of various words in different time periods. Dodds’ main thesis was that the world of ‘rational’ thought of Classical Greece, characterised largely by the writings of the Platonists, was preceded by a much more ‘irrational’ period. He begins with Homer, with Achilles’ outbursts in the *Iliad* attributed to loss of rational thought and an ἄρπη sent by Zeus. He then charts how the shame-culture of Homer’s world became a guilt-culture in the archaic period, when words formally morally neutral such as μοῖρα and δοκίμον took on a new social meaning, before postulating that in the 5th and 4th centuries, as belief in an daemonic world and its its of unexplained irrationalism subsided, the more ‘rational’ ideas of Platonism began to take shape. This trajectory is largely similar to that of Adkins: there was a trend in the 5th and 4th centuries towards a greater social responsibility and moral virtue than had come before.

Relatively few studies since have addressed changes in social patterns by assessing broad-level vocabulary shifts in the way that Adkins did. In part, this is in response to some of the lukewarm reviews that Adkins received, in general throwing scholarship back towards close-reading of select passages. Shorter article-length studies by both Long and Creed paid direct respect to Adkins and his methodology, focussing on narrower time-slices, respectively only on the literature of Homer (c. 8th century BC) and on Thucydides (5th century BC). Connor took a similar but markedly different track: deconstructing the idea of ‘political parties’ in classical Athens he analysed the political language used in various contexts to try and identify different types of individual or collective political affiliation. His methodology was not diachronic, as such, but focussed on finding associated semantic meanings of similar lexical items. The most direct successor of Adkins and his work, it can be argued, was Walter Donlan. Donlan both studied the particular development of certain words and *formulae* and also conducted his own survey of the changing social vocabulary of the 5th century BC (1978), exploring further the patterns that Adkins had identified. He noted that as the vocabulary of ancient Greek expanded between the 7th and 5th centuries BC, whereas earlier there had been few words available to denote high or low status by birth, ‘vocabulary of distinction’ grew considerably in the 5th century. This he attributed to the long-term development of the sophistic movement, and the increasing tendency for polemical debate: traditional categories came under scrutiny and new ways of expressing certain concepts were required. But studies of this sort have been few in number. While it is clear that a broad study of vocabulary can indeed reveal broad social patterns about the ancient world, and while it is also clear that new methods and tools available for lexicometry are widely available, vocabulary-driven sociological studies of the ancient Greek world are rare and their potential have been thus far underexploited.

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75 We refer in the following review to vocabulary studies that relate to *changes in social patterns*. This is quite a separate topic to unpicking the vocabulary of Greek religion and various religious practices (e.g. gift-giving or sacrifice), on which there has been substantial work, e.g. Rudhارت 1958, Casabona 1966, Parker 2004b, Jim 2014. In a similar way to Adkins, Sakellariou 1989 (with criticism by Snodgrass 1991), Hansen 1995 and 1997 and Hansen and Nielsen 2004 have discussed definitions of the term *polis*, variously thought to be a physical political entity like a city or a conceptual entity like a community with shared ideologies. But this is more about understanding the evolution of certain institutions over time, rather than on changes in social attitude, as discussed in this paper.

76 Green 1974:108.
78 Connor 1971.
Analysis

This section evaluates the archaeological pattern identified above in light of lexicometrical analysis, as conducted on 39 surviving texts originating from Ionia between the 7th and 4th centuries BC. Specifically, it looks at the changing frequency through time with which words semantically connected with gods and men are used, and tries to relate these to broader changes in society and its attitudes to the divine.

Obviously, lexicometrical analysis of a modern and an ancient dataset is quite a different affair. The modern world is saturated by text, and both the literary output of the ancient world and its chance survival is, by contrast, hardly ‘Big Data’ by the same order of magnitude. Furthermore, while a lexicometrical study on contemporary data can look across texts produced at a range of registers for different sorts of audiences, ancient literary text comes from a largely elite male world, written specifically for that same male world. Any results must be evaluated, therefore, with these parameters in mind. However, as outlined above in the discussion of Adkins and others, it is productive to chart vocabulary changes over time despite the limitations of such a literary dataset. Furthermore, given that part of the interest of this paper is methodological, it is productive to bring ‘Big Data’ methodologies to the data, whatever its state, and see what patterns emerge.

Another issue is one of genre. Genre clearly affects vocabulary.\(^{80}\) One expects the relative frequencies of certain words, the diversity of words, and the usage of certain technical terms to vary if looking at elegy, or philosophy, or scientific text.\(^{81}\) This is a concept that is relevant to both contemporary and ancient texts.\(^{82}\) Clearly, in a dataset such as the present one in which different time slices are better or worse represented by various genres, then we expect different word frequencies and that the results of each century might be ‘weighted’. In this study, the genres of the four centuries are not distributed evenly (contrast, for example, three elegists of the 7th/6th centuries [Kallinos, Minnermos and Phokylides] vs only one of the 5th/4th centuries [Ion]). The result is that the dataset of each century is different not only in content but also in fundamental substance. The discussion of any patterns identified, therefore, must be evaluated in light of the nature of the dataset.

The first step, however, involves identifying words that are suitable for analysis. Quite obviously, the clearest large-scale diachronic patterns will emerge when the lexemes are analysed that are the most common in the whole corpus (i.e. the most common across all authors analysed). To identify this set of target lexemes, a list of the 100 most common words from the 7th to 4th century authors was generated using the tools of TLG (Figure 3). From this collection, we chose 27 items that were most relevant semantically to the question posed above, namely concerning the changing relationship of men and gods between the 7th and 4th centuries BC. These words were connected generally to the themes of gods and men, of nature and landscape, and of self and being. It was from this list of words that lexemes were counted in the target authors’ texts.

The methodology used in this paper has been designed with the specific dataset of Ionian texts in mind. Namely, one must take account of the systematic and random holes in the corpus, resulting both from authors whose works have been lost entirely, and also from authors whose work survives in only a few fragments (compare, for example, c.13000 surviving lines of Hekataios vs c.35 lines from Bias of Priene). In-

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\(^{80}\) One might argue there is some circularity here, that it is in fact the use of different sorts of lexicons is just one of a range of factors that allow us as readers to identify different genres of writing.

\(^{81}\) Biber 1988; Biber 1995:9; Olinghouse and Wilson 2013.

\(^{82}\) Palmer 1980: 83ff; Tribulato 2010.
steady of looking at discrete counts of words found in the corpus, the rate of a lexeme’s appearance was measured relative to the overall quantity of discrete words used in the text surviving from a given author (cf. Risi), where the appearance of each lexeme was scored as a fraction on a scale of 0–1. In the above example, a target lexeme recorded as appearing once in Bias—an author whose works comprise 21 discrete words—would have a score of 1/21, whereas the same word appearing once in Hekataios—who uses 2775 discrete words—would be give a score of 1/2775 (if the lexeme appeared five times, it would receive scores of 5/21 and 5/2775 for each author respectively, etc.).

A raw count was obtained for the target lexemes in the works of each author, which was then converted to a fraction on the basis of the calculation outlined above (Figure 4). The aggregate score for each century analysed was then collected (i.e. 7th, 6th, 5th, and 4th centuries, Figure 5). Purely to help sorting the data and visualising the patterns generated, the target lexemes were divided into six (roughly semantic) groups: terms relating to gods and men (ἄθανατος, ἄνθρωπος, γάνος, Ζεύς, θεά, θεός); verb forms (διδόμι, θηνήσκω, οἴδα, πάσχω, τίθημι); terms relating to the body or mind (μοίρα, νόος, σῶμα, φύσις, ψυχή); terms relating to the state (βασιλεύς, δίκη, νόμος, πόλις); terms relating to moral values (ἀγαθός, δίκαιος, κακός); and terms relating both to description of the world and of activities that take place within it (γῆ, ἔργον, ἥλιος, χρύσεος). Finally, the usage of each of these lexemes was plotted against an axis of time, according to these six categories (Fig 2).

Century dates have been taken as they appear ascribed in the TLG. In a number of cases, author dates straddle a century boundary (e.g. 7th / 6th century BC): counts for these authors have been allocated to both centuries in which the author appears. This accounts for some of the temporal uncertainty of ascribing authors to particular dates, and also considers that any temporal categories or boundaries discussed are in some senses rather arbitrary constructions that mask a continuous temporal pattern, such as will be considered further below. No Ionian authors are designated by the TLG as originating for certain in the 4th century BC: they are only listed, at best, as ‘5th / 4th century BC’. One must note, therefore, that any word counts for the 4th century are double counted from the 5th century. Again, as long as our focus is long term continuous temporal patterns, this is not an issue: but we might place less significance on changes specific to the 4th century BC.

In most cases, weighting the results relative to the total volume of text changes the pattern when compared to raw vocabulary counts alone (cf. Figure 6). For example, with regard to the usage of verbs, the word οἴδα and its inflected forms seem to appear in their greatest number of times in the 6th century BC (more than 40 instances, if one considers only raw counts); however, when this figure is weighted relative to the total volume of text analysed, the aggregate score is higher in the 5th century BC (a weighted score of just over 8). In terms of both total occurrences and weighted scores, the vocabulary of the 6th century BC tends to score highest of all periods analysed (note in particular items like ἄγαθός, κακός, πόλις, θεός, γῆ and ἥλιος, Figure

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83 This does, of course, take some epistemological assumptions about the dataset. Namely, that the distribution of words in our sample of text is completely representative of an original population of words in the ‘complete’ dataset of Ionian texts. On the other hand, weighting the results like this helps to prevent encountering a picture skewed by authors whose texts survive in more significant quantities.

84 As this is a first ‘exploratory’ analysis of the methodology used, uncertainty is not taken quantitatively into account. It is clear that 1/21 is less representative of lexeme occurrence than 132/2775 (i.e. because there is a larger sample size) even though they both produce the same fractional index.

85 Some of the case studies quoted above (in particular the N-Gram studies) are accurate to units of one year. While precision like this sheds greater light on the diachronic pattern, it is not possible in this particular case. For many authors, we cannot be more precise about when they were composing their texts; and the total number of datapoints is such that were authors plotted against individual years, there would be too many ‘empty’ data points for years in which we have no authors recorded as composing texts.
7). This not only indicates that most of the data for analysis comes from the 6th century BC, but it also reiterates a point noted above by Adkins and Donlan that the vocabulary of ancient Greece became significantly richer and larger from the 5th century onwards: each author used a greater range of words from this point onwards, so the weighted score as a fraction of all words available decreases from this point onwards. This trend continues into the 4th century BC. Overall, in interpreting these results it is important to note not only the basic shape of each of the graphs produced, but more crucially the points at which the lines overlap, i.e. at what times certain items of vocabulary were used in greater preference to others. On the basis of the above discussion, these are the key indicators of much wider social changes within Ionia at these times.

The results relating to vocabulary of gods and men indicates that there was a sea-change in the use of these words between the 6th and 5th centuries (Figure 6). Moreover, it is not just that this is a critical point, but that the 6th century BC represents a peak, after which there is a gradual decline in the usage of all terms.

Two concepts in particular experience an altogether downward trend in usage overtime, namely γένος and Ζεύς, both decreasing from an average weighted usage score of 4 to just above 1 between the 7th and 4th centuries BC.

Let us take each word in turn. The primary meanings of γένος concern ‘race’, ‘descent’, and ‘age’ or ‘generation’. It has already been suggested that progressively throughout ancient Greek history, Greeks became less interested in the values ‘inherited’ through lines of noble birth, and this may indeed be reflected in a disengagement with the concept of γένος. The character of Ζεύς, the Olympian king of the gods, is one who also received less attention over time. This can be attributed, in part, to genre. Framed by the worlds of epic (Asios of Samos), elegy (Mimnermos of Kolophon) and lyric (Anakreon of Teos) in the 7th and 6th centuries BC, the philosophers (such as Anaxagoras, Heraclitus, and Xenophanes) kept Zeus in view while they puzzled out the mysteries of the universe: being part of their literary world he was thought to directly or indirectly influence the moral domain, by contrast, in the 5th and 4th centuries BC Zeus appeared nowhere in the philosophical texts of Ionia. Moreover, given that he was no longer a major literary figure in Ionia and that he was becoming a less familiar figure to the society and to its thinkers, the role he played in Ionian philosophy was consequently somewhat smaller. In both of these cases, it is possible that different priorities of authors were shaping the vocabularies of their texts, and that different themes were becoming a priority in the 5th and 4th centuries BC.

The analysis conducted here suggests that vocabulary relating to the world of the gods and men changes in three main ways over our period of study. First, there is a general increase in the use of terms over time with a peak in the 5th century BC, followed by a sharp decline in usage for the 4th century BC (Θεός, ἄνθρωπος, γένος); a steady increase in the use of terms over time with a peak in the 5th century BC, followed by a more gentle tail-off in the 4th century BC (ἄθανατος, θεία); and a general steady usage over time in the 7th, 6th and 5th centuries, with a sharp decrease in usage in the 4th century BC (Zeus). As noted above, the decrease in usage of terms in the 4th century BC might be a genuine pattern, or it might be a result of the data mining process: that many of the results of the 4th century BC are from authors who dates are shared with the 5th century BC, wherein word counts are ‘double counted’ —this is an edge effect, and it should not distract from the main subject of this paper, which is the transition between the 6th and 5th centuries BC. In any case, the main pattern is consistent: the vocabulary of gods and men increases over time to a peak in the 5th century BC: and the semantic world of the 6th century is significantly different to that of the 5th century BC.

86 Donlan 1978.
These downward patterns are in contrast to the general upward trend demonstrated by ‘moral’ vocabulary (Figure 3c), whose usage increased in the 5th and 4th centuries BC. Both σῶμα and ψυχή were used for the first time in any great number in the 5th century BC, while the concepts νόος and φώς were popular items across the transition between the 6th and 5th centuries BC.88 Concerning its meaning, σῶμα can be a literal and physical ‘body’ (cf. also a ‘corpse’), but can also refer more generally to the concept of a body as opposed to the ‘soul’ (Liddell and Scott in their dictionary entry for σῶμα refer specifically to the word in opposition to ψυχή). The meaning of ψυχή is less ambiguously connected to moral philosophy (primary meanings ‘life’, ‘spirit’, ‘the soul’), and its ubiquity in the 5th century BC demonstrates a new fascination with human virtues and characteristics. Even though both νόος and φώς were in decline in their usage between the 6th and 5th centuries BC (with weighted average scores of 6 then 2 and 6 then 5, respectively), their decline in usage is not as dramatic as that of μοίρα (from a weighted average of 4 to 0.5). To put this another way, vocabulary concerning the nature of immutable fate as ordained by the gods on high (i.e. those things over which humans have no control; μοίρα being ‘lot’, ‘destiny’, ‘fate’, ‘doom’) became a less prominent part of the general Ionian sociolect, while, by contrast, the nature of the mind and the soul took precedence (i.e. those things over which humans do have control; νόος being ‘mind’, ‘a thought’, ‘purpose’, ‘resolve’, and φώς being ‘one’s nature’, ‘order’, ‘disposition’, ‘property’). While all of these items of vocabulary were concerned with intangible ideas and were generally used in consistent numbers throughout, there was a slight leaning towards the use of terms expressing ideas on the nature of human being.

There is also a peak usage period around the 6th and 5th centuries BC for certain items of vocabulary. This concerns words to do with the state (Figure 3d) and with citizens (Figure 3e), wherein πόλις (with a weighted average of nearly 20), ἀγαθός (weighted average 8.5) and κακός (weighted average 6.5) are all key items of vocabulary. One should perhaps not be surprised by this: the end of the 6th century was a key moment in ancient Greek history for population growth and urbanisation during which communities of Greeks organised themselves into new political units through a process of state formation.89 It is to be expected, therefore, that authors were reflecting on these changes in society: even as far back as the nineteenth century in the dictionary entry for ἀγαθός, Liddell and Scott note that the meaning of ἀγαθός changes over time, and that the ἀγαθός of Homer (8th century BC) is not the same as the ἀγαθός of Aristotle (4th century BC). Furthermore, as discussed above, Adkins and Donlan (and, albeit in a different way, Dodds and Snell) have both argued that these words were not deployed neutrally, but that it was throughout this period that societies were struggling with the meanings of these terms: to be ἀγαθός or κακός was no longer to exhibit an innate heroic characteristic but to develop a personal moral responsibility.

Discussion

The principal research interest of this paper is whether the methodology used allows us to shed further light on ancient religious practices and belief. The success (or not) of the methodology, therefore, hinges on whether or not we can now say something more about the history of Ionia, and so we must turn to the more substantive historical conclusions.

88 Although these three items have lower weighted scores in the 5th century BC than in the 6th century BC, they are still considered ‘important’ terms relative to the overall corpus, as we note here that the lines on the graph for these lexemes do not cross over at this point, i.e. no one term is ‘replaced’ in the general sociolect by a more significant and more popular term.

There are certainly broad changes in the vocabularies used by authors right across the corpus of Ionian texts between the 7th and 4th centuries BC. This is shown by the changing weighted frequency of common vocabulary items, for which there are clear diachronic patterns. First, there is a decreasing usage over time of words relating to gods, divine fate, and to noble birth—with notable peaks in the 6th century, followed by gradual changes in the 5th and 4th centuries. Taken together, these are words that represent a world beyond human control: a world influenced by the divine. It is certainly possible that over time Ionian society began to reject this idea, and as their thoughts turned away from the divine realm of the gods so too did the language their authors used.

Second, there is a pattern concerning an increased use of the vocabulary of moral virtue. The development of critical thinking concerning the nature of human being in the 5th century BC has long been discussed by scholars, and certainly in the context of the so-called ‘Ionian Enlightenment’ — the florescence of scientific and philosophical thought in the region, particularly in the 6th and 5th centuries BC — it has been suggested that philosophers from this region played a significant part in driving that sea-change. Moreover, the data discussed above suggests this was a continuous trend between the 7th and 4th centuries BC, and that such a change was not marked suddenly at the start of the 5th century BC. It is tempting to read this pattern in light of the first: namely, that as interest in the world of the gods diminished, an interest in human characteristic took its place.

How does this compare to patterns observed in the material record? There is an increase of imperishable objects starting during the late 8th century BC, a peak during the 7th and 6th century BC and a drastic decline at the beginning of the 5th century BC. To take completely ballpark figures, the number of published ceramic sherds available for study from the Samian Heraion are in the order of 1259 for the 8th century, 2848 for the 7th century, 2966 for the 6th century, 384 for the 5th century, and 170 for the 4th century. Mapped literally against the patterns of language, one notes the striking similarity of material and linguistic trends (Figure 8, with ratio adjustment to allow linguistic and material patterns to appear together visibly on the same graph). When, during the second half of the 5th and the 4th centuries, the number of objects increases again the total amounts are still less than the peak of the 7th-6th centuries BC. In addition the ‘exotic’ objects of foreign provenance seems to have been replaced by objects of local manufacture made of less precious raw materials (e.g. preference of clay over metal). This points to a substantial change within the formerly well-established tradition of gift giving, and calls for a further explanation.

We might try to account for the simultaneous changes in the literary and the material record in a number of ways. From a local Ionian historical perspective, the temptation is to attribute this fundamental change to the economic depression the region experienced during the 5th century, as a result of the Persian wars or Athenian suppression. But it has to be pointed out that the observed general development is by no means a phenomenon that is restricted to Ionia. Seeking the cause of this complete abandonment of earlier traditions of ‘worship’ or interaction with the gods cannot therefore be sought only in ‘pinpoint’ historical events but instead in wider economic or social processes. Quite clearly, we cannot rely on geography alone.

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90 Note that this is very clearly a change in *literary* language. It is beyond the scope of this study to evaluate how language changes in the epigraphic record over the same time span.
91 Graham 2013; Boylan 2015.
93 Cook 1961; Osborne 1999.
Second, we might reflect on the dataset and conclude that this is a ‘false’ pattern created by variable visibility. In the publication of the small finds from the Ionia sanctuary near Philia in Thessaly, Imma Kilian-Dirlmeier first proposed that the lack of 5th century votive deposits in Ionia was not a result of changing cult practices at all, but instead of rising levels of looting and removal of finds which nonetheless continued to be given. Heide Frielingshaus too has suggested recently that the transformation was not in the number of votive gifts, but their destination: whereas in the Archaic era, large sanctuaries received the bulk of dedications to the gods, from the Classical era onwards, gifts were deposited in smaller shrines—difficult for us to identify or excavate. Could it just be there was very little changed in absolute dedication numbers between the Archaic and Classical periods, but it is our ability to retrieve and interpret the evidence that has changed. While this must certainly remain a possibility, we consider for two main reasons that this is unlikely to be the case. First, while it would be somewhat remarkable for this widespread change in votive visibility to have been made between just a few sanctuary sites, to see this happen between all the sites of an entire region seems to indicate there is something more going on here than just chance visibility. Furthermore, we noted above that this pattern is consistent across much of Ionia at this time: must we really assume that dedication remained the same but that visibility changed so dramatically everywhere across the Aegean so simultaneously? Second, and perhaps more significantly, the pattern identified in the (partial and selective) material dataset is strikingly similar to the pattern identified in the (partial and selective) literary dataset. Of these two very different corpora, subject to entirely different factors of preservation and loss, are we to assume that it is down to complete chance that the diachronic patterns resemble one another so closely? It would seem that, all difficulties with the dataset put aside, there is something historically significant about these changes between the 7th-6th and 5th-4th centuries BC. The key question then remains: exactly what processes transformed the relationship between humans and gods, and how can we use the evidence to better describe and delineate this phenomenon more precisely?

The notion that changing dedication practices depend on social change is not new, and discussion of such a phenomenon has been of interest to archaeologists periodically for some time. Anthony Snodgrass’s review examined a wide range of potential explanations, emphasising the importance of economic and social factors after observing a shift from so-called ‘raw’ towards ‘converted’ dedications. A ‘raw’ dedication is an unmodified object of real, secular use; by contrast a ‘converted’ dedication is a conversion of parts of the dedicatee’s wealth into the creation of a statue group or alike suitable only for dedication. Brita Alroth reiterated the probable role of changing social structures (albeit of an under-defined nature), and argued that votive practices changed in response to this.

What is new here is that the lexicometrical analysis helps to identify some of the social changes that might have been responsible for the restructuring of religious practice. Namely, around the end of the 6th and start of the 5th centuries BC, at the same time as the vocabulary of the gods and the immortals was in decline, there was a major spike in the usage of words relating to the state and its citizens. As noted above, Ionia at this time—as the rest of the Greek world—was undergoing structural-political changes for the ways in

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95 Archaeological visibility is always challenging, but archaeologists are [epistemologically] driven to assume “stasis” as the default human state, and tend to focus on problematising change, i.e. ‘why did something change?’ We should sometimes ask: ‘why shouldn’t things change?’ The assumption of long-term continuity in religious traditions might be simply the wrong approach, and perhaps we should think about shorter temporalities (e.g. van Nuffelen 2016:357). An aspect that is particularly important when it comes to the exceptional wealth and overfill of Greek sanctuaries as described by Pausanias (7.5.4.; e.g. Araf 2009) and its implications in regards to maintenance and long-term storage.

96 Kilian-Dirlmeier 2002:197.


which its communities were organised. Communities formed larger and more socially complicated political units than had existed previously in previous centuries.\textsuperscript{99} While this is not the place to involve ourselves with the problems of defining and characterising political units,\textsuperscript{100} it is indisputable that the size and organisation of Ionian cities became more complex between the 7th and 4th centuries BC.\textsuperscript{101} Extensive excavation across a number of urban sites in the region confirm that such changes in societal organisation were widespread across Ionia between the end of the 6th and start of the 5th centuries BC.

Why should a widespread change in the complexity of societal organisation affect religious dedication practices? Throughout Ionia and other regions, clearly the arbiters of authority and power change between the start of the Archaic and the end of the Classical period. No longer was power concentrated in the hands of a few ‘bigmen’;\textsuperscript{102} as the first lawcourts and written laws were established to choreograph the movements of communities.\textsuperscript{103} As legal power became more tangible for councillors, jurors, and even ordinary citizens,\textsuperscript{104} people’s relationship not only with that power but also with the wider-world changed. Communities were becoming progressively less subservient to a privileged few, and their members were experiencing more personal relationships with power and responsibility.\textsuperscript{105} As a consequence, communities could turn to moral concepts such as ὀγαθός, δίκαιος, and κακός\textsuperscript{106} — those discussed above, i.e. items of vocabulary whose occurrence in Ionian texts increased over the later Classical period — as an outlet for exploring these new personal and social responsibilities; and it was against this transformed world that the florescence of moral philosophy in the 5th and 4th centuries BC took place.

Although what follows here is necessarily conjecture — owing to a paucity of direct sources — the explanation which we propose is in any sense consistent with the evidence we have presented from across various sources. Crucial to our story about votive dedication practices were power relationships between individuals and their communities’ social fabric. In the ‘olden times’, these were the gods of myths and legends (Zeũς, θεά, and θεός) and the unseen forces that permeated the physical and invisible world (γῆ, ἔργον, ἡλιος, and χρόνος). Communities felt obliged to make offerings to higher forces: power was something fairly intangible and out of reach, while votive dedication served to placate invisible but omnipotent power-holders. But from the 5th century BC onwards, the Greek world (or at least the literary Greek world, in any case) attained a new relationship with concepts of power, morality, and the self, based on the restructuring of community-level political units. This brought an increased social awareness on metaphysical concepts of μόρα, νός, σῶμα, φύς, and ψυχή, while interest in the ‘old ways’ of the gods were in decline. Against this backdrop, communities were less inclined to make dedication, as concepts of belief were beginning to change.

Clearly, we cannot attribute these sorts of religious changes to monocausal factors, and even if variables seem related they are not necessarily linked. What the preceding discussion does, however, is help to make

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\textsuperscript{100} Most recently Routledge 201; Taylor and Vlassopoulos 2015; Whitley 2015.

\textsuperscript{101} cf. Herda 2016.

\textsuperscript{102} Donlan 1985; Morris 1991:40–4; Davies 2018:60–3.

\textsuperscript{103} Whitley 1997; Gagarin 2013; Duplouy 2018. We pass over specifically ‘sacred law’, a category of evidence whose very definition has been deemed unsatisfactorily defined, cf. Parker 2004a; Lupu 2005; Carbon and Pirenne-Delforge 2012; Petrovic 2015; Taylor 2015. Although itineraries of dedication and votive gifts could be productively studied in qualitative terms, both the evidence and synthesis are so partial and fragmentary that this dataset cannot feed productively into our quantitative assessment.

\textsuperscript{104} Funke 2007; Bleicken 2008; Lewis 2008; Papakonstantinou 2008:93–9.

\textsuperscript{105} Osborne 2010:96.

\textsuperscript{106} Interestingly, as usage of δίκαιος increases between its usage in the 7th and 6th century, and in the 5th and 4th century, at the same time there is a decline in usage of δική, formed from a cognate root. It is not so much that these concepts disappear or are replaced entirely; rather the ways in which they were expressed changed: here from a purely abstract concept that could be described as a noun to an adjective that could be attached to a specific person or group.
some sense of these distinct patterns which we have identified in two very different datasets (i.e. the material and the literary). There are, indeed, changes at the level of the community. The data analysed suggests that the vocabulary of the Ionian authors was shifting right from the 7th through the 4th century BC; in the same vein, the changes in societal organisation characterised by state-formation and urbanisation were not instantaneous processes of the 7th and 6th centuries BC but transformations that took place over a much longer period of time. This is not a phenomenon that took place on a local scale, nor can we attribute change to the habits or fashions of a few individuals at a specific time. This was regional-scale, community-embedded, continuous social change.

What we observe here is that there was a key moment in the history of Ionia as a region between the 6th and 5th centuries BC when these changes were somewhat more dramatic, more pronounced, and more visibly documented than at any other time. As demonstrated consistently across our data analysed, society was changing in all sorts of ways; alterations in object dedication practice constitutes just one of these types of change.

**Conclusions**

There are clear problems with explaining changes in depositional patterns and religious behaviours: this article has aimed to show that the road to shedding light on such phenomena lies in exploring new avenues. With regard to ancient Ionia, the substantial archaeological evidence has been studied according to isolated material categories (ceramics, metals, terracotta, sculpture etc.) and explanations have often been sought with only one field of study in mind. Here, we have suggested a new approach that reflects on the intellectual developments of the region between the 7th and 4th centuries BC. By analysing the early Greek texts that reflect on science and philosophy, on contemporary concepts of life, death, and the relationship between the human and the supernatural, we have been able to identify with more precision possible social changes that impacted on the way religious participants engaged with the practice of votive dedication. Quite crucially, these changes were apparent at the level of the community, and were not happenstance fluctuations in dedication or linguistic practice enacted by one or two individuals.

Our analysis has advanced a methodological point, but is has also brought to light a substantive historical point that is worth exploring further. Lexicometrical analysis conducted across the large corpus of Ionian literary, historical, and philosophical texts can productively map for us principal items of vocabulary used in the region, and, through mapping specifically *changes* in this lexic, we can suggest quite precisely when the concerns of contemporary authors shifted. These sorts of methodologies, while familiar to corpus linguists, are less commonly used with ancient texts, where philologists favour close reading of targeted passages. There are, of course, problems in bringing a methodology designed for much ‘bigger’ contemporary datasets to a fragmentary, incomplete and much smaller ancient dataset and the authors acknowledge that the merit of such approaches is open to attack, but this paper brings to light some issues and broad patterns that one hopes might stimulate productive discussion.

Substantively, the data indicate that the vocabularies of the 7th and 6th centuries BC centred around notions of the gods, and the unseen forces of nature —notably, these interests spiked in the 6th century BC; in the 5th century, alongside an increased interest in concepts of the city and citizenship, vocabularies turned towards abstract moral concepts, and away from such gods. We have suggested that this pattern is related (although not necessarily causally) to a decline in the number of votive dedications the region received across the same time span: as the organisation of political communities in the region changed, so did its members’ relationship with power and a need to placate unseen forces. Ironically —and going back to Adkins whose studies of ancient vocabulary predated any sort of large scale text-mining sophistication— it was these
changing concepts of merit and responsibility that are clearest in the literary dataset, and map most closely onto changes in the material dataset. Now, equipped with new methodologies and the technological means to explore the data in new ways, we propose it would be productive to re-engage with some of these questions. Not least of all, it would be productive to test this same region and same time span using the same methodology for the epigraphic record.
Bibliography


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