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Exploring Ancient Greek Comedy: Material Engagement Theory and Computational Tools

Abstract: Material objects are of outstanding importance for theater studies and the analysis of drama, the genre in which the imaginary world is performed and embodied on stage. Material Engagement Theory (the world of things, artifacts and material signs added to the cognitive equation) proves to be an insightful tool when applied to ancient Greek comedy, a genre which preserves a significant number of objects from antiquity. Material Engagement Theory is the theoretical basis of the database we have been building since 2019, namely the *Lexicon of Objects from Greek Comedy* (https://www.lggk.uni-freiburg.de/wordpressNew/), the first database collecting and visualizing mentions of artifacts from the entire field of ancient Greek comedy.

This paper explains the principles of applied Material Engagement Theory (section 1) and gives examples of how objects in drama influence human perceptions (section 2). It then discusses the database and its functions (section 3), and finally presents the research results from the database with detailed explanations of several case studies (section 4). The examples in the last section show that both quantitative analysis and the computer-assisted processing of the dramatic corpus are necessary for contemporary research on ancient drama. They open up fresh avenues for interpretation and raise philological and scholarly work to a new level of research.

1 Materialities and Our Engagement With Them

To be human is to be closely connected to the non-human, material things that surround us. This is the main area and goal of new materialism: an interdisciplinary, theoretical and politically engaged field of research that emerged at the dawn of the new millennium as part of what might be called the post-constructivist, ontological or material turn (Coole and Frost 2010). The revival of materialist ontologies has been stimulated by a productive friction with the linguistic turn and the

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social constructivist framework, critically questioning their limits, which derive from the meaning of language, culture and representation. Accordingly, the polycentric investigations that have consolidated the scientific corpus of new materialism focus on the primacy of matter or "things" as an unexplored question and seek a renewed substantive engagement with the dynamics of materialization, whether in relation to bodily life or material phenomena. The new materialism revises the earlier notion of things as a unitary, inert substance or a socially constructed fact and foregrounds novel accounts of their active force, processual character, formative impulse and self-organizing capacities.

Things, then, are capable of influencing our thinking because their material components attract and appeal to our senses, and the values we attach to such experiences can influence our behavior in profound and diverse ways. Recently, much work has been done on approaches to material culture that express the role of things in shaping human practices and values. Literary studies have also taken a "material turn," due to Bill Brown's "thing theory" (Brown 2001). The things of the past, the present and the (imaginary) future – both in their material reality and in their literary and artistic renderings – are experiencing a rebirth.

The original aim of the database *Lexicon of Objects from Greek Comedy* is to explore how the mind and things interact by focusing on everyday objects in classical Greece, such as weapons, shoes, clothes, vases, textiles and utensils (among many others). These objects are part of a fluid economy of exchange between mind, body, and things. There are clear advantages to focusing on concepts that span multiple material registers (metal, fabric, wood, clay, etc.) in an interdisciplinary way rather than looking at just one type of object or material. In this way, we gain a better understanding of (1) how, by applying the same terminology to a variety of things, the ancient Greek mind conceived of the relationship between different kinds of artifacts and (2) how the perception and effect of objects remained constant or changed across different media and eras. Through its interest in experience as a form of interaction between people and things, the database project joins the growing body of works in the humanities that address the question of the ways in which people make sense of things and, conversely, how things make sense of people – how things make us who we are as individuals, societies and epochs.

This paper shows how the use of computer data in the analysis of dramatic texts can contribute to exploring (1) how matter influences or even constitutes human thought and action and (2) how human cognitive processes develop and unfold via interaction with things. Literary representations of material objects and human experiences with them can reveal much about the contours of the human mind and body as perceived by authors across different eras and genres. Conversely, the textual approach adopted here ensures that equal attention is paid

to the ways in which texts give meaning to material substances and bring them into effect.

Furthermore, a recurrent feature of "new materialisms" is their concern with the ontological distinctions between people, persons, things and materials. In the context of objects from ancient Greek comedy – which encompasses all kinds of things, both living and non-living, material and immaterial, organic and inorganic – the interstices and transitions between these categories have proven to be a pervasive theme. Jane Bennett's 2010 concept of vital or "vibrating" materialism is particularly relevant to the comic stage. By the term "vibrant" Bennett refers to the affective vitality of material things – the ability of non-human substances to color and shape the human experience of the world. According to Bennett, drawing attention to material things in this way means highlighting the extent to which human beinghood and thinghood intersect, the extent to which the "we" and the "it" slide into one another. One moral of the story is that we are also non-human and that things are also important actors in the world (Bennett 2010, p. 4).

In this sense, the interpretations that emerge during the textual analysis will not only address the effect of things on people and thus the power of materiality, but also the mixing of human and non-human elements in the representation of cognition and perception. In analyzing the data, we come across objects and materials that are both vital and alive. By this, we are specifically referring to the acting and affective capacities of things as manifested in the evocation of affects, emotions and other kinds of human responses. Vital refers to the appearance or impression of vitality in objects, i.e. the way in which the sensorial qualities of the materials mentioned in dramatic texts signal their own acting capacities.

Whereas the new materialism approach aims to establish a balance between persons and things and between human and non-human beings, the embodied approach to cognition challenges the notion of thought as a process tied to the brain. A number of theories of embedded, enactive extended and/or embodied ("4E") cognition have emerged in recent decades, but they all share the attempt to decipher how the brain responds to and engages with forces outside the skull, be they physical senses or features of the external world (Newen et al. 2018). New materialisms and the 4E cognition theory challenge Cartesian dualism, which juxtaposes material things and mental processes. More generally, embodied cognition emphasizes that mental activity is linked to the functioning of the body. This means that cognition is also dependent on the body's interactions with its physical environment, including material entities.

Some manifestations of embodied cognition prove particularly relevant to the cognitive facets of the objects referred to in dramatic texts: enactive perception and the extended mind on the one hand and material engagement on the other. The enactive perception and extended mind theories – as formulated by Alva Noë

(2004) and Andy Clark (2008), respectively – assume that sensory perception and higher order thinking (e.g. mathematical calculation) emerge from our dynamic, embodied engagement with the things that populate our everyday world. While Noë's enactive approach looks at the input of our sensorimotor abilities with respect to our qualitative experience of the phenomenal world, Clark's work focuses on the tools and external "props" (including language itself) that guide and structure thought:

> The proper response is to see mind and intelligence themselves as mechanically realized by complex, shifting mixtures of energetic and dynamic coupling, internal and external forms of representation and computation, epistemically potent forms of bodily action, and the canny exploitation of a variety of extrabodily props, aids, and scaffolding. Minds like ours emerge from this colourful flux as surprisingly seamless wholes: adaptively potent mashups extruded from a dizzying motley of heterogeneous elements and processes. (Clark 2008, p. 219)

The findings of 4E cognition shed light on the particular ways in which our physical environment can direct and promote human thought processes and thus provide useful patterns for the interplay between cognitive activity and material properties so often mentioned in Greek comedies.

Lambros Malafouris' theory of material engagement instead emphasizes that the objects in our environment are not only cognitive tools, but also contribute to constituting thought (Malafouris 2013, 2018, 2019; Poulsgaard and Malafouris 2020). He argues, for example, that Linear B tablets were not simply passive vehicles for the transmission of thought in the form of linguistic signs, but that these tablets, in their sensory and spatial dimensions, actively shaped and transformed the task of recording and remembering data:

> Thinking is not simply a matter of reading a series of meaningful linguistic signs inscribed on the surface of a tablet, but also a matter of meaningfully engaging with the tablet itself as a material sign. (Malafouris 2013, p. 238)

More particularly, Malafouris' theory of material engagement explains how the specific sensory qualities of certain materials (e.g. textile, clay, wood, metal) can alter and shape the course of human engagement with that material.

The objects of the literary and material tradition provide information about the media in which this quality can materialize, as well as the effects of this materialization on human beings. At the same time, the descriptions of the objects themselves, as found especially in literary representations, reveal the ways in which the ancient sources conceptualized the relationships between the human body, the mind and material things.

In a previous publication we emphasized the significance of objects in comic texts and argued that access to these objects through our database enables a vivid perception of them not as objects mentioned in ancient Greek texts, but as real haptic and visual artifacts that are present in our consciousness (Novokhatko et al. 2021). This will also be made clear through some examples in the next section. In the following pages we will briefly present the structure of the database and show the recent changes it has undergone to meet the needs of our ongoing work. We will then explore the interpretive tools/possibilities in relation to the material objects found in comedy and demonstrate how one object can indicate a great deal about the overall dramatic context.

2 The Relevance of Objects in Greek Comedy

The interaction between objects and characters is crucial for ancient comedy, not least in terms of its effect on the audience. Through their visual impact, objects determine and enrich the set design, dictating the timing, space and humorousness of the scenes.[1] Characters interact with objects, manipulate them, use their names for verbal puns or create absurd or ridiculous situations by misusing them.

Complete surviving comedies offer enlightening examples of the effects produced on the audience's perception by the interaction of objects and characters. In Aristophanes' *Acharnians* one of the characters, the Athenian general Lamachus, enters the scene armed with a plumed helmet and a shield decorated with the head of the Gorgon (ll. 574–575).[2] Given the context of this scene, these weapons have an intrinsically comic effect: the protagonist of the play, the Athenian Dikaiopolis, has just signed a personal peace treaty with the Spartan enemies, and Lamachus shows up in arms with very bad timing. He embodies the image of war, but is ridiculously out of place, since the peace has already been established. Lamachus' weapons do not exhaust their comic effect with the plain contrast between war and peace. On the contrary, the hilarity of the scene grows to a climax through the characters' physical interactions with these objects. While Lamachus and Dikaiopolis are talking, the weapons are displaced and manipulated, and gradually lose their dignity. Dikaiopolis makes Lamachus remove the

1 For humor studies, especially the application of humor theories to classical texts, see e.g. Raskin (1985), Attardo (2001), Bolens (2001), Morreall (2009), Davies (2011), Dennett et al. (2011), Double (2014), Attardo (2017), and Lowe (2020).

2 On the symbolic value of these objects, cf. Castellaneta and Maffione (2016, pp. 459–460). On the plot of the *Acharnians*, cf. Olson (2002, pp. xl–lii).

helmet from his head and place it on the ground (so that the plume – the noblest part – enters in contact with dirt, l. 583); he then asks him for a feather from the plume (l. 584), which in a sign of utmost irreverence Dikaiopolis uses to induce vomiting (l. 587). Later in the play, a similar scene makes fun of Lamachus' weapons by contrasting them with foods (ll. 1095–1149). As Lamachus assembles his military equipment, everything he mentions is ridiculed by Dikaiopolis, who is getting his dinner ready. They ask their slaves to bring out of the house weapons and food (respectively), and the slaves run back and forth collecting what has been called for. The result is the materialization of the objects onstage. The strong contrast between the two characters is reflected not only by the hostile language they employ in this scene, but also by the display of the objects. Food abundance, such as that resulting from Dikaiopolis' requests, jars with a war context, such as the one Lamachus is getting ready to enter, since in war time food is anything but abundant. Funnily enough, Dikaiopolis echoes Lamachus' requests by changing either a single word or very few ones, but the final result of his requests, assembled onstage, is antithetical to the general's orders.

A similar comic technique, whereby objects first create a visual contrast and then, through their interaction with the characters, achieve dynamic comic effects, is exploited by Aristophanes in the prologue to another comedy, the *Thesmophoriazusae*.[3] The famous tragedian Euripides is featured here as a character and appears on stage together with his relative Mnesilochus. Euripides is convinced that the Athenian women want to sentence him to death because of his habit of depicting female vices and wants to persuade one of his colleagues, the tragic poet Agathon – a young, handsome and effeminate man – to infiltrate the celebrations of the Thesmophoria festival, which is restricted to women, to avert the danger.[4] Agathon's character is brought on stage, probably by means of a sliding or rotating stage machine, certainly together with a bed (l. 261). In this way the setting (Agathon's furnished dwelling and accessories) enters the scene together with the character. Faced with the confusion of Agathon's wardrobe, Mnesilochus launches into a long interrogation (ll. 136–140). The presence on stage of a male figure dressed as a woman must have instantly achieved a visual comic effect. Verbal mockery ensues: Mnesilochus focuses on Agathon's accessories, which are listed in order to emphasize the absurdity of their juxtaposition. The list is interesting because it also highlights a series of gender stereotypes: typical feminine objects include the saffron gown (l. 138), the hairnet (l. 138), the breast-band (l.

3 On the prologue of the *Thesmophoriazusae*, see Austin and Olson (2004, p. lv).

4 On the plot of the *Thesmophoriazusae*, see Austin and Olson (2004, pp. lii–lxviii).

139) and the mirror (l. 140).[5] The Greek term used here for "garb" (*stolē*, l. 136) could indicate either a male or female garment; however, the context of the joke determines the identification of the *stolē* as a feminine item (cf. Austin and Olson 2004, pp. 82, 101): as the actor playing the character enters the scene in what is clearly a woman's dress, one should not expect a more precise designation. At the same time, Agathon possesses objects that are exclusive to men: the *barbitos* ("bass") and the lyre, stringed musical instruments used by poets, the oil-flask used in gymnasiums (l. 139) and a soldier's sword (l. 140).[6]

In response to Agathon's refusal to infiltrate the Thesmophoria celebrations, Mnesilochus offers to dress as a woman and plead Euripides' cause before the Athenians. Mnesilochus' disguise scene opens with him shaving: the old man must be completely smooth, so Euripides asks Agathon for a razor (l. 219). Agathon tells Euripides to take one from the case (l. 220): we can imagine Euripides' movements on the stage as he grabs the razor case and draws out a blade. After the razor, Euripides asks for a torch or a lamp (l. 238) to singe the hair on the rest of the man's body, particularly his buttocks. Since the sources report that women used a lamp for this operation,[7] it is probable that the object brought on stage and used to prepare the playwright's relative was a large torch, which would have amplified the ridiculousness of the scene when brought close to the reluctant character's bottom (Sommerstein 1994, p. 173). After the shaving comes the dressing. Mnesilochus must wear a *krokōtos*, a yellow-dyed garment typically worn by women at festivals and religious celebrations.[8] In an evidently awkward manner, Mnesilochus first wears the robe and, only afterwards, a girdle to hold up the breasts (ll. 255–253). It is unclear whether the fact of first wearing the robe and then the bra was a way of emphasizing the characters' awkwardness or whether, as a result of this action, he then wore the girdle over the robe, instantly achieving a visual comic effect. The preparation of Euripides' relative is completed by hair accessories (l. 257) and shoes (l. 262, with the generic term *hypodēmata*, but obvious recourse to women's shoes on stage). Agathon invites Euripides to take everything from his bed (l. 261): the props construct the setting and their location dictates the space and time of the stage action.

5 On these objects, see Austin and Olson (2004, pp. 101–103). On their symbolic value in the scene, see Castellaneta and Maffione (2016, pp. 320–321).

6 On these objects, see Austin and Olson (2004, pp. 102–103).

7 Aristoph. *Lys*. 825–828, *Eccl*. 12–13.

8 In a theatrical context, this was a costume of Dionysus, the effeminate god par excellence, e.g. in Aeschylus' *Aedonians* or Aristophanes' *Frogs*; cf. Stone (1981, pp. 174–175); Dover (1993, p. 40); Mastromarco and Totaro (2006, p. 312 n. 9, p. 452 n. 23, p. 564 n. 6.).

Not only complete dramas, but also comic fragments testify to the centrality of the interaction between characters and objects for the staging of dramatic scenes. In a fragment from the Sicilian comic repertoire (Epicharmus' fr. 147 K.-A.), two characters talk about an object that lies in front of them by playing on its name. This is a tripod – plainly, says character (B.) (l. 1). Tripods were composed of three-footed supports of bronze, or a similar material, and a fixed or movable vessel supported by the three feet and by a fourth, more slender element at the center. They were used as tables in houses, but also had a votive function: they were typically displayed in sanctuaries as votive offerings.[9] This tripod, however, has four legs, which would actually make it a 'tetrapod,' as both characters (A.) and (B.) state (ll. 2–3). The final stanza alludes once again to the name of the tripod with a reference to the myth of Oedipus, who solved the Sphinx's riddle about something that has four, two or three feet (i.e. man). In Epicharmus' fragment, at a micro-level the object provides a cue for the gag about the contrast between the name and the identity of the four-footed tripod; at a macro-level, it suggests what the setting of the action might be, namely a sanctuary (a usual place for votive tripods) or a household.

The examples just discussed show that in dramas, too, people (i.e. the characters) interact with their environment in material ways, as Malafouris (2013) pointed out. This interaction extends beyond the stage: through their visual impact, objects determine the setting and ensure the immediate involvement of the spectators. On a more complex level, the interaction of props and characters allows the playwright to develop entire scenes by playing on dynamic comic effects. Finally, on an abstract level, they can allow the characters to verbally play upon the contradictions between objects' forms and their denominations.

The examples provided once again confirm the value of a materialistic approach to ancient Greek comedy. An essential step to bringing materiality into focus – and to exploiting the information it can provide for drama analysis – is the cataloguing of the objects found in comic plays and fragments.

3 The *LGgK* Database

The *LGgK* (from the German *Lexikon der Gegenstände aus der griechischen Komödie*) is a database which not only collects data, but proves to be a useful tool for the quantitative analysis of ancient drama. While this second point will be discussed

9 Novokhatko (2020) identifies it as a votive tripod. On this object, see Reisch (1905, coll. 1669–1696); Suhr (1971).

in the next section, in the present one we shall present the contents and structure of the database.[10]

The *LGgK* is an interdisciplinary tool designed to collect all objects mentioned in ancient Greek comedy,[11] a genre notoriously rich in information on artifacts.[12]. Information is derived from already existing commentaries on ancient texts.[13] The material is catalogued as follows. For each object the database provides: a translation; references to author(s) and fragment(s) where the object is found; potential additional information on the object, such as dialectal variants attested in the texts or different spellings for the same object; modern literature on the object; and an image.[14] To facilitate not only the cataloging, but also the research, we have divided all the objects on the database into categories (see the next section). The "search-by-category" function allows the user to get an overview of groups of objects belonging to the same field and proves useful to understand the diffusion of certain artifacts compared to others, as we shall demonstrate in the next section.

The structure of the *LGgK* is a mySQL database supported by WordPress and hosted by the server of the University of Freiburg (https://www.lggk.uni-freiburg.de/wordpressNew/). We originally decided to develop the database according to the relational database model:[15] this seemed like the most suitable for organizing and searching a large amount of rather simply structured data, as it had proven to serve as a valuable basis for the quantitative and qualitative analysis of large corpora.

However, by expanding and refining the categories used to catalogue the objects, it became clear that the database needed a more complex system of links. The first problem was that we had objects that could be assigned to more than one category. The second problem was the need for a more complex division into

10 We offered a thorough description of the database and its functions in Novokhatko et al. (2021, pp. 262–267). The account presented here is functional to introduce those points that are most relevant for the discussion in the next section.

11 The aim is to make the data accessible to researchers from different disciplines and with different backgrounds. On this requirement, see Poulsgaard and Malafouris (2020).

12 For the reasons behind the choice of Greek comedy, see Novokhatko et al. (2021, pp. 256–262)

13 We started from the commentaries on comedic fragments published as part of the project *Kommentierung der Fragmente der griechischen Komödie* (https://www.komfrag.uni-freiburg.de/). The series is still ongoing. Upon completion, the corpus will also include the complete comedies by Aristophanes and Menander.

14 The "image" section is still a work in progress and is designed to collect available pictures and reproductions of the artifacts or hyperlinks to archaeological databases.

15 See https://cloud.google.com/learn/what-is-a-relational-database. For a description of the relational database model, see, moreover, Codd (1970).

subcategories: on the one hand, to split categories into further subcategories, and on the other hand, to combine different existing categories into macro-categories.

Although the relational model has long been a popular one for databases, it suffers from the limitations imposed by the structure of the data. In this model, values attributed to the objects (in the *LGgK*: term, annotation, translations, references, literature, image and category) are fixed according to a defined scheme. What we need is a model in which an object's attribute can evolve over time. Therefore, the relational data model is to be replaced by a Resource Description Framework (RDF), also known as "Triplestore." Rather than assigning a single value to a given key item, the *triplestore* consists of "subject-predicate-object" entities that allow any number of "objects" (according to RDF terminology) to be assigned to a given "subject." While relational data models associate items with attributes (e.g. categories, authors etc.) that do not communicate with each other, the RDF model allows a single "subject" to be associated with multiple "objects." Therefore, RDF will enable more complex attributions, guarantee more precision and allow for more options in the retrieval process. At the same time, it will also provide additional access to the data via standard query languages (e.g. SPARQL) for more experienced users.

4 The *LGgK* for Quantitative Drama Analysis

Notwithstanding future improvements, the *LGgK* already shows great potential as a starting point for quantitative drama analysis. As anticipated in the previous section, a key aspect of the database is the cataloging of objects according to categories, which also proves to be an insightful tool for material analysis. So far, the process of identifying categories and cataloging objects has been carried out manually. The search for objects starts from the index of the commentaries on comic fragments and the selection process is subject to vetting by the research team. The choice of categories has been made empirically on the basis of the data collected. The reason for this is threefold: first, research on fragments is still largely ongoing. The full corpus has not yet been studied in detail[16] and thus has yet to be coded in

16 Comic fragments are still the focus of commentaries and editions today, and some of them have not yet been studied in depth. The last volume of R. Kassel and C. Austin's edition of comic fragments (*Poetae Comici Graeci* (PCG), De Gruyter: Berlin and New York 1983–2001), containing Menander's papyrus fragments (edited by R. Kassel and S. Schröder), has only recently been published (2022). Concerning the 73 planned volumes of commentaries on comic fragments, 37 have been published to date (October 2022).

such a way that it might be used in machine learning processes. The second reason lies in the characteristics of the corpus, which mostly consists of fragments that are sometimes in a poor textual condition. Gaps and variants occur, and human intervention is still crucial to overcome such textual challenges. The third reason is the risk of coming across cases that do not conform to the established standard, which would preclude a machine-based approach to identifying and categorizing objects. This is the case, for instance, with the lemma *kanabeuma*, "carver's sketch," attested in an Aristophanes fragment (fr. 719.2 K.-A.).[17] This word only occurs in this passage as an alternative form of *kinabeuma*, translated by lexica as "knavish trick." The standard translation cannot be applied to this word: one needs to consider not only the text, but also the context and the general meaning.

On the other hand, computational analysis may be an effective and easily applicable method to study the data collected in the database (see below). At the moment, the *LGgK* database includes objects from the 21 commentaries scrutinized so far.[18] This involves 75 ancient authors chronologically divided into three groups – 6th- and 5th-century BC poets, 5th–4th-century poets, and 4th-century poets (see Tables 1a–1c)[19] – and a total of 526 objects. The chronological distribution of the various categories (Table 2) reflects the fact that so far, we have included more material from the 5th–4th centuries and from 6th and 5th centuries than from the 4th.[20] A greater variety is attested for the 5th–4th centuries than for the 6th and 5th centuries, as Tables 1a–2 show. Although the number of 6th- and 5th-century poets in the *LGgK* significantly exceeds that of 5th–4th-century poets, the number of commentaries covering the two periods is 9 for the 6th- and 5th-centuries, and 8 for the 5th–4th centuries, thus constituting very similar percentages of the total volumes contained in the database (42.9 % and 38.1 % respectively). The chronological distribution of the objects can also be interpreted on the basis of qualitative explanations, namely the characteristics of the comic genre, both in general and in a given period (see below), and the characteristics of the fragments (for instance, their state of preservation or the sources' interest in them).

17 See Bagordo (2017, pp. 122–127). All comic fragments are quoted according to K(assel)–A(ustin)'s edition mentioned in the previous footnote.

18 At the present stage, items from the last 16 published commentaries on comic fragments are yet to be included in the database, as are the data from the remaining 36 volumes that have not yet been published.

19 Depending on the number of fragments preserved for each author, the commentaries may collect a single playwright or several ones.

20 This depended on the publication of the commentaries, which began with the most ancient texts.

Although the results are not yet to be regarded as definitive, they offer interesting insights that can fruitfully be combined with approaches inspired by Material Engagement Theory. The most widely represented category is "food" (*Essen*, 91 entries, approximately 16 % of the total of 559 categorizations),[21] followed by the category encompassing all "vessels" associated with dining (*Gefäß*, 51 entries, approximately 9 % of the total – as distinct from *Behälter*, applied to "containers" used outside the culinary context) and the category "clothing" (*Kleidung*, 41 entries, approximately 8 % of the total). The last statistics concern categories of objects from more specific fields, such as "medicine" or "fishing" (*Medizin* and *Fischfang*, both with 2 headwords, 0.358 % of the total). For more details, see Figure 1.

Individual authors can also provide insights on these statistics. One example is Eupolis (5th century BC), a poet who accounts for a total of 494 fragments (Olson 2014, 2016, 2017), 348 of which have already been included in the database. Given this material, Eupolis' statistics slightly differ from the general ones (chart 3). Several categories are not represented at all; out of the 37 total categories, only 15 are found in his extant production (in order of frequency: *Gefäß*, *Essen*, *Mobiliar*, *Konstruktion*, *Getränk*, *Kleidung*, *Landwirtschaft*, *Werkzeug*, *Musik*, *Geld*, *Gewürz*, *Küchengerät*, *Kult*, *Material* and *Textilie*). The categories most frequently associated with this author are "tableware" (*Gefäß*, 7 records, approximately 20 % of the 33 categorizations), followed by "food" and "furniture" (*Essen* and *Mobiliar*, 4 records each, approximately 12 %) (Figure 2).

In the analysis of quantitative data from the database a few aspects should be considered in order to avoid reaching hasty conclusions. First, the characteristics of the ancient comic genre must be taken into account. As mentioned, the most widely represented category in the database is "food," followed by "tableware." The above-mentioned case of Eupolis presents a slight inversion – "tableware" as the first category, with "food" and "furniture" sharing second place – but the podium is often occupied by the same winners. This is perfectly consistent with something we have long known about the comic genre, namely that it assigned a prominent role to corporeality (cf. Davidson 1993; Gilula 1995; Davidson 1997; Wilkins 2000). Indeed, this genre is rich in all those elements that shape the physicality of bodies, specifically food and drink, and objects useful to consume them (Wilkins 2000, particularly pp. 1–51). Even things that seem distant from the culinary sphere, such as politics, are often discussed onstage through food images

21 We are considering the overall number of categorizations (559), which is higher than that of the headwords (526), because a lemma can be assigned to more than one category.

(cf. Beta 2004, pp. 144–147). This tendency increases the recurrence of terms pertaining to the semantic field of food.

A second point to consider concerns the sources of the fragments. Many fragments have not been transmitted "directly" (on papyrus scraps, for instance), but rather "indirectly" as quotations in later authors. As a consequence, fragments are the result of a selection depending on the needs of the authors quoting them. If one considers Eupolis again, the majority of his fragments have been handed down by the lexicographical tradition (351 out of 494, 71.05 %).[22] This figure is also mirrored by the database: out of 348 Eupolis fragments already catalogued, 250 of them are transmitted by lexicographical sources (71.84 %). It is possible that the sources play a role in the recurrence of certain types of objects. On the other hand, indirect transmission could provide a reliable sample of the objects mentioned in the complete plays. To ascertain this, a comparison between the data from comedic fragments and that from complete comedies is needed, ideally works by contemporary authors (for Eupolis one can take Aristophanes, whose 11 complete comedies, with a total of 15 291 lines,[23] would provide a good point of comparison).[24] This will be possible once the database has been completed.

Besides the analytical data it provides, the database also offers a number of insights and interpretative possibilities. As far as the data are concerned, we mentioned the fact that the most widely represented category is *Essen* ("food") and we have laid out the reasons why this is the case (i.e. the characteristics of the genre, the sources of the fragments). Comedy allows us not only to learn about a vast range of everyday ancient foods (like bread, olives and cheese), but also to acquire information about more specific types of food, recipes and cooking methods. For instance, besides providing repeated occurrences of the simple word for "bread," *artos* (in the database: Telekleides fr. 1.4; Aristophanes fr. 955.2; Nicophon fr. 6.1; Mnesimachos fr. 4.11), the *LGgK* lists numerous specific types of bread and baking techniques: "bread of whole wheaten meal" (*autopyritēs*) and "baked bread" (*dipyritēs*) in Phrynichus fr. 40; "roll or loaf baked or toasted on a spit" (*obelias*) in Nicophon fr. 6.2; "bread baked in a baking dish" (*klibanitēs*) in Ameipsias fr. 5; "bread baked over the fire" (*escharitēs*) in Antidotos fr. 3.1 and Krobylos fr. 2.2; "white bread" (*katharos*) in Krobylos fr. 2.2; "oven bread" (*ipnitēs*) in Timokles fr. 3.2.

Everyday items also provide instances of objects that are either attested by authors who are chronologically very distant from one another or span the whole

22 These data are drawn from Nesselrath (2010, p. 430).

23 According to the edition by Wilson (2007).

24 Menander is the only other author for whom we still have a complete comedy, running to a total of 969 lines (according to the Arnott 1979 edition).

evolution of the genre. The most common ones are again foods, household objects and everyday clothing items. Concerning foods, the above-mentioned term for "bread" (*artos*) provides an example of a staple food found throughout the history of comedy. In this case, we can safely state that comedy mirrors everyday life. By the same token, we also register a good number of occurrences for objects linked to the household: *chytra*, for instance, defining a common cooking "pot," is found in 6th- and 5th-century BC comedy (Krates frr. 16.8; 32.1; 47; Eupolis fr. 218.3), as well as in the 5th and 4th century BC (Alkaios fr. 24; Diokles fr. 9; Polyzelos fr. 6; Aristophanes frr. 606.1; 693) and in the 4th (Timokles frr. 7.4; 23.3). The same can be said for ordinary objects like the "table" (*trapeza*), listed as *Mobiliar* ("furniture") and found across all periods (5th cent. BC: Crates fr. 16.5; Telekleides fr. 1.7; 5th–4th cent. BC: Apollophanes fr. 5.2; Aristophanes fr. 903; 4th cent. BC: Klearchos fr. 4.3; Mnesimachos fr. 8.2; Timokles fr. 13.4) and common clothing items like the "cloak" (*himation*), listed as *Kleidung* (clothing) and found in the 5th century BC (Crates fr. 35), the 5th–4th (Aristophanes fr. 92) and the 4th (Timokles fr. 10.3).

Another revealing case is represented by objects that are only attested from a certain point in time onwards and in relation to which the comic sources provide important pieces of information. Two examples might be the musical instrument called *giggras* and the catapult. The *giggras* is mentioned in a 4th-century BC fragment by Amphis (fr. 14).[25] A speaker, probably Dionysus, boasts about his latest invention, a musical instrument his interlocutor has never heard about: a new kind of pipe called *giggras*. This small instrument (a hand's span in length), with a high-pitched and plaintive tone,[26] was imported from Phoenicia or Caria (West 1992, p. 92). It has never appeared on stage, says the first speaker, but it is already[27] fashionable at symposia in Athens. The surprise shown by the second speaker, who apparently does not know what a *giggras* is, is probably intended to stress the exotic provenance of the object, which is not an Athenian product. Although we have no precise information on when this instrument was imported

25 The fragment reads: "And I, for one, the most cleverly devised *giggras*. (B.) But what is a '*giggras*'? (A.) A new invention of mine, which I have never yet presented at the theatre, although in Athens it has already become fashionable at banquets. (B.) Why don't you bring it forth then to the crowd? (A.) Because I am waiting to be allotted a tribe that is really fond of victory. For I know that it will shake with applause everything as with a trident" (Trans. Papachrysostomou 2016, p. 97).

26 Athenaeus 4.174f (the source of Amphis' fragment), who defines this instrument as "mournful," adds that the Carians used it in their laments: see Barker (1984, pp. 261–263).

27 Amphis' dates are very vague: Papachrysostomou (2016, p. 11) places his *floruit* in first half of the 4th century BC.

to Greece, the fragment provides a *terminus post quem* not only for the object – namely one of the earliest dates at which the item is attested – but also for its uses (as an instrument played first at symposia and later at the theater).

The second example too sheds light on the interpretative possibilities offered by the database. It regards the mention of the "catapult" in two fragments from the 4th century BC, namely Mnesimachos fr. 7.9 and Timokles fr. 12.5.[28] The invention of the catapult is due to Dionysius I of Syracuse, who in 399 BC gathered a large group of technicians to conduct research on new weaponry, including – precisely – the tension catapult. It is not known with certainty when this weapon was introduced into Greece. A likely guess is in the 370s, with the auxiliaries that Dionysius I dispatched to the Spartans following the Battle of Leuctra. At about the same time catapults would appear to have reached Athens. Nevertheless, both fragments mention the weapon in relation to Philip II of Macedon, who was probably responsible for introducing a new catapult model with a twisting mechanism. This type of catapult can be traced back to the Macedonian king's innovations in siege warfare.[29] Again, the comic mention of an object from a specific point in time onwards can prove revealing with respect to the chronological diffusion of that object and provide hints that most often are not found in other sources.

Lastly, dialectal variants – noted in the Annotation column of the database – can prove insightful for interpretative purposes, for instance to identify a speaker's origin, even in fragmentary contexts. Thus the Doric (presumably Laconian) word for "broth" in Epilykos fr. 4 (*dōmos*, the Attic equivalent being *zōmos*: see Metagenes fr. 18.2), together with the rest of the fragment's lexicon (other words are also in Doric dialect) and the context of the source (a discussion on Spartan symposia), suggests that the speaker is a Spartan (cf. Orth 2014, pp. 263–273).

5 Conclusions

This paper has outlined the theoretical background of the *LGgK* database and the analytical possibilities it affords. In the first section, we introduced MET theory as a cognitive reading for objects in ancient drama. In the second section, we showed to what extent objects brought on stage, or even just mentioned, come alive through the characters' interaction with them. Objects are therefore inde-

28 Concerning these fragments, see Mastellari (2020, pp. 453–467) (on Mnesimachus) and Apostolakis (2019, pp. 115–123) (on Timocles).

29 See Mastellari (2020, pp. 465–467) with further bibliography.

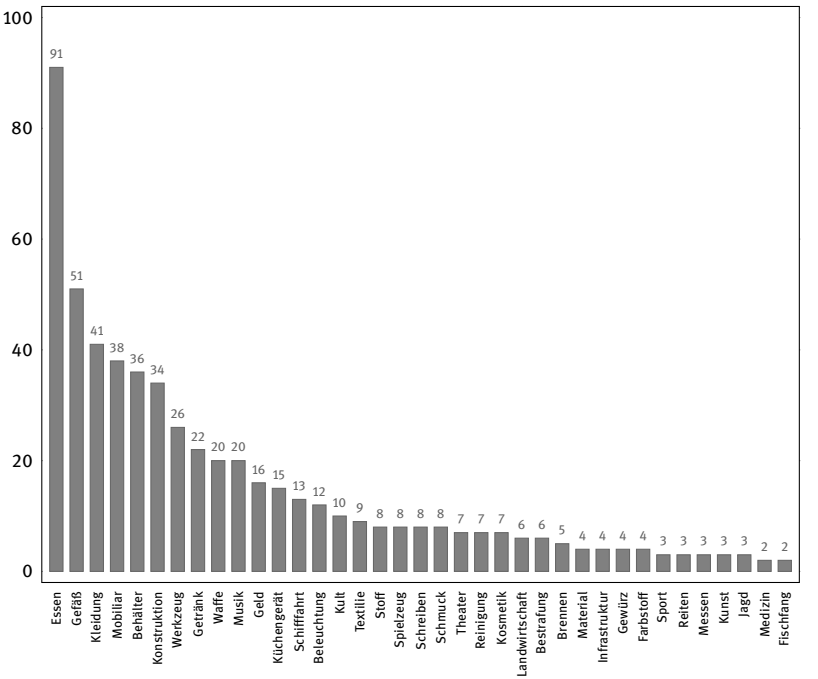

Fig. 1: Number of records per category, main table.

pendent and central research targets. In the third section, we presented the structure of the database for all objects mentioned in comedy and the improvements that are currently being made to it. Finally, the fourth section discussed the possibilities which *LGgK* offers in the field of computer-aided drama analysis. As the database is an ongoing project, we were able to present only provisional results, which nevertheless show its potential.

Specifically, we considered some categories which include different objects, showing their chronological distribution. Secondly, we presented the most widely attested categories in relation to the production of individual authors (taking the 5th-century BC comic poet Eupolis as an example). We issued a specific caveat with respect to the results obtained, in light of the characteristics of the genre and the sources of the fragments. We then listed a number of other interpretative opportunities: the variety of items and detailed information associated with specific categories; the possibility of identifying staple items, attested in Greek comedy across all periods, or objects introduced from a certain point onwards; and, lastly, dialectal variants as a means to identify characters.

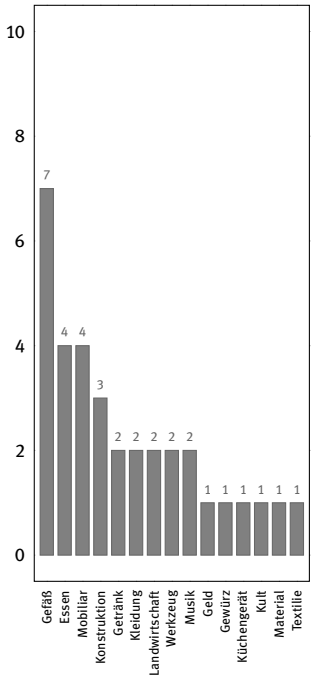

Fig. 2: Number of records per category. Author: Eupolis.

This paper has illustrated the usefulness of having a database of objects mentioned in dramatic texts, arguing that computer-based tools can contribute to the analysis of such textual material. This entails a shift from looking at individual objects to looking at the relationships between objects, characters and settings, on both a synchronic and diachronic level. Database analysis can and should be based on a critical awareness of the contextual research that shapes the compilations, a reflective practice for ongoing material documentation and analysis, and a responsive, sensitive and community-oriented approach to interpretation and access.

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Tab. 1: Percentage presence of authors from a given period of time in the database

(a) 6th and 5th century BC

Author	Volume
Alkimenes	FrC 1.1
Arkesilaos	FrC 1.1
Aristagoras	FrC 1.1
Chionides	FrC 1.1
Diop]eithes	FrC 1.1
Ekphantides	FrC 1.1
Euphronios	FrC 1.1
Euthykrates	FrC 1.1
Euxenides	FrC 1.1
Hegemon	FrC 1.1
Ion	FrC 1.1
Kallias	FrC 1.1
Kallistratos	FrC 1.1
Kantharos	FrC 1.1
Leukon	FrC 1.2
Lykis	FrC 1.2
Lysippos	FrC 1.2
Magnes	FrC 1.2
Menandros II	FrC 1.2
Menekrates	FrC 1.2
Myllos	FrC 1.2
Myrtilos	FrC 1.2
Philonides	FrC 1.2
Susarion	FrC 1.2
Thugenides	FrC 1.2
Xenophilos	FrC 1.2
Krates	FrC 2
Kratinos	FrC 3.2
Telekleides	FrC 4
Hermippos	FrC 6
Phrynichos	FrC 7
Eupolis	FrC 8.2, 8.3
32 (42.7%)	9 (42.9%)

(b) 5th and 4th century BC

Author	Volume
Alkaios	FrC 9.1
Ameipsias	FrC 9.1
Apollophanes	FrC 9.1
Aristomenes	FrC 9.2
Aristonymos	FrC 9.2
Autokrates	FrC 9.2
Demetrios I	FrC 9.2
Diokles	FrC 9.2
Epilykos	FrC 9.2
Eunikos	FrC 9.2
Kephisodoros	FrC 9.2
Krates II	FrC 9.2
Metagenes	FrC 9.2
Nikochares	FrC 9.3
Philonikos	FrC 9.3
Philyllios	FrC 9.3
Poliochos	FrC 9.3
Polyzelos	FrC 9.3
Sannyrion	FrC 9.3
Xenophon	FrC 9.3
Aristophanes	FrC 10.3, 10.9, 10.10, 10.11
Nikophon	FrC 15
22 (29.3%)	8 (38.1%)

(c) 4th-century BC

Author	Volume
Asklepiodoros	FrC 16.1
Dionysodoros	FrC 16.1
Alkenor	FrC 16.1
Anaxilas	FrC 16.1
Antidotos	FrC 16.1
Apollinaris	FrC 16.1
Araros	FrC 16.1
Euboulides	FrC 16.5
Euphanes	FrC 16.5
Euthias	FrC 16.5
Euthykles	FrC 16.5
Heniochos	FrC 16.5
Heraklides	FrC 16.5
Kalliades	FrC 16.5
Kallikrates	FrC 16.5
Klearchos	FrC 16.5
Kratinos iunior	FrC 16.5
Krobylos	FrC 16.5
Mnesimachos	FrC 16.5
Anaxandrides	FrC 17
Timokles	FrC 21
21 (28%)	4 (19%)

Tab. 2: Chronological distribution of the objects according to category

Category		Number of records	Century		
German	**English**		**6th, 5th BC**	**5th–4th BC**	**4th BC**
Medizin	Medicine	2		✔	
Fischfang	Fishing	2		✔	
Sport	Sport	3	✔	✔	✔
Reiten	Horse riding	3		✔	
Messen	Measuring	3		✔	
Kunst	Art	3	✔	✔	
Jagd	Hunting 3		✔		
Material	Material	4	✔	✔	
Infrastruktur	Infrastructure	4	✔	✔	
Gewürz	Spice	4	✔	✔	✔
Farbstoff	Dye	4	✔	✔	
Brennen	Burning	5		✔	✔
Landwirtschaft	Agriculture	6	✔	✔	
Bestrafung	Punishment	6	✔	✔	✔
Theater	Theater	7	✔	✔	✔
Reinigung	Cleaning	7	✔	✔	
Kosmetik	Cosmetics	7	✔	✔	✔
Stoff	Fabric	8	✔	✔	✔
Spielzeug	Toys	8	✔	✔	
Schreiben	Writing	8	✔	✔	✔
Schmuck	Jewellery	8	✔	✔	✔
Textilie	Textile	9	✔	✔	
Kult	Cult	10	✔	✔	✔
Beleuchtung	Lighting	12	✔	✔	✔
Schifffahrt	Navigation	13	✔	✔	✔
Küchengerät	Kitchenware	15	✔	✔	✔
Geld	Money	16	✔	✔	✔
Waffe	Weapon	20	✔	✔	✔
Musik	Music	20	✔	✔	✔
Getränk	Drink	22	✔	✔	✔
Werkzeug	Tool	26	✔	✔	✔
Konstruktion	Construction	34	✔	✔	✔
Behälter	Container	36	✔	✔	✔
Mobiliar	Furniture	38	✔	✔	✔
Kleidung	Clothing	41	✔	✔	✔
Gefäß	Tableware	51	✔	✔	✔
Essen	Food	91	✔	✔	✔
Total		559			