

PrevNet. A FAIR and inclusive resource for the study of preverbs in historical languages

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ABSTRACT (ENGLISH)

The digitization of Classical texts and the development of corpus and computational methods has revolutionized the study of Ancient Greek and Latin. Despite their profound impact on verb semantics and syntax, preverbs (prefixes attaching to verbal bases, cf. It. *circum-* in *circumnavigare* 'sail around') lack a dedicated digital resource; *PrevNet* addresses this need with a focus on Ancient Greek and Latin preverbs and motion verbs. It combines digital humanities methodologies with insights from historical and cognitive linguistics, and socio-cultural studies to explore how these ancient languages conceptualized movement, space, and reality. Based on a manually annotated dataset of 35 texts (500,000+ tokens) from multiple genres and periods (8th century BCE – 2nd century CE), *PrevNet* systematically captures the meanings and functions of preverbed motion verbs, facilitating linguistic and cultural analysis. Designed as an inclusive FAIR resource, it serves diverse audiences across Classics, Linguistics, and Digital Humanities, while also addressing various educational levels, from high school to academia. The resource enables cross-linguistic comparison, promotes accessibility to digital tools, and advances the study of linguistic diversity and cultural thought in the ancient Mediterranean. *PrevNet* demonstrates the transformative potential of digital humanities to bridge gaps between disciplines, democratize knowledge, and support underrepresented audiences in research and education.

Keywords: preverbs; Classical languages; motion verbs; FAIR principles; online resources

ABSTRACT (ITALIANO)

PrevNet. Una risorsa "FAIR" e inclusiva per lo studio dei preverbi nelle lingue storiche

La digitalizzazione dei testi classici e lo sviluppo di metodi della linguistica computazionale e dei corpora hanno rivoluzionato lo studio del greco antico e del latino. Nonostante il loro profondo impatto sulla semantica e sulla sintassi dei verbi, i preverbi (prefissi che si attaccano alle basi verbali, es. It. *circum-* in *circumnavigare*) mancano di una risorsa digitale dedicata; *PrevNet* risponde a questa esigenza concentrandosi su preverbi e verbi di movimento in greco antico e latino. *PrevNet* combina metodologie delle digital humanities con approfondimenti di linguistica storica e cognitiva e studi socioculturali, per esplorare come queste lingue antiche concettualizzassero il movimento, lo spazio e la realtà. La risorsa si basa su un dataset annotato manualmente di 35 testi (oltre 500.000 tokens) provenienti da diversi generi e periodi (VIII secolo a.C. - II secolo d.C.). *PrevNet* cattura sistematicamente i significati e le funzioni dei verbi di movimento preverbat, facilitando analisi linguistiche e culturali. Progettato come risorsa FAIR inclusiva, si rivolge a un pubblico diversificato nei campi di studi classici, linguistica e digital humanities, affrontando inoltre vari livelli educativi, dalla scuola superiore all'università. La risorsa consente il confronto interlinguistico, promuove l'accessibilità agli strumenti digitali e avanza lo studio della diversità linguistica e del pensiero culturale nel Mediterraneo antico. *PrevNet* dimostra il potenziale trasformativo delle digital humanities nel colmare le lacune tra discipline, democratizzare la conoscenza e supportare pubblici sottorappresentati nella ricerca e nell'educazione.

Parole chiave: preverbi; lingue classiche; verbi di movimento; principi FAIR; risorse online

1. INTRODUCTION

Since Busa's (1974–1980) pioneering work, the digitization of Classical texts and the consequent creation of corpora have transformed the study of historical languages such as Ancient Greek and Latin and fostered the creation of new online resources. Linguistics, with its quantitative methods, has particularly thrived in this digital landscape. Tools and resources have been developed to facilitate morphological analysis (e.g., Crane, 1991; Kahane and Mueller, 2001; Passarotti, 2007a; Vatri & McGillivray, 2018), sentence structure (e.g., Passarotti, 2007b; Bamman & Crane, 2011; Celano, 2019; 2024; Gorman, 2020), and word meaning (e.g., Miller et al., 1990; Bizzoni et al., 2014; Bermúdez Sabel, 2019; Biagetti et al., 2021; McGillivray et al., 2022). Efforts towards the harmonization and linking of many of these

linguistic resources for Latin have further been carried on by the ERC-funded project (2018–2023) “LiLa: Linking Latin” (Passarotti & Mambrini, 2021). Nonetheless, other areas of Classical studies have made, and continue to make, efforts to leverage digital tools to advance the discipline (e.g., Simon et al., 2012; Elliott, 2021 on geography; Parker et al., 2019 on papyrology; Sommerschield, 2020 on epigraphy; Holleran, 2021 on social history).

Despite this *mare magnum* of resources for Ancient Greek and Latin, all focus on general linguistic phenomena. Resources like the valency lexica in Passarotti et al. (2016) and McGillivray (2012; 2021), and treebanks (e.g., Bamman & Crane, 2011) provide broad coverage of verbal behavior but lack targeted analyses of specific linguistic phenomena and their impact on verbal meaning and syntax. Additionally, despite their invaluable insights, these resources often face diversity and inclusion challenges, appearing distant from real world applications, accessible only to specialists or linguists, and disconnected from broader cultural contexts. This restricts their potential to engage a wider audience, including those from diverse linguistic and cultural backgrounds, who could benefit from a more inclusive and applied approach to the study of ancient languages and their conceptualizations of movement.

This paper presents *PrevNet*, a new online resource dedicated to the study of preverbs in Ancient Greek and Latin, particularly in motion verbs. Preverbs are meaningful prefixes that attach to verbal bases and profoundly shape both the semantics and syntactic behaviors of verbs (e.g., *circum-* in It. *circumnavigare* ‘sail around’). In contrast with existing lexica, *PrevNet* provides data about the specific meanings that preverbs have in the contexts in which they are used, alongside the linguistic changes they trigger in the verbs they are attached to. *PrevNet* combines digital and corpus methodologies with insights from historical and cognitive linguistics, geography, and socio-cultural studies. The resource is based on the annotation of a corpus of 35 texts (500,000+ words) from both languages, spanning different authors, periods (8th century BCE – 2nd century CE), and literary genres (see Section 4). Starting from linguistic analyses on preverbs, *PrevNet* captures diverse information on meanings of preverbs and preverbed motion verbs, facilitating a deeper exploration of how these ancient cultures conceptualized movement and reality. For instance, Ancient Greek’s 45 preverbed forms of ‘sail’ versus Latin’s 14 (Farina, 2021) reflect broader socio-cultural distinctions, such as Greek maritime expertise (Vázquez Hoys, 2006; Beaulieu, 2016) and Roman pastoral traditions (Jones & Sidwell, 1997: 185). *PrevNet* records many Ancient Greek preverbed forms of *pléō* ‘sail’, showing how useful they were in expressing subtle differences in meaning (e.g., *para-pléō* ‘sail across’), with related examples. The resource interface allows users to understand that these concepts were either absent or expressed by preverbed forms of more generic motion verbs in Latin (e.g., *transeo* ‘travel across’, often used when crossing a river). These linguistic patterns align with broader Aquamotion verb studies (Lander et al., 2012), showing that cultures with stronger ties to the sea develop richer Aquamotion lexica (e.g., Bartolotta, 2020; cf. Section 2).

PrevNet also exemplifies a commitment to inclusion and accessibility within the Digital Humanities by creating a FAIR resource that bridges linguistic, socio-cultural, and geographical analyses of Ancient Greek and Latin preverbs. Designed to be accessible to diverse audiences in terms of background (e.g., Classics, Linguistics, Digital Humanities, Anthropology) and level (e.g., researchers in academia, university students, teachers/students in high schools), *PrevNet* challenges the traditional focus of linguistic tools, which is often exclusively aimed at domain experts, providing an intuitive resource for exploring the role of preverbs in shaping ancient Mediterranean thought and culture. This resource also promotes cross-linguistic comparison, fostering a more inclusive understanding of linguistic diversity across historical languages. Additionally, its scalable and reusable design ensures long-term accessibility for a wide range of communities, aligning with efforts to reduce educational disparities in access to digital resources. *PrevNet* also bridges theoretical and empirical research, allowing both specialists and non-specialists to explore linguistic diversity and the socio-cultural contexts embedded within the systems of the ancient world. Being a scalable and reusable resource for advancing the study of preverbs across time, space, and linguistic boundaries, *PrevNet* demonstrates how Digital Humanities can empower underrepresented audiences, democratize knowledge, and enhance participation, meeting the core objectives of inclusivity and diversity in research, education, and public engagement.

2. LINGUISTIC CONTEXT

Preverbs are a fascinating linguistic category that has attracted significant scholarly attention (e.g., Booij and Van Kemenade, 2003). These prefixes not only possess semantic value themselves (e.g., Lat. *circum-* ‘around’), but also modify the verbs they attach to, often reshaping their meaning and syntactic behavior. For example, while Lat. *navigo* ‘sail’ denotes general sailing, *circumnavigo* ‘sail around’ implies a specific

action requiring a mass of land as the object (see also It. *circumnavigare l'isola* 'sail around the island' vs. *navigare il mare* 'sail over the sea'). Preverbs also alter so-called aspectual properties, as seen in Lat. *edo* 'eat' versus *comedo* 'eat up' (Cuzzolin, 1995), where the latter denotes a completed action, paralleling similar constructions in German (*trinken* 'drink' vs. *austrinken* 'drink up'). Despite their prominence in many languages, preverbs have largely been studied through theoretical or small-scale analyses (e.g., Revuelta Puigdollers, 2014; 2016). A few quantitative studies derived from the growing availability of large digital corpus data (see Section 1) exist (e.g., McGillivray, 2009; 2013; 2014; Meini and McGillivray, 2010), highlighting a gap in diachronic and cross-linguistic perspectives.

Given the cross-linguistic diversity of preverbs and their prominence in many languages and language families (Indo-European, e.g. Latin, Sanskrit, Italian, English; Ugro-Finnic, e.g., Estonian, see Ackerman, 2003; Kartvelian, e.g. Georgian, see Harris, 2003), creating an online resource dedicated to their study has the potential to allow for broader cross-linguistic comparisons. This widespread phenomenon may highlight the cognitive and linguistic strategies for encoding nuanced spatial, temporal, and metaphorical relationships. Within this context, the study of motion verbs provides an ideal foundation. Universally present in languages due to their connection to everyday experiences, motion verbs offer insights into the cognitive and cultural processes underlying spatial conceptualization (e.g., Talmy, 1985; Feinmann, 2020). In her typology, Levin (1993) identifies seven categories of English motion verbs, ranging from inherently directed motion verbs (e.g., *go*, *arrive*) to manner-of-motion verbs (e.g., *run*, *float*), and motion using vehicles (e.g., *drive*, *sail*). This categorization underpins VerbNet (Kipper Schuler et al., 2009), an online resource for English verb classes. Similarly, Talmy (2000) explores typological patterns in motion verb encoding, while Bartolotta (2020) highlights the diversity of manner-of-motion verbs in Aymara, spoken in Bolivia, Peru, and Chile, which vividly describe nuanced ways of moving (e.g., *hithitha* 'walk dragging', *ccuycutha* 'walk head down'). Studying preverbs in motion verbs thus provides a window into how ancient and modern languages reflect cultural and cognitive strategies for encoding motion, enriching our understanding of linguistic diversity and its socio-cultural underpinnings.

3. CREATION OF THE RESOURCE

To build *PrevNet*, we started from Ancient Greek and Latin preverbs verbs of motion. A sample of 16 preverbs (e.g., Lat./AGr. *ab-/apo-* 'away', *cum-/sun-* 'together', *in-/en-* 'in') and eight motion verbs spanning different motion domains (e.g., Lat./AGr. *eo/eîmi* 'go', *navigo/pléō* 'sail', *volo/pétomai* 'fly', *curro/trékhō* 'run') has been selected for each language. The total number of verbs is 256, of which 205 are attested (e.g., *ab-* does not attach onto *venio*, *curro*, *navigo*, *gradior*, *no*, so verbs like **abvenio*, **abcurro*, etc. are not attested). Given the diachronic and comparative scope of this study, we have tried to create a balanced corpus according to language periods, literary genres and their importance within a specific language/culture. The latter factor led to a wider representation of a specific literary genre among all the text we possess (e.g., theatre in Greece, Untersteiner, 1984; the satire in Rome, Petersman, 1999). Moreover, both sub-corpora focus more on the Classical period of these languages, as the number of texts and the literary, historical, and cultural importance of this period cannot be ignored.

Overall, our corpus includes 35 texts for more than 500,000 word occurrences. The general rule governing our choice of texts was to build onto existing studies, especially considering that *PrevNet* aims to be linkable to other existing resources (see Section 1). For this reason, we chose texts that have already been considered in previous quantitative studies (e.g., Plautus' *Amphitruo* and *Mostellaria*, see McGillivray, 2009) and/or have been annotated in the Ancient Greek and Latin Dependency Treebank. All preverbed verbs (2,829 tokens) occurring in the corpus were manually annotated following 20 linguistic parameters including morphology, preverb, preverb meaning in context, verb class using VerbNet labels (see Section 2), literal/non-literal meaning of the resulting verb, meaning of the verb itself (Farina, 2024). The annotation was carried out using INCEpTION (Klie et al., 2018). Data was retrieved through computational methods, using a Python script specifically designed for retrieving data from INCEpTION. The resulting CSV file includes 62,238 cells of data, which constitute the foundation of *PrevNet*. To allow for greater accessibility and reuse of data (Farina et al. 2025), the dataset will be made available on Figshare as soon as *PrevNet* is launched.

4. INCLUSIVE DESIGN

When designing the resource, a major factor was to ensure that it could serve the needs of a broad range of users, well beyond the linguistics community which was the target user group of previous similar resources for ancient languages. To maximize usefulness for the broadest audience possible, we actively

contacted potential user groups and circulated a survey seeking their feedback. This not only helped promote the creation of the resource but also allowed users themselves to take part in the development process and boost its ultimate impact. The survey included various queries about respondents: career stage (e.g., high school students and teachers, undergraduates, postgraduates, PhD students, lecturers), fields of study (e.g., Classics, Linguistics, Digital Humanities, Cultural History), and their familiarity with preverbs and motion verbs (see Section 2). Respondents were also asked what type of content they would like to see populate *PrevNet* and how they would want to engage with it. In total, 92 participants across 16 different fields responded to the survey (see Fig. 1), with the majority coming from Classics (42.6%), Linguistics (21.7%), and Digital Humanities (16.3%). This broad feedback was invaluable in ensuring that *PrevNet* meets the needs and expectations of its varied user base. For instance, most of the respondents manifested their interest in references – intended as curated lists of books, articles, or other resources related to preverbs, motion verbs, and Ancient Greek/Latin linguistics – and case studies (see Section 5) – intended as detailed examinations of specific linguistic phenomena or examples, showing how preverbs and verbs are used in various contexts. Besides the survey, usability tests were conducted by the developers with a group of volunteers that helped refine the user experience. We have also planned workshops to introduce users to the resource and solicit further input about how to ensure *PrevNet* keeps evolving in relation to its users' needs.

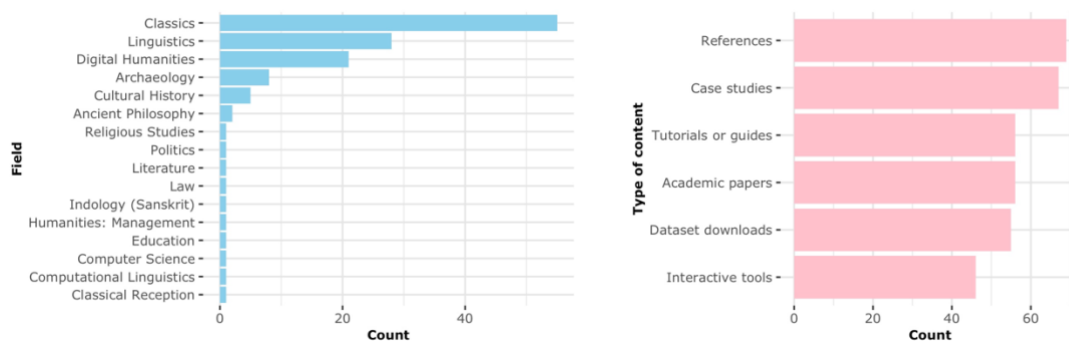


Figure 1. Results of the user survey question *What is your field of study?* (left) and *What type of content would you like to see in PrevNet?* (right)

The creation of *PrevNet* was a key component of the projects “Crossing Boundaries: Celebrating Linguistic Diversity at King’s” (31st March 2025), funded by a Diversity & Inclusion Grant from the Faculty of Arts & Humanities at King’s College London, and “From Classics to classrooms: enhancing linguistic understanding with digital resources” (February-December 2025), funded by a Public Engagement Small Grant Scheme at King’s College London.

The first initiative brought together students from various departments within the Faculty of Arts & Humanities, such as Digital Humanities, and Languages, Literatures and Cultures. “Crossing Boundaries” was designed to draw on King’s richly multicultural environment. The project organized a workshop with a group of students to explore linguistic diversity, specifically through the lens of how languages encode concepts of motion and spatial relationships across diverse cultures and historical periods. This allowed us to analyze the diversity of thought and perception across languages and cultures, fostering inclusivity and cross-cultural understanding. *PrevNet* allowed students to explore and compare motion verbs across different languages, showcasing how languages like English, Albanian, Chinese, Italian, and Latin uniquely represent movement, and revealing the cultural and linguistic underpinnings of these concepts. For instance, while English commonly uses verbs like *enter* or *exit* to express directional movement, other languages might convey the same ideas through subtle modifications to the verbs themselves (e.g., It. *circumnavigare* ‘sail around’) or display both options (e.g., Eng. *enter* / *go in(to)*). The workshop also encouraged collaboration across disciplines, with students from diverse linguistic and cultural backgrounds working together to compare motion verbs in their own language. Students also collaborated in the creation of “Paths of Motion”, an art installation visually representing the diversity of linguistic approaches to movement. “Paths of Motion” was conceived as both a physical and digital artwork serving as a tangible and inspiring testimony of the project’s commitment to celebrate linguistic diversity.

The project “From Classics to classrooms” was designed to make classical languages more accessible and engaging to secondary school students and teachers by leveraging *PrevNet* to explore linguistic diversity. Through interactive presentations and tailored teacher training sessions, the project fostered a new understanding of classical languages as living subjects that enrich modern linguistic perspectives.

Collaborations with schools, including Notting Hill & Ealing High School, ensured the resource’s practicality and relevance. By equipping educators with innovative digital methods and involving students in hands-on linguistic analysis, the project not only revitalized interest in ancient languages but also empowered learners to appreciate the cross-linguistic connections between classical and contemporary languages. The effectiveness and impact of the project have been and will be evaluated through pre- and post-session questionnaires and follow-up focus groups, allowing for continuous refinement and ensuring long-term relevance.

5. PREVNET, A NEW NETWORK OF PREVERBS

*PrevNet*¹ is generated from linguistic annotations. It includes statistics associated with the linguistic parameters resulting from the manual annotation mentioned in Section 3. For instance, Fig. 2² shows the frequency of different verbal bases associated with the Lat. preverb *circum-* ‘around’ (left), alongside all the meanings associated with the resulting lemmas (*circumeo*, *circumvenio*, *circumvolo*) (right). All meanings are listed in the section “Examples” (bottom). Clicking on a specific meaning allows users to retrieve all annotated passages where any lemma appears with that meaning (Fig. 3).

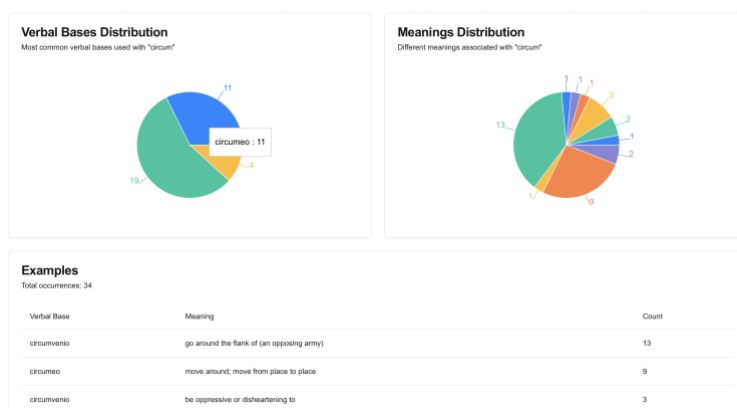


Figure 2. *PrevNet* query for the preverb *circum-*. The resource shows interactive visualizations of the verbal bases occurring with *circum-*, providing their lemmas (left pie chart), and of the meanings associated with verbs preverbed with *circum-* (right pie chart), which are also given in the “Examples” section.

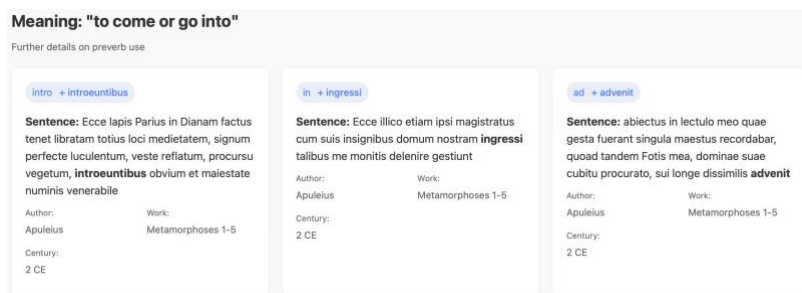


Figure 3. *PrevNet* query for the verb meaning “to come or go into”. The resource lists all annotated passages where verbs with this meaning appear, regardless of their preverb.

Fig. 5 shows an example of the meanings of the preverb *cum-*, spanning from the prototypical ‘together’ to the grammaticalized³ meaning ‘completely’, including negative implications in negative contexts (marked by ‘malefactive’). The resource also shows the frequency of such meanings alongside a visualization to favor readability. All meanings are linked to their respective textual passages, making it possible to easily retrieve textual excerpts.

¹ *PrevNet* will be available at <https://prevnet.sites.er.kcl.ac.uk>. The resource is currently (April 2025) under construction, so for the moment access is restricted to developers only.

² Fig. 2 and Fig. 3 show screenshots from <https://prevnet.sites.er.kcl.ac.uk> (April 2025). Fig. 4 and Fig. 5 show mock-ups of *PrevNet*, as these functions are not yet available on *PrevNet* at the time of writing this article.

³ Grammaticalization is the process by which a word – in this case, a preverb – with a concrete, specific meaning evolves into a grammatical element with a more abstract or functional role in language. For example, in the case of *cum-* it evolved from its original meaning ‘together’ to simply mark a completed situation (expressed with ‘completely’ in Fig. 2).

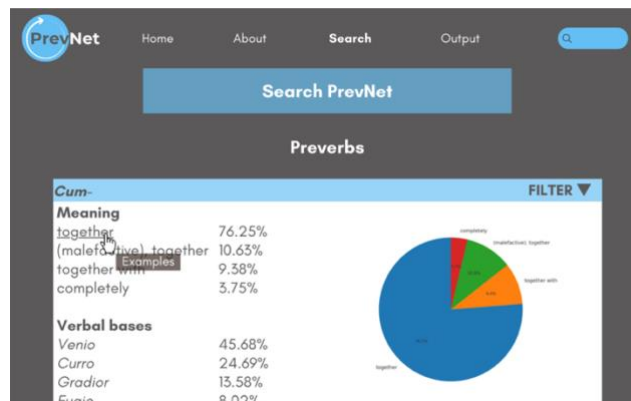


Figure 4. *PrevNet* mock-up query for the preverb *cum-*. The resource shows frequency percentages and visualizations, with the option of reading textual excerpts as examples

PrevNet also contains extra-linguistic information, such as places occurring with specific preverbed verbs. Using the World Historical Gazetteer (WHG) for geographical annotation, *PrevNet* cross-links to WHG for detailed place information. *PrevNet* offers the opportunity to visualize place names occurring with specific preverbs, linking them to the verbal bases they mostly co-occur with (e.g., the river Rhine always occurs with *transeo* ‘cross’, in Caesar’s *De bello Gallico*), as well as to textual passages and directly to the WHG for deeper information about the history of the place itself and its visualization on a map (Fig. 5).

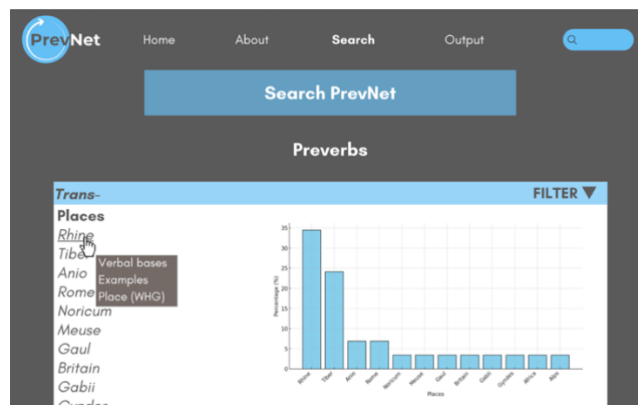


Figure 5. *PrevNet* mock-up query for the preverb *trans-*. The resource lists and ranks all the names of places occurring with the preverb *trans-*, with the option to view verbal bases connected to specific places, textual excerpts, or cross-linking to the World Historical Gazetteer

To enhance usability and in response to the users’ demand (see Section 4), a section of comparative case studies is included in *PrevNet*. This way, users can unlock the potential of the resource, performing similar analyses for their own research and gaining insights not only into the development of metaphorical meanings but also into their socio-cultural implications. For instance, metaphorical meanings originating from preverbed basic motion verbs such as Lat. *eo/venio* and AGr. *eîmi/baínō* make for compelling comparative case studies (e.g., Lat. *evenio*, AGr. *sumbaínō*, *apobaínō* ‘happen’). *PrevNet* adheres to the FAIR principles (Wilkinson et al., 2016). To make the resource findable and promote inclusion and interdisciplinarity, *PrevNet* is designed as a comprehensive repository containing information about preverbs and motion verbs across various languages, with metadata linking to academic papers on their linguistic and cultural significance, as also demanded by users (see Section 3). The resource is open access to eliminate barriers and interoperable with other existing resources (e.g., WHG), enabling seamless integration with broader digital infrastructures. Finally, the resource is reusable and designed to be expandable to additional (historical or modern) languages and verb classes over time. Open-access annotation guidelines are available for contributions and adaptations ensuring long-term utility and scalability (Farina, 2024).

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