

# Learning Greek and Latin Through Digital Annotation: The *Euphoria*EDU System\*

## The *Euphoria* system: digital annotation through DSLs

*Euphoria* is a system for the digital annotation of ancient texts, based on domain specific languages (DSLs), developed by the Laboratory of Anthropology of the Ancient World (LAMA), the CoPhiLab at the ILC-CNR in Pisa, and the Venice Centre for Digital and Public Humanities. (Fig. 1)

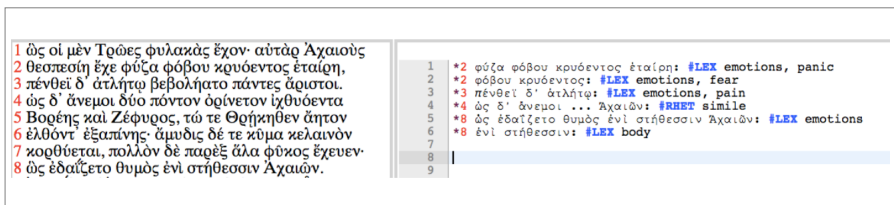


Fig. 1: *Euphoria*: web interface of the annotation platform.

The annotation system, and all its components, are conceived with a user-centred approach: starting from specific research questions, the domain experts and the digital humanities specialists define the conventions of the DSL, in order to have a simple and concise annotation language, close to the usual annotation practices of classicists.<sup>1</sup>

The stand-off annotation is carried out on a web interface, displaying the text, a modern translation (if needed), and a column for the annotation.

The text uploaded on the platform is subdivided into minimum units, such as verses, speeches, or paragraphs, according to the different genres (poetry, theatre, prose), and it is tokenised so that each word is given a unique identifier. Each token,

\* The video of the talk, presented at the online conference *Teaching Classics in the Digital Age* on June 15-16, 2020, is available at <https://doi.org/10.5446/51812>.

1 In Mugelli et al. 2016 we show an example of a DSL built for the study of rituals in the corpus of Greek tragedy, which allows the recording of textual variants useful for reconstructing the ritual dynamics.

>> This book chapter is published under the Creative Commons Attribution Attribution-ShareAlike 4.0 International license (<https://creativecommons.org/licenses/by-sa/4.0/deed.en>). Please note that individual, appropriately marked parts of the book chapter may be excluded from the license mentioned or may be subject to other copyright conditions. If such third party material is not under the Creative Commons license, any copying, editing or public reproduction is only permitted with the prior consent of the respective copyright owner or on the basis of relevant legal authorization regulations.

identified by a progressive number, is associated with a CTS URN<sup>2</sup> in order to ensure interoperability. Once the texts have been uploaded to the platform, the annotation process is rather simple: the user performs their annotation on the web interface, copying and pasting the words to be annotated from the left to the right column, and uses the conventions of his or her DSL to express continuity, discontinuity, variants, etc. Then the user types their annotation, expressed in the form of hashtags, or in triples according to the research needs. The annotated corpus is then converted in standard languages (TEI-XML-compliant annotations,<sup>3</sup> and CTS for the citation system) using an ANTLR parser.<sup>4</sup>

## Research projects: anthropology of ancient Greece

At the Laboratory of Anthropology of the Ancient World, we tested the potential of the *Euporia* system to study ancient Greek texts from a historical anthropological perspective.<sup>5</sup> In particular, the first pilot project (*EuporiaRAGT*) implemented the *Euporia* system as a digital support for Gloria Mugelli's PhD research on the form and function of ritual in ancient Greek tragedy.<sup>6</sup> The annotation, performed on the entire corpus of the surviving Greek tragedies, registered different ritual facts with keywords expressed in the form of hashtags: these are passages in which a ritual is performed onstage, descriptions of ritual actions, and also comments or allusions to different rites. The annotation process followed a bottom-up approach:<sup>7</sup> after the markup phase, the tagset was structured in an ontology, designed in OWL with the software Protégé,<sup>8</sup> following the anthropological theories on ritual action.<sup>9</sup>

In this way, it was possible to structure the information in order to connect the different keywords, creating networks of concepts linked to the different dynamics of the ritual norms. It was therefore possible to carry out, through SPARQL queries on the ontology, complex searches on the relationships between different concepts.

---

2 CTS URNs provide permanent canonical references to texts or passages of text. For example, the first word of The Persians of Aeschylus, *τάδε*, is associated with CTS URN 8:urn:cts:greekLit:tlg0085.tlg001:1@τάδε, dynamically generated from author (Aeschylus: tlg0085), work (Persians: tlg001), verse, and word. CTS specifications can be found at: <http://cite-architecture.org/ctsurm/> (last accessed: May 27, 2021).

3 <https://tei-c.org/> (last accessed May 27, 2021).

4 The process of converting annotation expressed in DSLs into standard languages is well illustrated by Bambaci, Boschetti 2020, which shows the use of the *Euporia* system for encoding critical apparatus.

5 On the theoretical foundations of the historical anthropology of the ancient world, see Di Donato 1990; Di Donato 2013. For an example of LAMA's approach to studying the texts of Greek tragedy see Taddei 2020.

6 Mugelli 2018.

7 For a different approach, cf. the Memorata Poetis project, for the annotation of Greek, Latin, and Arabic epigrams: the tagset was at first inspired by an index rerum notabilium (Boschetti et al. 2014), that was restructured in an ontology in the second phase of the project (Khan, Arrigoni, et al. 2016).

8 <https://protege.stanford.edu/> (last accessed May 27, 2021); Musen 2015.

9 Mugelli et al. 2017. On ritual action see Humphrey, Laidlaw 1994; Humphrey, Laidlaw 2006. On the use of ontologies to study literary texts see Khan, Bellandi, et al. 2016.

A search engine was then built, combining SPARQL queries on the ontology and SQL queries on the database, in order to retrieve series of textual passages related to the different tragic rituals that were discussed in the PhD dissertation.

The *Euporia* system was then adapted to Giulia Re's PhD research, focused on religious landscape in the corpus of ancient Greek tragedy: the project *EuporiaLANGT* aims at studying implicit and explicit associations starting from the elements of the ritual landscape mentioned in the plays; it required the annotation to be structured in triples, in order to begin structuring the information in the ontology during the annotation process itself.

Because they are based on the same corpus, the two annotations can be integrated, drawing from the interaction of the two different systems interesting information on ritual and religious interpretation of the texts of the Greek tragedies.

The historical anthropology of the ancient world is only one of the fields in which *Euporia* is being tested: many projects are underway, in different fields of the humanities, for which the domain experts have built different DSLs suitable for ecdotics, the study of variants, studies on the lexicon, and rhetoric.

## ***Euporia*EDU: toward a collaborative annotation**

PhD research projects produce considerable amounts of data, on extended corpora, to answer very specific research questions. At LAMA, when we developed the digital-annotation system as a support to PhD research, our purpose was to reproduce in a digital environment the entire process of the anthropological study on ancient texts, so that all the work 'behind the scenes' on the texts was not lost, but was reusable in other contexts. We shared not only results, but also all the rough materials used in our research, including annotations resulting from the study and reading of the text, in order to create a collaborative environment, where researchers and students can work at different levels on the same texts. This was possible because all our research is firmly anchored to the texts, the same texts that are studied, with different objectives, at the university and in secondary school.

The first didactic experiments with the *Euporia* system were carried out with students in their first year of Classics at the University of Pisa, as part of the Workshop on Greek Language, that aims to strengthen the language and translation skills of the students, and as part of the Greek Language and Literature course.

The students were given the opportunity to record on the annotation platform different types of observations on the Greek texts (on morphology, lexicon, metrics, stage directions, textual variants, and scholia), commenting on the text with keywords expressed in the form of hashtags.

The didactic experimentation, which received good feedback at the university, especially as regards the collaborative and laboratory work on the texts, encouraged us to experiment with the annotation system in the collaborative context of a secondary school, creating the *EuporiaEDU* project, to promote the digital annotation of texts in the context of the Italian *Liceo Classico* curriculum.

## Teaching classics in Italy: the 'Liceo Classico'

In the last fifteen years, the Italian school system has faced a loss of interest in classical studies, conforming to the European trend that sees the study of Latin and Greek increasingly marginalised in higher education. Nonetheless, together with the gymnasium in the Netherlands, the Italian school system is one of the few in which Latin and Greek are taught for an entire school cycle in secondary school: the 'Liceo Classico' is a secondary-school course in which students from ages 14 to 19 learn ancient languages, together with scientific and humanistic core subjects; furthermore, Latin language and literature studies, with different degrees of detail, are part of other school curricula. Liceo Classico's Ancient Greek teaching system is structured into two years focused on grammar and syntax; from the third to the fifth year the study of Greek and Latin literature is supported by regular work on the translation of ancient texts in prose and poetry.<sup>10</sup>

In recent years, the Liceo Classico has registered a drop in enrolment, facing a 'crisis' that has led to the dismissal of the curriculum in many schools, especially in central-northern Italy: the percentage of Italian students who choose to enrol in Liceo Classico is rather small (6.8), in particular if compared with the 25.5 per cent of students who choose to take the Liceo Scientifico curriculum, with growing success for the course that excludes the teaching of the Latin language.

The crisis of the Liceo Classico has opened a rather heated public debate that questions the status of the Liceo Classico and, more generally, the usefulness of the humanities in the contemporary world.<sup>11</sup> At the beginning of every year, when students are asked to pre-enrol in a secondary-school course, the usefulness of classical education is once again discussed in newspapers and weeklies, with various arguments.

The Liceo Classico has historically been a very traditional and conservative institution, and one of the main arguments of its detractors is the supposed 'incompatibility' between a world based on 'new technologies' and the study of the ancient world.

The public debate on the crisis of the Liceo Classico has encouraged the publication of numerous essays, which have had some success, on the importance of the humanities.<sup>12</sup>

<sup>10</sup> On the Ancient Greek and Latin curriculum of the Liceo Classico see Palmisciano 2004. On didactic strategies for teaching Ancient Greek see Taddei 2011.

<sup>11</sup> Roscalla 2016; Giunta 2017.

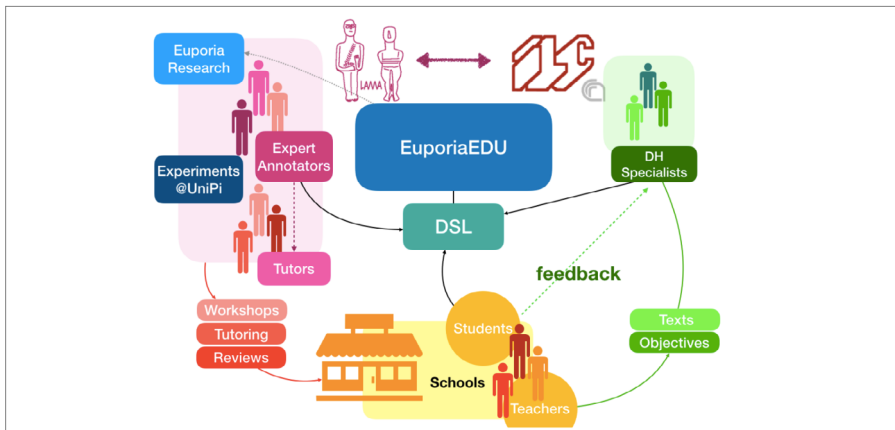
<sup>12</sup> See, for example, Dionigi 2016; Gardini 2016; Marcolongo 2016; Condello 2018.

At the same time, being a ‘threatened environment’, the Liceo Classico is open to possibilities for renewal, especially on the technological side: it is therefore a breeding ground for projects and experiments in the field of digital humanities.

### **EuporiaEDU: toward a collaborative annotation for high school students**

In 2018, the *Euporia* team began a collaboration with three schools, two in the centre and one in the south of Italy, who agreed to experiment with their students using textual annotation with the *Euporia* system. The idea was to build a collaborative system, creating different virtual circles of collaboration and peer education, among schools and universities: all those involved work to define a DSL based on the type of text and the objectives of the annotation (Fig. 2). At LAMA, senior annotators (PhD students) and MA students interested in teaching Greek work together to offer support to the schools, in the form of workshops and seminars, guiding and supporting the high school students during the annotation process; digital humanities specialists take care of the prototype of our system, and train students on the basis of digital textual annotation.

On the other side, high school students contribute not only with their annotation data, but also with valuable feedback on how the system matches their learning needs.



**Fig. 2:** The *EuporiaEDU* system.

It is important to point out that the first approaches to digital annotation have been very time-consuming for schools, since teachers are currently working on the *EuporiaEDU* project during their normal school hours. For this reason, during these first two years of work, we opted to leave teachers totally free to choose the text and the target of the

annotation, in order to adapt it as much as possible to their ordinary teaching program. During the last two school years, the three schools involved in the *EuporiaEDU* project started four different annotation experiments: the two projects carried out in Pisa involved the same students, who tested the system in 2018/2019 working on a text of Lysias, and continued working on Homer in 2019/2020 (Tab. 1).

Text	Year	School	Project
Aeschylus The Persians (Parodos)	2018-2020	Liceo Gargallo, Siracusa	Collaborative translation of the text; comparison with the translation by Fraccaroli; annotation of stylistic devices, compounds, named entities; observations on the text and the translation
Lysias I	2018/2019	Liceo Galilei, Pisa	Morphology; lexicon of law, house- hold, and family
Isocrates XIII	2019/2020	Liceo Volta, Colle val d'Elsa (SI)	Syntax; inferences on the different agents mentioned in the speech
Homer, Iliad IX	2019/2020	Liceo Galilei, Pisa	Morphology; semantics of speech and speech acts

Tab. 1: *EuporiaEDU* projects.

The teachers' selection of texts followed two main criteria. As far as prose texts are concerned, the work aims to strengthen students' translation skills and focuses particularly on morphology and syntax. The annotation of poetry focuses on style and on the dynamics of translation: the students presented their own translation of the text, then compared it with an existing translation and used the annotation to mark stylistic devices and semantics.

In order to keep the data produced with the *Euporia* system accessible and reusable, we chose to work on copyright-free translations: the students worked on Italian translations from the late 19<sup>th</sup> century, which have also proved particularly interesting as an exercise on the Italian language.

### ***Euporia The Persians (Siracusa, 2018-2020)***


The students from the Liceo Gargallo in Siracusa were the first to experiment with the *Euporia* system, during a School-Work Alternation project<sup>13</sup> that took place over two years, concluded in June 2020 when the students took their high school final exam.<sup>14</sup>

<sup>13</sup> School-Work Alternation was introduced by Law no. 53/2003 and disciplined by Legislative Decree no. 77/2005. It is addressed to students of upper secondary schools, and allows them to 'alternate' periods of training in the classroom and inside companies (or other hosting establishments).

<sup>14</sup> The results of the project were published online in June 2020, together with an interesting report written by the students <http://www.himeros.eu/persiani/index.html> (last accessed May 27, 2021).

The students carried out a collaborative translation work on the Parodos of Aeschylus's *The Persians*, and then compared their translation with the Italian translation by Fraccaroli (19<sup>th</sup> century).<sup>15</sup> They then used the *Euporia* system to annotate the text, focusing in particular on stylistic devices, compounds, and named entities, but also marking their observations, structured as free comments, on the characteristics of the text and the translation choices (Fig. 3).

The long work that the students conducted, in a collaborative way, on the Greek text and its translation allowed them to reflect, on the one hand, on the characteristics of the Aeschylean style, and on the other, on strategies for translating a poetic text into contemporary Italian.



HomePage | Figure Retrichie | Composi | Entità nominate | Descrizione del progetto

**Eschilo, *I Persiani* (1-268)**

Tr. di G. Fraccaroli	Testo greco	Tr. degli studenti del Liceo Gargallo (SR)
<b>CORO</b> 1 Ecco i canuti de la Persa gente, 2 Che uscì la patria a conquistar de' Greci: 3 Ne le sedi per molto oro opulente 4 Serse ne clesse a sostener sue veci, 5 Serse di Dario, Serse onnipotente. — —	<b>Χορός</b> 1 Τόδε μὲν Περσῶν τῶν οὐχομένων 2 Ἐλάδ' ἔξ' οὐρανὸν καί πολεμῶντων 3 καὶ τῶν ἀργύρου καὶ πολυχρύσων 4 ἐδάσαντο φύλακας, 5 κατὰ πρῶσθειαν οὓς αὐτὸς ἀναξ 6 Ξέρξης βασιλεὺς Δαριαγομένης 7 εἰλάτο χώρας ἐφορεῦεν.  1 Τόδε μὲν Περσῶν ... / 65 χρόνων προέβλεψα : L'ingresso e la disposizione del coro sulla scena sono sottolineati dalla rigidità e dalla lentezza del metro anapestico. Subito dopo viene contestualizzato il luogo, la reggia di Susa. Segue il lungo e dettagliato catalogo degli eroi in stile epico. 1 Τόδε ... / 153 προσωπῶν : Si tratta della Parodo. La tragedia non presenta un prologo ma inizia con la Parodo che ha struttura tripartita. Due sezioni anapestiche delimitano una sezione lirica. 2 ες : εἰς 3 πολυχρύσων = 3 per molto oro opulente : La ricchezza dell'esercito e della flotta è ancora più marcata dal quadruplicato utilizzo dell'aggettivo. 3 πολυχρύσων : I composi omerici che presentano il prefisso in πολυ- hanno una funzione iperbolica; questi trasmettono infatti l'immagine di un reno all'insegna della grandezza e della maestosità, l'Impero Persiano. 5 κατὰ πρῶσθειαν = 1 canuti : Il termine indicante la causa, πρῶσθειαν, viene sostituito nella traduzione dal termine indicante l'effetto.	<b>CORO</b> 1 Siamo i fedeli, i custodi dei sontuosi palazzi reali 2 colmi d'oro, quelli che lo stesso signore Serse, 3 Re, figlio di Dario, scelse perché vecchi, 4 per sorvegliare la regione. 5 quando i Persiani partirono per la terra ellenica.
6 Ah! ma l'anima mia turbano bieci 7 Auguri, e il dubbio la sgonmenta ... ah il giorno 8 Dunque mai non verrà del suo ritorno?  6 l'anima ... / 7 Auguri : Fraccaroli nella sua traduzione elimina il concetto dell'animo che si turba nelle profondità di sé stesso. 8 Dunque ... ritorna : Fraccaroli traduce i versi 8 e 9 dopo il verso 11 trasformando un'affermativa in un'interrogativa dal tono fortemente patetico.	8 ἀμφὶ δὲ νόστον τῷ βασιλεῖ 9 καὶ πολυπόλοισι στρατιᾶς ἡβῆ 10 κλαυόμεναις ἔγγιν ὀρθολοπέται 11 ἠυμῶν, ἔσθηεν δὲ βελύξει.	6 Per il ritorno del re 7 e dell'esercito armato d'oro, 8 l'animo, ormai profeta di sventure, 9 è profondamente angosciato e pieno di sgomento.

Fig. 3: Results of the *Euporia The Persians* project.

### ***Euporia Lysias I* (Pisa, 2018/2019)**

The students of the Liceo Galilei in Pisa started testing the system in 2018/2019, working on the speech by Lysias on the murder of Eratosthenes. It was a first approach with the digital-annotation process, for young students in their second year of Greek.

The teacher chose to focus on morphology, and the students performed a morphological markup of the words they found difficult to analyse, with the help of online tools (Perseus). To increase interest in elements of Greek culture strongly linked to the language, they marked all the words in the semantic field of law and family.

Even when the annotation is standardised, we find it useful to adopt the DSL close to the conventions for textual analysis that the students adopt in class with their teacher.

15 Fraccaroli 1876.

### ***Euporia Isocrates XIII (Colle val d’Elsa, 2019/2020)***

During the first term of 2019/2020, the students in the last year of Liceo Classico at the Liceo Volta in Colle val d’Elsa worked on the speech ‘Against the Sophists’ by Isocrates (Isocrates XIII).

In the first step of their annotation, the students focused on the syntax of the verbs. The verbal dependencies and the syntactic structure of the sentence are expressed with the DSL, so that the students do not have to deal with treebanking.<sup>16</sup>

In the second phase, we asked the students to focus on Isocrates’ statements about all the people involved in the speech (mainly, the sophist and the education professionals). The students marked the different agents mentioned in the speech and then made inferences (expressed in triples) about the characteristics that the author attributes to these characters.

For example, when Isocrates states that the sophists are ready to sell off their teaching, students could infer that the sophists were greedy, and that their teaching was of little value.

### ***Euporia Iliad IX (Pisa, 2019/2020)***

Finally, during the second term of school year 2019/2020, we continued the project with the students from Pisa.

The third-year program in Liceo Classico includes the reading of a book of Homer, in this case Iliad IX. The teachers guided their students toward a very complete annotation of the morphological, linguistic, and stylistic phenomena in the Homeric text. The students then performed an annotation of the semantic field of speech and speech acts. The tutors from LAMA defined with the students a tagset of the different speech acts to be marked, starting from the distinction between nonverbal sounds and speeches and then detailing various ways of articulating the speech. (Fig. 4)

## **Teaching classics during COVID-19**

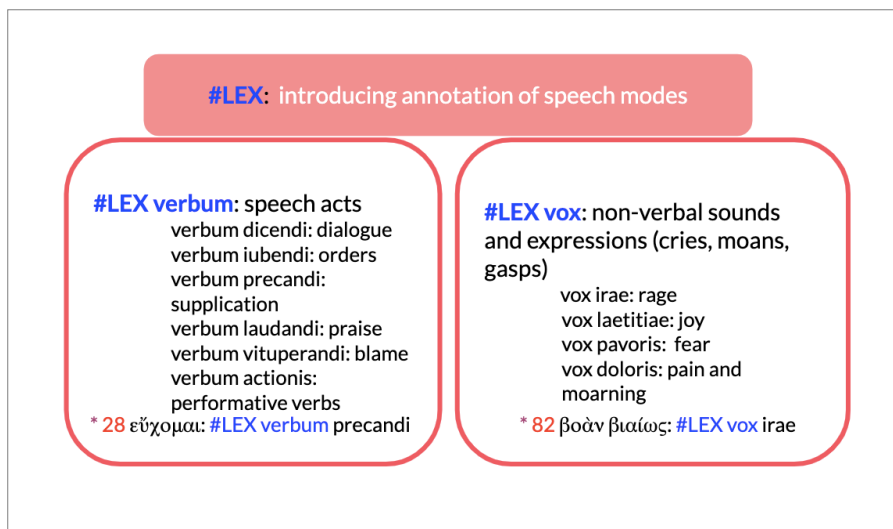
The project with the students from the Liceo Galilei in Pisa was scheduled for the second term, with preliminary activities (meetings with teachers and an introductory workshop on the principles of digital annotation) in February 2020.

Italian schools interrupted their activity at the beginning of March due to the COVID-19 crisis. Even if it was not clear at first that remote learning would be the only resource available during the last three months of the academic year, the school closure represented for the *Euporia* team an opportunity to be in direct contact with the students, a sort of stress test that certainly improved the collaborative aspect of the project.

---

<sup>16</sup> Ancient Greek Dependency Treebank (AGDT) [https://perseusdl.github.io/treebank\\_data/](https://perseusdl.github.io/treebank_data/) (last accessed May 27, 2021); cfr. Bamman et al. 2009; Mambrini 2011. For a teaching experiment that involved students in treebanking see Mambrini 2016.





**Fig. 4:** Tagset for annotating speech acts in Iliad IX.

Knowing that we were dealing with students who had already become familiar with the digital-annotation task last year, we decided with the teacher to initiate the project immediately after the start of the lockdown, as a first strategy to deal with the emergency.

The students from the first phase were excited to take part in the project and were eager to communicate with the experts from LAMA, because they saw in the work on Greek a way to resume their usual school habits.

To facilitate the remote-learning process, we prepared a user guide for the annotation. Each student translated a portion of the text (10–15 lines) and performed the first phase of the morphological, stylistic, and semantic annotation on the text. The annotation then went through several stages of revision by the tutors from LAMA.

In the second term, MA students from LAMA were carrying out their internships at the school. During the lockdown they followed the remote-teaching activities organised by the school, and acted as tutors for the *Euporia* project: they reviewed the student annotations, and provided feedback on their work.

This workflow offered two advantages. First, the students had to review their annotation several times, encouraged by the tutors to add more notes, to deepen the detail of their analysis, and to improve the translation. At the same time, the work reinforced MA students' skills as future teachers, given their active role in motivating and guiding students.

In this sense, the collaborative work involved a continuous exchange of knowledge and skills that cultivated education at different levels and different kinds of feedback on students' habits and learning needs.

## From research to teaching: a round trip

The activities of the various projects launched during the school year ended in May 2020 with an online workshop, during which the students working on Homer had the opportunity to meet their colleagues who had finished working on Aeschylus. During normal school activity, a workshop between schools so far away (Pisa and Siracusa) would be very difficult to organise, but in a context of remote learning it was rather simple to have 70 students online for the entire afternoon.

During the workshop, the students were able to give their feedback on the project, and show the results of their annotation; the workshop was a first opportunity to encourage dialogue between two different schools that would have never shared experience otherwise. The tutors provided students with in-depth materials, and ideas for deepening their knowledge of the texts they dealt with. Finally, the expert annotators from LAMA showed students how their data can interact with that produced by *Euporia* for research, so as to project their work into the broader framework of advanced classical studies.

The true success of the workshop was measured, however, by the fact that the question time was entirely occupied by questions from the students to their colleagues from the other high school: they were curious about their work strategies and the difficulties they had encountered, and of course they were eager to know how the pandemic had been managed in the other school.

## Perspectives for data collection and reuse

The school year 2020/2021, with the management of anti-COVID 19 measures, will certainly be a very challenging year for Italian schools from an organisational point of view. The precarious situation in which schools have resumed work will also influence teaching strategies and approaches, in particular with regard to didactic experiments: it will be very difficult for schools to give space to projects that require additional hours, and the intervention of external staff.

For this reason, the *EuporiaEDU* project will need to maintain and enhance the remote-teaching approach: moving our work entirely into a digital environment facilitated communication between students and researchers, and offered great opportunities for discussion.

At the same time, the work on text carried out with the *Euporia* annotation system, based on the learning needs of the students and the teaching strategies of their teachers, is not an alternative to the usual school work on text; rather, it can be considered as an integrated digital-teaching activity: in building an annotation project on a Greek text, the objective is to maintain the customs and good practices of linguistic and literary analysis of ancient texts in the digital environment.

Working with schools is a very slow process in terms of data production, in both the quantity and quality of data, which needs to be reviewed and processed. Consequently, in the coming school years we plan to converge the work of different students on the same texts, in order to have a critical mass of data that can be made available to other students (as teaching support or in-depth tools). Students' data can then be very useful, for us, as a starting point for research on students' strategies and needs in learning ancient languages.

The aim is to involve students in a knowledge-production process (which will be increasingly structured as the project continues): among the students' feedback, a recurring theme is strong motivation in the awareness that their work on the text is not lost, but can be reused by researchers and other students.

---

## Authors

**Gloria Mugelli** , University of Pisa


Gloria Mugelli is a PhD in Classics and Anthropology of the Ancient World at the University of Pisa and at the Centre ANHiMA of the École des Hautes Études en Sciences Sociales in Paris. She adopted the *Euporia* system for her doctoral research on ritual actions in the corpus of ancient Greek tragedy, focused on the representation of different ritual dynamics on and off the tragic stage. She is currently working as a teacher in secondary school, and she is part of the *EuporiaEDU* project.

[gloria.mugelli@gmail.com](mailto:gloria.mugelli@gmail.com)

**Giulia Re**, University of Pisa

Giulia Re is a PhD student in Anthropology of Ancient Greece at the University of Pisa and at École Pratique des Hautes Études (Paris). Her research project deals with the notion of "religious landscape" in ancient Greek tragedy from a religious perspective. Alongside with the work on Greek tragedy she is using *Euporia* as a support for her research, by annotating ancient texts through her own DSL.

[giulia.rex90@gmail.com](mailto:giulia.rex90@gmail.com)

**Federico Boschetti** , CNR Pisa, Institute of Computational Linguistics "A. Zampolli"

Federico Boschetti graduated in Classics at the University Ca' Foscari of Venice in 1998. He got his PhD in Classical Philology jointly at the University of Trento and the University of Lille III in 2005 (thesis: *Essay of computer-assisted linguistic and stylistic analyses of the Aeschylus' Persae*). He also got a PhD in Cognitive and Brain Sciences – Language, Interaction and Computation at the University of Trento in 2010 (thesis: *A Corpus-based Approach to Philological Issues*). Since 2011 he has been a researcher at the Institute of Computational Linguistics 'A. Zampolli' of the CNR of Pisa. His research interests are: digital philology, collaborative and cooperative philology, historical OCR and distributional semantics applied to ancient.

[federico.boschetti@unive.it](mailto:federico.boschetti@unive.it)

**Andrea Taddei** , University of Pisa

Andrea Taddei is Associate Professor of Ancient Greek Language and Literature at the University of Pisa. He is the Scientific Secretary of the Laboratorio di Antropologia del Mondo Antico, and an associate member of the Centre ANHiMA – EHESS in Paris. The main fields of interest of his research are ancient Greek literature of the archaic and classical period studied under an anthropological perspective, ancient Greek religion and ancient Greek law. He is also interested in didactics of ancient languages.

[andrea.taddei@unipi.it](mailto:andrea.taddei@unipi.it)

## References

- Bambaci, Luigi / Federico, Boschetti 2020. Encoding critical Encoding the Critical Apparatus by Domain Specific Languages: The Case of the Hebrew Book of Qohelet, in *Quaderni di Umanistica digitale*, 7–13.
- Bamman, David / Mambrini, Francesco / Crane, Gregory 2009. An ownership model of annotation: The Ancient Greek Dependency Treebank, in: Marco Passarotti, Adam Przepiórkowski, Savina Raynaud and Frank Van Eynde (eds), *Proceedings of the Eighth International Workshop on Treebanks and Linguistic Theories (TLT 8)*, Milan, 5–15.
- Boschetti, Federico / Del Gratta, Riccardo / Lamé, Marion 2014. Computer Assisted Annotation of Themes and Motifs in Ancient Greek Epigrams: First Steps, in: Roberto Basili, Alessandro Lenci and Bernardo Magnini, *Proceedings of the First Italian Conference on Computational Linguistics CLiC-it 2014*, 9th and 10th December 2014, Pisa, 83–86.
- Condello, Federico 2018. *La scuola giusta*. In difesa del liceo classico, Milano.
- Di Donato, Riccardo 2013. *Per una Storia Culturale dell'Antico: Contributi a una Antropologia Storica*, Pisa.
- Di Donato, Riccardo 1990. *Per una antropologia storica del mondo antico*, Firenze.
- Dionigi, Ivano 2016, *Il presente non basta. La lezione del latino*, Milano.
- Fraccaroli, Giuseppe 1876. *Eschilo, Le tragedie*, Torino.
- Gardini, Nicola 2016, *Viva il Latino*, Milano.
- Giunta, Claudio 2017. *E se non fosse la buona battaglia? Sul futuro dell'istruzione umanistica*, Bologna.
- Humphrey, Caroline / Laidlaw, James 1994. *The Archetypal Actions of Ritual: A Theory of Ritual Illustrated by the Jain Rite of Worship* (Oxford Studies in Social and Cultural Anthropology), Oxford, New York.
- Humphrey, Caroline / Laidlaw, James 2006. Action, in: Jens Kreinath, Jan A. M. Snoek and Michael Stausberg, *Theorizing Rituals*, Leiden-Boston, 265–284.
- Khan, Anas F. / Arrigoni, Silvia / Boschetti, Federico / Frontini, Francesca 2016. Restructuring a Taxonomy of Literary Themes and Motifs for More Efficient Querying, *Materialities of Literature 4* (2), (MATLIT), 11–27.
- Khan, Anas F. / Bellandi, Andrea / Benotto, Giulia / Frontini, Francesca / Giovannetti, Emiliano / Reboul, Marianne 2016. Leveraging a Narrative Ontology to Query a Literary Text, in: Ben Miller, Antonio Lieto, Rémi Ronfard, Stephen G. Ware and Mark A. Finlayson (eds), *7th Workshop on Computational Models of Narrative (CMN)*, 11th and 12th July 2016, Saarbrücken/Warden, 10:1–10:10.
- Mambrini, Francesco 2011. 'L'Ancient Greek Dependency Treebank'. Un nuovo strumento per lo studio della lingua greca, in: *LEXIS*, no 29, 51–70.
- Mambrini, Francesco 2016. *The Ancient Greek Dependency Treebank: Linguistic Annotation in a Teaching Environment*, London.
- Marcolongo, Andrea 2016. *La lingua geniale: nove ragioni per amare il Greco*, Bari.
- Mugelli, Gloria 2018. *Spazi drammatici e pratiche rituali: forma e funzionamento dei riti nella tragedia attica*, (unpublished doctoral thesis, University of Pisa).
- Mugelli, Gloria 2017. Designing an Ontology for the Study of Ritual in Ancient Greek Tragedy, in: Francesca Frontini, Larisa Grčić Simeunovic, Spela Vintar, Anas, Fahad Khanh and Artemis Parvisi, *Proceedings of Language, Ontology, Terminology and Knowledge Structures Workshop (LOTKS 2017)*, Montpellier, 95–104.
- Mugelli, Gloria 2016. A user-centred design to annotate ritual facts in ancient Greek tragedies, *BICS* 59 (2), 103–120.
- Musen, Mark A. 2015. The protégé project: a look back and a look forward, *Al Matters* 1 (4), 4–12.
- Palmisciano, Riccardo 2004, *Per una riformulazione del curriculum di letteratura greca e latina nel Ginnasio e nei Licei*, in: *A.I.O.N.*, sezione filologico-letteraria, XXVI, 245–284.
- Roscalla, Fabio 2016. *Greco, che farne? Ripensare il passato per progettare il futuro: manuali e didattica tra Sette e Novecento*, Pisa.
- Taddei, Andrea 2011. *Testi e contesti. Per una didattica della letteratura greca nei nuovi licei*. Prefazione di R. Di Donato, Pisa.
- Taddei, Andrea 2020, *Heorté. Azioni sacre sulla scena tragica euripidea*, Pisa.