

Defixio Digital(is): A Semantic-enabled Digital Archive For the Study of Ancient Curse Tablets

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Abstract

In this paper we present a relevant example of how new technologies can be applied to the study of the ancient world. In particular, we present a set of activities whereby we apply semantic technologies and open source software for the study of a very specific class of archaeological and textual objects, the so-called defixiones. The term defixio refers to a cursing tablet, engraved on thin sheets of lead, especially as used in the Ancient Mediterranean area for various "magical" uses. The study of this field has not yet produced any complete systematisation of all the different material and interpretations. We intend developing a system bringing together all the existing information in order to offer scholars a tool comprising all available knowledge to date and the possibility to extend it with the results of their research.

Categories and Subject Descriptors (according to ACM CCS): Information Storage and Retrieval [H.3.5]: Web—based Services

1. Introduction

Defixiones are cursing tablets engraved with a text on very thin sheets of lead, usually rolled or folded, discovered in all the Ancient World (from the Mediterranean to Britain), written in various ancient languages (Greek, Latin, Oscan, Iberian, Celtic etc.) and dating from the 6th century B.C. until the Middle Ages.

At the present day we possess about 1500 such artefacts. Many sources (such as Plato, Pliny the Elder, Cicero and Tacitus) state that these magical practices were very frequent in the Ancient World. Tacitus (Ann. II 69) even ascribes the death of Germanicus, the son of Drusus the Elder and the heir to the Roman empire, to a *defixio: nomen Germanici plumbeis tabellis insculptum*.

The main purpose of *defixiones* was to bend the will of the adversary: the goal of the defigens (i.e. the curser) was to prevent his opponents from reaching their goals, to undermine what they had already achieved, or even their physical annihilation. To this end, the defigens used the power of magic and the enchanting power of words; the right words gave their possessor absolute power to bend others, whether humans or divinities, to his will: hence it would appear that

these cursing tablets were produced by professional sorcerers.

In order to actuate the curse, it was necessary to find a way to communicate with the Underworld, so that it could reach its destination, thereby becoming effective. It was important in this sense to find an appropriate place in which to bury the tablet, a place generally communicating with hell: wells, rivers and, above all, tombs, especially those of *biaio-thanatoi*, persons "who died of violent death", or *aoroi*, those "who died prematurely", since such persons were considered to be anxious to take revenge on living people. It was possible to place a curse inside the tomb of someone who had died, thereby making the deceased person take on the role of 'postman to Hell' [FO97].

This is the origin of the widespread use of the verb 'to give' as a cursing verb. The cursing tablets could also come from a public or sacred place, as in the case of the *defixiones* from the sanctuary of Demetra Malophoros in Selinunte and Corinth and of the Magna Mater in Mainz. Scholars assume that this was due to the presence of professional magicians in these sacred areas.

It is generally believed that the use of lead was not random but functional, in order to unleash the *actio magica*: the use

of this metal is considered to have dictated by its physical characteristics (colour, heaviness, coldness) that would make it particularly appropriate for the content of the texts.

There is also an objective reason: the remarkable flexibility of the lead, which made it suitable to be folded or rolled. Curses, like all magical acts, had a ritual form and was composed of verbal utterances (formulas believed to produce an effect) and non-linguistic actions (manipulation of matter) that may have been complementary or alternative rites. *Defixiones* are categorised on the basis of thematic taxonomy: they could be judicial (against opponents in court), erotic (to arouse love or to oppose rivals), athletic and theatrical (against competitors in the circus and theatrical contests), commercial (against economic rivals) and against thieves and slanderers. Example of the possible appearance of a *defixio* are shown in figure 1. The *defixio* Jordan 112 [Jor85], from necropolis of Messina, gives a typical example of one of these texts:

"(I curse) Ninphis and I give her to you, ruler of hell, for your eternal possession, and to Kore and to the Erinyes, to destroy her completely and to take her away as quickly as possible, and so that the Erinys may lead the bitch underground..."

Another example is DTA 78 [Wue97], from Attica:

"(I curse) Aristocydes and the women who will be seen with him. May he marry no other woman or maiden."

Different people with different backgrounds have studied *defixiones* at various times [Aud04] [Gag99]. Such scholars have been linguists, philologists and historians. However, a complete and organic systematisation of all this material has not yet been produced. The aim of this paper is to define a system in which all the knowledge in this field can be put together and may be enriched in the future by scholars.

2. The Making of a System

The management of *defixiones* in our project concerns their two main aspects. *Defixiones* are primarily physical objects which can be scanned, photographed, sketched and represented in various ways. Correspondingly, we would first propose the creation of a featured digital library in which to store digital (2D or 3D) replicas of the original objects, together with a relevant set of metadata. This will produce a powerful tool that can be consulted by all those interested in the "iconographic" aspect of these tablets.

Maybe the most important feature that interests scholars researching cultural heritage when dealing with *defixiones* is their linguistic aspect, i.e., the study of the text or texts inscribed upon them: collecting all the texts in one place and encoding them in a standard format would provide an effective tool for the study of this class of objects, especially if we consider that a typological study of all the *defixiones* has never been done before and is absolutely necessary in order

to solve most of the as yet unresolved hermeneutic doubts concerning them.

3. CIDOC-CRM Ontology

We are convinced that a valid resource for this kind of study could be developed only if we are able to emphasise the various semantic aspects of the inscriptions in order to create a reliable framework for comparison [AF07]. Of course, we must first take into account the interpretation already given by the most representative scholars in this field.

However, we consider that it is also important to give modern scholars the possibility not only to compare the different interpretations available but also to add more linguistic considerations via the mechanism of annotation.

For the semantic encoding of the texts we have chosen the CIDOC-CRM ontology, which in our opinion would simplify and help to resolve most of the semantic interpretation discrepancies which for a long time have affected (and still affect) the acquisition of a correct reading and comparison of most of the texts. The use of the entities provided by CIDOC-CRM seems particularly suitable for such operations [GN06].

4. The Implementation of the Defixio Digital(is)

To create the repository for storing the digital representations of *defixiones* we shall use an extended instance of the Fedora 3.4 digital repository framework [FED], which, for each *defixio*, will host its 2D/3D representation (for this kind of object, this is also a fundamental tool for the understanding of the text), all the textual transcriptions of its specific text (which also means all interpretations) made by scholars, and all the related bibliographical references.

In addition, each digital object will come with a rich set of metadata providing all the relevant information concerning both the object itself (provenance, material, dimension, date of creation etc.) and its texts (language, length etc.). Finally, the metadata will form a semantic network of information extracted from each text, which will constitute the machine-readable version of the text itself (in RDF).

Fedora already provides most of the functionalities required for the development of such an archive. The missing features (such as support for CIDOC-CRM ontology, user interfaces for annotations, knowledge extraction, complex and semantic queries and so on) will be implemented as modules directly on top of the Fedora core framework.

The core of Fedora repository natively comes with:

- A digital object repository to ingest, store, aggregate manage and extract digital objects (images, videos, documents and other relevant files).
- A semantic resource index (i.e. an instance of the Mulgara triple store) which provides the infrastructure for indexing

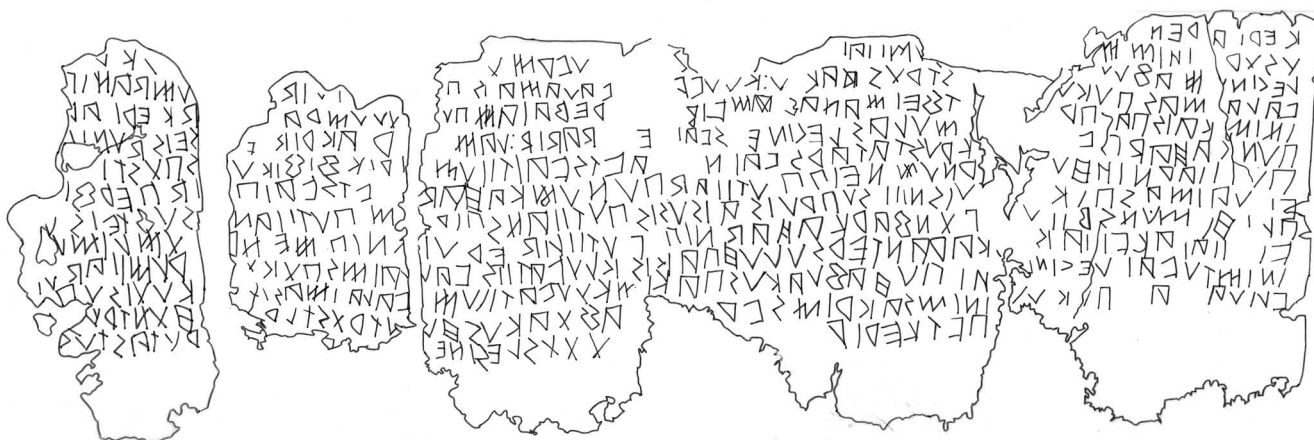


Figure 1: Defixio 'Vetter 6' from Capua (Italy). Oscan language.

the complex RDF network of metadata concerning the relationships between objects and components [DST04].

Fedora hence implements the most typical operations of a digital repository, including a content versioning module, capable to track when a change is made on a certain object and by whom, and to create a new version of the modified data every time a change occurs.

The most important element to be implemented afresh is the capability to manage the CIDOC-CRM semantic network of knowledge extracted from the inscriptions: the Mulgara triple store provides the required high degree of flexibility to build a solid semantic network of this kind.

However most of the work has to be put into creation of a user friendly set of interfaces for the operations of knowledge extraction and query. Additional interfaces are required for the effective management of the whole semantic network. The development operation has been recently made easier by some middleware software which simplify the work of interface creation (e.g. the Islandora framework [ISL] and other similar ones)

The system will also provide users (i.e., scholars) with a annotation mechanism whereby they will be able to add more knowledge and bibliographical references for each text every time new interpretations or linguistic discoveries become available. This will immediately enrich the semantic network of knowledge and extend the related bibliographical entries of the related topics.

5. The CIDOC-CRM Encoding of the Texts

The encoding process of the texts can be seen as an extraction of knowledge and is usually composed of 4 steps:

1. Finding the relevant elements (actors, places, objects and so on) taking part in the event referred to in the text
2. Finding the right properties (i.e. relationships) linking the relevant elements together within the context of the inscription.
3. Describing these elements and relationships by using the CIDOC-CRM classes and properties
4. Encoding the CIDOC-CRM conceptual descriptions in a formal language (RDF).

Once we have semantically expressed the sentence through the CIDOC-CRM set of triples, we can finally create its digital version by encoding each triple in an RDF triple. The RDF metadata model is based upon the same idea of making statements about resources in the form of subject-predicate-object expressions in RDF terminology. The subject denotes the resource, and the predicate denotes traits or aspects of the resource and expresses a relationship between the subject and the object.

CIDOC-CRM gives also the possibility to capture the implicit semantic meaning hidden in the sentences in order to extend and enrich the encoding by providing a set of complex spatial relation definition properties *formsPartOf*, *contains*, *overlapsWith*, *bordersWith*, *fallsWithin* and advanced temporal definition predicates (*occursBefore*, *occursAfter*) to define sequences of events, *termini ante* and *post quem*.

At the end of the process, all the inscriptions processed via this mechanism will have a semantic machine-readable RDF representation which can be put in a triple store and queried according to different semantic criteria. The whole set of RDF encoding will create a semantic network of meanings available to be browsed and enriched with new information added by scholars.

The RDF information network will form part of the meta-data framework of the digital library by relating each encoded text with the physical object corresponding to a digital replica in the repository.

The encoding process will also permit the creation of a thesaurus of relevant terms used in the inscriptions (comprising people, places, actions and other elements typical of this kind of texts) which could further represent a valid contribution to the creation of a thesaurus of ancient magical terms.

6. Conclusions and Future Work

This project has been made possible by the collaboration between VAST-LAB (PIN, Italy), which has a long experience in the development of archives and semantic tools for Cultural Heritage [NFHN09], and the Dipartimento di Scienze dell'Antichità, Medioevo, Rinascimento e Linguistica of the Università degli Studi di Firenze, Italy, in charge of the study of *defixiones*, which also provided all the iconographical, textual and bibliographical material [Mur10].

The development of the system, which has just begun, will focus during the current year on the implementation of the digital archive and the encoding of the texts. It will eventually evolve into the creation of a set of prototypes, which will be distributed to a group of scholars working in the same field, so that they can test it with their data. The final system will collect all the results produced by this work and will implement online the final version of the whole system.

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