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# **GESHAEM and the Challenge of Encoding Greek and Demotic Papyri**

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*Nicola Reggiani (Ed.)*

# DIGITAL PAPHYROLOGY III

THE DIGITAL CRITICAL EDITION OF GREEK PAPHYRI:  
ISSUES, PROJECTS, AND PERSPECTIVES

*Nicola Reggiani (Ed.)*  
DIGITAL PAPHYROLOGY III



The volume collects contributions about the most recent developments of the theoretical and practical concept of digital critical edition applied to Greek Papyrology, redacted by outstanding scholars involved in ground-breaking projects devoted to advanced methods of representing textual data and contextual metadata of Greek papyri in digital environments.



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Marie-Pierre Chaufray — Lorenzo Uggetti

# GESHAEM and the Challenge of Encoding Greek and Demotic Papyri

## 1 GESHAEM: the Graeco-Egyptian State – Hellenistic Archives from Egyptian Mummies

The project GESHAEM (The Graeco-Egyptian State – Hellenistic Archives from Egyptian Mummies), directed by Marie-Pierre Chaufray at the Ausonius Institute in Bordeaux, aims to improve our knowledge of the administration of the Fayyum during the first century of Ptolemaic rule by studying texts that have long been neglected: the papyri of the Jouguet Collection in Paris. This paper will not present the historical issues concerning the documents, but, after a short description of the context and the object of study, the questions raised by the encoding and some of the choices made for the website database, implemented by Nathalie Prévôt, the software engineer for digital humanities at the Ausonius Institute in Bordeaux<sup>1</sup>.

The Jouguet Collection is a bilingual corpus, with texts in Greek and in Egyptian demotic. Most of the texts date from the 3<sup>rd</sup> century BC (with a few texts from the 2<sup>nd</sup> century). Administrative documents prevail, such as contracts, letters, petitions etc., which belonged to the archives of officials at various levels of the administration. A few literary texts have also been found<sup>2</sup>: fragments from Menander, Homer and Euripides and, in demotic, one fragment of a wisdom text. Greek documents have been published in the first volumes of P.Lille<sup>3</sup>, and then P.Sorb.;<sup>4</sup> the *enteuxeis* (Greek petitions) were gathered in a special volume<sup>5</sup>. Some accounts have been published in the P.Count<sup>6</sup> and other texts have been published separately. In total, around 330 Greek documents have been published and 11 literary texts. The demotic texts have been published in 3

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1 <https://geshaem.huma-num.fr>.

2 Uggetti 2022a, 326–7.

3 Jouguet 1907–28 (P.Lille I); Lesquier 1912 (P.Lille II).

4 Cadell 1966 (P.Sorb. I); Cadell – Clarysse – Robic 2011 (P.Sorb. III).

5 Guéraud 1931 (P.Enteux.).

6 Clarysse – Thompson 2006.

volumes of P.LilleDem.<sup>7</sup> and in one volume of P.Sorb.<sup>8</sup>. Other documents have been published separately in periodicals or collective works. In total, around 500 papyri of the Jouguet Collection have been published.

Given that there are today around 1000 inventory numbers of the Jouguet Collection in the book register of the Sorbonne, and that one inventory number often contains several fragments, a lot remains to be done on the collection. The main reason for this rather low level of publication is the state of the texts, which is linked to their provenance. The Jouguet Collection comes mostly from Pierre Jouguet's excavations in the Fayyum which took place in the winters of 1901 and 1902 at the southwestern sites of Medinet Ghôran and Medinet Nehas, the ancient Magdôla<sup>9</sup>. In the necropoleis, Jouguet discovered hundreds of mummy decorations called cartonnages. Most of them date from the 3<sup>rd</sup> and 2<sup>nd</sup> centuries BC. The majority of these pieces of cartonnages were made of papyri, and they were destroyed soon after their discovery, in order to take out the papyri. Only 20 or so pieces of cartonnages remain today in good overall condition. Part of the project GESHAEM is concerned with the restoration and study of these objects, but the major part of the project is the study of the texts, among which some new texts which have been extracted from the pieces of cartonnages that existed within the collection in very poor condition. Some had been partially destroyed and the plaster had been almost completely removed from their surface: it was even difficult to recognise the different elements of the original cartonnage<sup>10</sup>.

The result of the extraction gave 438 new inventory numbers, which were photographed by Adam Bülow-Jacobsen both in colour and in infrared. Like in the rest of the Jouguet Collection, the texts are very fragmentary. One major goal of GESHAEM was therefore to develop a computerised tool to help in the reconstruction of the texts by automatically proposing suggestions of pairing papyri. This part of the project was completed by Antoine Pirrone in 2022<sup>11</sup>, at the Laboratoire Bordelais de Recherche en Informatique (LaBRI)<sup>12</sup>. Given the state of the fragments, a discussion on associating some metadata to the images to help the computer with the matching of fragments took place at the beginning of the project. This information has been entered into the project database in XML, and some encoding issues came up.

The other encoding issues concern the content of the texts that will be published within GESHAEM. The corpus of bilingual surety contracts is planned to be displayed online. Part of this corpus was published by Françoise de Cenival in 1973<sup>13</sup>, but she pub-

<sup>7</sup> Sottas 1921 (P.LilleDem. I); De Cenival 1973 (P.LilleDem. II); De Cenival 1984 (P.LilleDem. III).

<sup>8</sup> Chaufray – Wackenier 2016 (P.Sorb. IV). The P.Sorb. III 76, 78, 81, 83 and 85 also bear demotic texts with Greek subscriptions, except for the last one: Cadell – Clarysse – Robic 2011, 57–71.

<sup>9</sup> Jouguet 1901; Jouguet 1902; Jouguet – Lefebvre 1902.

<sup>10</sup> Uggetti 2022b, 989–93 and 997–1000.

<sup>11</sup> Pirrone 2022.

<sup>12</sup> <https://www.labri.fr>.

<sup>13</sup> See above, n. 7.

lished only the demotic recto of the documents and not the Greek docket on the verso, which gives a short summary of the demotic text. Besides, many more fragments have been discovered in the Jouguet Collection since de Cenival's publication, which makes a corpus of around 200 documents, which Marie-Pierre Chaufray and Willy Clarysse are currently working on. Specific aspects of these documents are the legal clauses of the demotic contract, which will be highlighted in the online publication. Another corpus of demotic tax-accounts coming from Magdôla will also be published and displayed online. These documents are long lists of taxes paid by individuals, often with names in one column and amounts of grains or money in another column. The online publication would like to help the reader not only find information on the people and the villages mentioned in those texts, but also on making calculations and statistics on these documents.

## 2 The Challenge of Encoding Greek and Demotic Papyri

Each document is represented digitally by one XML file, which is univocally connected to four photographs: two in colour and two in infrared, so as to have a comprehensive photo coverage of both recto and verso. Every XML file name is formed by a specific identification number preceded by the letter *g*, standing for GESHAEM, which does not correspond to Sorbonne inventory numbers<sup>14</sup>: the project focuses on a part of the Sorbonne collection and not on the whole of it, so adopting inventory numbers as file names would have brought about gaps in the numbering.

The definition of recto and verso of a papyrus is nested in the file section concerning the textual content, that is under the root *text*, within the child body: a first element *division* introduces the encoding of the whole text, whereas a second subchild element *division* represents the single papyrus thanks to the attribute value *fragment*. Both sides are defined by a further element *division* bearing the initials of either "recto" or "verso" as an attribute value: an *xml:id* is assigned to each of them, formed by the XML file name followed by the ending *-recto* or *-verso*<sup>15</sup>.

For each side, a correspondence with this *xml:id* is established in the file section *facsimile*, which lists the pictures of the described object, thanks to an attribute

<sup>14</sup> For instance, Inv. Sorb. 779 and 1257, joined together, bear the number *g335*.

<sup>15</sup> As an example:

```
<text>
<body>
<div type="edition">
<div n="1" type="textpart" subtype="fragment">
<div n="r" type="textpart" ana="#perfibral" xml:id="g335-recto">
```

correspondence associated to the child element surface. The subchild element `graphic` links each single photo to the Uniform Resource Locator (URL) of its digital repository. A further subchild element `description` provides a name for the images formed by their Sorbonne inventory numbers, followed by acronyms which help recognise whether they are colour or infrared images, either of *recto* or *verso*<sup>16</sup>. This way, the XML file itself links unambiguously the parts of text on each side of a papyrus to the metadata describing the pictures. The repository chosen is NAKALA, a service created by the Research Infrastructure Huma-Num specifically dedicated to humanities and social sciences<sup>17</sup>: it ensures long-term data preservation, is in accordance to the International Image Interoperability Framework<sup>18</sup>, and respects eco-design criteria, as guaranteed by the GreenWeb certified index<sup>19</sup>.

In order to add metadata which might be helpful for the automatic matching of fragments, specific attention has been given to the encoding of the physical description of the papyri<sup>20</sup>: in particular, the *kollêsis*, that is the narrow area where two sheets are pasted together, in order to make a roll<sup>21</sup>. When a text is drafted along the fibres on the internal side of a roll, such overlaps run perpendicularly to the written lines: if two or more fragments show the same approximate position for a *kollêsis*, they might belong to the same vertical section of a papyrus, even if there is a gap between them which does not allow a direct join. This is particularly useful when reconstructing documents with a high and narrow format, such as the approximately 200 surety contracts within the Jouguet Collection<sup>22</sup>. It is often easy to detect *kollêseis* when looking at the original papyri, but sometimes it is difficult to see them on photographs (for example, when they are very close to the borders): therefore, it is better to point them out clearly in the XML files, nested in the physical description of the support, next to the overall dimensions of each papyrus. They are encoded as `referencing string`, with two attributes: `type`, using the value `kollesis` to introduce the concept itself within the file, and `number`, in case of multiple ones on the same fragment. Their distance has been measured in

---

16 For instance:

```
<facsimile>
  <surface corresp="#g335-recto">
    <graphic url="https://www.nakala.fr/iiif/11280/084adedb">
      <desc type="R_IR">0779_1257_r_IR</desc>
      <desc type="view">Image infra-rouge du recto</desc>
      <desc type="copyright">Adam Bülow-Jacobsen</desc>
```

17 <https://www.nakala.fr>; <https://documentation.huma-num.fr/nakala-guide-de-description>.

18 <https://iiif.io>.

19 With a score of 90 over 100: <https://green-web.fr/index/www-nakala-fr/?lang=en>.

20 Analysing some sample files, other papyrological databases, like the Duke Data Bank of Documentary Papyri (<https://papyri.info>) and the Heidelberger Gesamtverzeichnis der griechischen Papyrusurkunden Ägyptens (<https://aquila.zaw.uni-heidelberg.de>), have apparently made different choices.

21 Bülow-Jacobsen 2009, 19–21.

22 New edition forthcoming by Marie-Pierre Chaufray and Willy Clarysse: see *supra*, §1.

centimetres from the right border of the papyrus, so that fragments showing similar distances might be grouped together<sup>23</sup>.

In order to avoid false joins between fragments, the presence of margins has been highlighted. Their preservation is often accidental and might also be partial: as a consequence, the choice has been made to indicate their position, but not to estimate their width. First, an element `layout` has been used to create a correspondence with the `xml:id` identifying the different sides of the object. Then, depending on the number of margins actually preserved (from none to four), individual child elements `dimensions` have been inserted: instead of metric indicators, the recurrent attribute value `margin` has been associated with another one (`top`, `bottom`, `left` or `right`), in order to locate it on the papyrus sheet<sup>24</sup>.

Another papyrological peculiarity is the orientation of the writing in relation to the fibres: along (perfibral) or across them (transfibral). Even if there are some rare excep-

---

23 For instance:

```
<teiHeader>
<fileDesc>
<sourceDesc>
<msDesc>
<msPart>
<physDesc>
<objectDesc>
<supportDesc>
<support>
<dimensions unit="cm">
<height>11</height>
<width>10</width>
</dimensions>
<rs type="kollesis" n="1">
<measure unit="cm">1.8</measure>
</rs>
</support>
```

24 The situation for a fully preserved papyrus would be the following:

```
<teiHeader>
<fileDesc>
<sourceDesc>
<msDesc>
<physDesc>
<objectDesc>
<layoutDesc>
<layout corresp="#g335-recto">
<dimensions type="margin" n="top"/>
<dimensions type="margin" n="bottom"/>
<dimensions type="margin" n="right"/>
<dimensions type="margin" n="left"/>
</layout>
```

tions<sup>25</sup>, the text on a single surface of the vast majority of the documents in the GESHAEM corpus follows the same orientation: so, this characteristic is specified in the XML file part hosting the body of the ancient text, within the division which identifies the side of the papyrus<sup>26</sup>. The attribute values `perfibral` and `transfibral` are established in the taxonomy of the corpus<sup>27</sup>.

An aspect which stands out, even without knowing the languages involved, is the number of columns and lines: it has been nested in the layout description, on the same hierarchical level as the margins. In the GESHAEM project, it has been assumed that each column of the corpus forms a consistent textual unit: all of them have been represented by a separate element `layout`, have been given an `xml:id`, formed by the XML file name followed by a progressive number, and finally have been described by the number of written lines which they contain and by a plain text in French<sup>28</sup>. Then, in the

---

25 As an example, the surety contract formed by the fragments Inv. Sorb. 802 + 803b + 1256b + 2733m, which presents a vertical *kollêsis* between two sheets showing different orientations of the fibres: so, the beginning of the lines on the right half of the document is `transfibral`, while the rest on the left is `perfibral`.

26 See above, n. 15.

27 In every XML file of the corpus:

```
<teiHeader>
  <encodingDesc>
  <classDecl>
  <taxonomy>
  <category xml:id="perfibral">
  <catDesc>perfibral</catDesc>
  </category>
  <category xml:id="transfibral">
  <catDesc>transfibral</catDesc>
  </category>
```

28 For instance:

```
<teiHeader>
  <fileDesc>
  <sourceDesc>
  <msDesc>
  <physDesc>
  <objectDesc>
  <layoutDesc>
  <layout corresp="#g335-recto">
  <dimensions type="margin" n="top"/>
  <dimensions type="margin" n="bottom"/>
  <dimensions type="margin" n="right"/>
  <dimensions type="margin" n="left"/>
  </layout>
  <layout xml:id="g335-1" columns="1" writtenLines="3">
  <desc>1 colonne de texte de 3 lignes</desc>
  </layout>
```

section devoted to the encoding of the actual text, under the division which identifies each side of the papyrus, there are as many child elements as the columns, each one showing a correspondence with the `xml:id` specifically created in the layout description: this is the place where the languages are also declared. The documents from the Jouguet Collection are either in Egyptian demotic or in ancient Greek: the former is indicated with the attribute value `egy-egy`, the latter as `grc`. Finally, any changing in the hand of the writer is indicated by the element `handShift` immediately preceding the lines of text concerned<sup>29</sup>.

Apart from the solutions mentioned above, which pay special attention to the materiality of the papyrus documents, the GESHAEM project follows the Text Encoding Initiative standards and sticks to the EpiDoc guidelines as much as possible<sup>30</sup>. For every fragment, both the modern repository (the Institute of Papyrology of Sorbonne University in Paris<sup>31</sup>) and the discovery site (usually, either Ghôran<sup>32</sup> or Magdôla / Medinet Nehas<sup>33</sup>) are provided: the former inside the child manuscript identifier of the element `manuscript part`, together with the inventory and the Trismegistos numbers<sup>34</sup>; the latter

---

```
<layout xml:id="g335-2" columns="1" writtenLines="32">
  <desc>1 colonne de texte de 32 lignes</desc>
</layout>
```

29 As an example:

```
<text>
  <body>
    <div type="edition">
      <div n="1" type="textpart" subtype="fragment">
        <div n="r" type="textpart" ana="#perfibril" xml:id="g335-recto">
          <div type="textpart" subtype="column" corresp="#g335-1" xml:lang="egy-egy">
            <ab>
              <handShift new="m1"/>
            <lb n="1"/>
          </div>
        </div>
      </div>
    </div>
  </body>
</text>
```

30 <https://epidoc.stoa.org/gl/latest/>.

31 TM Coll 275: <https://papyrologie.sorbonne-universite.fr/>.

32 TM Geo 715.

33 TM Geo 1284.

34 For instance:

```
<teiHeader>
  <fileDesc>
    <sourceDesc>
      <msDesc>
        <msPart>
          <msIdentifier>
            <country ref="http://geotree.geonames.org/3017382/">France</country>
            <settlement ref="http://geotree.geonames.org/2988507/">Paris</settlement>
            <institution ref="www.trismegistos.org/collection/275">Paris, Sorbonne, Institut de Papyrologie</institution>
            <repository ref="http://thot.philo.ulg.ac.be/concept/thot-4792">Sorbonne
```

nested in the element `history` and its child `origin`<sup>35</sup>. Next to the place of origin the dating is encoded: whenever the fragmentary conditions of the support or the type of text do not allow a precise date, a time span is given using the attributes `notBefore` and `notAfter`. All the texts in the Jouguet Collection come from Ptolemaic necropoleis: as a consequence, their dates are preceded by the minus sign, that is the way of expressing years BC in XML. For the moment, the corresponding Egyptian date is given as plain text within the element `note`<sup>36</sup>. Like most of contemporary humanities computing projects, interoperability is held in due consideration by GESHAEM: whenever possible, links are established with other platforms which ensure stable identifiers for ontological definitions, as THOT<sup>37</sup>, or geographical sites, like Trismegistos<sup>38</sup> and Geonames<sup>39</sup>.

---

```
- Institut de Papyrologie</repository>
<idno>0779+1257</idno>
<altIdentifier>
<idno type="TM" corresp="http://www.trismegistos.org/text/4410"/>
</altIdentifier>
</msIdentifier>
```

35 As an example:

```
<teiHeader>
<fileDesc>
<sourceDesc>
<msDesc>
<history>
<origin>
<origPlace cert="low" type="found">
<country ref="http://www.trismegistos.org/place/8881">Egypte</country>
<region ref="http://www.trismegistos.org/place/332">Arsinoite (Fayoum)
</region>
<settlement ref="http://www.trismegistos.org/place/715">Ghoran (Medinet
Ghoran - Kom Medinet Ghuran)</settlement>
</origPlace>
```

36 For instance:

```
<teiHeader>
<fileDesc>
<sourceDesc>
<msDesc>
<history>
<origin>
<origDate notBefore="-0226-02" notAfter="-0226-03">février/mars 226a
<note>Ptolémée III, an 21 = 22, Tybi</note>
</origDate>
```

37 THesauri & OnTology for documenting Ancient Egyptian Resources, hosted by the University of Liège: <https://thot.philo.ulg.ac.be>.

38 Either Trismegistos Places (<https://www.trismegistos.org/geo>) or Trismegistos Collections (<https://www.trismegistos.org/coll>).

39 <http://geotree.geonames.org>.

In order to provide the entire corpus with consistent cross references, whenever the same entity appears multiple times in different texts, three external authority lists have been compiled up to now: toponyms, persons and legal clauses. Toponyms are univocally identified by an internal `xml:id` and a stable Uniform Resource Identifier (URI) in Trismegistos Places: their different names in demotic, Greek and French are recorded, thus allowing comprehensive researches<sup>40</sup>. Similarly to places, every person is given an `xml:id`, a link to Trismegistos People (if available) and the multiple variants of his name in the three languages previously mentioned: correspondences between demotic and Greek are often supplied by bilingual papyri, like surety contracts. When the context reveals details about a person, the element `roleName` allows one to encode them: the attribute value `activity` is used for juridical relationships like debtor, guarantor or witness; `occupation` for actual professions; `title` for official ranks. For family bonds, it might employ either the attribute value `filiation` for `roleName`, or the separate element `relation` with an attribute value `personal`, then detail the type of relationship (`parent`, `sibling`, `spouse` etc.), the people involved and the hierarchy between them (`active` for ancestors, `passive` for descendants, `mutual` for siblings and spouses)<sup>41</sup>. Finally, in order to compare variants in different legal agreements and to

---

40 As an example:

```
<text>
<body>
<list>
<item corresp="http://www.trismegistos.org/place/367" xml:id="Athenon">
<label>settlement</label>
<placeName xml:lang="egy-egy" >P3- ' .wy-n-Tmtys</placeName>
<placeName xml:lang="grc">Ἀθηνᾶς κώμη</placeName>
<placeName xml:lang="fr">Athenas Kome</placeName>
</item>
```

41 For instance:

```
<text>
<body>
<div type="commentary">
<listPerson>
<person corresp="www.trismegistos.org/person/16258" sex="1" xml:id="
Nehtenebis58">
<persName>
<name xml:lang="egy-egy">Nḥt-nb=f</name>
<name xml:lang="grc">Νέχθενιβίς</name>
<name xml:lang="fr">Nehtenebis fils de Pasis</name>
<roleName type="titre">comogrammate</roleName>
<roleName type="occupation">scribe de village</roleName>
<roleName type="activity">garant en second</roleName>
</persName>
</person>
<person corresp="www.trismegistos.org/person/76793" sex="1" xml:id="
Pasis93">
```

make synoptic studies easier, an original authority list has been compiled, entirely focused on clauses: an `xml:id` and a definition have been assigned to each item, inserting mutual exclusions whenever juridically motivated<sup>42</sup>. All these definitions are called back in the XML files through a series of tags `reference`, put around the name or the phrase appearing in the texts.

Like other papyrological portals, the single XML files and the images will be freely accessible under a Creative Commons Licence<sup>43</sup>, and the interface available on the website `geshaem.huma-num.fr` will be user-friendly. GESHAEM aims at giving the edition of some of the texts selected for their historical issues, mainly the surety contracts. The corpus will be available in open-access and accompanied by a paper version: it will not include all the papyri kept by the Institute of Papyrology of Sorbonne University, but will be limited to the documents studied by the project.

One might search for papyri either by inventory or by publication number. Each record will present a brief description in French of the support, of the text, of its provenance and date, then two lists: one for the places mentioned, `Lieux`, the other for the individuals, `Personnes`. Clicking on a button, it will be possible to highlight the former (GEO) or the latter (PER) in the document, displayed on two side-by-side columns: on the left, depending on the language, there will be either a transliteration of demotic or a transcription of Greek; on the right, their translation in French. After the critical apparatus and the commentary, referring to specific lines of the text, both colour and infrared photos will be available and might be magnified on screen. On the bottom left corner of the webpage, there will be the link to Trismegistos Texts, a button which will give access to the XML source file, and the stable URI for every papyrus.

---

```

<persName>
  <name xml:lang="egy-egy" >Pa-sy</name>
  <name xml:lang="grc" >Πάσις</name>
  <name xml:lang="fr" >Pasis</name>
  <roleName type="filiation" >père</roleName>
</persName>
</person>
<relation type="personal" active="#Pasis93" name="parent" passive=
"#Nechtenebis58" />

```

<sup>42</sup> A clause of “obligation of payment”, for example, precludes the presence of an “obligation of appearance”, given the different nature of surety contracts bearing them:

```

<text>
<body>
<list>
  <item xml:id="OP" exclude="#OA">
  <term xml:lang="en">Obligation of payment</term>
  <term xml:lang="fr">Obligation de paiement</term>
  </item>

```

The same applies to the “penalty for failure to pay” and the “penalty for failure to appear”.

<sup>43</sup> <https://creativecommons.org/licenses/by/4.0>.

For certain types of texts such as accounts, the possibility of automatic calculations using encoding is being explored. In particular, that which has been developed for an online edition of the temple accounts of the village of Soknopaiou Nêsos / Dime during the Roman period, which has been another digital project led by Marie-Pierre Chaufray and Nathalie Prévôt, namely DimeData<sup>44</sup>, might be utilised.

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