

# Processing of XML Documents, XPath - XSLT - XQuery

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**Selezione, Elaborazione e Presentazione di documenti XML-TEI mediante  
i linguaggi XPath, XSLT e XQuery**

Istituto di Linguistica Computazionale “A. Zampolli”,  
11th November 2024

# Outline

Processing of  
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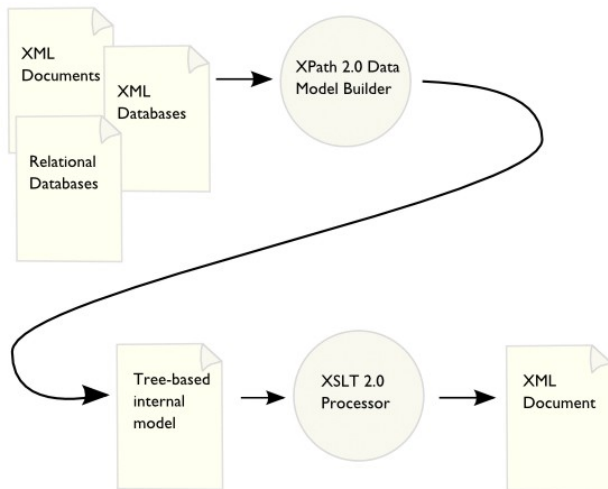
XQuery in  
action

References

## We talk about

Introduction to processing and visualizing XML documents via  
**XPATH** and **XSL** languages.

# Seminar path



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# eXtensible Style Sheet

## XSL-T

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## Basics

A transformation expressed in XSLT **describes rules for transforming input data into output data**. The inputs and outputs will all be instances of the XDM data model.

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### Basics (cont.)

The input often is an XML document referred to as the **source tree**, and the output is a document referred to as the **result tree**.

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### Basics (cont.)

The transformation is achieved by **a set of template rules**. A template rule associates a pattern, which typically **matches nodes** in the source document, with a **sequence constructor**.

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### Basics (cont.)

The structure of the result trees can be completely different from the structure of the source trees.

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## URL to Documentation

- <https://xsltdev.com/xslt/xsl-stylesheet/>
- <https://xsltdev.com/xslt/xsl-template/>
- <https://xsltdev.com/xslt/xsl-value-of/>
- <https://xsltdev.com/xslt/xsl-apply-templates/>
- <https://xsltdev.com/xslt/xsl-for-each/>
- <https://xsltdev.com/xslt/xsl-if/>
- <https://xsltdev.com/xslt/xsl-choose/>

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## URL to Documentation

- <https://xsltdev.com/xslt/xsl-sort/>
- <https://xsltdev.com/xslt/xsl-variable/>
- <https://xsltdev.com/xslt/xsl-element/>
- <https://xsltdev.com/xslt/xsl-attribute/>
- <https://xsltdev.com/xslt/xsl-key/>
- <https://xsltdev.com/xslt/xsl-preserve-space/>
- <https://xsltdev.com/xslt/xsl-strip-space/>
- <https://xsltdev.com/xslt/xsl-analyze-string/>

# XSLT main elements

## xsl:stylesheet

### xsl:stylesheet

The `xsl:stylesheet` element is always the top-level element of an XSLT stylesheet. The name `xsl:transform` may be used as a synonym.

*Available in XSLT 1.0 and later versions. Available in all Saxon editions.*

- **Content:** ( *declarations* )

### Attributes

`id?`

*id*

Used to reference stylesheet modules embedded in a document.

`version`

*decimal*

Standard attribute that may appear on any XSLT element. Indicates the version of XSLT required by the stylesheet.

<https://xsltdev.com/xslt/xsl-stylesheet/>

# XSLT main elements

xsl:stylesheet

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<xsl:stylesheet version="2.0"
```

```
  * * * xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
```

```
  * * *
```

```
</xsl:stylesheet>
```

<https://xsltdev.com/xslt/xsl-stylesheet/>

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# XSLT main elements

## xsl:template

### xsl:template

Defines a processing rule for source elements or other nodes of a particular type.

*Available in XSLT 1.0 and later versions. Available in all Saxon editions.*

- **Category:** declaration
- **Content:** ( `xsl:context-item?`, `xsl:param`\*, \*sequence-constructor\* )
- **Permitted parent elements:** `xsl:package`; `xsl:stylesheet`; `xsl:transform`; `xsl:override`

### Attributes

`match?`

*pattern*

Pattern to identify the type of node to be processed. The most common form of pattern is simply an element name. However, more complex patterns may also be used: the syntax of patterns is given in more detail in XSLT Pattern Syntax. The following examples show some of the possibilities:

<https://xsltdev.com/xslt/xsl-template/>

# XSLT main elements

## xsl:template

```
<?xml version="1.0" encoding="UTF-8"?>

<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform">

  <xsl:template match="/">

  </xsl:template>

  <xsl:template match="div">
    *
  </xsl:template>

  <xsl:template match="head">
    *
  </xsl:template>

  <xsl:template match="lb">
    *
  </xsl:template>

</xsl:stylesheet>
```

<https://xsltdev.com/xslt/xsl-template/>

# XSLT main elements

## xsl:value-of

### xsl:value-of

Evaluates an expression as a string, and outputs its value to the current result tree.

*Available in XSLT 1.0 and later versions. Available in all Saxon editions.*

- **Category:** instruction
- **Content:** *sequence-constructor*
- **Permitted parent elements:** any XSLT element whose content model is *sequence-constructor*; any literal result element

### Attributes

`select?`

*expression*

Identifies the expression. If this is not specified, the value to be output is obtained by evaluating the sequence constructor contained within the `xsl:value-of` element. The full syntax of expressions is outlined in XPath Expression Syntax. Here are some examples of expressions that can be used in the `select` attribute:

<https://xsltdev.com/xslt/xsl-value-of/>

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## xsl:value-of

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```
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform">

  <xsl:template match="/">
    <xsl:value-of select="concat('&#10;', normalize-space(descendant::titleStmt/title=>string()))" />
  </xsl:template>

  <xsl:template match="div">
    <xsl:value-of select="@type" />
  </xsl:template>

  <xsl:template match="head">
    <xsl:value-of select="." />
  </xsl:template>

  <xsl:template match="1b">
    <xsl:value-of select="concat('&#10;', current()/@n)" />
  </xsl:template>

</xsl:stylesheet>
```

txt.txt U X

```
<?xml version="1.0" encoding="UTF-8"?>
Dedication to Commodus
```

<https://xsltdev.com/xslt/xsl-value-of/>

# XSLT main elements

## xsl:apply-templates

### xsl:apply-templates

Causes navigation from the current element, usually but not necessarily to process its children. Each selected node is processed using the best-match `xsl:template` defined for that node.

*Available in XSLT 1.0 and later versions. Available in all Saxon editions.*

- **Category:** instruction
- **Content:** ( `xsl:sort` | `xsl:with-param` )\*
- **Permitted parent elements:** any XSLT element whose content model is *sequence-constructor*; any literal result element

### Attributes

`select?`

expression

Sequence of nodes to be processed. If this attribute is omitted, then all the immediate children of the current node are processed.

`mode?`

<https://xsltdev.com/xslt/xsl-apply-templates/>

# XSLT main elements

## xsl:apply-templates

```
<?xml version="1.0" encoding="UTF-8"?>

<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform">

  <xsl:template match="/">
    <xsl:value-of select="concat('&#10;',
      normalize-space(descendant::titleStmnt/
        title->string()))" />
    <xsl:apply-templates select="//text//div" />
  </xsl:template>

  <xsl:template match="div">
    <xsl:text>&#10;</xsl:text>
    <xsl:value-of select="@type" />
    <xsl:text>&#10;</xsl:text>
  </xsl:template>

  <xsl:template match="head">
    <xsl:value-of select="," />
  </xsl:template>

  <xsl:template match="lb">
    <xsl:value-of select="concat('&#10;', current()/
      @n)" />
  </xsl:template>
</xsl:stylesheet>
```

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 Dedication to Commodus
3 bibliography
4
5 history
6
7 edition
8
9 apparatus
10
11 translation
12
13 commentary
14
15 figure
16
```

<https://xsltdev.com/xslt/xsl-apply-templates/>

# XSLT main elements

## xsl:apply-templates

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```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
  <xsl:template match="/">
    <xsl:value-of select="concat('&#10;',
      normalize-space(descendant::titleStmt/
        title=>string()))" />
    <xsl:apply-templates select="//text//div" />
  </xsl:template>

  <xsl:template match="div">
    <xsl:text>&#10;</xsl:text>
    <xsl:value-of select="name(.)=>concat(':',@type)
      " />
    <xsl:text>&#10;</xsl:text>
    <xsl:apply-templates select="head" />
  </xsl:template>

  <xsl:template match="head">
    <xsl:value-of select="name(.)=>concat(':',@type)"/>
  </xsl:template>

  <xsl:template match="lb">
    <xsl:value-of select="concat('&#10;', current()
      @n)" />
  </xsl:template>
</xsl:stylesheet>
```

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 Dedication to Commodus
3 div : Bibliography
4 head : Bibliography
5 div : history
6 head : Text constituted from
7 div : edition
8 head : Text
9 div : apparatus
10 head : Apparatus
11 div : translation
12 head : Translation
13 div : commentary
14 head : Commentary
15 div : figure
16 head : Photographs
```

<https://xsltdev.com/xslt/xsl-apply-templates/>

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## xsl:apply-templates

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```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="2.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
  <!--
  <xsl:strip-space elements="*" />
  -->
  <xsl:template match="/">
    <xsl:value-of select="concat('&#10;','title ':'',
      normalize-space(descendant::titleStmt/title)>string())" />
  </xsl:template>
  <xsl:apply-templates select="//text//div" />
</xsl:stylesheet>

<xsl:template match="div">
  <xsl:text>&#10;</xsl:text>
  <xsl:value-of select="name(.)>concat(':',@type)" />
  <xsl:text>&#10;</xsl:text>
  <xsl:apply-templates select="head" />
</xsl:template>

<xsl:template match="head">
  <xsl:value-of select="name(.)>concat(':',@type, '&#10;')
  </xsl:template>
  <xsl:apply-templates select="following-sibling::*" />
</xsl:template>

<xsl:template match="lb">
  <xsl:value-of select="concat('&#10;','riga ':'',current
    ())/@n, ':'>'" />
</xsl:template>

</xsl:stylesheet>
```

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 title : Dedication to Commodus
3 div : bibliography
4 head : Bibliography
5 Not previously published.
6 div : history
7 head : Text constituted from
8 Transcription (Reynolds, Ward-Perkins)
9 div : edition
10 head : Text
11 riga 1 : ImperatorCaesarMarciAntoniniPiifili
12 riga 2 : diuiPiinepdiuiHadrianipronepdiui
13 riga 3 : TraianiParthiaciabnepdiuiNerueadnep
14 riga 4 : LuciAeliAureliCommodAugust
15 div : apparatus
16 head : Apparatus
17 Line 4 is represented by the upper parts only of
18 two letters with rounded bowls.
19 div : translation
20 head : Translation
21 Emperor Caesar son of Marcus Antonius Pius,
22 grandson of deified Pius, great grandson of
23 deified Hadrian, great great grandson of deified
24 Trajan victor in Parthia, great great great
25 grandson of deified Nerva, Lucuis Aelius Aurelius
26 Commodus Augustus
27 div : commentary
28 head : Commentary
29 No comment
30 div : figure
31 head : Photographs
32 head : Ward-Perkins Archive, BSR (BSR 48.XXVII.13)
```

<https://xsltdev.com/xslt/xsl-apply-templates/>



# XSLT main elements

## xsl:for-each

### xsl:for-each

Causes iteration over the nodes selected by a node-set expression.

Available in XSLT 1.0 and later versions. Available in all Saxon editions.

- **Category:** instruction
- **Content:** ( `xsl:sort`\*, *sequence-constructor* )
- **Permitted parent elements:** any XSLT element whose content model is *sequence-constructor*; any literal result element

### Attributes

**select**

*expression*

Defines the nodes over which the statement will iterate. The XSLT statements subordinate to the `xsl:for-each` element are applied to each source node selected by the node-set expression in turn. The full syntax of expressions is outlined in XPath Expression Syntax.

<https://xsltdev.com/xslt/xsl-for-each/>

# XSLT main elements

xsl:for-each xsl:sort

```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <xsl:stylesheet version="2.0"
3   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
4   <xsl:output method="text" encoding="UTF-8" />
5
6   <xsl:template match="/">
7     <xsl:for-each select="distinct-values(//w/@lemma)">
8       <xsl:sort select="." data-type="text" lang="la"/>
9       <xsl:text>&#32;</xsl:text>
10      <xsl:value-of select="." />
11      <xsl:text>&#32;</xsl:text>
12    </xsl:for-each>
13  </xsl:template>
14
15 </xsl:stylesheet>
```

out-text.txt U X

```
1 diuus filius imperator
```

<https://xsltdev.com/xslt/xsl-for-each/>

# XSLT main elements

xsl:if xsl:key

## xsl:if

Used for conditional processing. It takes a mandatory test attribute, whose value is a boolean expression. The contents of the `xsl:if` element are expanded only if the expression is true.

*Available in XSLT 1.0 and later versions. Available in all Saxon editions.*

- **Category:** instruction
- **Content:** *sequence-constructor*
- **Permitted parent elements:** any XSLT element whose content model is *sequence-constructor*; any literal result element

## Attributes

**test**

*expression*

The boolean expression to be tested. The full syntax of boolean expressions is outlined in XPath Expression Syntax.

<https://xsltdev.com/xslt/xsl-if/>

# XSLT main elements

xsl:key xsl:if

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```
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2 <xsl:stylesheet version="2.0"
3   xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
4   <xsl:output method="text" encoding="UTF-8"/>
5
6   <xsl:key name="lang" match="language" use="@ident"/>
7
8   <xsl:template match="/">
9     <xsl:if test="key('lang','la')">
10       <xsl:value-of select="key('lang','la')"/>
11     </xsl:if>
12   </xsl:template>
13
14 </xsl:stylesheet>
15
```

out-text.txt U X

1 Latin

<https://xsltdev.com/xslt/xsl-key/>

# XSLT main elements

## xsl:variable

### xsl:variable

Used to declare a variable and give it a value. If it appears at the top level (immediately within `xsl:stylesheet`) it declares a global variable, otherwise it declares a local variable that is visible only within the stylesheet element containing the `xsl:variable` declaration. The value of a variable can be referenced within an expression using the syntax `$name`.

*Available in XSLT 1.0 and later versions. Available in all Saxon editions.*

- **Category:** declaration
- **Category:** instruction
- **Content:** *sequence-constructor*
- **Permitted parent elements:** `xsl:package` ; `xsl:stylesheet` ; `xsl:transform` ; `xsl:override` ; `xsl:function` ; any XSLT element whose content model is *sequence-constructor*; any literal result element

### Attributes

**name**

*eqname*

Defines the name of the variable.

`select?`

# XSLT main elements

## xsl:variable

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```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <xsl:stylesheet version="2.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
3   <!--<xsl:output method="text" encoding="UTF-8" -->
4   <!--<xsl:key name="lang" match="language" use="@ident"></xsl:key>
5
6   <!--<xsl:template match="/">
7     <!--<xsl:if test="key('lang','la')">
8       <!--<xsl:variable name="latLang" select="key('lang','la')"/>
9       <!--<xsl:value-of select="
10         <!--concat('Selected Language: ', $latLang/text(), ' (' , $latLang/@ident, '))'
11       <!--"/>
12     <!--</xsl:if>
13   <!--</xsl:template>
14
15 </xsl:stylesheet>
```

out-text.txt U X

```
1 Selected Language: Latin (la)
```

<https://xsltdev.com/xslt/xsl-variable/>

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```
<?xml version="1.0" encoding="UTF-8" ?>
<teiHeader>
  <fileDesc>
    <titleStm
    <title>
      <rs type="textType">Christian</rs>
      <rs type="textType">funerary</rs> inscription for Helladios</title>
    <editor>J. M. Reynolds</editor>
    <editor>J. B. Ward-Perkins</editor>
  </titleStm>
  <publicationStm>
    <authority>Centre for Computing in the Humanities, King's College London</authority>
    <idno type="filename">IRT256a</idno>
    <availability>
      <p>Creative Commons licence Attribution UK 2.0 (<ref>http://creativecommons.org/li
      <p>All reuse or distribution of this work must contain somewhere a link back to th
    </p>
    </availability>
  </publicationStm>
</sourceDesc>...
```

*The Inscriptions of Roman Tripolitania -  
<https://inslib.kcl.ac.uk/irt2009/>*



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```
1 <?xml version="1.0" encoding="UTF-8"?>
2 <!-- $Id$ -->
3 <xsl:stylesheet
4   xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
5   xmlns:t="http://www.tei-c.org/ns/1.0"
6   xmlns:xs="http://www.w3.org/2001/XMLSchema"
7   exclude-result-prefixes="t" version="2.0">
8   ...
9   <xsl:output method="html" encoding="UTF-8"/>
10
11   <!-- HTML FILE -->
12   <xsl:template match="/">
13     <xsl:choose>...
171   </xsl:choose>
172 </xsl:template>
173
174 </xsl:stylesheet>
175
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
angelodel80@LAPTOP-V8V3MLG0:/mnt/c/Users/angel/risorse/universita/corsoCodifica/tools$ java -jar SaxonHE10-3J/saxon-he-10.3.jar -s:source/IRT256a.xml -xsl:source/Stylesheets-9.4/start-edition.xsl -o:source/out/out-text-epidoc.html
```

```
1 <!DOCTYPE HTML><html xmlns:i18n="http://apache
org/cocoon/i18n/2.1">
2   <head>
3     <meta http-equiv="Content-Type"
4       content="text/html; charset=UTF-8">
5     <title>IRT256a... Christian funerary
6       inscription for Helladios</title>
7     <link rel="stylesheet" type="text/css"
8       media="screen, projection" href="global.
9       css">
10   </head>
11   <body>
12     <h1>IRT256a... Christian funerary
13       inscription for Helladios</h1>
14     <div id="metadata">
15       <p><b>Description:</b> The right-har
16         part of a marble
17         panel.
18       (surviving width w 0.46 metre x h
```

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# eXtensible Style Sheet

## Working with XSL-T

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- XQuery

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Grosso

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References

### Bibliography

Not previously published.

### Text constituted from

Transcription (Reynolds, Ward-Perkins)

### Text

5 [Εὐμοιριτο] Ἑλλάδιος ἔζησε ἔτι ν'  
[πλέον ἔλατ(τ)ον μῆ]ν[ες γ'] ἡμέρας  
[δεκαπέντε ὁ Χριστὸς μετὰ τ(ο)ῦ] πνεύ-  
[ματός σ(ο)υ ἐτ]ελεύ[τισεν μ]νι Παυνι  
[έβδό]μι κατὰ τοὺς Ἀφρ<ο>υς

### Apparatus

#### Apparatus

The supplied letters are no longer legible.

#### Translation

[May he be well off]. Helladios lived approximately 50 years, three months and fifteen days. Christ be with your spirit. He died on the seventh of the month of Payn among the Africans.

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```
<parameter>
  <name>edition-type</name>
  <value>interpretive</value>
  <value on="yes">diplomatic</value>
</parameter>

<!-- Line-numbering increment -->
<parameter>
  <name>line-inc</name>
  <value>1</value>
</parameter>
```

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### Text

1	[.....]ΕΛΛΑΔΙΟΣΕΖΗΣΕΕΤΙΝ
2	[.....]Ν[...]ΗΜΕΡΑΣ
3	[.....]ΠΙΝΕΥ
4	[.....]ΕΛΕΥ[.....]ΝΙ.ΑΥΝΙ
5	[....]ΜΙΚΑΤΑΤΟΥΣΑΦΡΥΣ

### Apparatus

#### Apparatus

The supplied letters are no longer legible.

#### Translation

[.....]. Helladios lived approximately 50 years, three months and fifteen days. Christ be with your spirit.  
He died on the seventh of the month of Payn among the Africans.

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```
<parameter>
  <name>edn-structure</name>
  <value>default</value>
  <value>ddbdp</value>
  <value>hgv</value>
  <value>inslib</value>
  <value>iospe</value>
  <value>edh</value>
  <value>edh-db</value>
  <value>rib</value>
  <value>sammelbuch</value>
  <value on="yes">sample</value>
  <value>eagle</value>
  <value>igcyr</value>
</parameter>
```

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**Current repository:** Unknown

**Text type:** Christianfunerary

**Editor(s):** J. M. Reynolds, J. B. Ward-Perkins

**Changes history:** 2010-08-18 GB Converted from TEI P4 (EpiDoc DTD v. 6) to P5 (EpiDoc RNG schema v. 8); 2008-09-09 ZA converted 2009-05-19 RV Added Figures; 2009-08-24 RV Added Figures

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[Interpretive](#)

**Text**

```
1      [Εὐμοριτο] Ἑλλαδιος ἐζησε ἐτι ν'
2      [πλέον ἔλατ(τ)ον μῆ]ν[ες γ'] ἡμέρας
3      [δεκαπέντε ὁ Χριστός μετὰ τ(ο)ῦ] πνεύ-
4      [ματός σ(ο)υ ἐτ]ελεύ[τισεν μι]νι Παυνι
5      [ἐβδό]μι κατὰ τοὺς Ἀφρ<ο>υς
```

[Diplomatic](#)

**Text**

```
1      [.....]ΕΛΛΑΔΙΟΣΕΖΗΣΕΕΤΙΝ
2      [.....]Ν[....]ΗΜΕΡΑΣ
3      [.....]ΠΙΝΕΥ
4      [.....]ΕΛΕΥ[.....]ΝΙ.ΑΥΝΙ
5      [....]ΜΙΚΑΤΑΤΟΥΥΣΑΦΡΥΣ
```

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```
<p><b>Text type: </b>
  <xsl:choose>
    <xsl:when test="//t:textClass//t:keywords//t:term[@type='textType']">
      <xsl:apply-templates select="//t:textClass//t:keywords//t:term[@type=
    </xsl:when>

    <!--xsl:when test="//t:teiHeader//t:rs[@type='textType']">
      <xsl:apply-templates select="//t:teiHeader//t:rs[@type='textType']"/>
    </xsl:when-->

    <xsl:when test="//t:teiHeader//t:rs[@type='textType']">

      <xsl:for-each select="//t:teiHeader//t:rs[@type='textType']">
        <xsl:apply-templates select="current()"/><xsl:text> </xsl:text>
      </xsl:for-each>

  </xsl:when>
```

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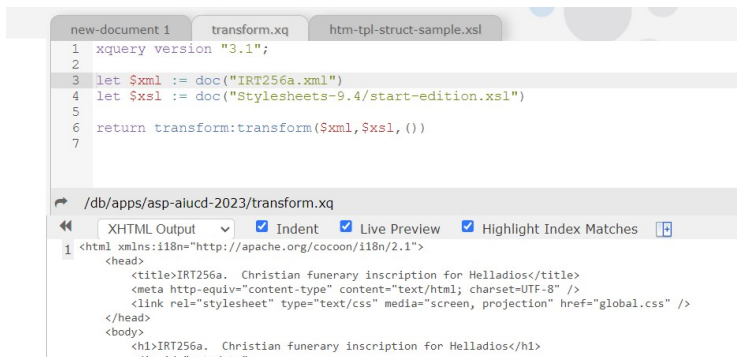
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```
1 xquery version "3.1";
2
3 let $xml := doc("IRT256a.xml")
4 let $xsl := doc("Stylesheets-9.4/start-edition.xsl")
5
6 return transform:transform($xml,$xsl, ())
7
```

/db/apps/asp-aiucd-2023/transform.xq

XHTML Output Indent Live Preview Highlight Index Matches

```
1 <html xmlns:i18n="http://apache.org/cocoon/i18n/2.1">
  <head>
    <title>IRT256a. Christian funerary inscription for Helladios</title>
    <meta http-equiv="content-type" content="text/html; charset=UTF-8" />
    <link rel="stylesheet" type="text/css" media="screen, projection" href="global.css" />
  </head>
  <body>
    <h1>IRT256a. Christian funerary inscription for Helladios</h1>
    <div id="content">
```

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deepen into XPath and XSLT

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- Walmsley, P. (2015) XQuery: Search Across a Variety of XML Data. O'Reilly.
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