

# Workshop Aspettando 2023: XPath - XSL

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

Istituto di Linguistica Computazionale “A. Zampolli”,  
18th May 2023

# Argomenti trattati

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# Di cosa mi occupo

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## Filologia Digitale e Computazionale

Attività di ricerca nell’ambito della filologia digitale e computazionale orientate alla produzione, rappresentazione, analisi, fruizione e interrogazione di testi d’interesse umanistico.

# Research Activities

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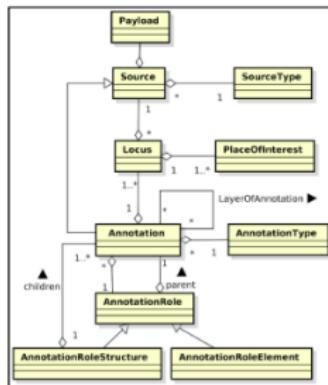
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## In sintesi

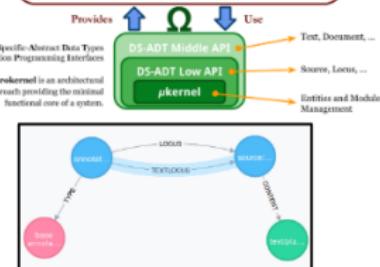
### Ingegnere Informatico prestatto alla filologia computazionale

```
text = Text.of("Literary Text to process", URI.create("//source/text/000"));
annotation = AnnotationText.of("Annotation on the text",
URI.create("//annotation/text/123"));
annotation.addLocus(text, 13, 18);
annotation.save();
```



Domain Specific Abstract Data Types Application Programming Interfaces

The Microkernel is an architectural approach providing the minimal functional core of a system.



# Seminar aims

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## Argomenti del seminario

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

# Seminar path

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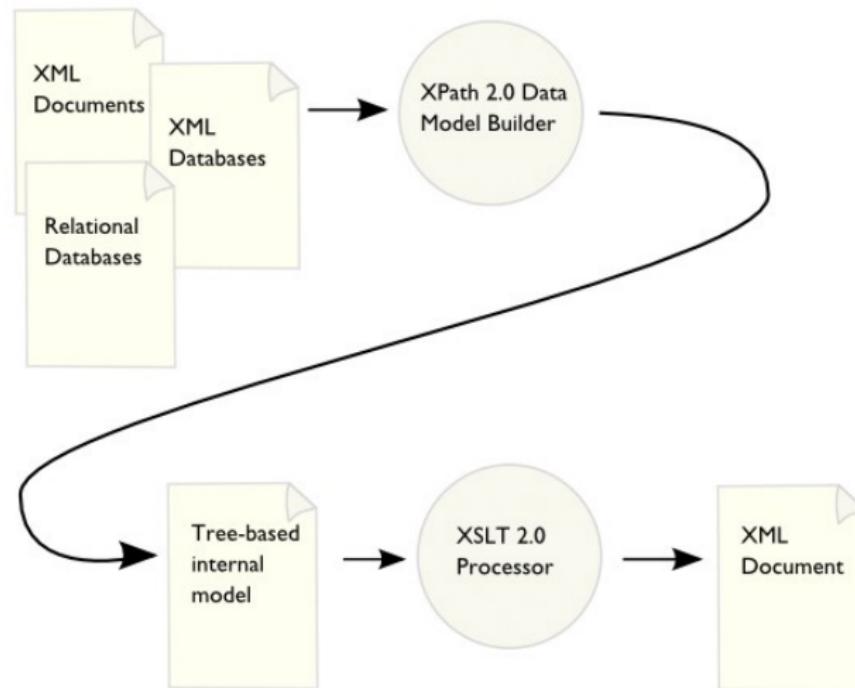
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# XSL XQuery

Una famiglia di linguaggi

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**XSL is a family of W3C recommendations for defining XML document transformation and presentation.**

## XSL

- **XSL Transformations (XSLT):**  
*a language for transforming XML*
- **The XML Path Language (XPath):**  
*an expression language to refer to parts of an XML document;*
- **XSL Formatting Objects (XSL-FO):**  
*an XML vocabulary for specifying formatting semantics.*

## XQuery

XQuery is a query language for XML to extract data.

# XSL Transformations

## Versioning

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W3C > Standards > All Standards and Drafts

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### XSLT COVER PAGE

2021-03-30	Recommendation	<b>XSL Transformations (XSLT) Version 2.0 (Second Edition)</b> This specification defines the syntax and semantics of XSLT 2.0, a language for transforming XML documents into other XML documents. XSLT 2.0 is a revised version of the XSLT 1.0 Recommendation [XSLT 1.0] published on 16 November 1999. XSLT 2.0 is designed to be used in conjunction with XPath 2.0, which is defined in [XPath 2.0]. XSLT shares the same data model as XPath 2.0, which is defined in [Data Model], and it uses the library of functions and operators defined in [Functions and Operators]. XSLT 2.0 also includes optional facilities to serialize the results of a transformation, by means of an interface to the serialization component described in [XSLT and XQuery Serialization]. <i>This document contains hyperlinks to specific sections or definitions within other documents in this family of specifications. These links are indicated visually by a superscript identifying the target specification: for example XP for XPath, DM for the XDM data model, FO for Functions and Operators.</i>
2017-06-08	Recommendation	<b>XSL Transformations (XSLT) Version 3.0</b> This specification defines the syntax and semantics of XSLT 3.0, a language for transforming XML documents into other XML documents.
1999-11-16	Recommendation	<b>XSL Transformations (XSLT) Version 1.0</b> This specification defines the syntax and semantics of XSLT, which is a language for transforming XML documents into other XML documents. XSLT is designed for use as part of XSL, which is a stylesheet language for XML. In addition to XSLT, XSL includes an XML vocabulary for specifying formatting. XSL specifies the styling of an XML document by using XSLT to describe how the document is transformed into another XML document that uses the formatting vocabulary. XSLT is also designed to be used independently of XSL. However, XSLT is not intended as a completely general-purpose XML transformation language. Rather it is designed primarily for the kinds of transformations that are needed when XSLT is used as part of XSL.

### RELATED RETIRED SPECIFICATIONS

2001-08-24	Retired	<b>XSL Transformations (XSLT) Version 1.1</b>
------------	---------	---

# XSL Transformations

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XPATH COVER PAGE		
2017-03-21	Recommendation	<b>XML Path Language (XPath) 3.1</b> XPath is an expression language that allows the processing of values conforming to the data model defined in the XQuery and Xpath Data Model.
2014-04-08	Recommendation	<b>XML Path Language (XPath) 3.0</b> XPath 3.0 (renamed from XPath 2.1 to align with the family of "3.0" specifications) is an expression language that allows the processing of values conforming to the data model defined in [XQuery and XPath Data Model (XDM) 3.0]. Some of the important new features since XPath 2.0 are: Literal function items, inline functions, dynamic function invocations, and function item coercion Clarification of rules associated with sequence type matching let expressions EQNames (QNames with a namespace URI instead of a namespace prefix) Support for union types in casting and function arguments
2010-12-14	Recommendation	<b>XML Path Language (XPath) 2.0 (Second Edition)</b> XPath is a way to refer to parts of an XML document. XPath 2.0 is based on the XQuery 1.0 and XPath 2.0 Data Model (XDM), and also introduces Schema awareness and data typing.
1999-11-16	Recommendation	<b>XML Path Language (XPath) Version 1.0</b> XPath is a language for addressing parts of an XML document, designed to be used by both XSLT and XPointer.

# XSL Transformations

## elements

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80 elements ca

xsl:accept	xsl:copy	xsl:include	xsl:non-matching-substring	xsl:sort
xsl:accumulator	xsl:copy-of	xsl:iterate	xsl:number	xsl:source-document
xsl:accumulator-rule	xsl:decimal-format	xsl:key	xsl:on-completion	xsl:stream
xsl:analyze-string	xsl:document	xsl:map	xsl:on-empty	xsl:strip-space
xsl:apply-imports	xsl:element	xsl:map-entry	xsl:on-non-empty	xsl:stylesheet
xsl:apply-templates	xsl:evaluate	xsl:matching-substring	xsl:otherwise	xsl:template
xsl:assert	xsl:expose	xsl:merge	xsl:output	xsl:text
xsl:attribute	xsl:fallback	xsl:merge-action	xsl:output-character	xsl:transform
xsl:attribute-set	xsl:for-each	xsl:merge-key	xsl:override	xsl:try
xsl:break	xsl:for-each-group	xsl:merge-source	xsl:package	xsl:use-package
xsl:call-template	xsl:fork	xsl:message	xsl:param	xsl:value-of
xsl:catch	xsl:function	xsl:mode	xsl:perform-sort	xsl:variable
xsl:character-map	xsl:global-context-item	xsl:namespace	xsl:preserve-space	xsl:when
xsl:choose	xsl;if	xsl:namespace-alias	xsl:processing-instruction	xsl:where-populated
xsl:comment	xsl:import	xsl:next-iteration	xsl:result-document	xsl:with-param
xsl:context-item	xsl:import-schema	xsl:next-match	xsl:sequence	

# XSL Transformations

## Documentazione istruzione

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### 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:

# XPath functions

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[accumulator-before](#)  
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[adjustdateTime-to-timezone](#)  
[adjust-time-to-timezone](#)  
[analyze-string](#)  
[apply](#)  
[available-environment-variables](#)  
[available-system-properties](#)  
[avg](#)  
[base-uri](#)  
[boolean](#)  
[ceiling](#)  
[codepoint-equal](#)  
[codepoints-to-string](#)  
[collation-key](#)  
[collection](#)  
[compare](#)  
[concat](#)  
[contains](#)  
[contains-token](#)  
[copy-of](#)  
[count](#)  
[current](#)  
[current-date](#)  
[current-datetime](#)  
[current-group](#)  
[current-grouping-key](#)

[fold-left](#)  
[fold-right](#)  
[for-each](#)  
[for-each-pair](#)  
[format-date](#)  
[format-datetime](#)  
[format-integer](#)  
[format-number](#)  
[format-time](#)  
[function-arity](#)  
[function-available](#)  
[function-lookup](#)  
[function-name](#)  
[generate-id](#)  
[has-children](#)  
[head](#)  
[hours-from-datetime](#)  
[hours-from-duration](#)  
[hours-from-time](#)  
[id](#)  
[idref](#)  
[implicit-timezone](#)  
[in-scope-prefixes](#)  
[index-of](#)  
[innermost](#)  
[insert-before](#)  
[iri-to-uri](#)  
[json-doc](#)  
[json-to-xml](#)

[parse-xml](#)  
[parse-xml-fragment](#)  
[path](#)  
[position](#)  
[prefix-from-QName](#)  
[put](#)  
[QName](#)  
[random-number-generator](#)  
[regex-group](#)  
[remove](#)  
[replace](#)  
[resolve-QName](#)  
[resolve-uri](#)  
[reverse](#)  
[root](#)  
[round](#)  
[round-half-to-even](#)  
[seconds-from-datetime](#)  
[seconds-from-duration](#)  
[seconds-from-time](#)  
[serialize](#)  
[snapshot](#)  
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[starts-with](#)  
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[stream-available](#)  
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# XPath

## Documentazione funzioni

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### fn:substring

`substring($sourceString as xs:string?, $start as xs:double) → xs:string`

Returns a substring of a given string starting at the given starting position and continuing to the end of the string.

#### Arguments

<code>\$sourceString</code>	<code>xs:string?</code>	The input string
<code>\$start</code>	<code>xs:double</code>	The position of the first character of the input string to be included in the result

#### Result

`xs:string`

`substring($sourceString as xs:string?, $start as xs:double, $length as xs:double) → xs:string`

Returns a substring of a given string starting at the given starting position and continuing to the end of the string, or \$length characters if shorter.

#### Arguments

<code>\$sourceString</code>	<code>xs:string?</code>	The input string
<code>\$start</code>	<code>xs:double</code>	The position of the first character of the input string to be included in the result
<code>\$length</code>	<code>xs:double</code>	The number of characters to be included in the result

#### Result

`xs:string`

### Namespace

<http://www.w3.org/2005/xpath-functions>

### Links to W3C specifications

[XPath 2.0 Functions and Operators](#)

[XPath 3.0 Functions and Operators](#)

[XPath 3.1 Functions and Operators](#)

# W3C XML standards

## XML specs

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### XML family specifications

[https:](https://www.w3.org/TR/?tag=xml&status=REC&version=latest)

//www.w3.org/TR/?tag=xml&status=REC&version=latest

# La rappresentazione ad albero (XDM)



- The W3C specifications for XSLT, XQuery, and XPath model an XML document as a tree. This data model is known as XDM, and the nodes of an XDM tree are known as XDM nodes.
- XDM defines the information contained in the input to an XSLT processor as well as it defines all permissible values of expressions in the XSLT
- The node-sets of XPath 1.0 are replaced in XPath 2.0 by sequences of nodes.

# La rappresentazione ad albero (XDM)



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# La rappresentazione ad albero (XDM)



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# XML Trees

## Hierarchical Ordered Nodes

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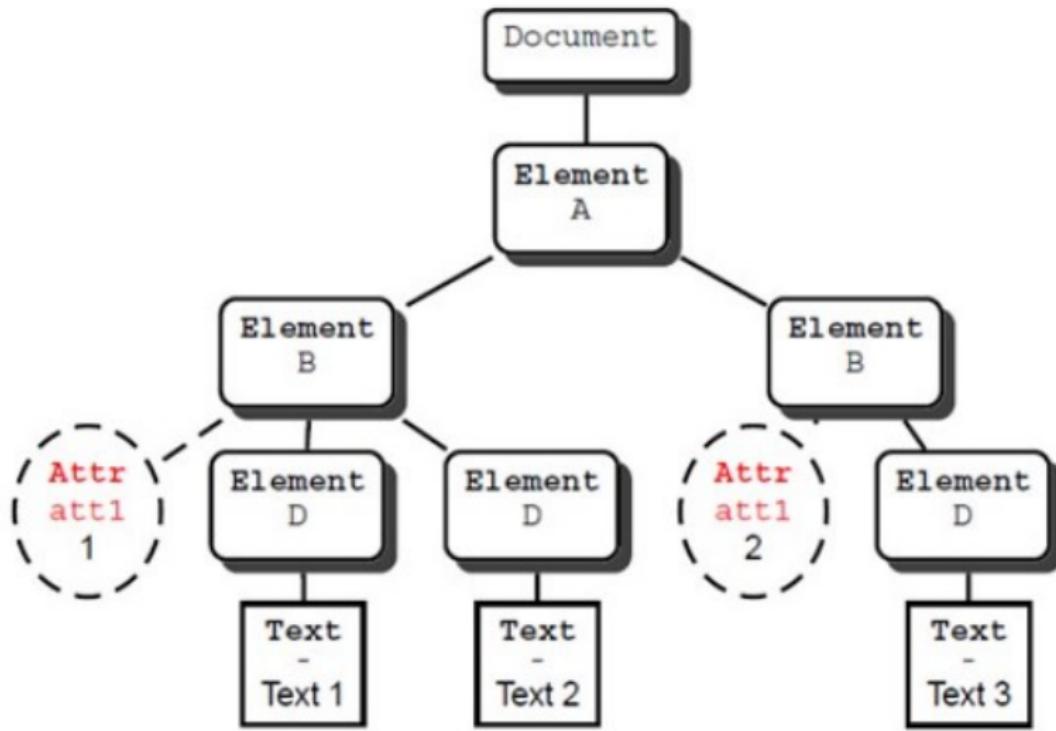
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# XPath Data Model

## XDM

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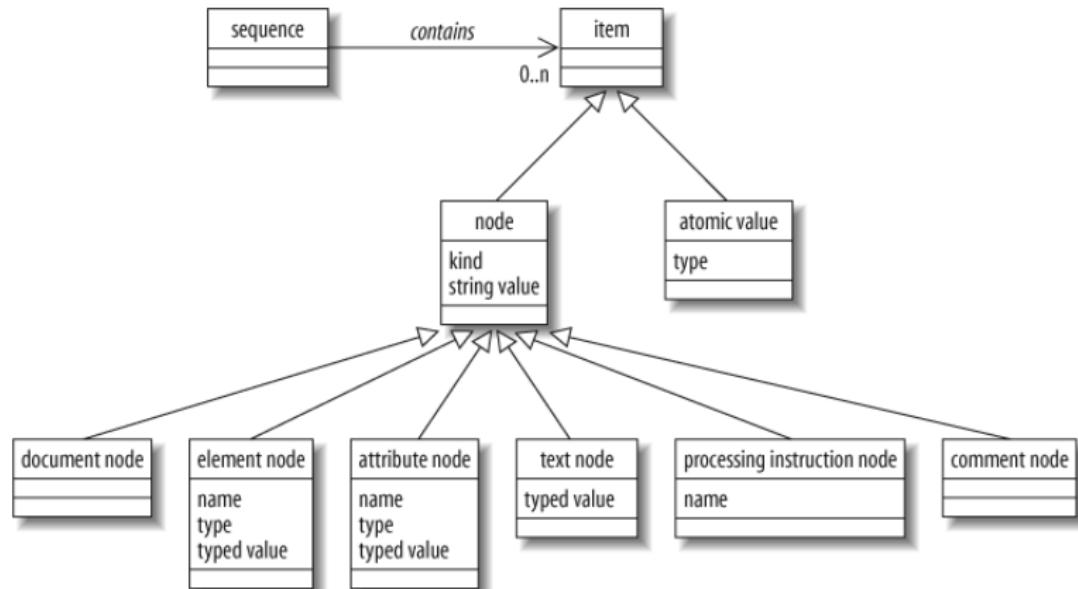
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# Fondamenti Extensible Stylesheet Language

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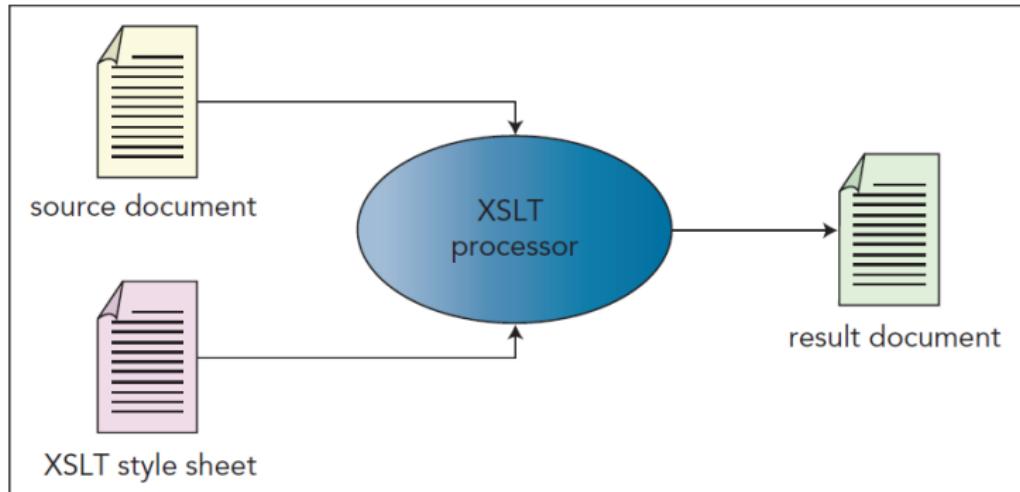
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# XML Document

## Exemple from The Inscriptions of Roman Tripolitania

```
<?xml version="1.0" encoding="UTF-8"?>
<TEI xml:lang="en">
    <teiHeader> ...
    </teiHeader>
    <text>
        <body>
            <div type="bibliography"> ...
            </div>
            <div subtype="text-constituted-from" type="history"> ...
            </div>
            <div type="edition" xml:lang="la"><head xml:lang="en">Text</head><ab> ...
            </ab></div>
            <div type="apparatus"> ...
            </div>
            <div type="translation"><head>Translation</head> ...
            </div>
            <div type="commentary"> ...
            </div>
            <div type="figure"> ...
            </div>
        </body>
    </text>
</TEI>
```

# eXtensible Style Sheet

## Example

```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <xsl:stylesheet version="1.0">
3  ...  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
4  ...  <xsl:output method="text" />
5  ...  <xsl:template match="/">
6  ...    <xsl:apply-templates select="current()/descendant::text" />
7  ...  </xsl:template>
8  ...  <xsl:template match="div[@type='edition']|div[@type='translation']">
9  ...    <xsl:value-of select="normalize-space(.)" />
10 ...  </xsl:template>
11 ...  <xsl:template match="div" />
12 </xsl:stylesheet>
```

PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL

wsl + □ ☰ ...

```
angelodel80@LAPTOP-V8V3MLG0:/mnt/c/Users/angel/risorse/universita/corsoCodifica/tools$ java -jar SaxonHE10-3J/
saxon-he-10.3.jar -s:source/IRT030.xml -xsl:source/built-in.xsl
```

Text Imperator Caesar Marci Antonini Pii fili diui Pii nep diui Hadriani pronep diui Traiani Parthici  
abnep diui Neruae adnep Luci Aeli Aureli Commod August

Translation Emperor Caesar case unknown son of Marcus Antonius Pius, grandson of deified Pius, great  
grandson of deified Hadrian, great great grandson of deified Trajan victor in Parthia, great great great grand  
son of deified Nerva, Lucius Aelius Aurelius Commodus Augustus



# eXtensible StyleSheet Language for Transformations

## XSL-T

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### How Does it work

The XSLT processor uses the instructions in the Style Sheet to process the input XML document by traversing the document's hierarchy.

### How Does it work

XSLT instructions indicate what portion of the tree should be traversed, how it should be inspected, and what output fragment should be generated at each point.

# Ordered Hierarchy of Content Objects

## OHCO

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### ■ OHCO

The nodes of the tree are ordered. The child nodes of a parent node, which are siblings of one another, occur in a particular order.

*This is why XML can be described as representing an ordered hierarchy of content objects.*

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# Selecting and Processing XML Document Trees

## Basic Concepts

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### XPath

Path expressions will return node sequences whose nodes are in document order

# Selecting and Processing XML Document Trees

## Basic Concepts

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### Sequence

The group of nodes that an XPath expression returns is a sequence, which is a technical term for an ordered collection of items that permits duplicates

# Selecting and Processing XML Document Trees

## XPath expression language

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## XPath

- Select nodes sequence from XML tree
- Process data via functions

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## XPath

XPath expressions are extremely accurate (selection of elements, attributes, texts etc.)

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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"/>
5
6      <xsl:template match="/">
7          ...
8              <xsl:value-of
9                  select="/TEI/text/body/div/@type"
10             />
11
12      </xsl:template>
13
14  </xsl:stylesheet>
15
```

out-text.txt U ×

```
1   bibliography history edition apparatus translation commentary figure
```

# Selecting and Processing XML Document Trees

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## XPath Basics

Path expressions are used to navigate from a current location  
(called the context node) to other nodes in the tree.

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## XPath Basics

Steps in a path expression are indicated with slash characters  
and the context node changes with each step.

## XPath Basics

- "div" (*div child*)
- "div/head" (*child of div*)
- "div/\*/persName" (*child of child*)
- "div//persName" (*descendant*)

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## XPath

The XPath expression can be absolute or relative to the **context node**

## XPath

The XPath expression encompasses three components: (**Axes, Test, Predicate**)

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## XPath

XPath expressions navigate the XML tree by using the so called (*expression axes*).

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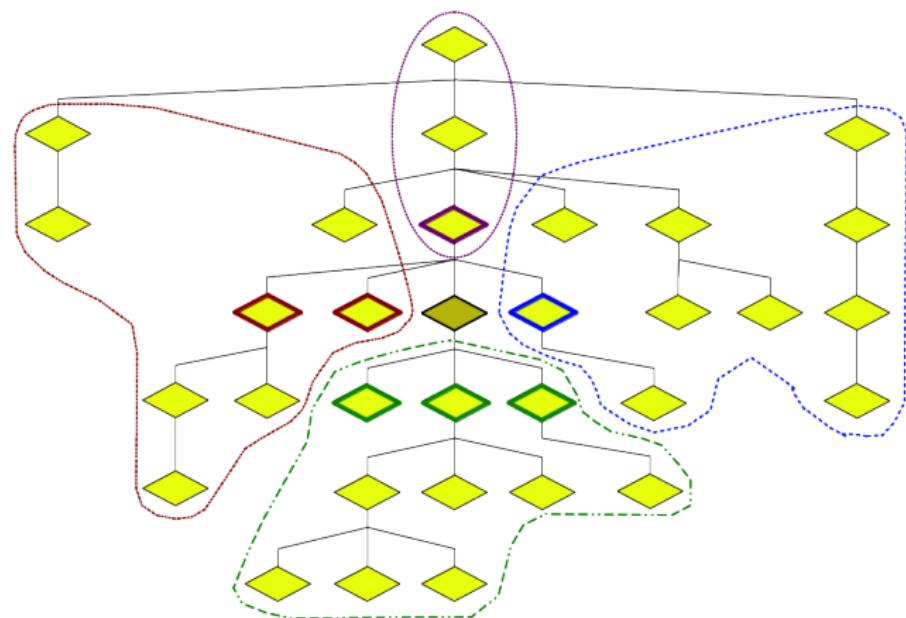
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Axes	Depiction	Nodes
child	Dark green edges	The three nodes immediately below the current location
descendant	Dashed green line	The three child nodes mentioned above, plus the seven nodes below them, all the way down (their children and their children's children)
parent	Magenta edges	The node immediately above the current location
ancestor	Magenta dashed line	The parent plus its parent, and its parent's parent
preceding-sibling	Dark red edges	The two nodes to the left of the current location that have the same parent
preceding	Dark red dashed line	The preceding-sibling nodes plus the six other nodes that are entirely to the left of the current location
following-sibling	Blue edges	The node to the right of the current location that has the same parent
following	Blue dashed line	The following-sibling node plus the nine other nodes that entirely to the right of the current location

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Symbol	Meaning	Expanded version
.	current context node	<code>self::*</code> (for elements)
..	parent element	<code>parent::*</code>
//	descendant axis	<code>descendant::</code> . At the beginning of a path expression, it means that the path starts at the document node.
@	attribute axis	<code>attribute::</code>

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```
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  ....
8  .... |.... <xsl:value-of select="TEI/descendant::langUsage/language" />
9  .... |
10 .... |
11 </xsl:template>
12 </xsl:stylesheet>
```

out-text.txt U X

```
1  Arabic English French German Ancient Greek Transliterated Greek Modern Greek Hebrew Italian Latin Punic
```

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## XPath Predicate

Predicates are conditional expression and are used to filter the results of the path expression.

## XPath Predicate

Predicate expression are written in square brackets after the step in the path expression to which they apply

**Any expression in square brackets that filters a step in a path expression is a predicate**

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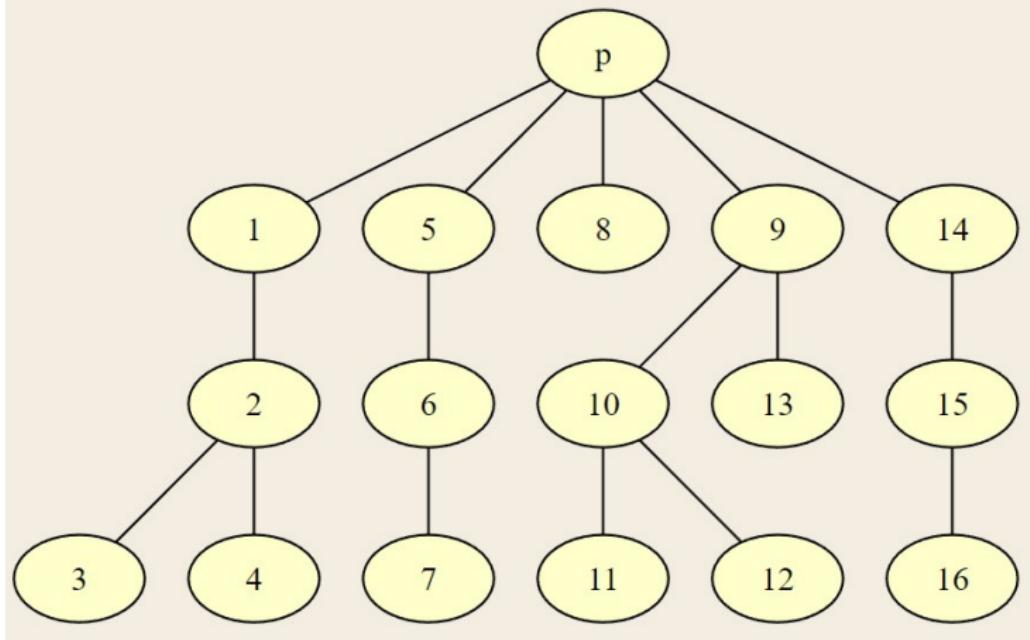
```
1  <?xml version="1.0" encoding="UTF-8"?>
2  <xsl:stylesheet version="2.0">
3      xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
4      <xsl:output method="text" encoding="UTF-8" />
5
6      <xsl:template match="/">
7          <xsl:value-of select="//div[1]" />
8
9
10     </xsl:template>
11
12 </xsl:stylesheet>
```

out-text.txt U X

```
1
2      Bibliography
3          Not previously published.
4
```

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Description	Value	General
Equal to	eq	=
Not equal to	ne	!=
Greater than	gt	> (&gt;)
Greater than or equal to (not less than)	ge	>= (&gt;=)
Less than	lt	< (&lt;)
Less than or equal to (not greater than)	le	<= (&lt;=)

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## Selecting and Processing XML Document Trees

### Predicates Examples

- `div[@type]`
- `div[@type="edition"]`

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## XPath Basics

### "jolly" element selection

- \*
- \*[@type]
- \*[@type="book"]

# Selecting and Processing XML Document Trees

## XPath: functions

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### Esempio predicati

- `//div[@type="edition"]`
- `//div[@type!="translation"]`
- `//div[@n > 2]`
- `//div[1]`
- `//div[last()]`
- `//div[position() = last() - 1]`
- `//div[position() mod 2 = 0]`

# Selecting and Processing XML Document Trees

## XPath location path

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## XPath Basics

Use of OR to select more than one named elements and ID  
function to select the element with the given ID

- "title | author"
- id("irt1952")

# Selecting and Processing XML Document Trees

## XPath location path

```
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" />
5  ...
6  ...<xsl:template match="/">
7  ...
8  ...  <xsl:value-of
9  ...    select="descendant::langUsage/language[@ident='it']/preceding-sibling::*[1]/text()"
10 ...
11 ...
12  ...</xsl:template>
13
14 </xsl:stylesheet>
15
```

out-text.txt U ×

1 Hebrew

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## XPath functions

- Functions operate on the information returned by a path expression or another function
- Functions can be nested
- functions can be used in predicates to filter expressions

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## XPath functions

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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   <xsl:template match="/">
6     <xsl:value-of select="concat(
7       name(TEI/descendant::langUsage/language[1]), ',',
8       count(TEI/descendant::langUsage/language), ',',
9       //w[contains(., 'filii')]/@lemma, ',',
10      upper-case(
11        substring(TEI/descendant::langUsage/language[@ident eq 'it'], 0, 4)
12      ), ','
13    )"
14   "/>
15 </xsl:template>
16 </xsl:stylesheet>
```

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1 language 12 filius ITA

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## XPath functions

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### fn:count

Counts the number of items in a sequence.

**count(\$arg as item()\*) → xs:integer**

#### Arguments

\$arg      item()\*

The sequence whose items are  
to be counted

#### Result

xs:integer

### Namespace

<http://www.w3.org/2005/xpath-functions>

### Links to W3C specifications

[XPath 2.0 Functions and Operators](#)

[XPath 3.0 Functions and Operators](#)

[XPath 3.1 Functions and Operators](#)

### Saxon availability

Available in XPath 2.0, XSLT 2.0, XQuery 1.0, and later versions. Available in all Saxon

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References

## fn:contains

Returns true if the second string is a substring of the first.

**contains(\$arg1 as xs:string?, \$arg2 as xs:string?) → xs:boolean**

Arguments		
\$arg1	xs:string?	The containing string
\$arg2	xs:string?	The contained string
<b>Result</b>		xs:boolean

**contains(\$arg1 as xs:string?, \$arg2 as xs:string?, \$collation as xs:string) → xs:boolean**

Arguments		
\$arg1	xs:string?	The containing string
\$arg2	xs:string?	The contained string
\$collation	xs:string	The collation to be used for comparing the strings
<b>Result</b>		xs:boolean

## Namespace

<http://www.w3.org/2005/xpath-functions>

## Links to W3C specifications



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References

## fn:name

**name() → xs:string**

Returns the name of the context node, as a string in the lexical form of a QName.

*There are no arguments*

<i>Result</i>	xs:string
---------------	-----------

**name(\$arg as node())? → xs:string**

Returns the name of the supplied node, as a string in the lexical form of a QName.

*Arguments*

\$arg	node()?
-------	---------

The node whose name is  
required

<i>Result</i>	xs:string
---------------	-----------

## Namespace

<http://www.w3.org/2005/xpath-functions>

Links to W3C specifications

XPath 2.0 Functions and Operators

XPath 3.0 Functions and Operators



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## fn:substring

`substring($sourceString as xs:string?, $start as xs:double) → xs:string`

Returns a substring of a given string starting at the given starting position and continuing to the end of the string.

### Arguments

\$sourceString	xs:string?	The input string
\$start	xs:double	The position of the first character of the input string to be included in the result

### Result

xs:string

`substring($sourceString as xs:string?, $start as xs:double, $length as xs:double) → xs:string`

Returns a substring of a given string starting at the given starting position and continuing to the end of the string, or \$length characters if shorter.

### Arguments

\$sourceString	xs:string?	The input string
\$start	xs:double	The position of the first character of the input string to be included in the result
\$length	xs:double	The number of characters to be included in the result

### Result

xs:string

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## fn:upper-case

Converts a string to upper case.

**upper-case(\$arg as xs:string?) → xs:string**

### Arguments

\$arg	xs:string?	The string to be converted to upper-case
-------	------------	--

### Result

xs:string

## Namespace

<http://www.w3.org/2005/xpath-functions>

## Links to W3C specifications

[XPath 2.0 Functions and Operators](#)

[XPath 3.0 Functions and Operators](#)

[XPath 3.1 Functions and Operators](#)

## Saxon availability

Available in XPath 2.0, XSLT 2.0, XQuery 1.0, and later versions. Available in all Saxon 

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## fn:concat

Concatenates the string-values of the arguments into a single string. There must be at least two arguments.

`concat($arg1 as xs:anyAtomicType?, $arg2 as xs:anyAtomicType?, $etc... as xs:anyAtomicType?) → xs:string`

### Arguments

\$arg1	xs:anyAtomicType?	The first string
\$arg2	xs:anyAtomicType?	The second string
\$etc...	xs:anyAtomicType?	The third and subsequent strings (as many as required)

### Result

xs:string

## Namespace

<http://www.w3.org/2005/xpath-functions>

## Links to W3C specifications

[XPath 2.0 Functions and Operators](#)

[XPath 3.0 Functions and Operators](#)

[XPath 3.1 Functions and Operators](#)

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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 in XDM.

# eXtensible Style Sheet

## XSL-T

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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.

# eXtensible Style Sheet

## XSL-T

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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.

# eXtensible Style Sheet

## XSL-T

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## Basics (cont.)

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

# eXtensible Style Sheet

## XSL-T

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### Basics (cont.)

In constructing a result tree, nodes from the source trees can be filtered and reordered, and arbitrary structure can be added.

# XSLT main elements

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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/>

# XSLT main elements

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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/>

# 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

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### 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/>

# XSLT main elements

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

</xsl:stylesheet>

txt.txt u ×
<?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

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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="@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('::', .)"/>
  </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/>

# 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:strip-space elements="" /-->

  <xsl:template match="/">
    <xsl:value-of select="concat('&#10;', 'title :: ', 
      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(':: ', ' ', '&#10;')
    " />
    <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 : diuipinepediuHadrianiprompediu
13 riga 3 : TraianiParthiciabnepdiuNeruaeadnepl
14 riga 4 : LuciAeliAureliCommmodAugust
15 div : apparatus
16 head : Apparatus
17 Line 4 is represented by the upper parts only of
two letters with rounded bowls.
18 div : translation
19 head : Translation
20 Emperor Caesar son of Marcus Antonius Pius,
grandson of deified Pius, great grandson of
deified Hadrian, great great grandson of deified
Trajan Victor in Parthia, great great great
grandson of deified Nerva, Lucius Aelius Aurelius
Commodus Augustus
21 div : commentary
22 head : Commentary
23 No comment
24 div : figure
25 head : Photographs
26 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.

# XSLT main elements

xsl:key xsl:if

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```
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:key name="lang" match="language" use="@ident"></xsl:key>
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.

# 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="concat('Selected Language: ', $latLang/text(), ' (', $latLang/@ident, ')')"/>
10    </xsl:if>
11  </xsl:template>
12
13 </xsl:stylesheet>
```

out-text.txt U X

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

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

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```
<teiHeader>
    <fileDesc>
        <titleStmt>
            <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>
            </titleStmt>
            <publicationStmt>
                <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/licenses/by/uk/2.0/</ref>)
                    <p>All reuse or distribution of this work must contain somewhere a link back to the original source</p>
                </availability>
            </publicationStmt>
        <sourceDesc> ...
```

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- References

```
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>...
14             </xsl:choose>
15         </xsl:template>
16
17     </xsl:stylesheet>
18
19 
```

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

PROBLEMS      OUTPUT      DEBUG CONSOLE      TERMINAL

$\sigma_{wsj} + \times$   $\square$   $\blacksquare$   $\cdots$

```
angelodel180@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
```

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### Bibliography

Not previously published.

### Text constituted from

Transcription (Reynolds, Ward-Perkins)

### Text

[Εύμοιριτο] Ἐλλάδιος ἔζησε ἔτι ν'  
[πλέον ἐλατ(τ)ον μῆ]ν[ες γ'] ήμέρας  
[δεκαπέντε ὁ Χριστὸς μετὰ τ(o)ῦ] πνεύ-  
[ματός σ(o)υ ἐτ]ελεύ[τισεν μ]νὶ Πλαυνί<sup>5</sup>  
[έβδο]μι κατὰ τοὺς Αφροδίτους

### 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[.....]ΝΙΑΥΝΙ
- 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>
```

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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

Publication details: Centre for Computing in the Humanities, King's College London;

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### Interpretive

#### Text

- 1 [Εύμοιριτο] Ελλάδιος ἔζησε ἐπι ν'
- 2 [πλέον ἔλατ(τ)ον μῆν[ες γ'] ήμέρας
- 3 [δεκαπέντε ό Χριστός μετά τ(ο)ῦ πνεύ-
- 4 [ματός σ(ο)υ ἐτ]ελεύ[τισεν μι]νὶ Πανι
- 5 [έβδο]μι κατά τοὺς Αφρο>νς

### Diplomatic

#### Text

- 1 [.....]ΕΛΛΑΔΙΟΣΕΖΗΣΕΕΤΙΝ
- 2 [.....]Ν[...]ΗΜΕΡΑΣ
- 3 [.....]ΠΙΝΕΥ
- 4 [.....]ΕΛΕΥ[.....]ΝΙΑΥΝΙ
- 5 [...]ΜΙΚΑΤΑΤΟΥΣΑΦΡΥΣ



# eXtensible Style Sheet

## Working with XSL-T

```
<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='textType']"/>
  </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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The screenshot shows a web-based XSLT editor interface. At the top, there are three tabs: "new-document 1", "transform.xq", and "htm-tpl-struct-sample.xsl". The "transform.xq" tab is active, displaying the following XQuery code:

```
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
```

Below the code editor, there is a URL bar with the path "/db/apps/asp-aiucd-2023/transform.xq". Underneath the URL bar, there are several checkboxes and dropdowns: "XHTML Output" (selected), "Indent" (checked), "Live Preview" (checked), "Highlight Index Matches" (checked), and a "Help" icon. The main content area displays the transformed XML output:

```
<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="mainContent">
```

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### Some References

- ...
- ...
- ...
- ...
- ...
- ...
- ...
- ...
- ...