

# Historisch- Kulturwissenschaftliche Informationsverarbeitung Woche 10

## Modellierung in den Wissenschaften Zusammenführung



# Vielfältigkeit des Modellbegriffs

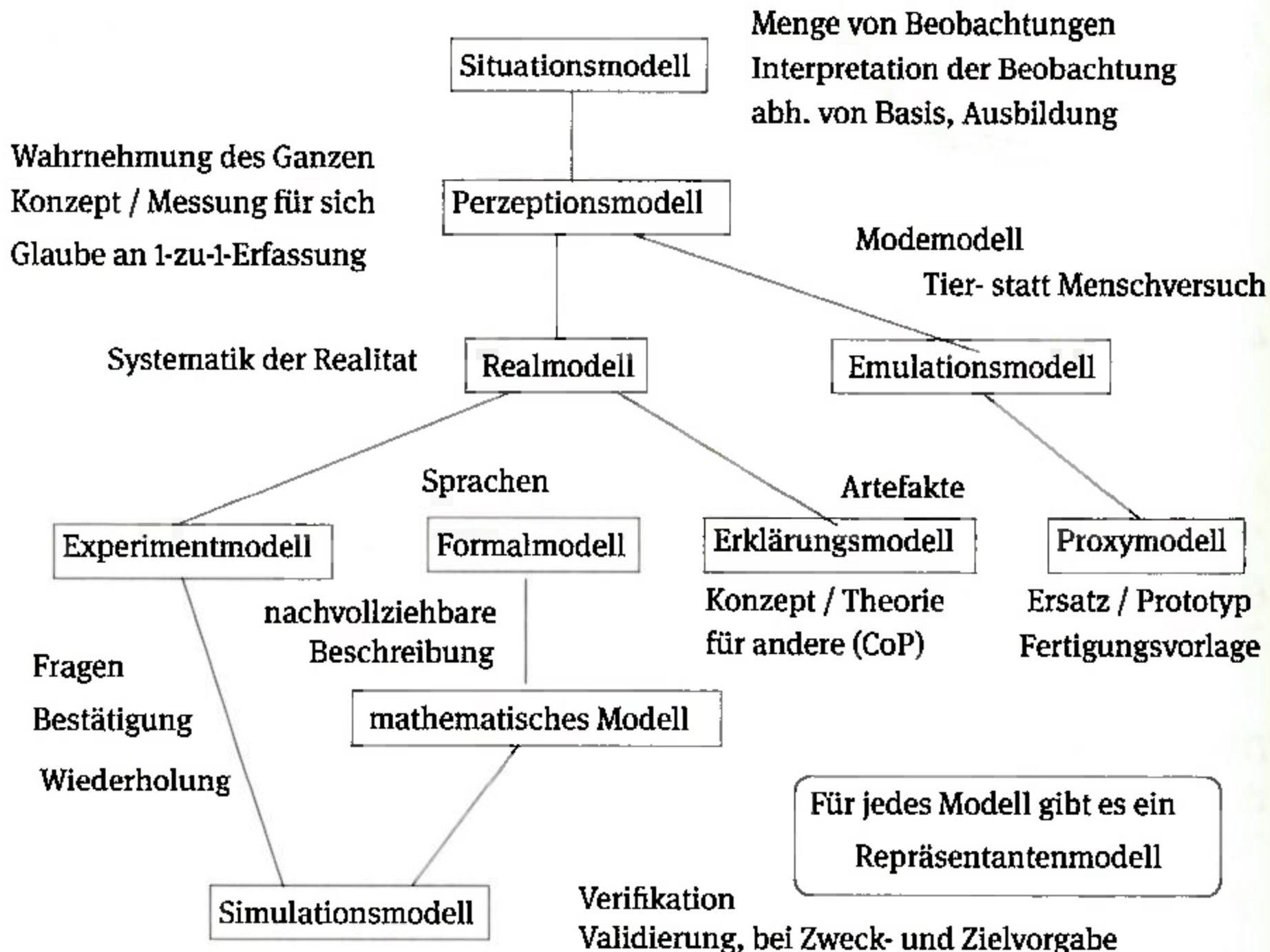
- Situationsmodelle
- Perzeptionsmodelle
- Realmodelle
- Experimentmodelle
- formale Modelle
- mathematische Modelle
- Simulationsmodelle
- Emulationsmodelle
- Ersetzungsmodelle
- Erklärungsmodelle
- Repräsentationsmodelle

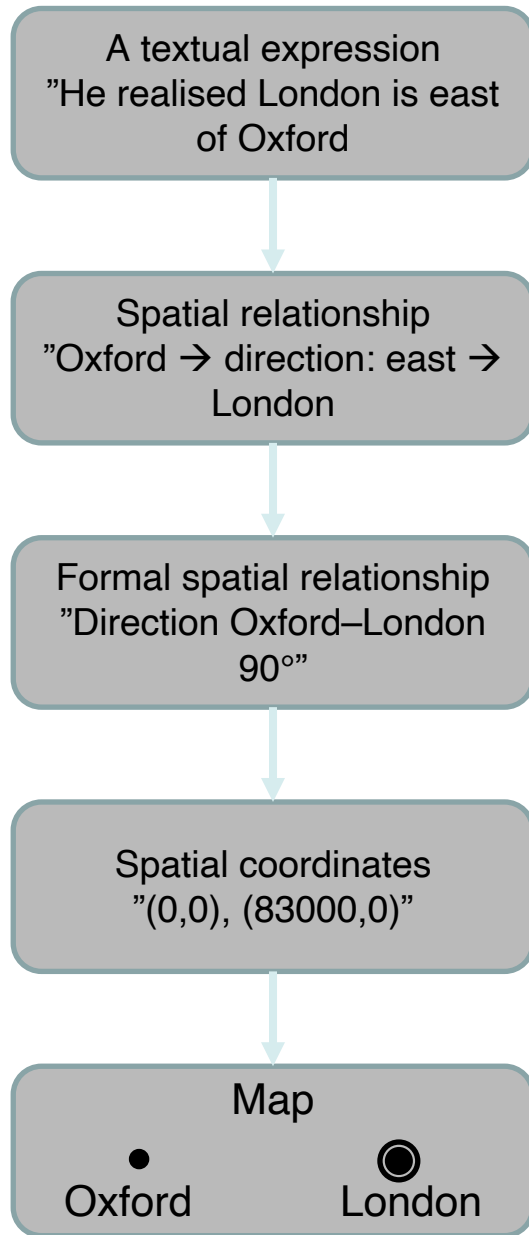


# Nutzungsszenarien

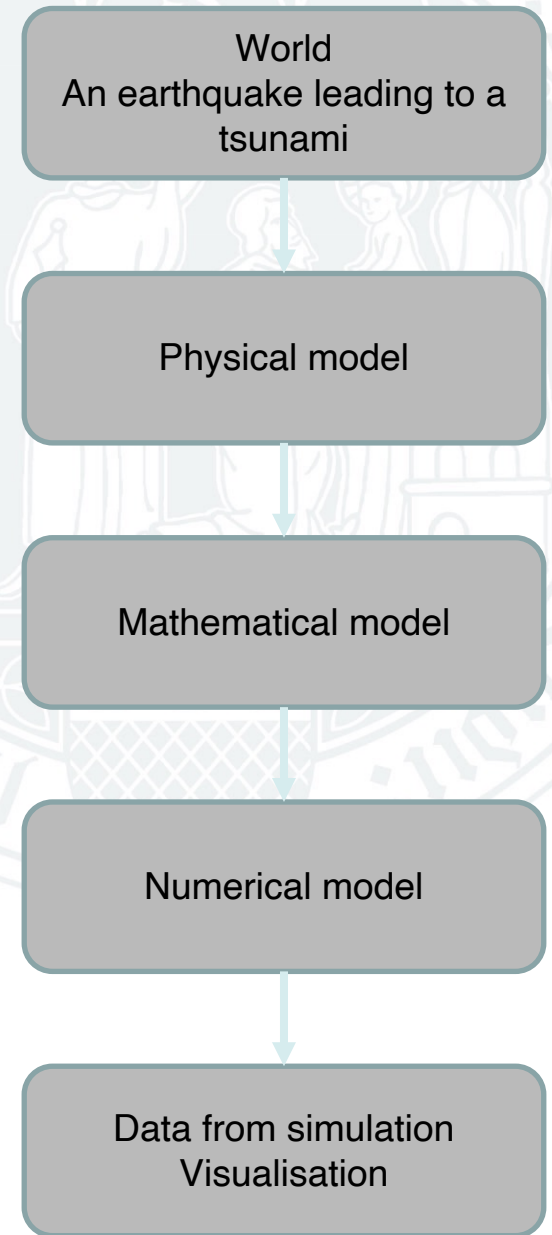
- deskriptiv zur Beschreibung
- präskriptiv als Vorlage
- konzeptuell zum Verständnis und als Vermittler
- exemplarisch mit einem Abbild als (Museums-)Exemplar
- experimentell mit einem Prototypen
- explikativ mit einer Erklärung
- normativ mit Postulaten und Annahmen







Critical  
stepwise  
formalisation  
*and*  
Using numerical  
models





# Nutzungsszenarien

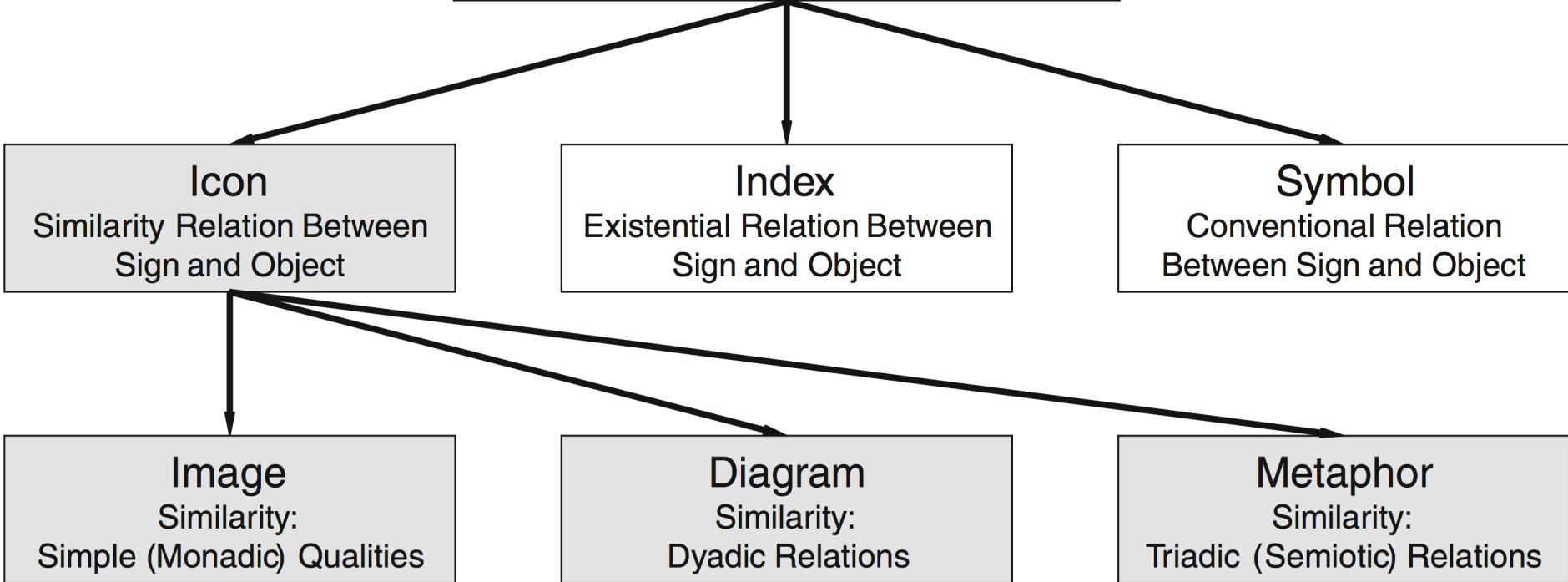
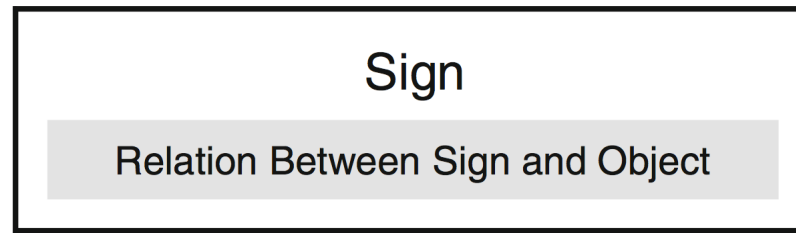
- prognostisch als Vorhersagemodell
- metaphorisch mit einer Anleihe oder einem Gleichnis aus anderen Semantikfeldern
- gestalterisch als Entwurf oder Plan
- nachprüfend als Testfall-Suite
- anschaulich als figurativer oder visueller Gegenstand
- anleitend als Arbeitsvorschrift



# Semiotics and modelling

- Signification and reasoning
    - Contextualising modelling within a framework of making sense via practical thinking
  - Interdisciplinary perspective
    - Construction: how models are made
    - Epistemic value: how something new is discovered/recognised in the process of making and using models
- = de-dichotomise ontology vs. epistemology





Kralemann and Lattmann 2013, fig 2





# Grades of iconicity



Resemblance (immediacy of perception)

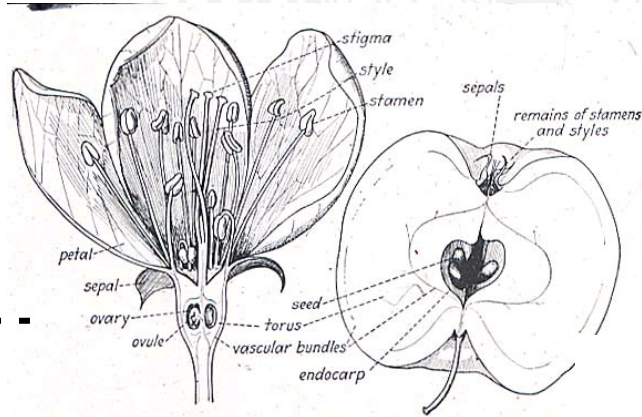


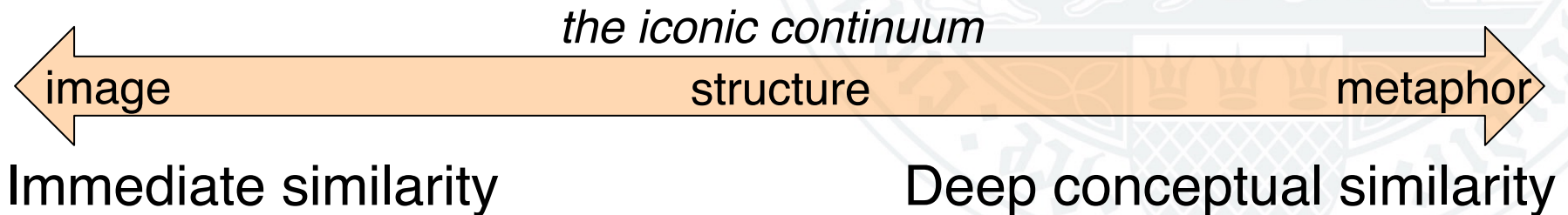
FIG. 381. Flower and fruit of apple (*Malus pumila*), cut lengthwise to show relation of the parts of the flower to the torus.



Complex leaps/interpretations

# Grades of iconicity

- Logic and syntax of models → iconic ground
- Selection of salient qualities
  - human and/or machine
  - context: theory, language, etc.



- Interplay between ‘intrinsic structure’ and ‘extrinsic mapping’ of models
  - different media
  - different similarity patterns

# Typische Modellzwecke

- Erkenntnis
- Erklärung/Demonstration
- Beherrschung des Originals
- Indikation
- Variation/Optimierung/Reorganisation
- Verifikation
- Simulation
- Planung



# Typische Modellzwecke

- Projektierung
- Konstruktion
- Theoriebildung
- Verifikation von Hypothesen
- Steuerung
- Kontrolle
- Ersatzfunktion



# Modelling in Digital Humanities

- Purposes include
  - making things
  - understanding things
  - teaching
  - making implicit information explicit
- Basis for modelling
  - media products
  - other objects/structures
- Mediated models
  - thus, no focus on mind models
- Models are dynamic
  - sometimes in form
    - can be modified
  - always in creation
  - always in use
- Thus: *modelling*





# Modellfunktionen

- Theorien
- Daten
- Simulationen
- Kausalität
- Verständnis
- Erklärungen
- Lehre
- Experimenten

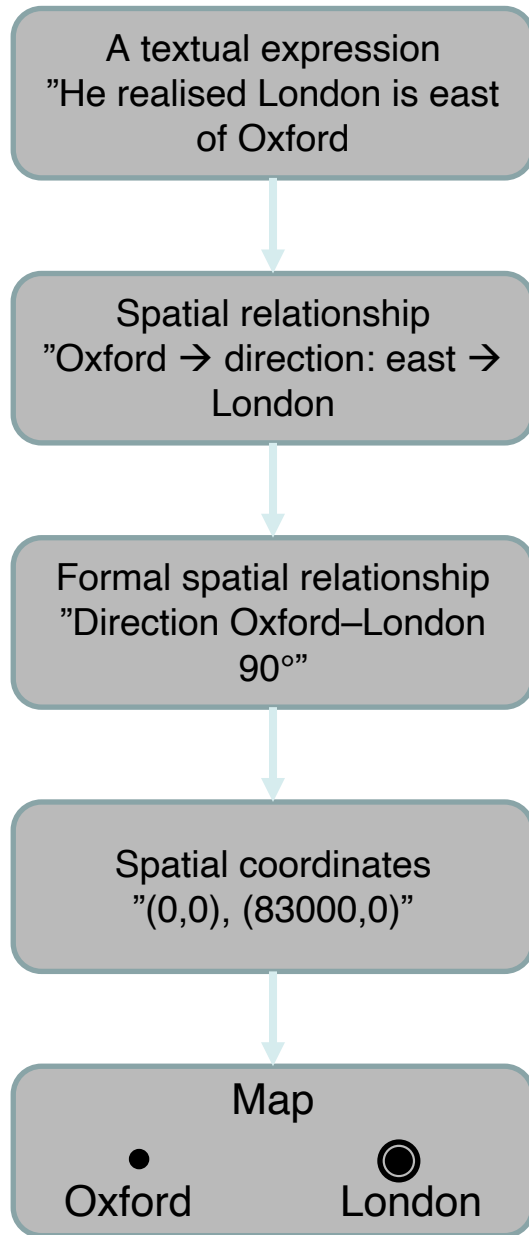




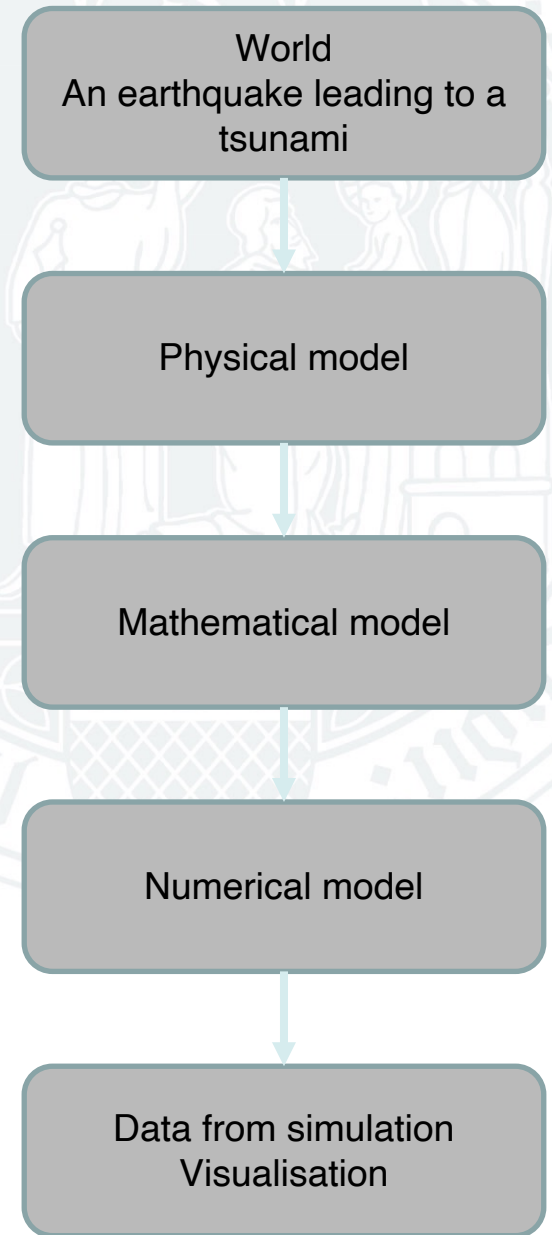
# Modelling in the humanities *and the role of DH*

- Re-introducing practice based reasoning
- Experimental
- Playful
- Learning by doing
- The process of coming to know
- The process of making





Critical  
stepwise  
formalisation  
*and*  
Using numerical  
models



# Modelling experiments

- Fall-off: what is lost in the process
- Modelling error: differences between the steps
- *Changes due to media differences*
- *Changes due to resolution*
- *Changes due to operationalisation*
- Changes or error?
  - humanities vs. natural science



# Digital Humanities and Numerical Mathematics

*Modelling*

*Simulation*

Astrophysics

Tsunami

History

Literature

Numerical  
mathematics

Operationalisation of problems  
Fall-off / error

Digital  
humanities

Climate

Energy transition

Archaeology

Games

*Visualisation*

*Operationalisation*



# Mind models

- Experience based decision making
- Experience is not enough in one single human mind any more?
- Experience based decision must be collective
  - will included human to human communication
  - communication, terminology.
- How people communicate with each other is very important.
- Communication is mediated
- Communicating in models as media products
  - even if models might be less formal





# Seeing through manipulation

- As programmers we can see through manipulation
  - making the world real by interacting with it (Piaget)
- Is this some version of the skilled decision maker?





# Embodied creative thinking

Post-Doc: You: you: get the  
formation of the barri[ers  
(.) and= PI: [(Right.) Post-Doc: =you're inside (a)  
barrier and all you're doing is you're fluctuating inside  
that  
barrier on that time scale, PI  
(?): Yeah  
[4d] RO LAB (10-10)

Ochs, E., Jacoby, S., & Gonzales, P. (1994). Interpretive Journeys: How Physicists Talk and Travel through Graphic Space. *Configurations*, 2(1), 151–171. <http://muse.jhu.edu/article/8023>



# UML

- Why
- For what
- Types of diagrams
  - the graphical languages of UML
- Syntax and semantics
- Modelling examples
  - use of UML in practice
  - know how to use UML in modelling



# CIDOC-CRM

- Motivation
- Objectives
- Formal Ontology
- Scope
  - intended
  - practical
- Principles
- Terms



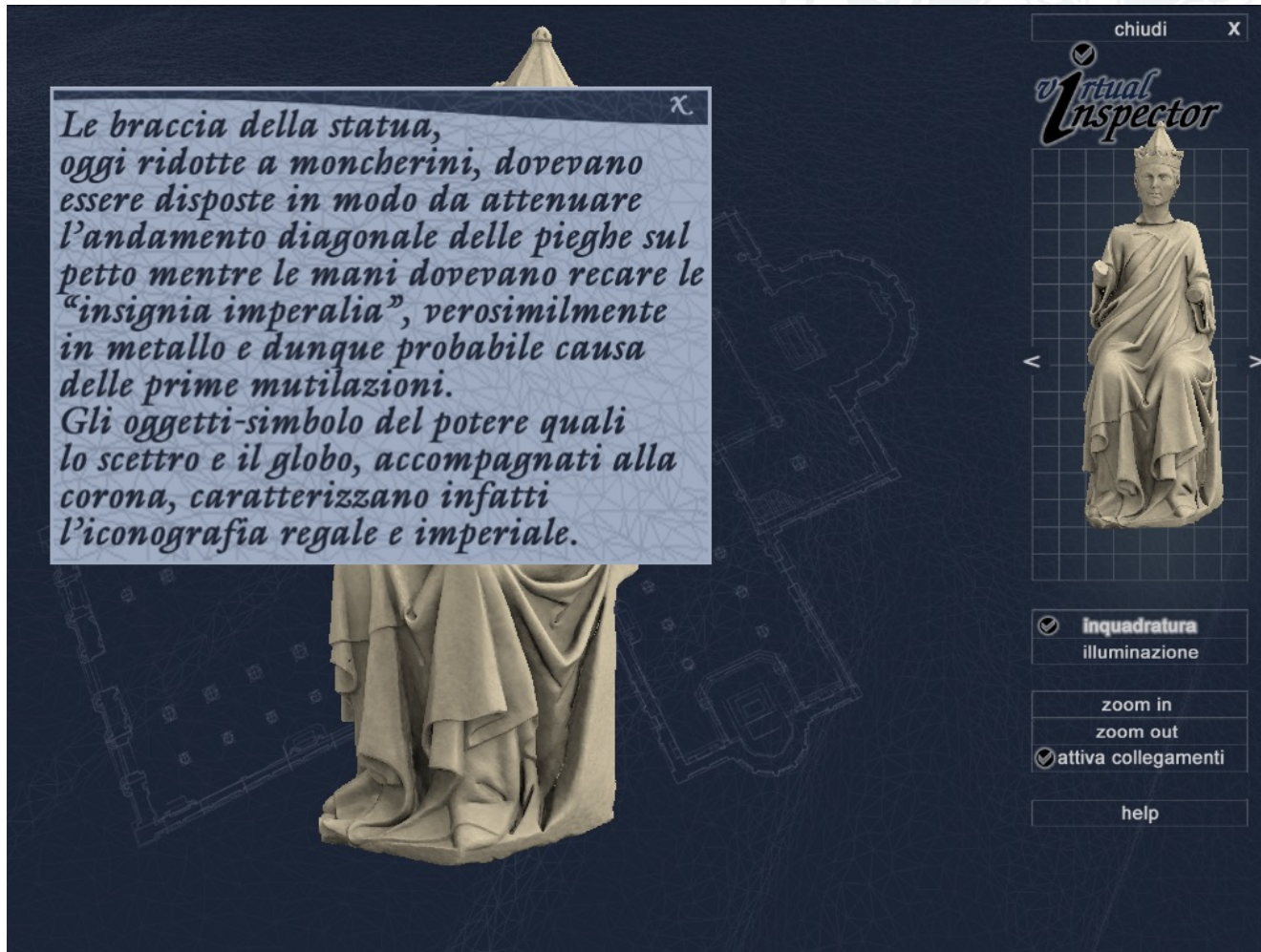
# Modelling and manipulation

- The form of the model
  - media products made to be interacted with
  - ontology
- The relationship between model and modelled object
  - fundamentally dynamic
  - semiotic focus
- Modelling is a media transformation process
  - like adaptation
- Learning new things
  - epistemology





# The Arrigo Showcase: Change the form of a model



Beautiful  
and useful

Can be used  
for  
experiments

But closed

Even the  
texts are  
bitmaps

# The new Arrigo system: TEI (converted to HTML)

## 1. Arrigo VII enthroned

### 1.1. Hands

The arms of the statue have been reduced to stumps. Originally, they must have been placed in such a way as to soften the diagonal folds of the dress on the chest. The hands must have held the imperial insignia. The first mutilation of the statue may have occurred when somebody tore them of: they were probably made of precious metal. The sceptre and the globe, together with the crown, symbolized power. They are therefore characteristic features of the iconographic representation of kings and emperors.

### 1.2. Head

The head of the emperor has broken off from the body and does not fit well on



# The new Arrigo system: CIDOC-CRM in RDF


MAD Semantic Web Database - Arrigo VII by VAST-LAB.org

[Entity Details](#) [Show Entities](#)  [Subscribe](#)

[Top of Document](#)

**Arrigo\_VII\_enthroned**

type	=>	<a href="#">E22.Man-Made Object</a>	
type	=>	<a href="#">E35.Title</a>	
P138.has_representation	=>	<a href="#">showStatue7PLY100k.dae</a>	<i>3D Model (linked resource)</i>
P102.has_title	=>	<a href="#">Arrigo VII enthroned</a>	
Description	=>	Arrigo VII enthroned	
P129.is_subject_of	=>	<a href="#">arrigo_kiosk.html#a1</a>	<i>TEI Document (linked resource)</i>
P129.is_subject_of	=>	<a href="#">arrigo_kiosk.html#a21</a>	<i>TEI Document (linked resource)</i>
P129.is_subject_of	=>	<a href="#">arrigo_kiosk.html#a29</a>	<i>TEI Document (linked resource)</i>
P62.Depicts	=>	<a href="#">Arrigo VII</a>	
P46.is_composed_of	=>	<a href="#">Hands</a>	
P46.is_composed_of	=>	<a href="#">Arms of the statue</a>	
P46.is_composed_of	=>	<a href="#">The imperial insignia</a>	
P46.is_composed_of	=>	<a href="#">Head</a>	
P46.is_composed_of	=>	<a href="#">Body</a>	
P46.is_composed_of	=>	<a href="#">Neck</a>	
P46.is_composed_of	=>	<a href="#">Trunk</a>	
P46.is_composed_of	=>	<a href="#">Rear</a>	
P46.is_composed_of	=>	<a href="#">Crown</a>	
P12.was_present_at	=>	<a href="#">The first mutilation of the statue</a>	
P12.was_present_at	=>	<a href="#">Removal of marble</a>	

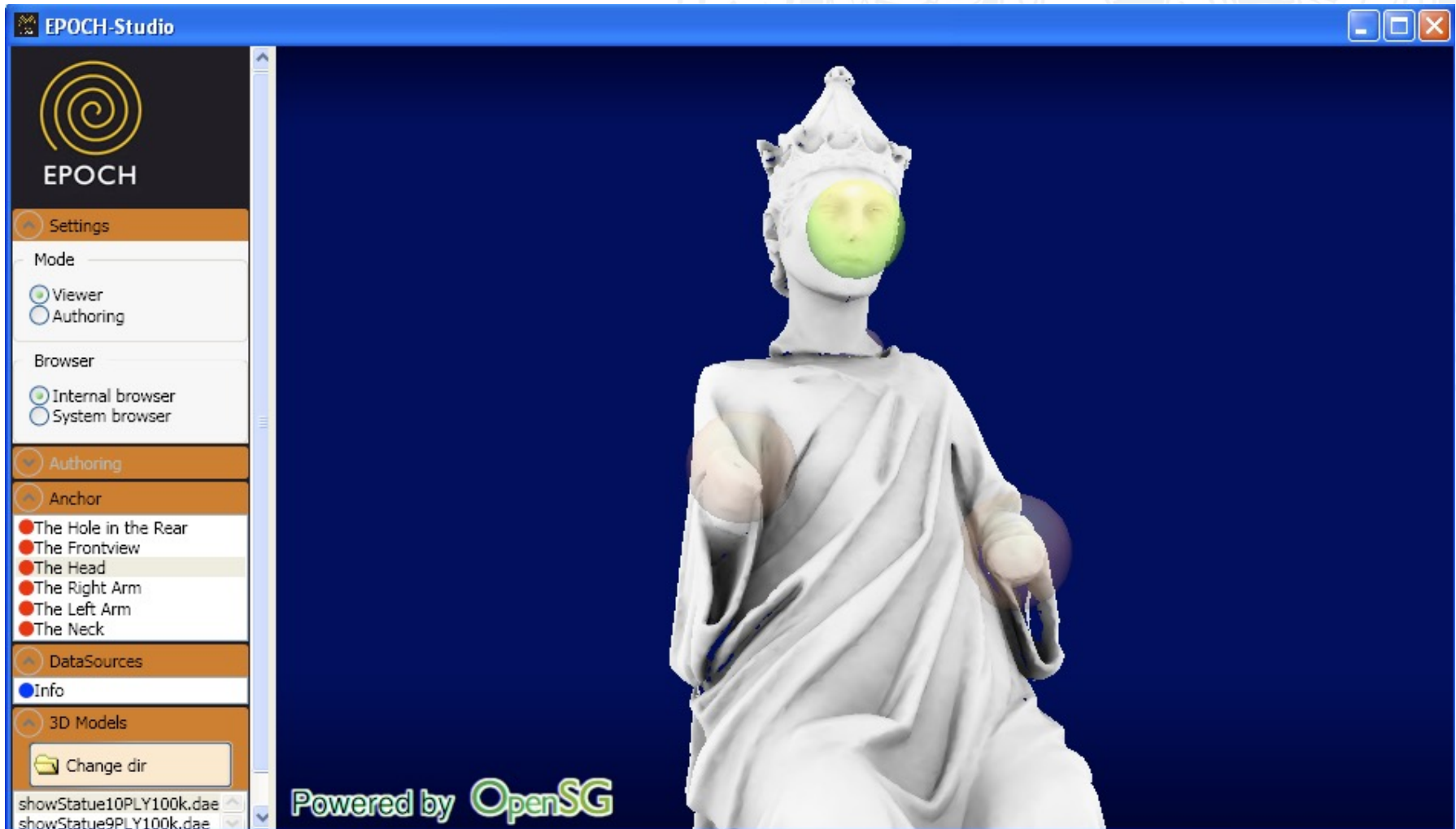


### MAD RDF Database

MAD is a powerful RDF Data Manager. You can use the following options to slice the model and to refine your queries

### Choose a class

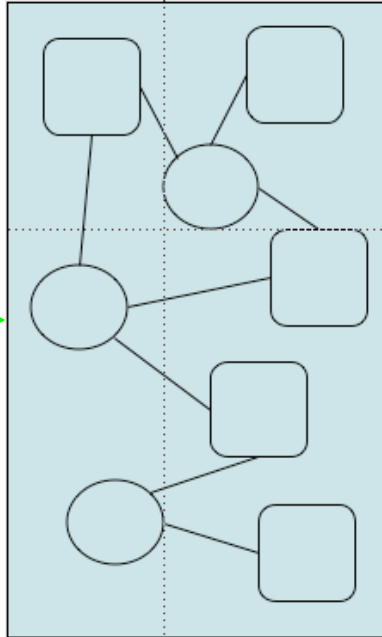
# The new Arrigo system: COLLADA files



# Intermediality



Other  
spatial  
objects



Other  
ontological  
objects

## 1. Arrigo VII enthroned

### 1.1. Hands

The arms of the statue have been placed in such a way as chest. The hands must have had the statue may have occurred made of precious metal. The statue symbolized power. They are the representation of kings and emperors.

### 1.2. Head

The head of the emperor has

Other texts

# Main result of Arrigo showcase

*The work with 3D models of culture historical artefacts will be located where it belongs: In the network of interconnected knowledge sources, both classical and modern, expressed in all sorts of media.*

Havemann, Sven, et al. "The Arrigo Showcase Reloaded—towards a Sustainable Link between 3d and Semantics." *ACM Journal on Computing and Cultural Heritage* 2(2009) 1.

# Text representation and modelling

Representations of texts are divided into three groups:

1. Linear (text as stream)
2. Hierarchical (text as tree)
3. Graph based (text as graph)

Type	Text representation system	Example of modelling tool type
1	Linear	Plain text
2	Hierarchical	XML encoding
3	Graph based	RDF encoding



# Editor presentation: line and tree

- div "Schn1\_1417" II. Peter Schnitler og hans d...
- head "TOC" II. Peter Schnitler og hans del...
- p "Schn1\_1419" II. Peter Schnitler og hans
  - hi "Schn1\_1420" II. Peter Schnitler og h
    - B hi "Schn1\_1421" II. Peter Schnitler c
      - name "Schn1\_1423" Peter Schni
- p "Schn1\_1427" Peter Schnitler, «grensem
  - name "Schn1\_1428" Peter Schnitler
  - #xAB «
  - #xBB »
  - name "Schn1\_1431" Schnitler
  - name "Schn1\_1434" Christianshavn
  - name "Schn1\_1437" København
  - date "Schn1\_1440" 17. januar 1690
  - name "Schn1\_1443" Lorentz Schnitler
  - name "Schn1\_1446" Dorothea Hansdat
  - note "Schn1\_1449" Se E. A. Thomle: Fc
    - name "Schn1\_1451" E. A. Thomle
    - name "Schn1\_1454" Schnitler

Peter Schnitler, «grensemajoren»  
stamfaren til den store og ansette norske slekt Schnitler, var født på Christianshavn i København 17. januar 1690 som sønn av den tyskfødte kjøbmann Lorentz Schnitler og hustru Dorothea Hansdatter Nobel.

Se E. A. Thomle: Forskjellige Slægtebogs-Optegnelser. I. Familien Schnitler, Personalhist. Tidsskr. 2 Række 2 Bind, Kbh. 1887, side 169 flg. Dette er en hovedkilde til Schnitlers personlige livshistorie. Se også Kr. Nissen artikel om Schnitler i Norsk biogr. leks. XII, Oslo 1954, s. 490-498.

Moren var datter av en kjøbmann i Christianopel i Blekinge, Hans Mortensen Nobel, som efter at Blekinge ved Roskildefreden 1658 var avstått til Sverige, hadde flyttet til København. Innen hun blev gift med Lorentz Schnitler, hadde hun endel år vært gift med presten Peder Hoffgaard, som døde på St. Thomas 1684.

Smlgn. E. A. Thomle: Familien Hofgaard i Norge.

# Editor presentation: graph

```
• linkGrp "element_in_registrer"
  link "#person448 schnitler-tei.xml#Schn1_134717"
  link "#person447 schnitler-tei.xml#Schn1_134716"
  link "#person446 schnitler-tei.xml#Schn1_134715"
  link "#person445 schnitler-tei.xml#Schn1_134714"
  link "#person444 schnitler-tei.xml#Schn1_134713"
  link "#person443 schnitler-tei.xml#Schn1_134712"
  link "#person442 schnitler-tei.xml#Schn1_134711"
  link "#person441 schnitler-tei.xml#Schn1_134710"
  link "#person440 schnitler-tei.xml#Schn1_134709"
  link "#person439 schnitler-tei.xml#Schn1_134708"

5702 <head>Lenker fra personregisteret til
5702 registerinnførsler</head>
5703 <linkGrp type="element_in_registrer">
5704 <link targets="#person448 schnitler-tei.xml#Schn1_134717"/>
5705 <link targets="#person447 schnitler-tei.xml#Schn1_134716"/>
5706 <link targets="#person446 schnitler-tei.xml#Schn1_134715"/>
5707 <link targets="#person445 schnitler-tei.xml#Schn1_134714"/>
5708 <link targets="#person444 schnitler-tei.xml#Schn1_134713"/>
5709 <link targets="#person443 schnitler-tei.xml#Schn1_134712"/>
5710 <link targets="#person442 schnitler-tei.xml#Schn1_134711"/>
5711 <link targets="#person441 schnitler-tei.xml#Schn1_134710"/>
5712 <link targets="#person440 schnitler-tei.xml#Schn1_134709"/>
5713 <link targets="#person439 schnitler-tei.xml#Schn1_134708"/>
```

Someone is the odd one out.

Of course, I see the links, but...



# The graph is here...?

The screenshot shows the Eclipse IDE interface. The title bar indicates the file path: `GeoModelText/src/no/uo/edd/model/geo/GeoModelElement.java`. The Project Explorer on the left shows a tree view of the project files, with `GeoModelElement` selected. The main editor window displays the source code for `GeoModelElement`. The code includes a constructor and a `getMyPersonElement` method.

```
/**
 * Create a wrapper object.
 *
 * @param inGeoModelRunner
 *         The runner owning this object.
 * @param inSchnitlerElement
 *         The DOM Element to be wrapped.
 */
public GeoModelElement(GeoModelRunner inGeoModelRunner,
    Element inSchnitlerElement) {
    myGeoModelRunner = inGeoModelRunner;
    myDomElement = inSchnitlerElement;
    corefId = getId();
    corefChangedDate = null;
    oldCorefs = new ExtensibleObjectList();
}

/**
 * If I am a persName node, and I have a person element connected to me,
 * that one is returned.
 *
 * @return My person element; if none found, null is returned.
 */
GeoModelPerson getMyPersonElement() {
    return myPersonElement;
}
```

The bottom status bar shows the following information: Writable, Smart Insert, 60 : 27.



# Being an encoder

1. Create a tree model of the text
2. Formalise that model in TEI/XML
3. Reify the model into the editing tool



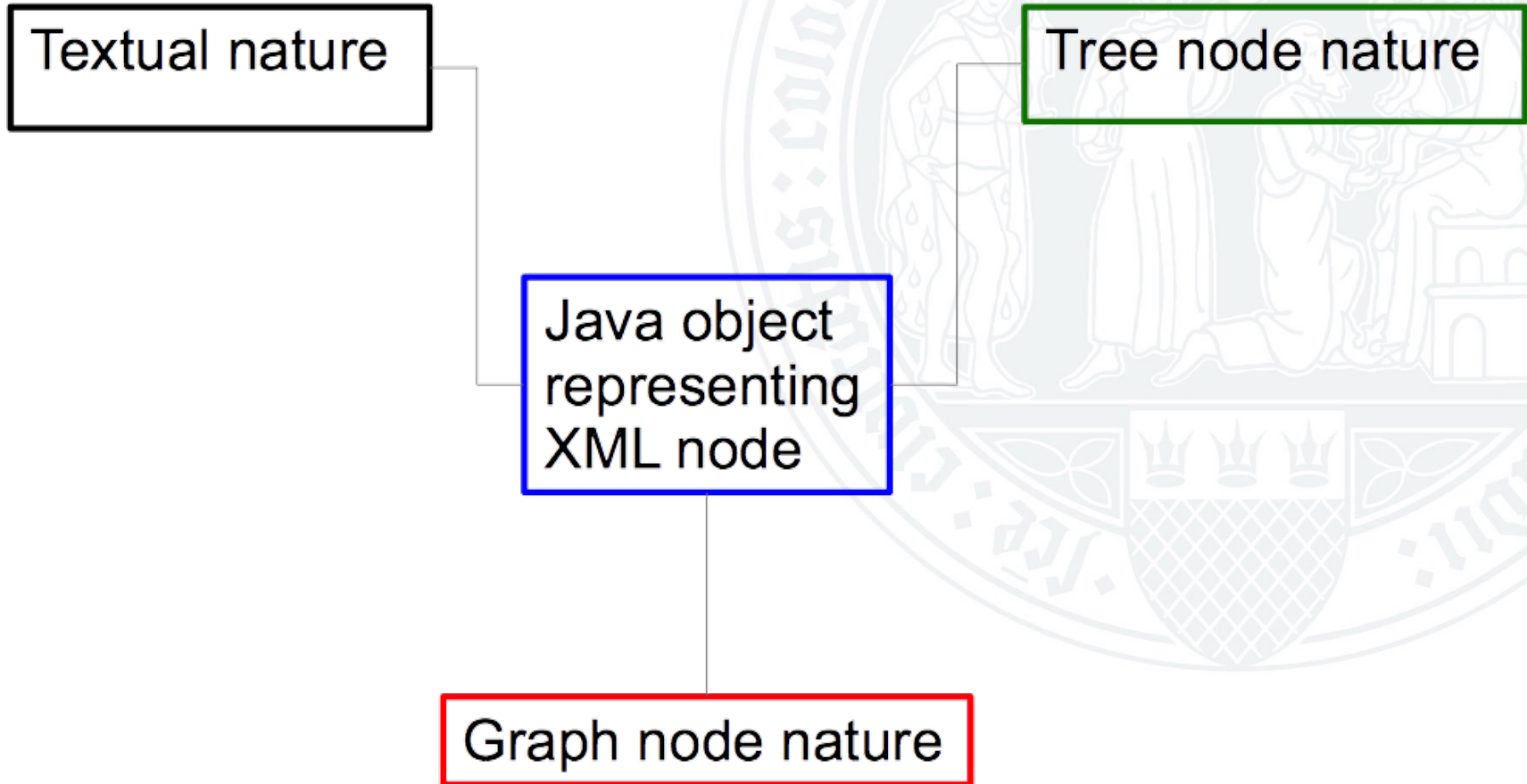
# Being a programmer

- The DOM tree: Document Object Model
- A node in the tree is indeed in the tree
  - has a parent, siblings, children
  - cannot break the tree structure as a DOM object
- But ...a DOM object is also just an object
- Objects encapsulating DOM objects
  - can link to whatever and from whatever
  - can be used as part of graphs or any other structure expressible in the programming language of use
- The triple nature
  - graph object
  - DOM object
  - ...and the text





# The three natures of representation



# The triple view: sameness

- A object in the DOM hierarchy includes a text
- The DOM object is a node in the tree
- The DOM object is encapsulated in a graph object
- *The DOM object is the same.*
- So....: any changes made from any of the three sides will change the same object
- (cf. call by address – all three addressing same object)



# A visualisation problem

- Being a programmer I can “see” the structure
- But how to make it available to the text tool user?
- Why do I see?
  - Seeing through manipulation
  - I see what happens when I change things
  - that way I know what the structure is
- ...but how can we operationalise object manipulation?
- How can a tool user be enabled to see through manipulation?



# Seeing through manipulation

- As programmers we can see through manipulation
  - making the world real by interacting with it (Piaget)
- Tool users
  - response
  - feedback mechanisms

