Models as Forms, Models as Concepts

Øyvind Eide
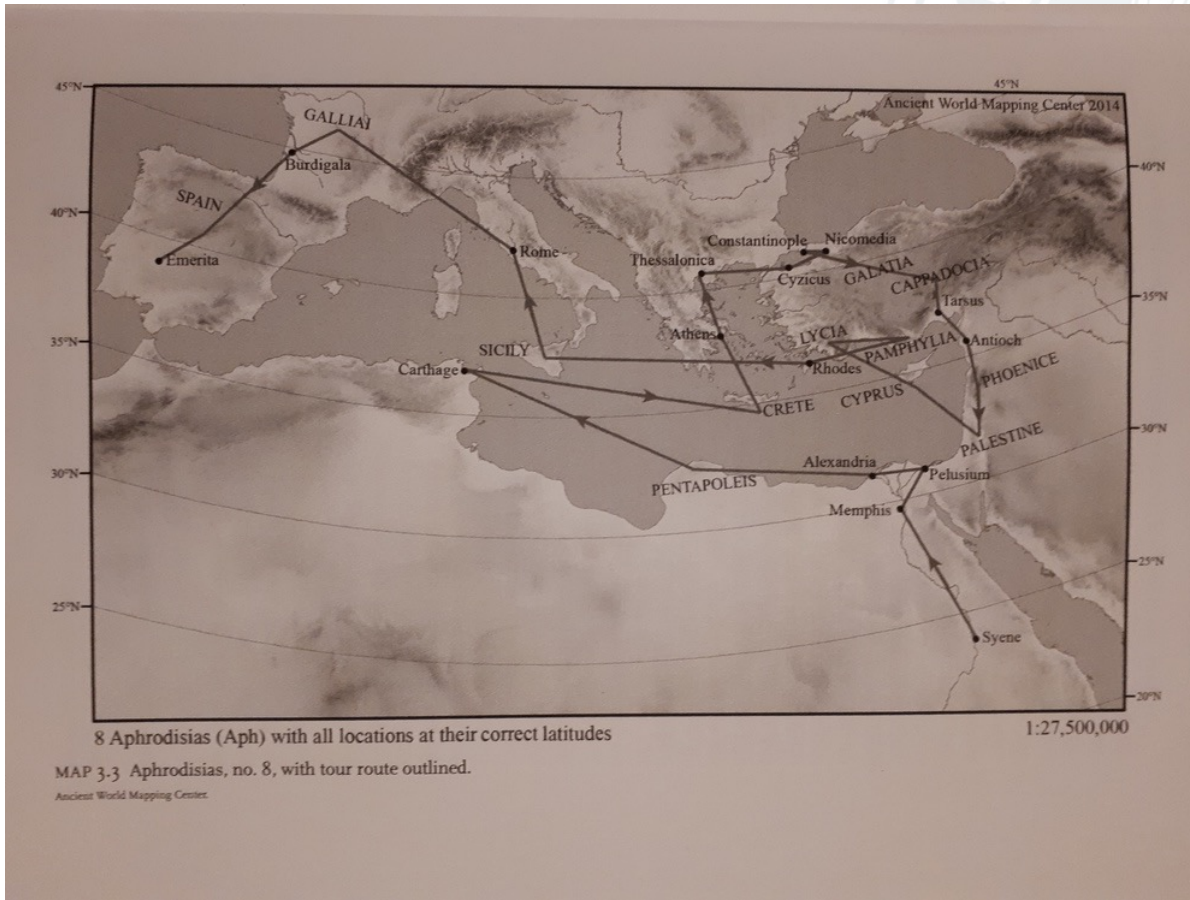
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Prof. Dr. Eide

Maps as models

8 Aphrodisias (Aph) with all locations at their correct latitudes

MAP 3.3 Aphrodisias, no. 8, with tour route outlined.
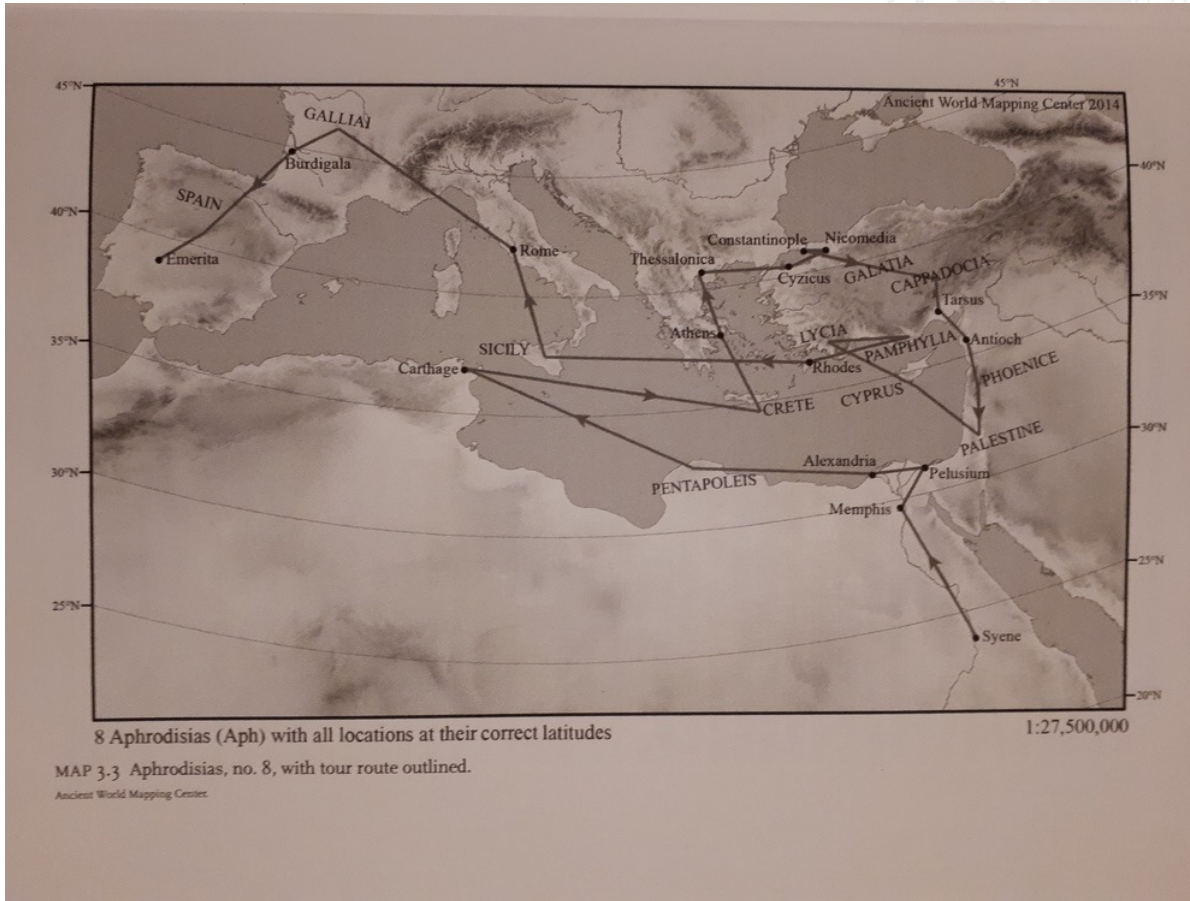
Ancient World Mapping Center

Modelling a listing of place names

Talbert, R. J. A. (2017). *Roman Porable Sundials : The Empire in your Hand.* Oxford, Oxford University Press: 135.

Maps as models

8 Aphrodisias (Aph) with all locations at their correct latitudes

MAP 3.3 Aphrodisias, no. 8, with tour route outlined.

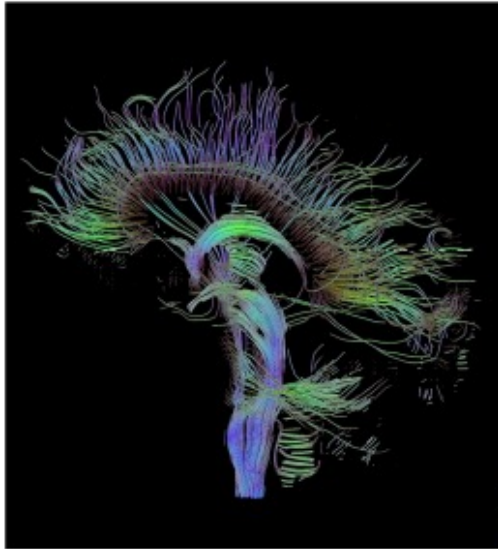Ancient World Mapping Center

Modelling an interpretation of a listing of place names

Talbert, R. J. A. (2017). *Roman Porable Sundials : The Empire in your Hand.* Oxford, Oxford University Press: 135.
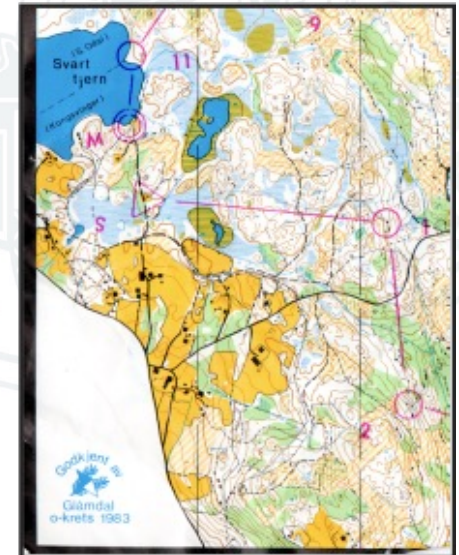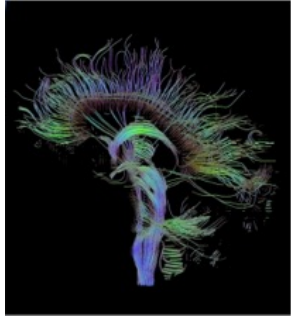
Signal transfer

You can run through the forests; they will be wild and blooming, you will turn right, or left, or straight up and fly. You will never go through before you want to.
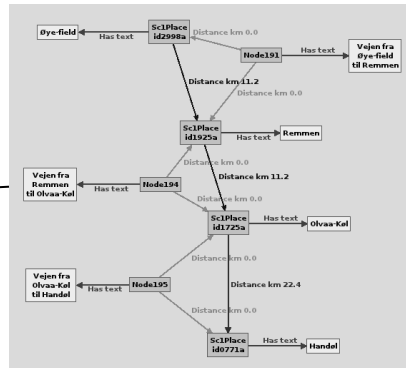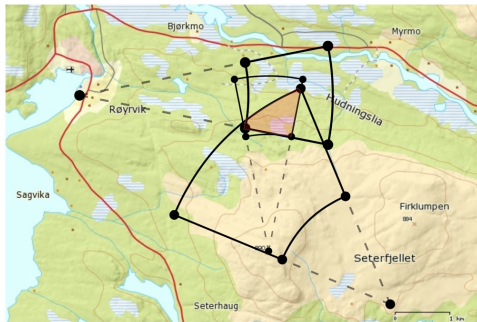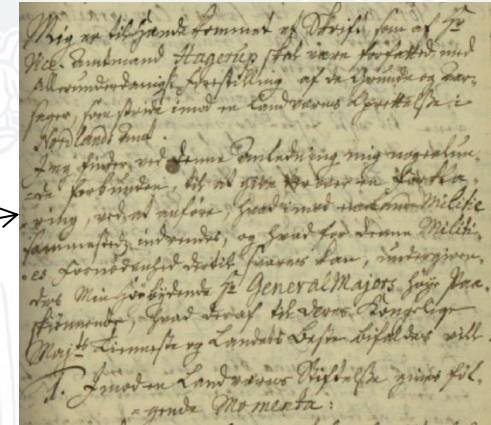
File from the Wikimedia Commons:
http://en.wikipedia.org/wiki/File:DTI-sagittal-fibers.jpg

Signal transfer

Witness statement

Scribe's understanding

<p>heeder
<name type="person">
Anders Henningsen
Miøsødal
</name> Er Fød paa
denne gaard
<name type="place">
Stuedahlen
</name>,...</p>

MAJOR PETER SCHNITLERS
GRENSEEKSAMINASJONSPROTOKOLLER
1742–1745

But...

PEER [...] (listens)

     What's that sound of childish grieving?

     Grief, but halfway to a song. —

     Underfoot there's threadballs weaving — ! (lashes out)

     Give me room, now! Get along!

THREADBALLS (on the ground) We are thoughts;

     you should have thought us; —

Henrik Ibsen: Peer Gynt : A Dramatic Poem, Act 5. Transl. John Northam. Ibsen.net, 2007.
http://ibsen.nb.no/asset/114049/1/114049_1.pdf

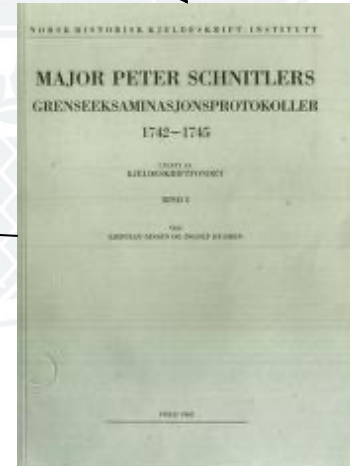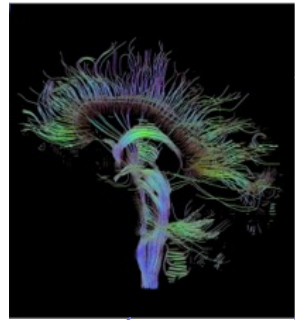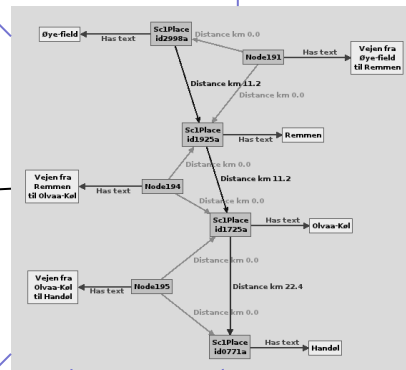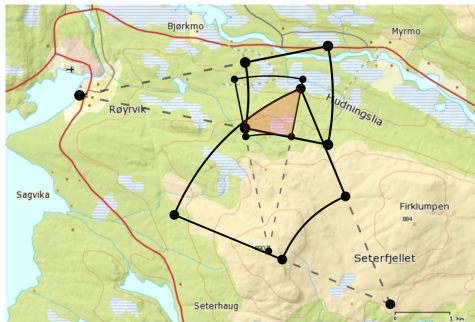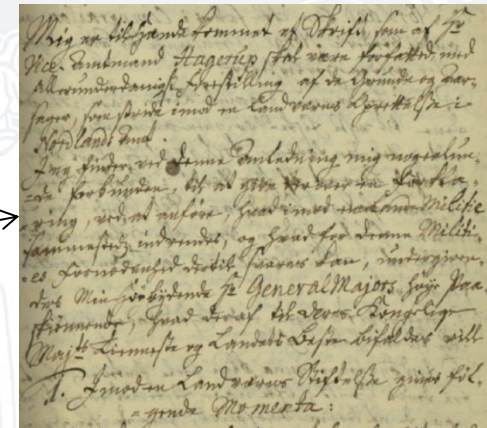# you should have thought us

Witness statement

Scribe's understanding

```
<p>heeder
<name type="person">
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Miøsødal
</name> Er Fød paa
denne gaard
<name type="place">
Stuedahlen
</name>,...</p>
```

Something is missing

- The model is a model
  - in a specific context
  - for somebody
  - based on interpretation

A large (infinte?) number of models were never created.

You should

Witness

Scribe

Witness statement → Scribe's understanding →
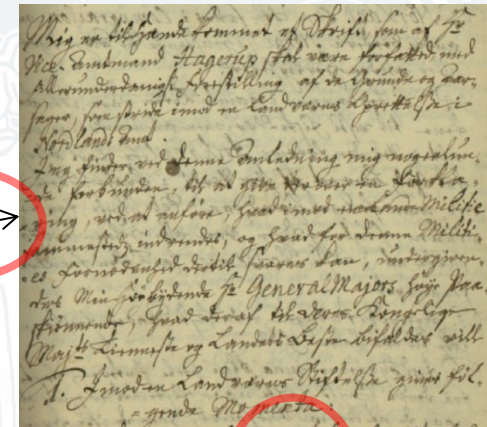
Eide

Publisher

```
<p>heeder
<name type="person">
Anders Henningsen
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</name> Er Fød paa
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```
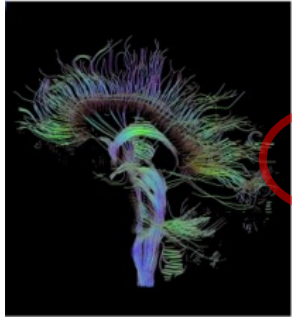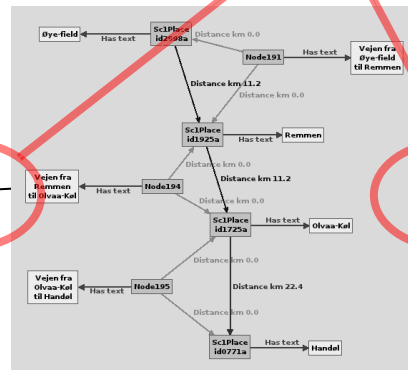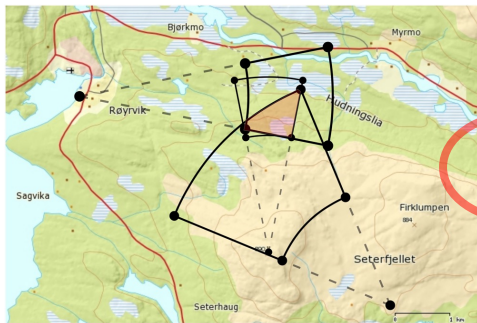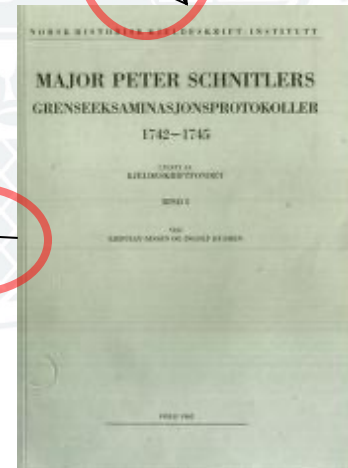
Models and their targets

- Complex relationship
- From representational view
  - e.g. isomorphism
- To pragmatic modelling
  - **somebody** creates a model of something with some **purpose**
- Models mediating
  - between theory and physical world
  - 'autonomous agents'

Modelling in Digital Humanities

- Practice of modelling in DH
  - mainly theorised around understandings of modelling in the technosciences and computer science in particular
  - (Flanders and Jannidis 2015)
  - ➢ Data modelling

- Recently model-making theorised within a semiotic framework
  - (Knuuttila 2010; Kralemann and Lattmann 2013; Ciula and Marras 2016)

Modelling as a process of signification
(semiotic process – meaning making)

Model

Theoretical aspects
model for

Empirical aspects
model of

Mediation

Abstraction

Abstract

Concrete

modelling goal

Targets

model source

ANSI 1975

Three perspectives on data modelling
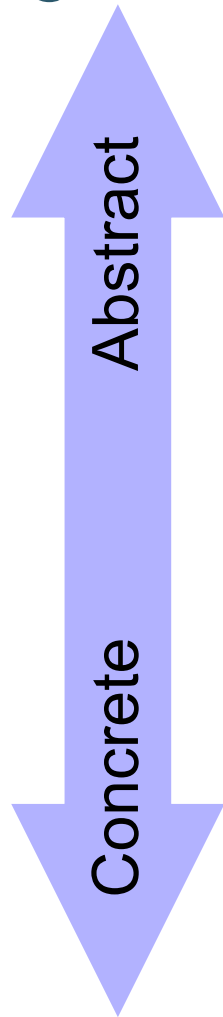
Abstract ↕ Concrete

Model

Conceptual schema

types of facts or propositions that can be expressed using the model

↕ *Independence*

Logical schema

tables, columns, classes, XML tags, …

↕ *Independence*

Physical schema

partitions, CPUs, tablespaces, …

Abstract and concrete

"The abstract graph"
(a problem of representation)
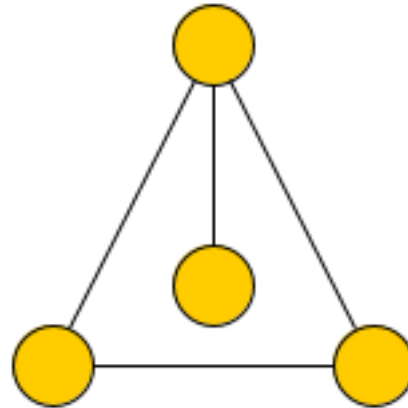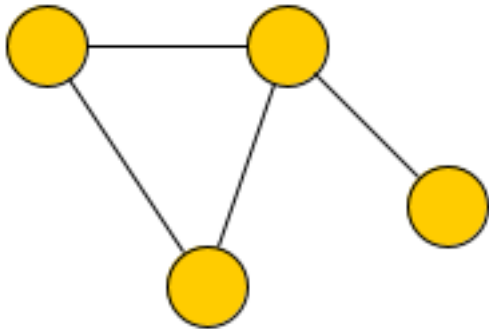
```
0  1  0  1
1  0  1  1
0  1  0  0
1  1  0  0
```

Abstract

Concrete

The concrete need for the abstract

- Hamlet
- What connects things?
  - text
  - performance
  - film
  - comics
  - ...

What is a model?

Dance

Video

Figures

Mathematical propositions

Virtual reality

Words
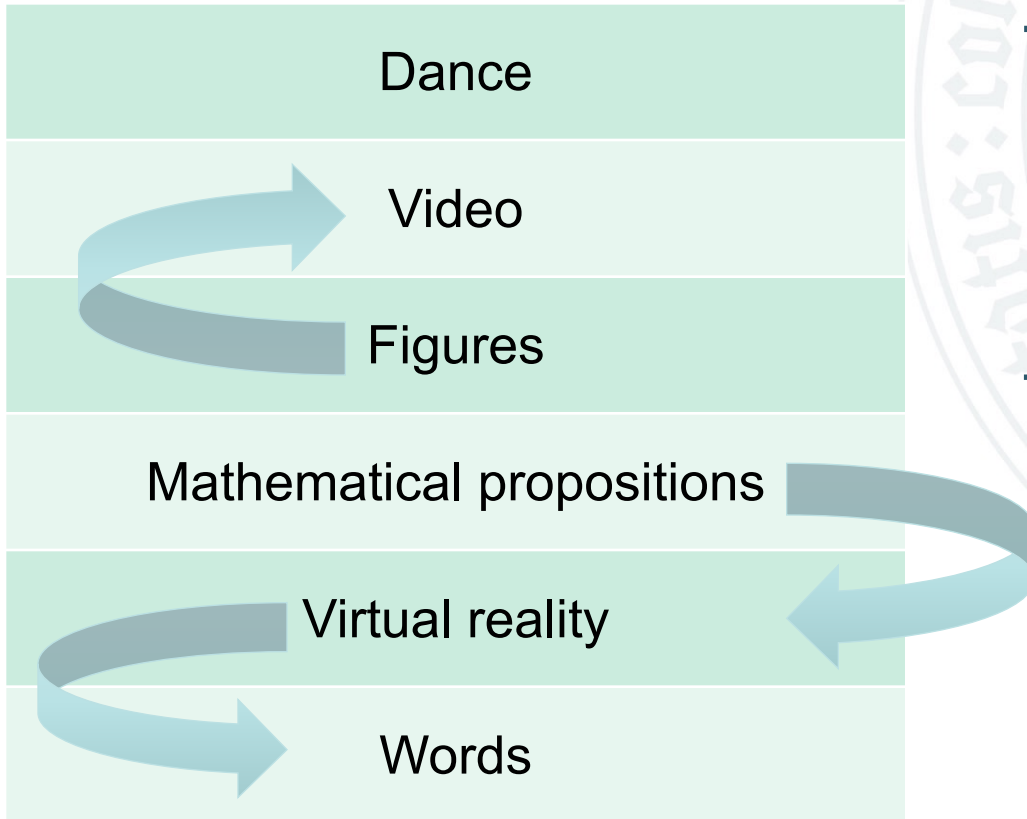
There is no general hierarchy

no "more" or "better" type of model at the top

The may still be relationships

a model based on another

abstraction/operationalisation of

E28 Conceptual Object

This class comprises non-material products of our minds and other human produced data that have become objects of a discourse about their identity, circumstances of creation or historical implication. The production of such information may have been supported by the use of technical devices such as cameras or computers.
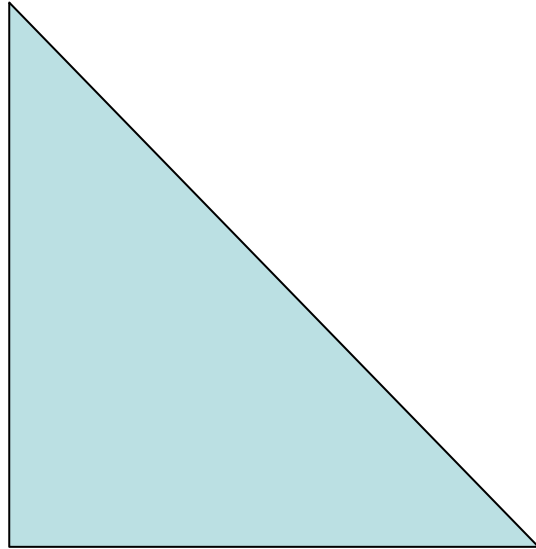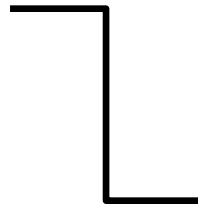
Characteristically, instances of this class are created, invented or thought by someone, and then may be documented or communicated between persons. Instances of E28 Conceptual Object have the ability to exist on more than one particular carrier at the same time, such as paper, electronic signals, marks, audio media, paintings, photos, human memories, etc.

They cannot be destroyed. They exist as long as they can be found on at least one carrier or in at least one human memory. Their existence ends when the last carrier and the last memory are lost. *(CIDOC CRM 6.2.3: 2018)*

Shared conceptualisations

- Meaning can only be negotiated in the human mind

- Must link conceptual objects to shared objects
  - For human to human communication, but also
  - For a meaningful semantic web

- Based on agreed upon meaning between humans
  - With formal ontologies this enables meaningful automatic reasoning

Knowledge

Model

Theoretical model
model for

comparison
calibration
verification

Empirical model
model of
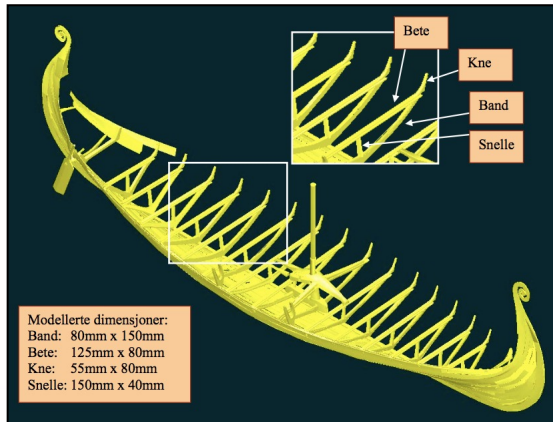
Generating knowledge

Bete
Kne
Band
Snelle

Modellerte dimensjoner:
Band: 80mm x 150mm
Bete: 125mm x 80mm
Kne: 55mm x 80mm
Snelle: 150mm x 40mm

comparison
evaluation

created object

modelled object

Thanks to Oliver Nakoinz for inspiration

The creative tension between concepts and implementation happens also *within* the modelling process

Model

doing

Programming

3D modelling

Concepts → Implementation

Database setup

Data entry

learning

The creative tension between concepts and implementation happens also *within* the modelling process
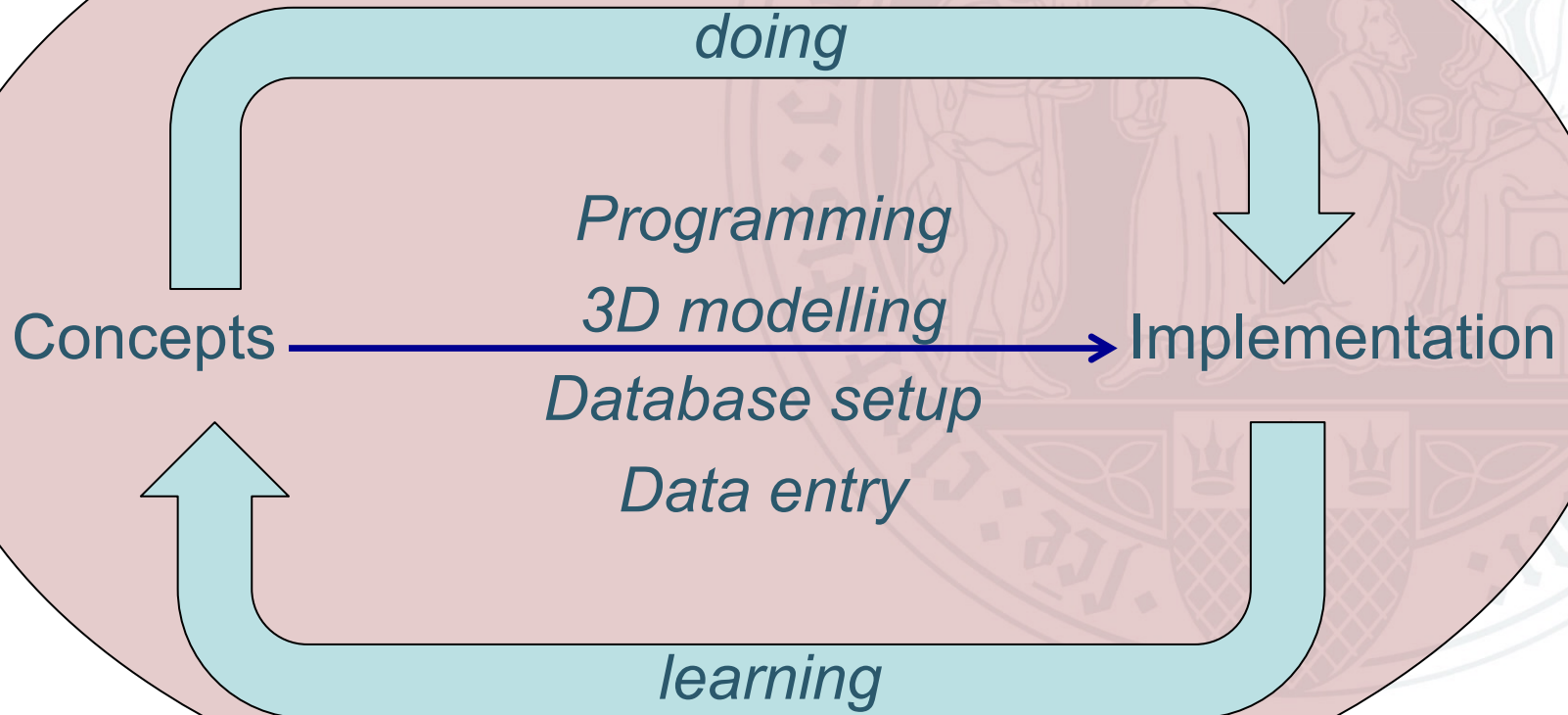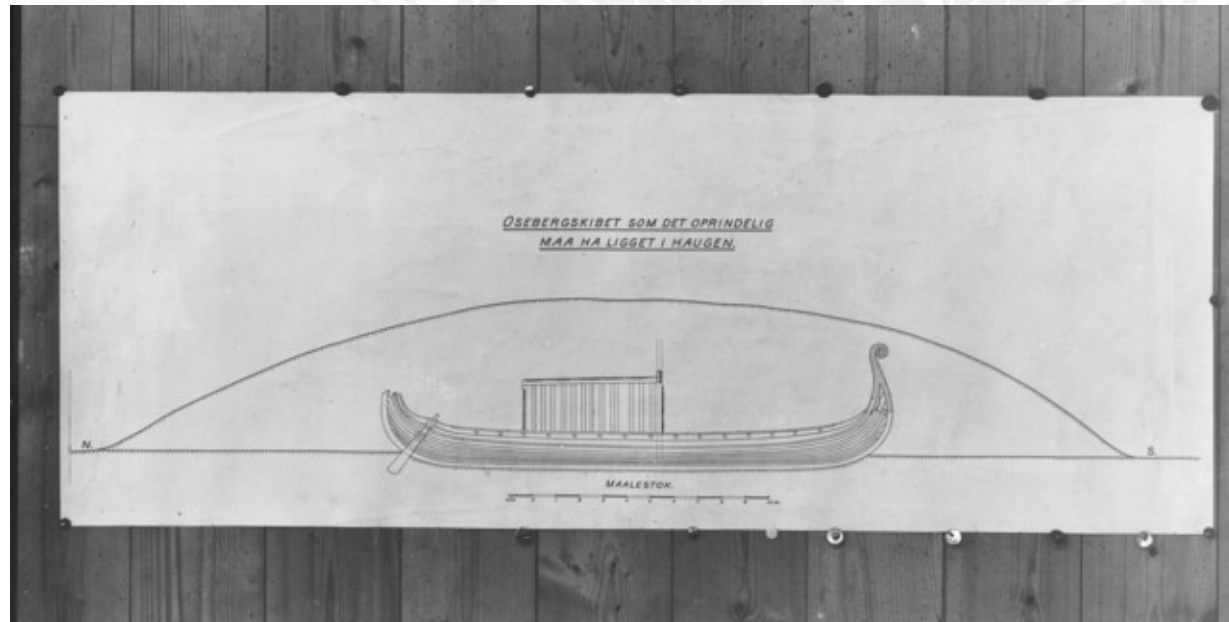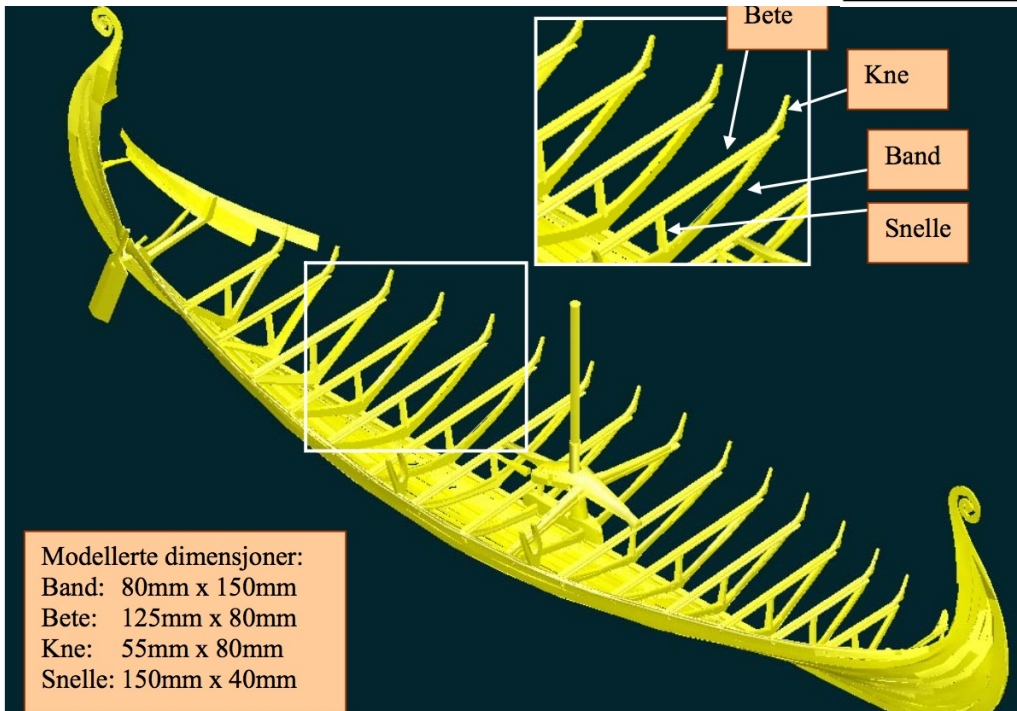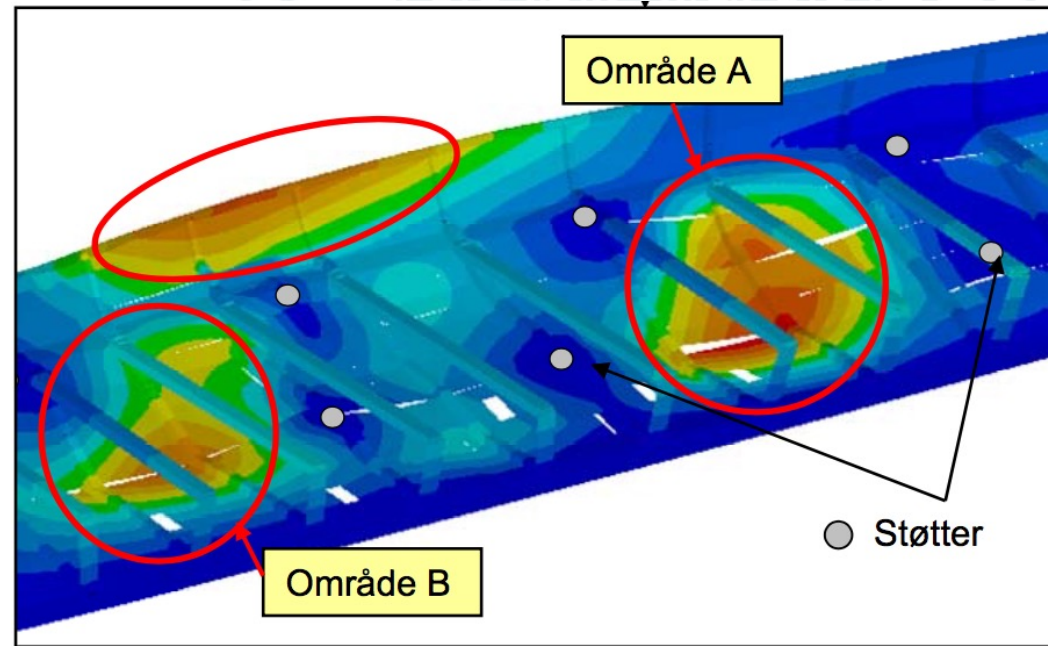
Oseberg

Oseberg

Område A

Område B

Støtter

Bete

Kne

Band

Snelle

Modellerte dimensjoner:
Band: 80mm x 150mm
Bete: 125mm x 80mm
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Snelle: 150mm x 40mm

$$h(x,y,z) = |I_0|^2 + 2|I_1|^2 + |I_2|^2$$

$$I_0(x,y,z) = \int_0^\alpha B_0(\theta,x,y,z)\left(t_s^{(1)}t_s^{(2)} + t_p^{(1)}t_p^{(2)}\frac{1}{n_s}\sqrt{n_s^2 - n_i^2\sin^2\theta}\right)d\theta$$

$$I_1(x,y,z) = \int_0^\alpha B_1(\theta,x,y,z)\left(t_p^{(1)}t_p^{(2)}\frac{n_i}{n_s}\sin\theta\right)d\theta$$

$$I_2(x,y,z) = \int_0^\alpha B_2(\theta,x,y,z)\left(t_s^{(1)}t_s^{(2)} + t_p^{(1)}t_p^{(2)}\frac{1}{n_s}\sqrt{n_s^2 - n_i^2\sin^2\theta}\right)d\theta$$

$$B_m(\theta,x,y,z) = \sqrt{\cos\theta}\sin\theta J_m(k\sqrt{x^2+y^2}n_i\sin\theta)e^{jW(\theta)}$$

$$W(\theta) = k\left\{t_s\sqrt{n_s^2 - n_i^2\sin^2\theta} + t_i\sqrt{n_i^2 - n_i^2\sin^2\theta} - t_i^*\sqrt{n_i^{*2} - n_i^2\sin^2\theta} + \right.$$
$$\left. + t_g\sqrt{n_g^2 - n_i^2\sin^2\theta} - t_g^*\sqrt{n_g^{*2} - n_i^2\sin^2\theta}\right\}$$
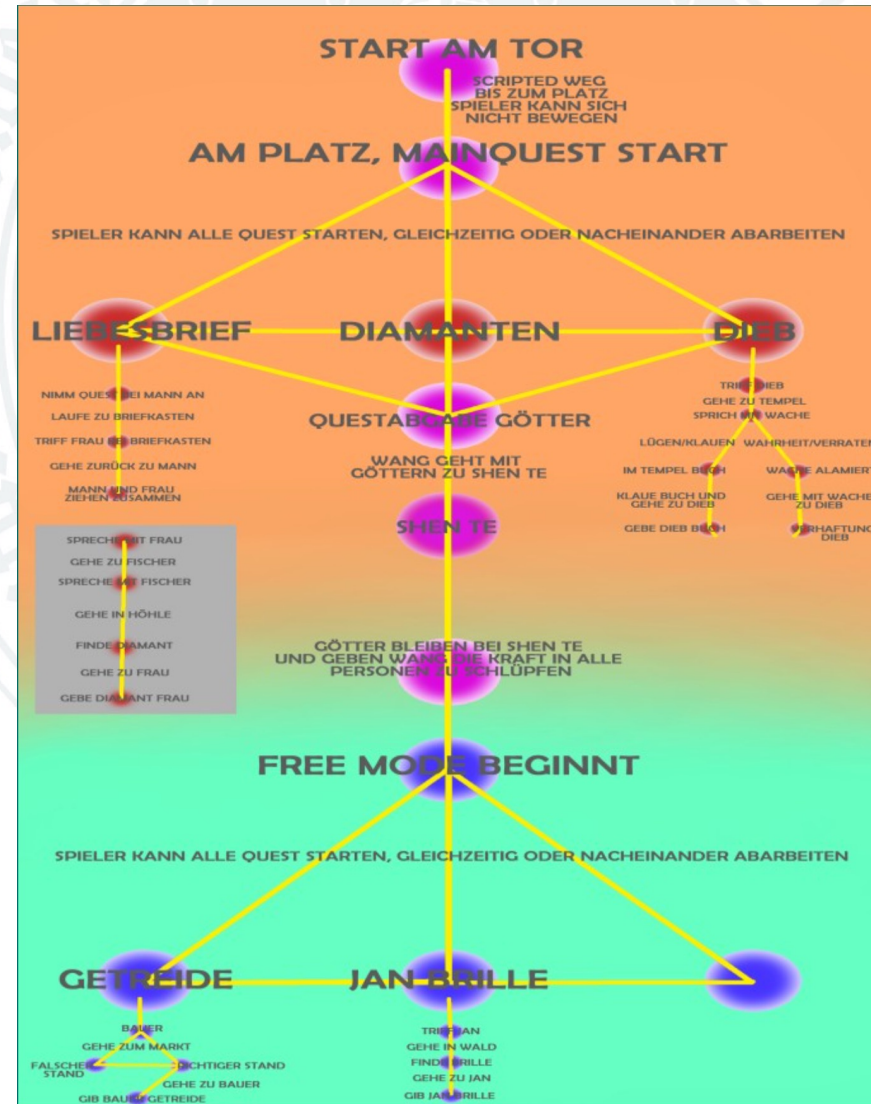
This is also a learning strategy

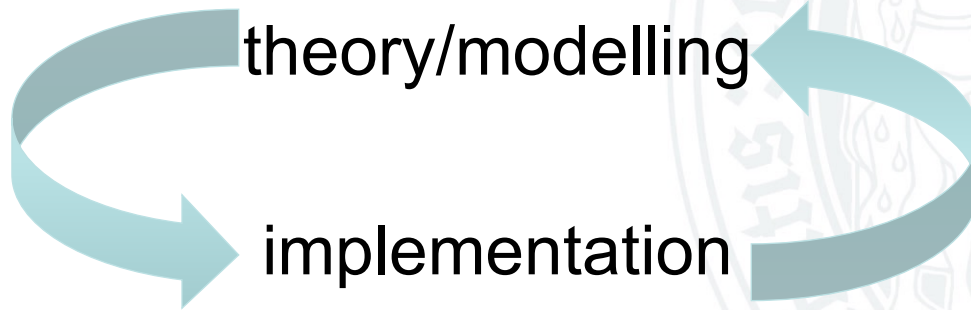We teach modelling as part of the teaching of programming

Theater as VR

Made by: Benedikt Mildenberger,
Niclas Schwarzbach, Kai Niebes,

Thomas Schiffer, Jason Steinkühler

Fusing theory with practice

theory/modelling

implementation

= practice based theory
= theory based practice
→ the role of modelling

The Cologne model
(established late 1990s, still going strong)

- Currently 400+ BA and 50+ MA students
- We train humanities candidates who are also developers
  - basis: Java or C++
  - then in projects: C#, javascript, python, prolog, ...
- This means, for instance:
  - students making VR systems do so in the context of media theory
  - tool use is based on knowing tool development
  - not programmer + humanities, as two distinct parties meeting

For us it is about the merging of two sets of competences/practices in one person

Research, practice, and theory

- Research based teaching
  - learning from researchers
- Practice based teaching
  - learning by doing
- The role of theory
  - what theory?
  - "The theory of the humanities" does not exist

Conclusions?   Or questions?

- A model is a way to
  - make the abstract concrete
  - manipulate this concretisation (also during creation)
- Beneficial when the meaning and the tools are understood by the same person
  - works differently in computer scientist – humanist collaboration, but differently
  - still some people needs to understand both
  - understanding for practical tasks (such as programming) is mastering practical work
- Digital + humanities is
  - practice + theory
  - operationalisation + abstraction

Digital humanities ≠ computer science + humanities

Thanks (but no responsibility):

- VW colleagues
  - Arianna Ciula, Cristina Marras, Patrick Sahle
- Students
  - from BA to PhD
- Manfred Thaller
- Other colleagues in Cologne & around the world
- Manfred Thaller
- All those who keep on asking questions
  - don't worry too much about answers
    we can usually find them later