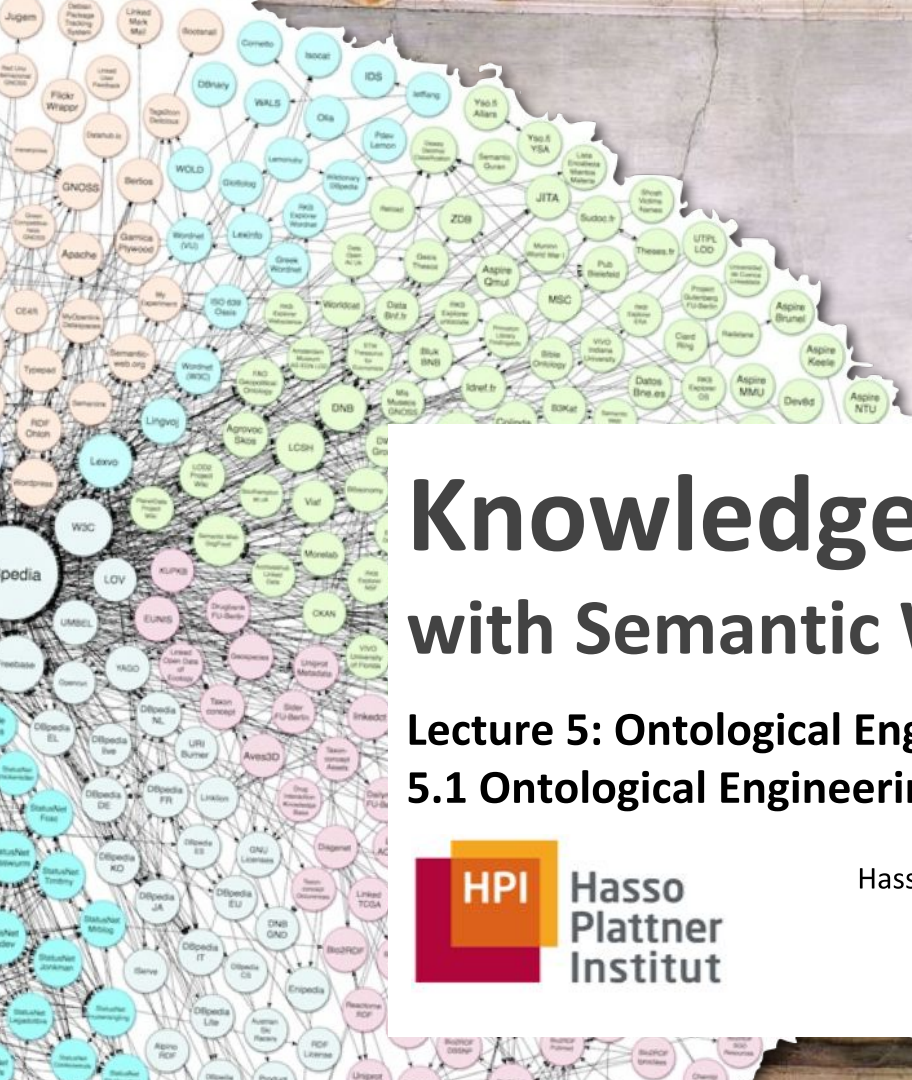




Knowledge Engineering with Semantic Web Technologies

Lecture 5: Ontological Engineering 5.1 Ontological Engineering



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Autumn 2015

Knowledge Management

understanding principles
(what is best, doing things right)

collective application of knowledge in context

understanding patterns
(principles: how to? why?)

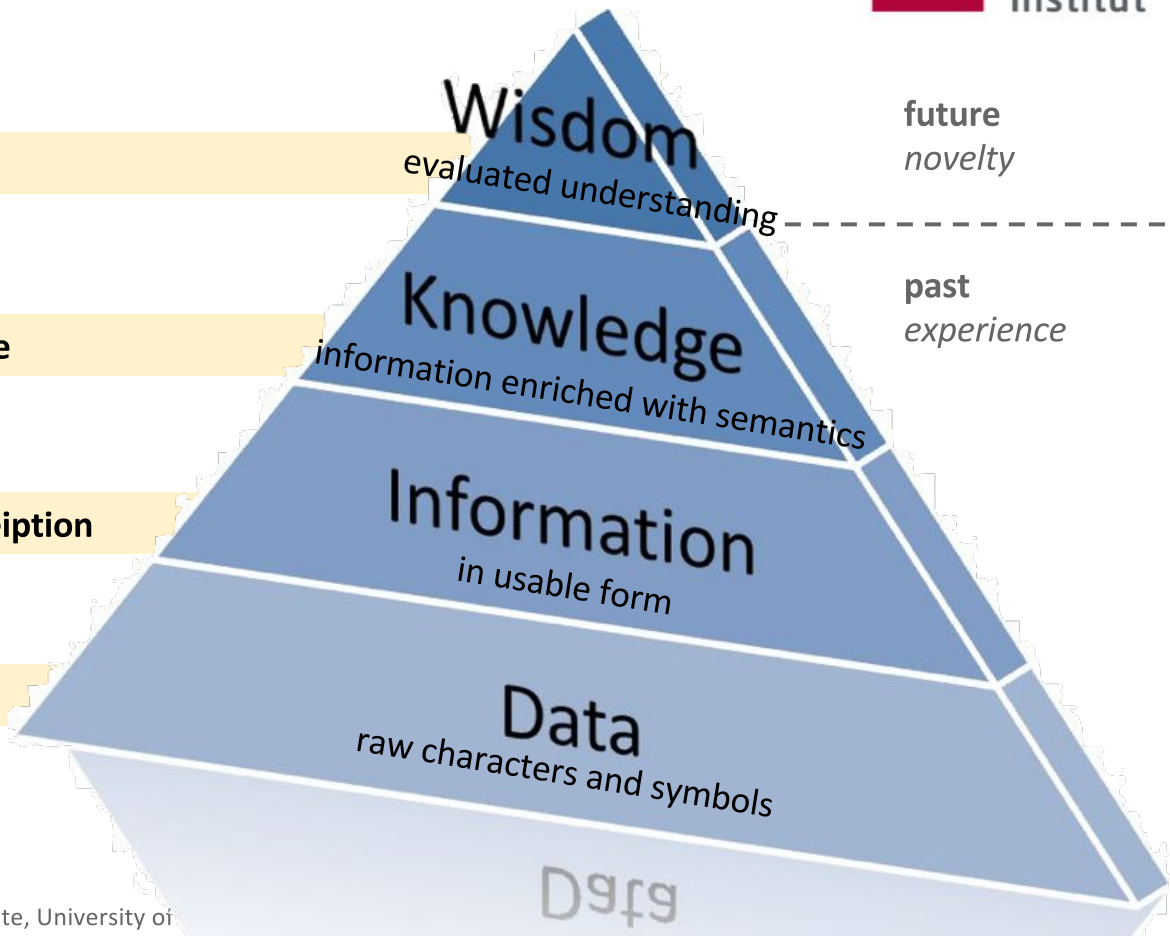
experience, context, value applied to a message

understanding relations
(description: what?)

a message meant to change the receivers perception

discrete objective facts about event

DIKW Pyramid

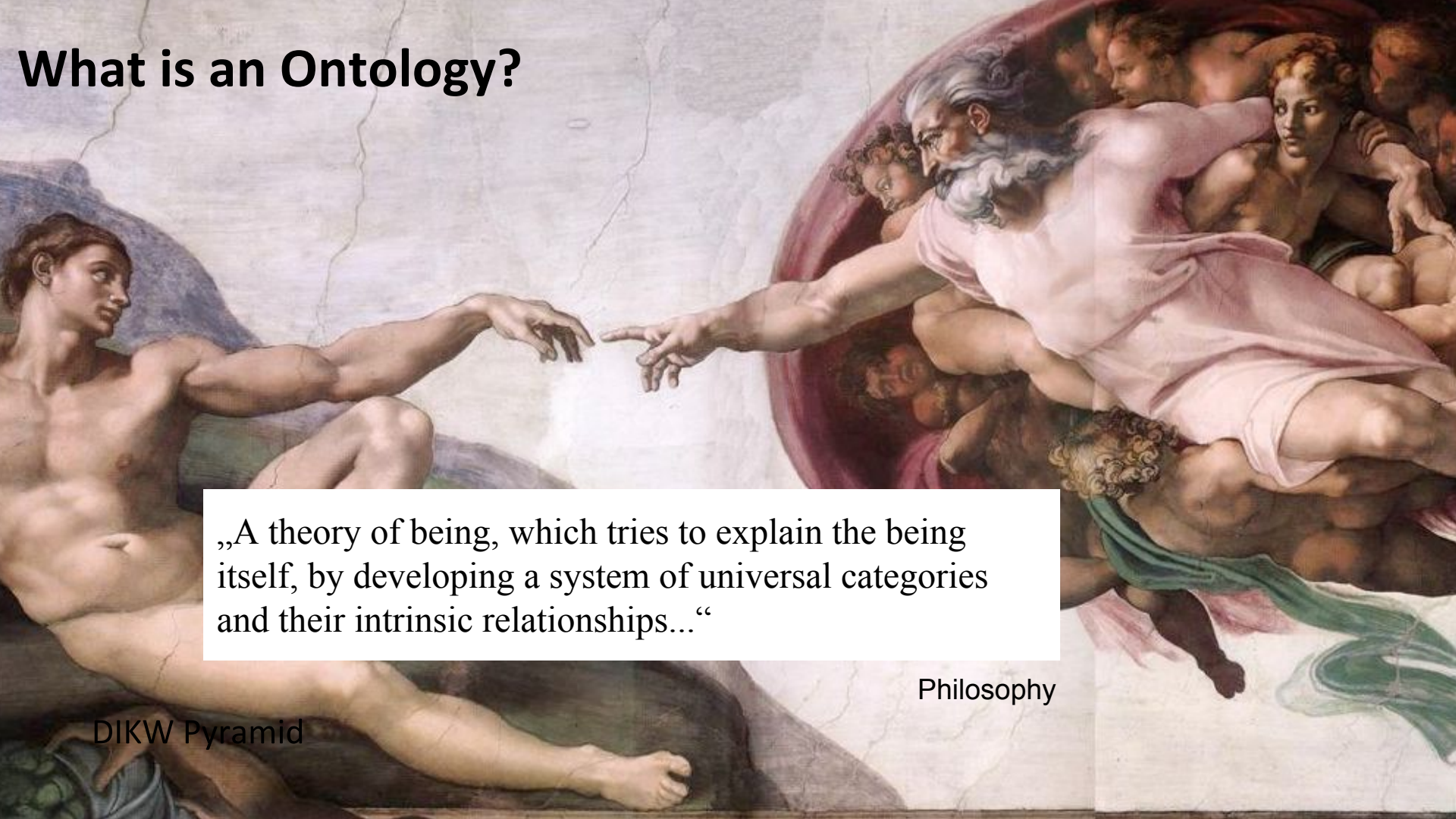


What is an Ontology?

„A theory of being, which tries to explain the being itself, by developing a system of universal categories and their intrinsic relationships...“

Philosophy

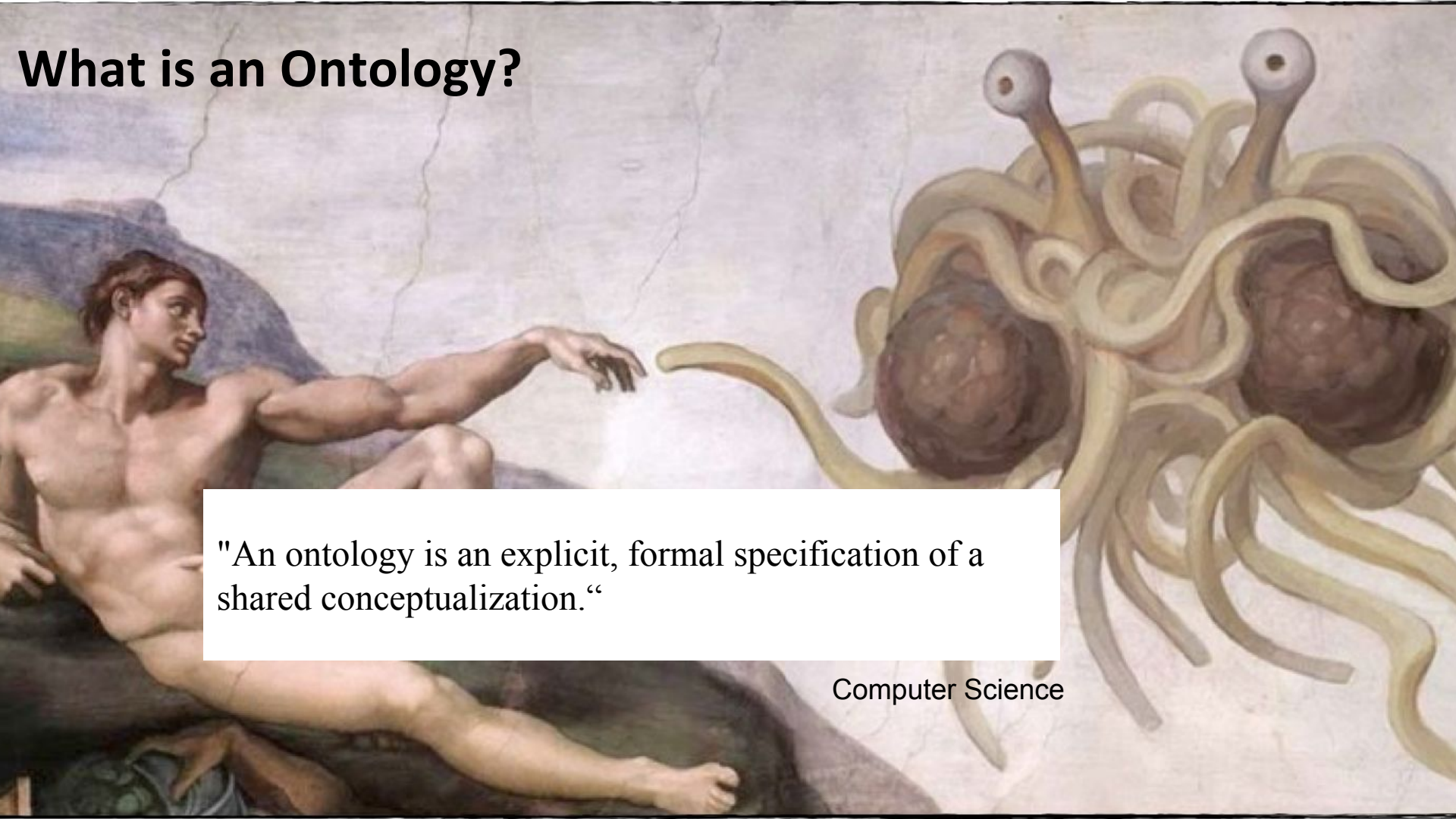
DIKW Pyramid



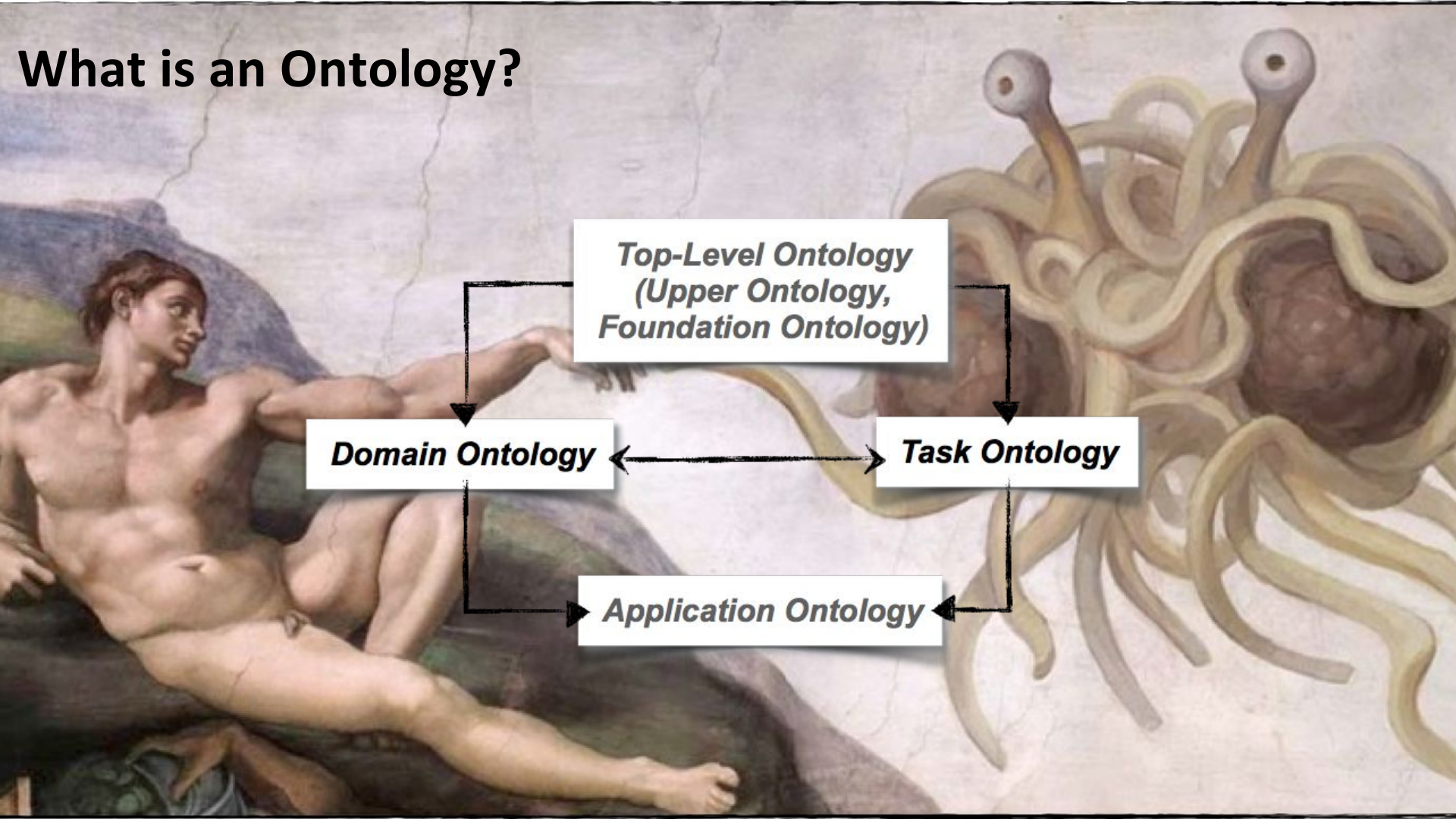
What is an Ontology?

"An ontology is an explicit, formal specification of a shared conceptualization."

Computer Science



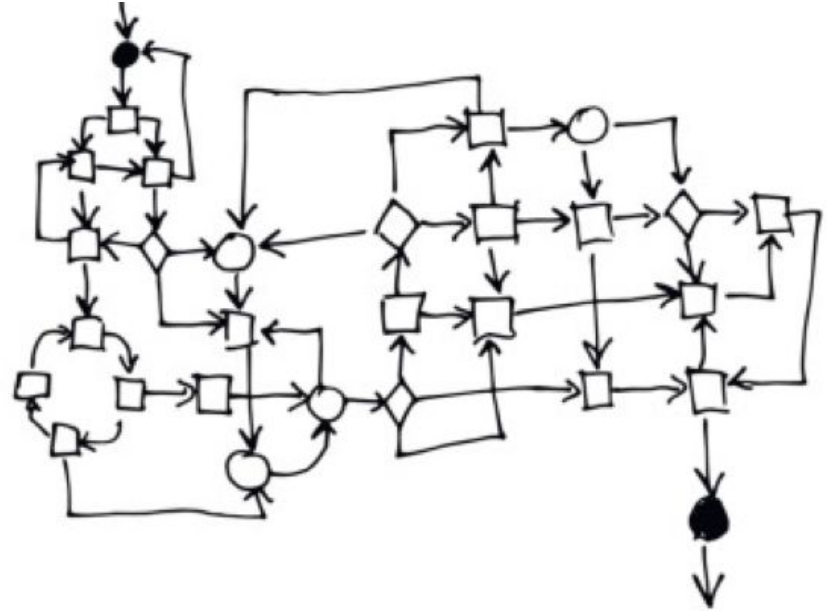
What is an Ontology?



- Ontologies enable **interoperability** among metadata
- Therefore, we need
 - Methods for efficient development of ontologies (Ontology Design)
 - Methods for efficient comparison of ontologies (Ontology Mapping)
 - Methods for efficient combination of ontologies (Ontology Merging)
- There are automated methods to support Ontological Engineering:
 - Learning new ontologies from a given set of information resources (Ontology Learning)
 - Populating existing ontologies with individuals from information resources

The Ontology Development Process

SOMETHING



**Great
Ontology**



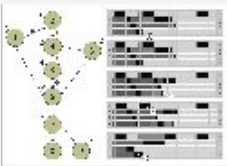
according to

<http://geekandpoke.typepad.com/geekandpoke/2012/01/simply-explained-dp.html>

- *A methodology of Ontology Design describes all activities necessary for the construction of an ontology.*
- Why do we need a formal methodology?
 - development of **consistent** ontologies
 - **efficient** development of complex ontologies
 - **distributed** development of ontologies
- We distinguish (*acc. to Fernandez-Lopez et. al., 1997*)
 - Ontology management activities
 - Ontology development oriented activities
 - Ontology support activities

Ontology Design

Management



scheduling



control



quality assurance

Design Oriented



environment study



feasibility study



specification



conceptualization



formalization



implementation



maintenance



use / re-use

Support



knowledge acquisition



evaluation



integration



documentation



merging

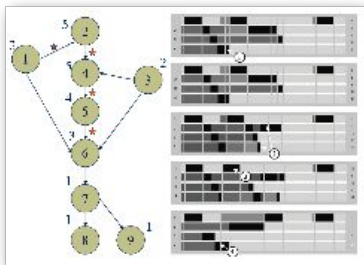


configuration management



alignment

Ontology Management Activities



- **Scheduling**

- Identification of tasks/problems to solve
- Arrangement/planning of tasks/problems to solve
- Identification of required resources (time, memory, etc...)

- **Control**

- Guaranteeing correct execution of tasks / problems to solve

- **Quality Assurance**

- Quality assurance of all produced resources during development (ontologies, software, documentation)

Ontology Development Oriented Activities

1. Pre-Development
2. Development
3. Post-Development



1. Pre-Development Activities

- **Environment Study**

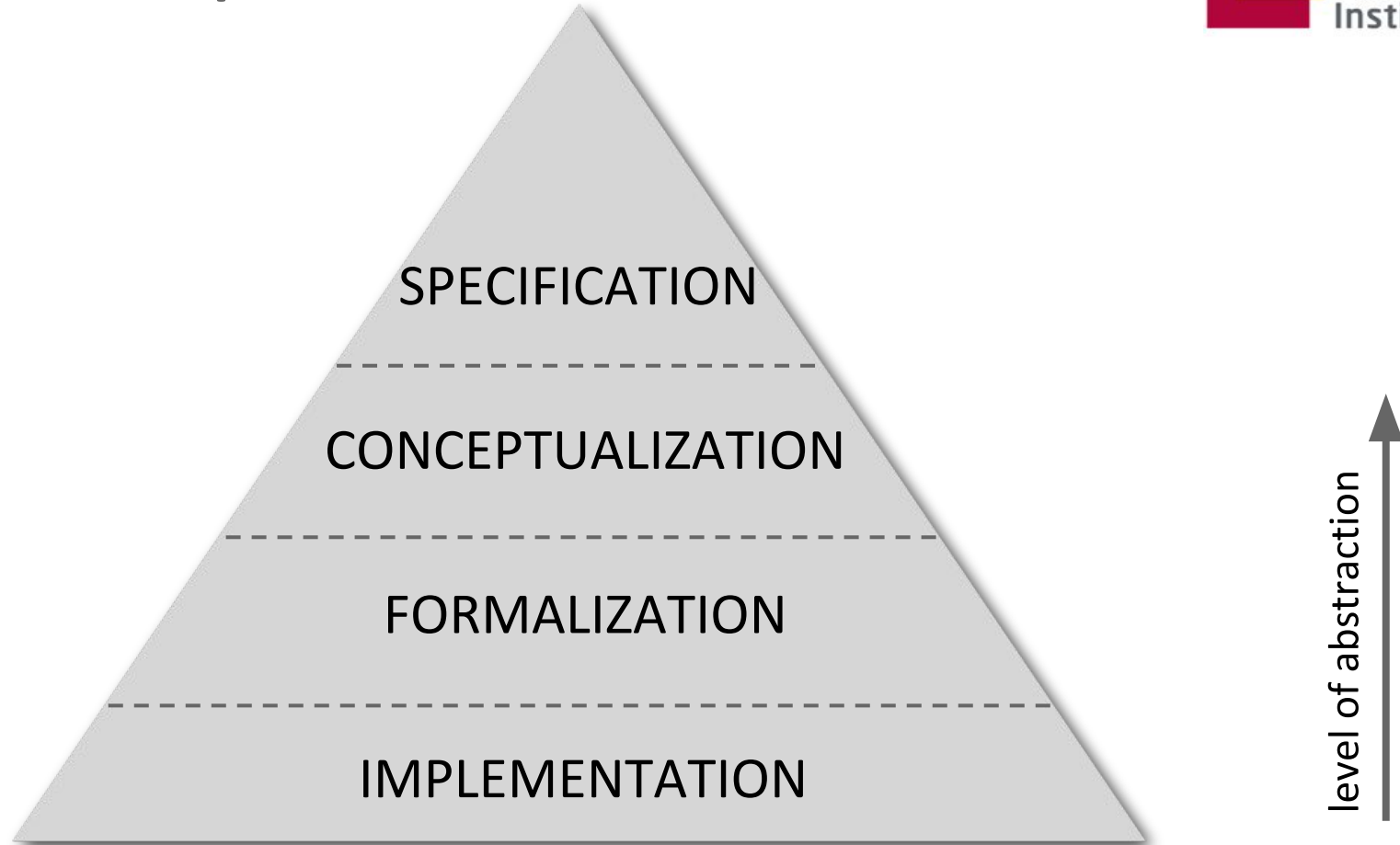
- What is the designated software platform for the ontology?
- Which applications should use the ontology?



- **Feasibility Study**

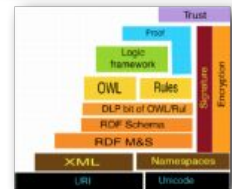
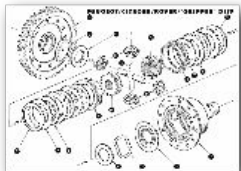
- Can the ontology really be developed?
- Does it make sense to develop the ontology?

Ontology Development Oriented Activities



Ontology Development Oriented Activities

2. Development Activities



- **Specification**
 - Why is the ontology developed, what is the benefit and who are the end-users?
- **Conceptualization**
 - Structuring domain knowledge in a conceptual model
- **Formalization**
 - Formalize conceptual model in (semi-)computable model
- **Implementation**
 - Construction of a computable model in an ontology representation language

3. Post-Development Activities



- **Maintenance**

- Update and adjustment of the ontology (if necessary)



- **Use / Re-Use**

- Usage of the ontology within the designated applications as well as in unplanned applications/ontologies?

Ontology Support Activities



- **Knowledge Acquisition**

- Gather knowledge from experts (Ontology Learning)



- **Evaluation**

- Technical evaluation of the ontology in each step of the development process



- **Integration**

- Reuse of existing ontologies (Ontology Reuse)



- **Merging**

- Construction of a new ontology from already existing ontologies within a specific domain



- **Alignment**

- Design/apply mapping rules for involved ontologies



- **Documentation**

- Each step of the ontology development must be accurately documented

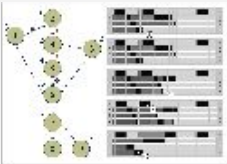


- **Configuration Management**

- Manages all versions of documentation and of the developed ontology

Ontology Design

Management



scheduling



control



quality assurance

Design Oriented



environment study



feasibility study



specification



conceptualization



formalization



implementation



maintenance



use / re-use

Support



knowledge acquisition



evaluation



integration



documentation



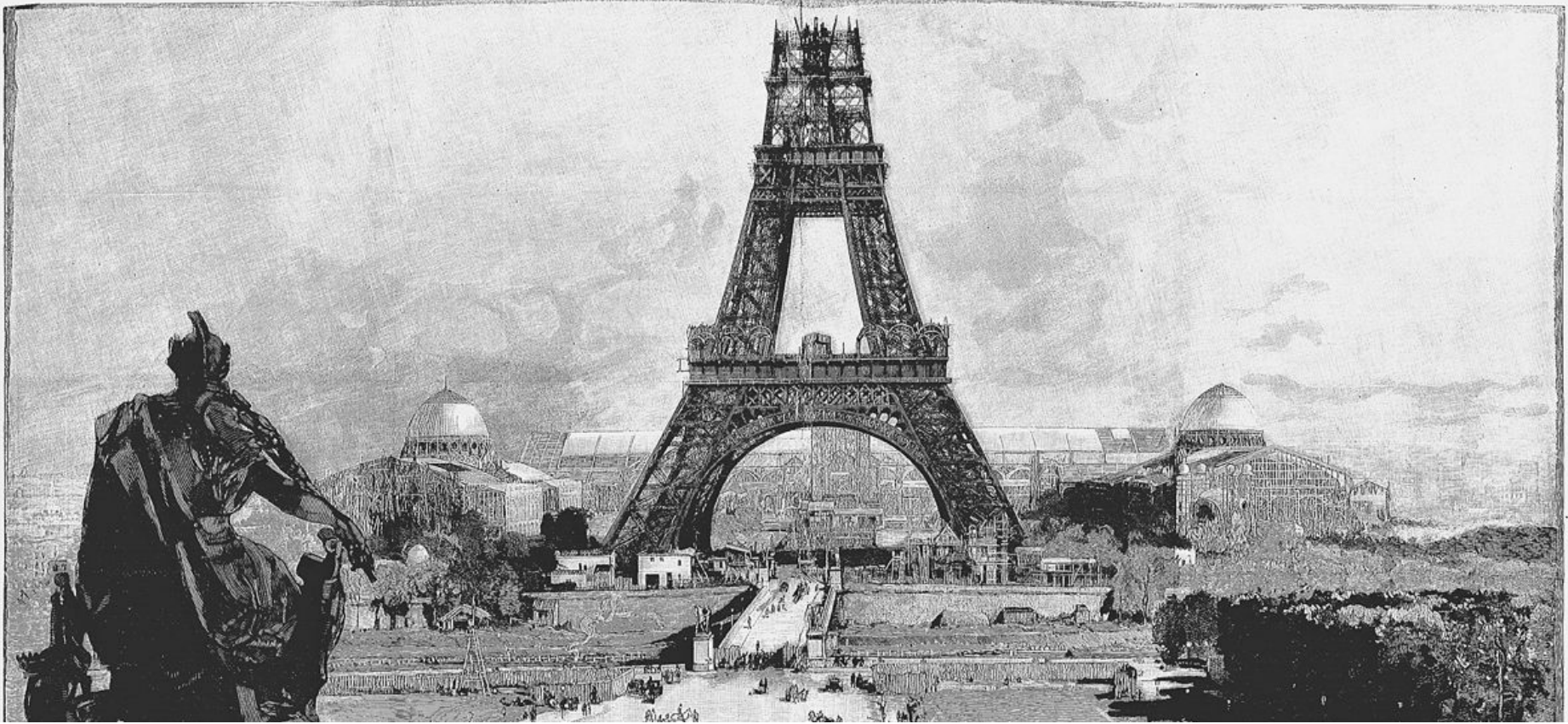
merging



configuration management



alignment



02: Ontology Design Methodologies

OpenHPI - Course Knowledge Engineering with Semantic Web Technologies

Lecture 5: Ontological Engineering