# Ontologies and ontological analysis:
## basic tools and application perspectives
## (in the land registers domain)

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# Applied Ontology:
# an emerging interdisciplinary area

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- This orientation towards ***helping people understanding each other*** distinguishes applied ontology from philosophical ontology, and motivates its ***unavoidable interdisciplinary nature***.

> (applied) ontological analysis: study of **content** (of these assumptions) ***as such*** (independently of their *representation*)

# Applied ontology and conceptual modeling

Conceptual modeling is the activity of **formally** describing some aspects of the **physical** and **social** world around us for the purposes of ***understanding*** and ***communication***

(John Mylopoulos)

3

# The problem: subtle distinctions in meaning

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The e-commerce case:

"Trying to engage with too many partners too fast is one of the main reasons that **so many online market makers have foundered**.

The transactions they had viewed as simple and routine actually involved many
***subtle distinctions in terminology and meaning***"

*Harvard Business Review, October 2001*

# Subtle distinctions in meaning...

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The key problems
- content-based information access *(semantic matching)*
- content-based information integration *(semantic interoperability)*

Semantic Interoperability is considered to be ***the problem of this decade***…[currently] costing productivity, lives and billions of dollars annually…the overall human and financial cost to society from our failure to share and reuse information is ***many times the cost of the systems' operation and maintenance***

# Desirability: Big data


Michael Stonebraker

**MICHAEL STONEBRAKER:** All of the fancy social benefits we expect from big data depends on seamless data integration. Solving the problem of how to improve data integration is going to be key in getting the most benefit from all the data being created. [C]

# When subtle distinctions are important: *fine prints*

***An ontology is like a contract's fine print***, *one of those things which require a very precise technical jargon, which you might ignore in many cases, but which* **can save your business in critical situations**.

**The Economist**

World politics | Business & finance | Economics | Science & technology | Culture | Blogs | Debate | Multimedia | Print edition

**World Trade Centre insurance**

# Bad forms

**After a rancorous trial, relief for many insurers of the twin towers**

May 6th 2004 | From the print edition      *Timekeeper*      Tweet 0

IT WAS a $3.5 billion question: was the crashing of two aeroplanes into New York's twin towers in September 2001 one event or two? One, many insurers are relieved to know. On May 3rd a jury ruled that Swiss Re, the world's second-largest reinsurer, which wrote about a quarter of the coverage for the World Trade Centre, was bound by a form that classed such attacks as a single occurrence. Last week the same jury had reached a similar verdict for several Lloyd's of London syndicates and seven other insurers. The loser was Larry Silverstein, the centre's leaseholder. He had argued that another form was valid, in the hope of claiming around $7 billion for two events. Now he may get only half that.

In most disaster insurance, "occurrence" is carefully defined. Earthquake coverage typically treats all shaking

AP



Silverstein's the loser

Follow *The Economist*

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Follow *The Economist*

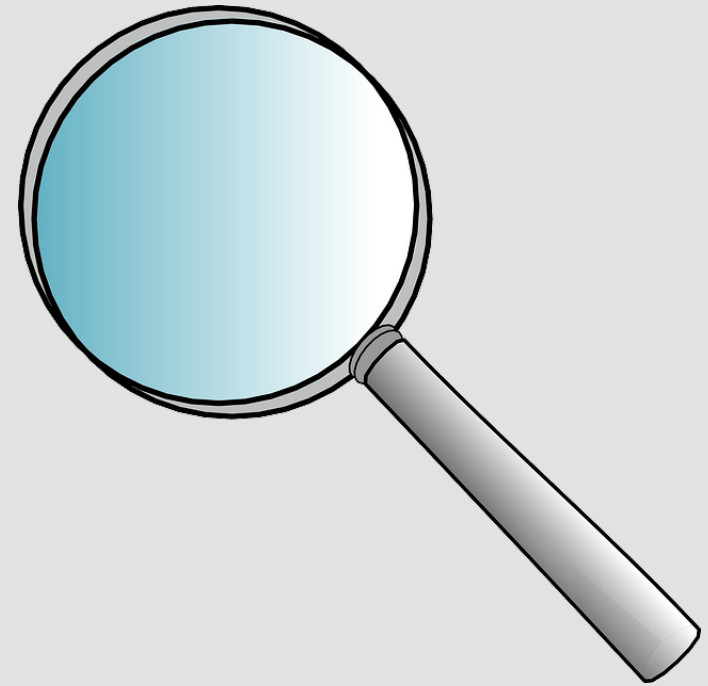**World Trade Centre insurance**

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Timekeeper reading list        E-mail

Reprints & permissions        Print

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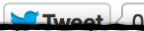
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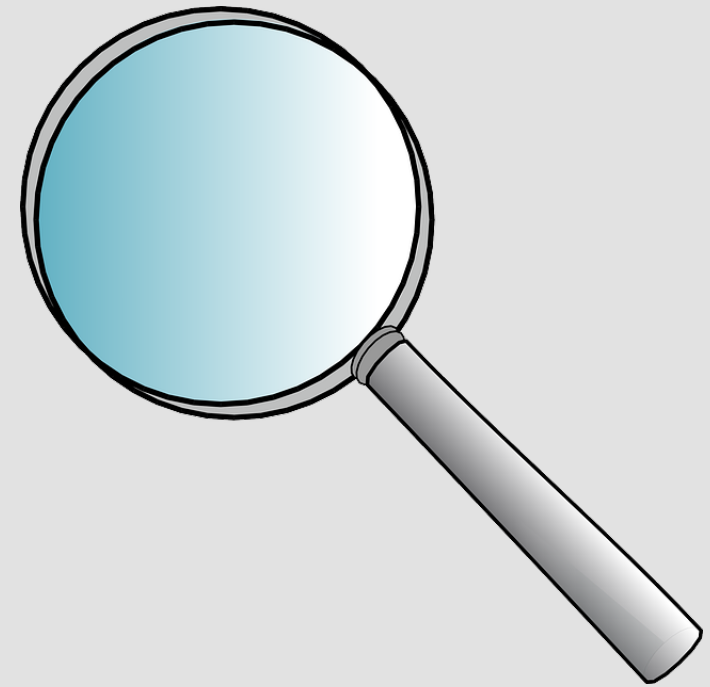
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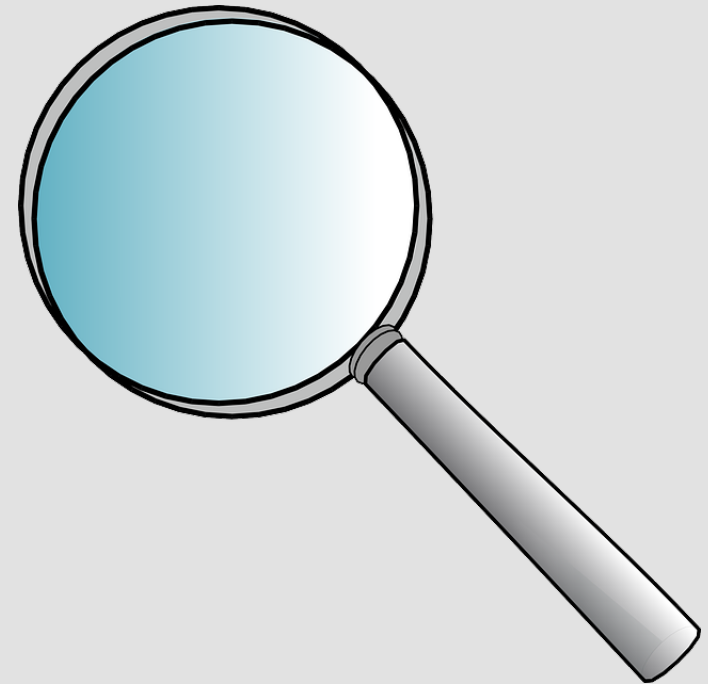
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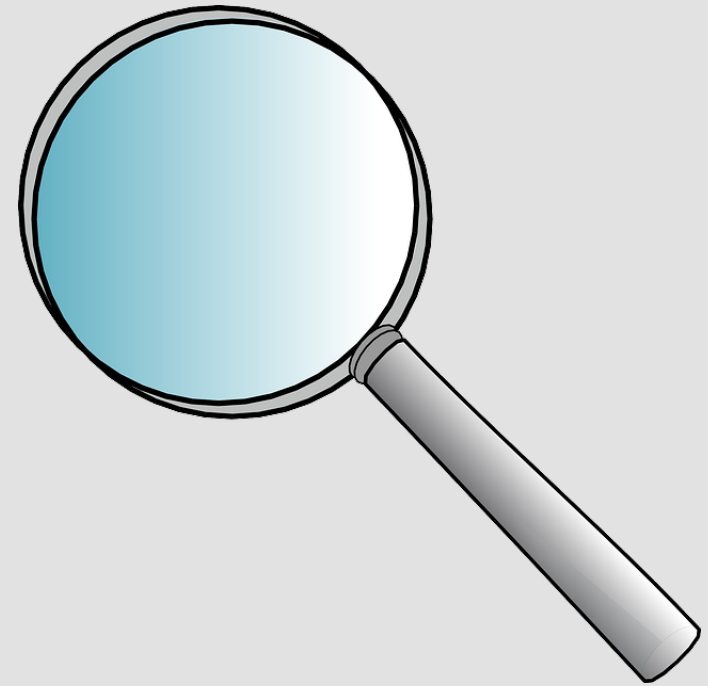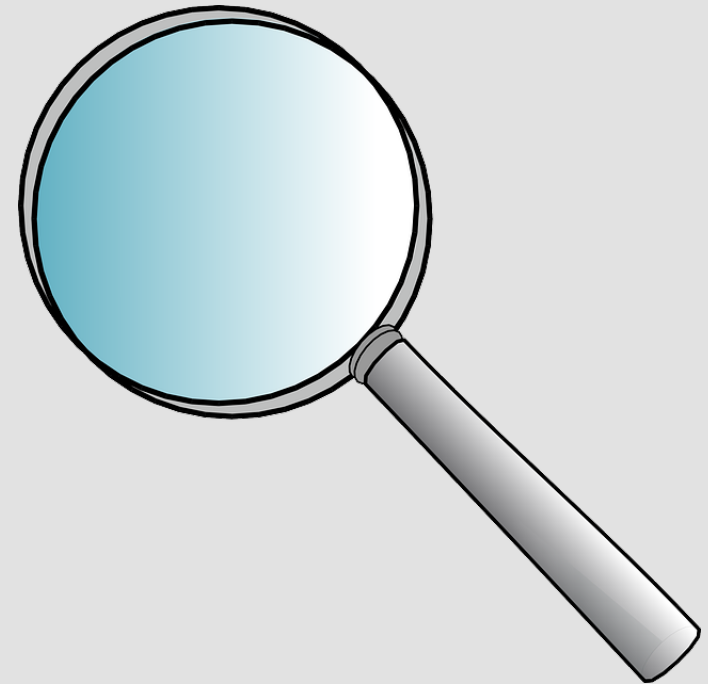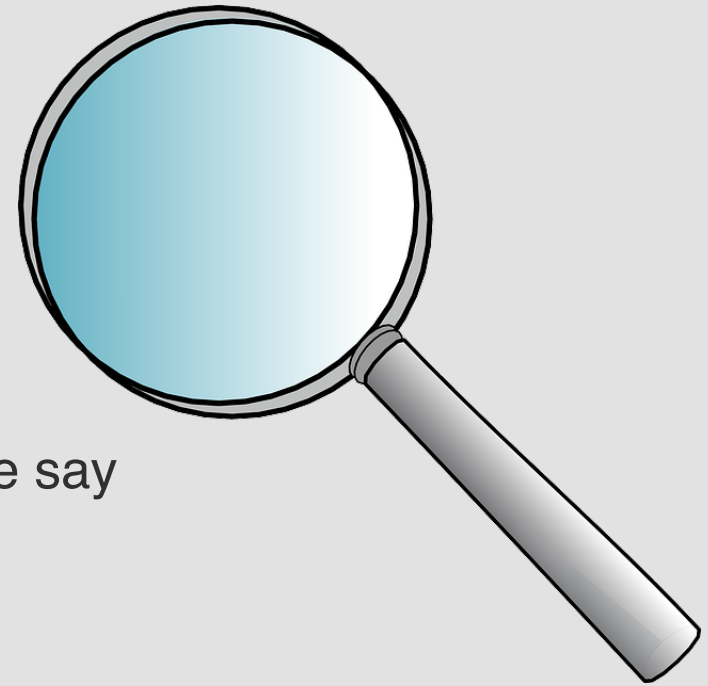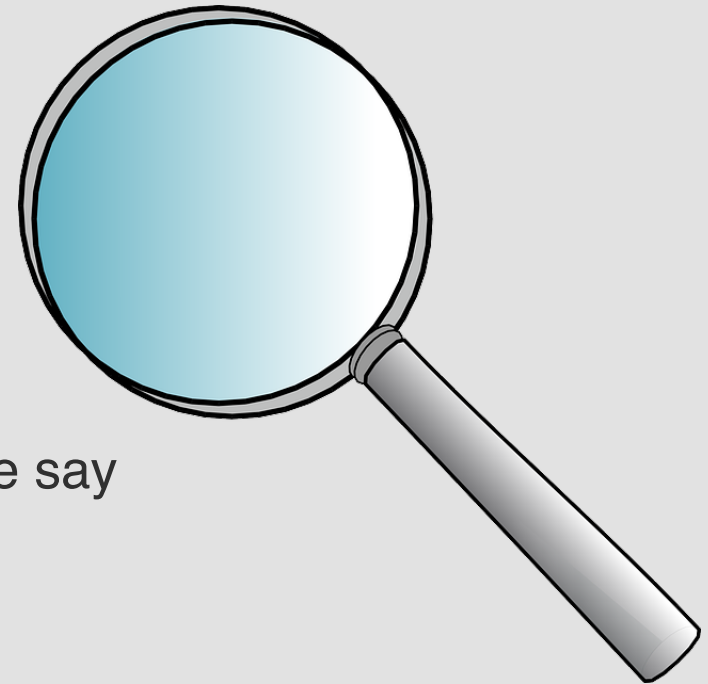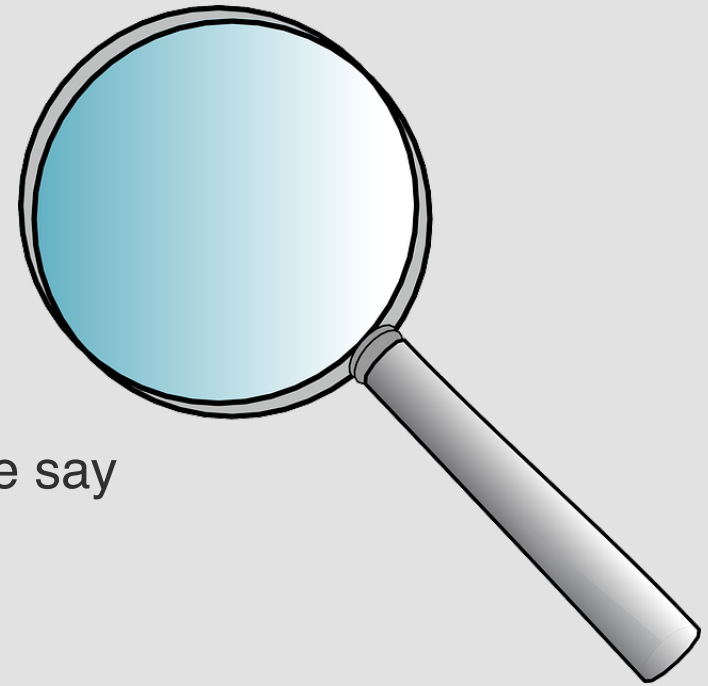
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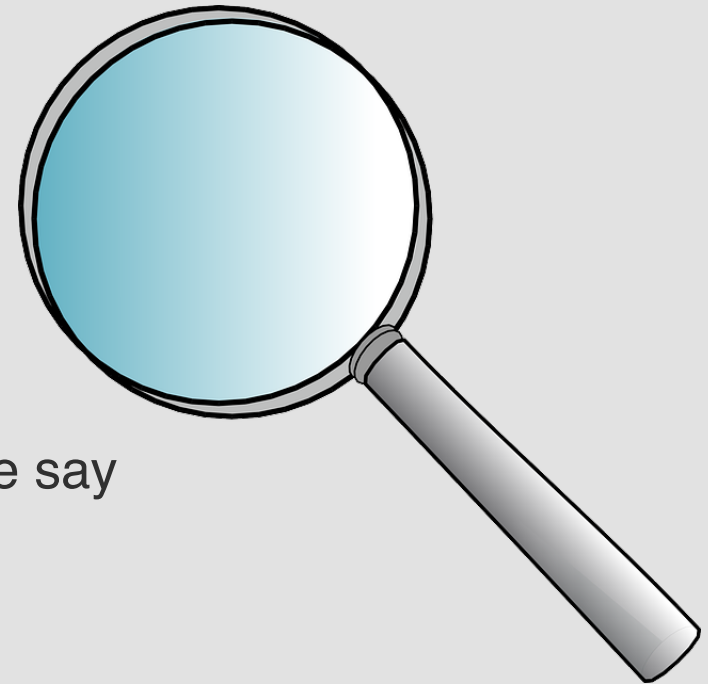- *Where*…?
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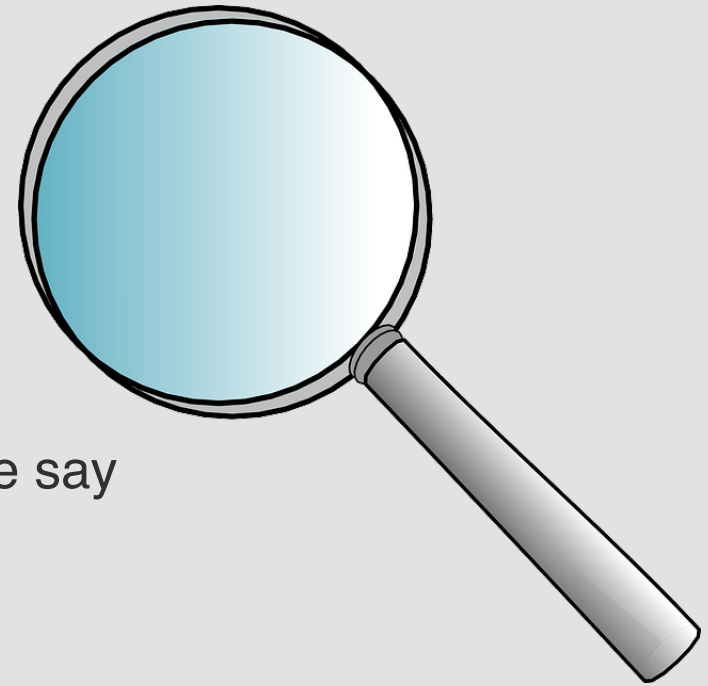- ***What*** makes our statements about the world ***true***?
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- Ontological analysis is all about *making truth-makers explicit*

# The double ontological nature of land ownership

- A classic case of *social reality*

- Whether or not a person owns the land requires that people believes (*collective intentionality*) that this is indeed a right.

- Such belief (typically resulting from an property acquisition act) is usually documented in a *register*

- But also the very nature and extent of *what* the person owns (the land itself) is the result of social conventions, and needs to be properly documented.

B. Smith and L. Zaibert, The Metaphysics of Real Estate, Topoi 2001

# Philosophical ontologies

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- ***Ontology***: the philosophical discipline

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  - Study of ***what there is*** (being qua being...)
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    **content *qua* content**, *independently of the way it is represented*

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- ***A (philosophical) ontology:*** a structured system of entities assumed to exists, organized in categories and relations

# Is applied ontology *just* about "carving reality at its joints" (Plato)?

# Preserving the joints, still multiple reality cuts are possible…
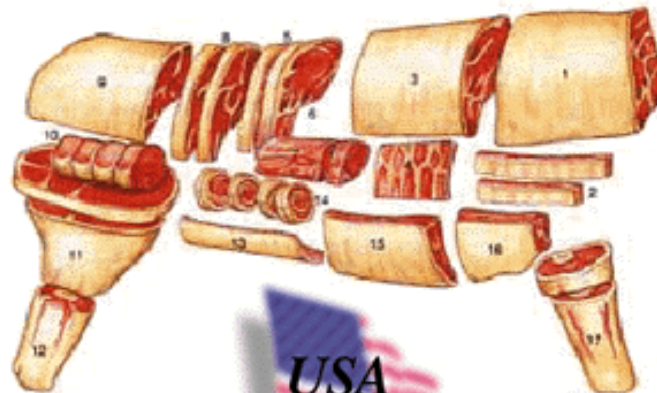
# What is an ontology

# The unavoidable descriptive stance of computational ontologies

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Gruber (93): "Explicit and formal specification of a *conceptualization*"

Computational ontologies, in the way they evolved, unavoidably mix
together philosophical, cognitive, and linguistic aspects.
Ignoring this *intrinsic interdisciplinary nature*
makes them almost **useless**.

# What is a conceptualization

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$L_E$ | apple |

| mela | $L_I$

*same conceptualization*

Reality

Phenomena

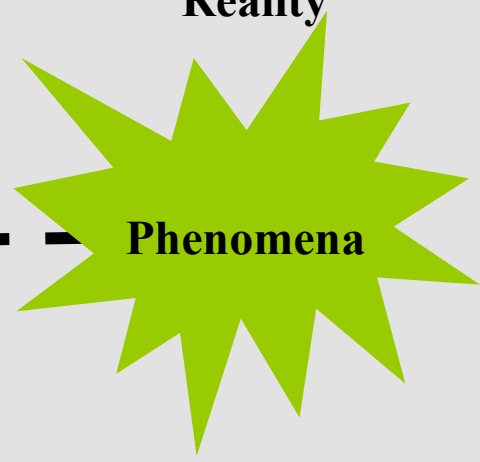Perception

Reality
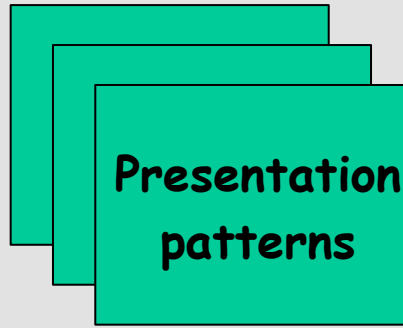
Presentation
patterns
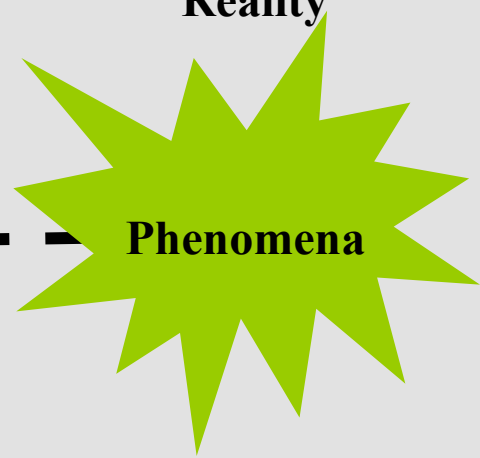
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**Conceptualization**　　　　　**Perception**　　　　**Reality**

relevant **invariants** within
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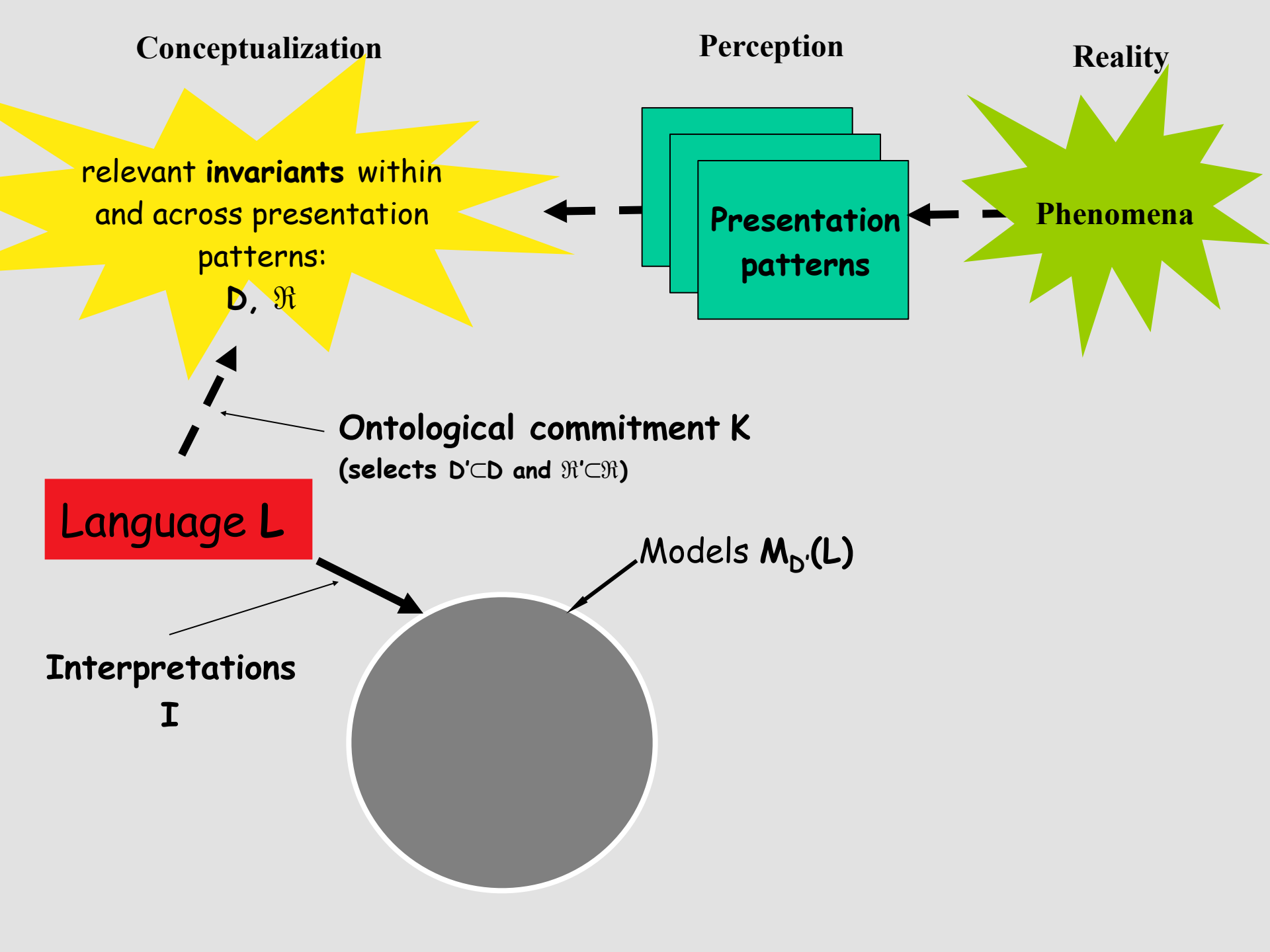
$D$, $\mathfrak{R}$
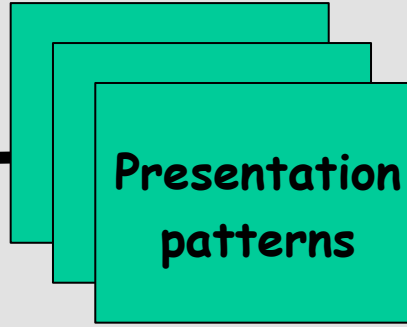
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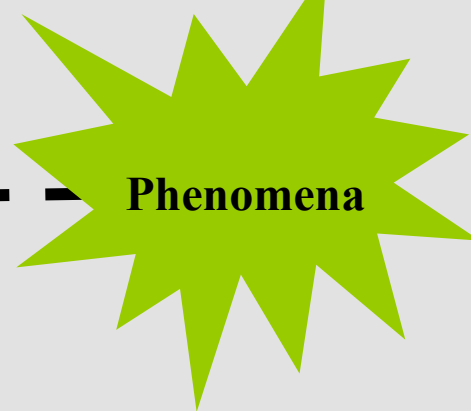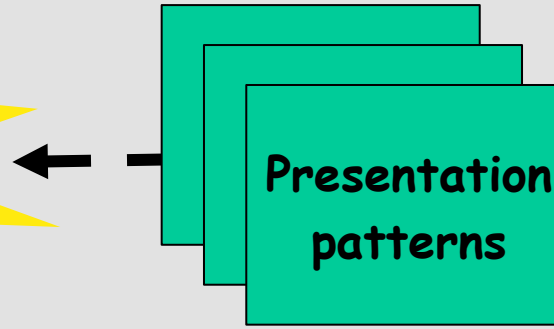
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**Ontological commitment K**

**(selects** $D'\subset D$ **and** $\mathfrak{R}'\subset\mathfrak{R}$**)**

Language L

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**Perception**

Presentation patterns

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Language L

Interpretations I

Models $M_{D'}(L)$

Intended models for each $I_K(L)$

Ontology

Ontology models

**Conceptualization**

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**Language L**

**Bad Ontology**

Models $\mathbf{M_{D'}(L)}$

**Interpretations I**

~Good Ontology

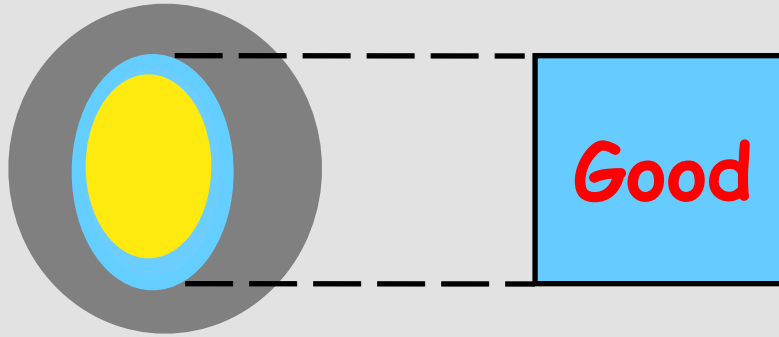**Intended models for each $\mathbf{I_K(L)}$**

Ontology models
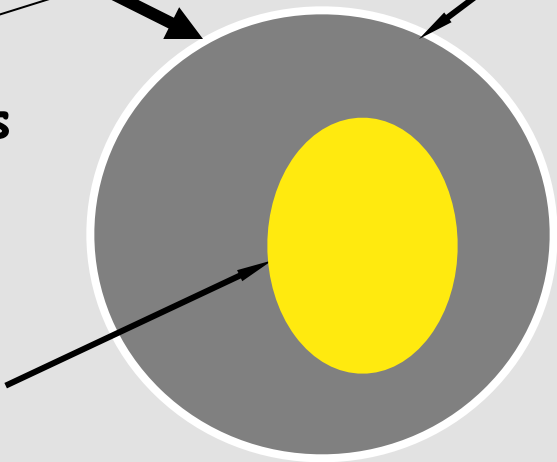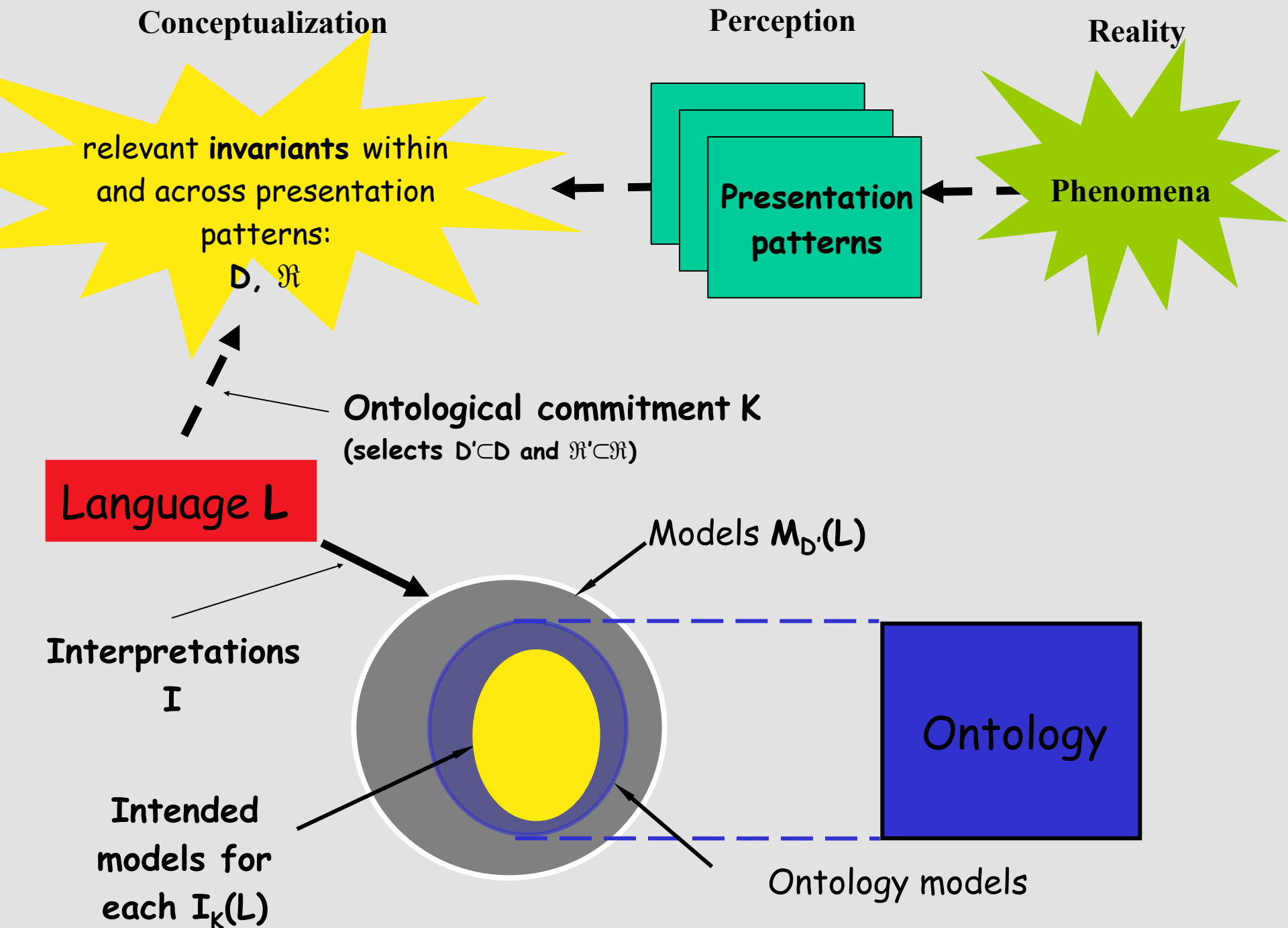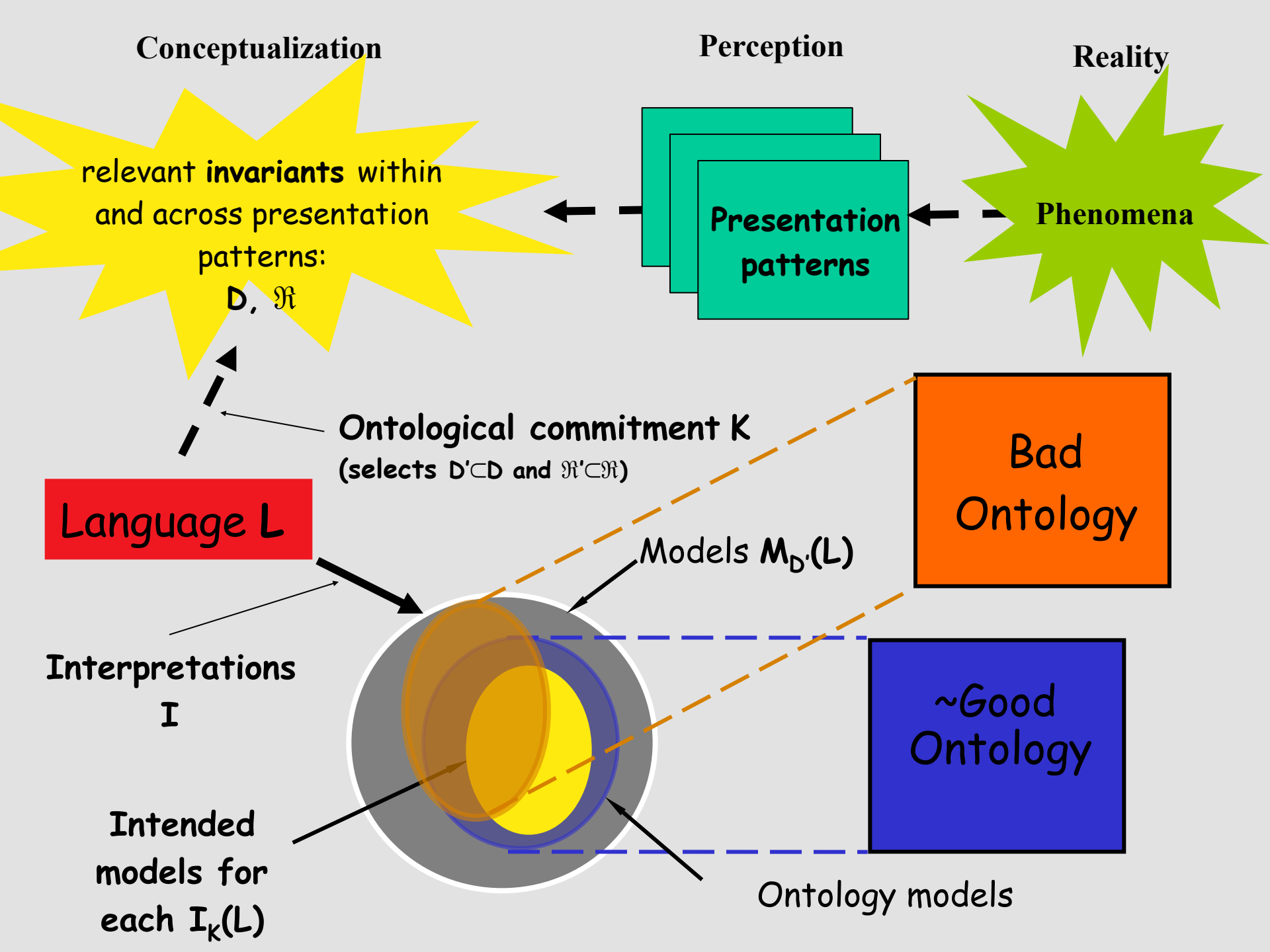
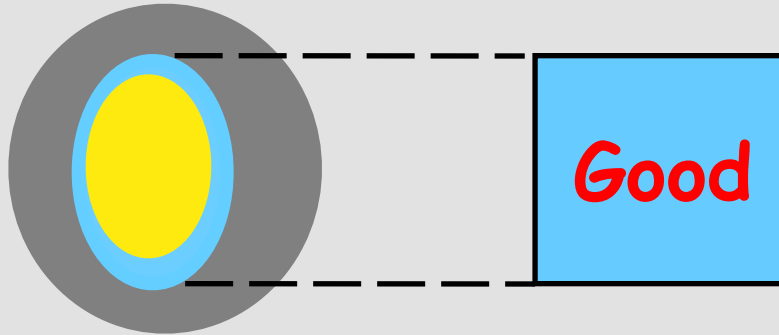# Ontology Quality: Precision and Correctness

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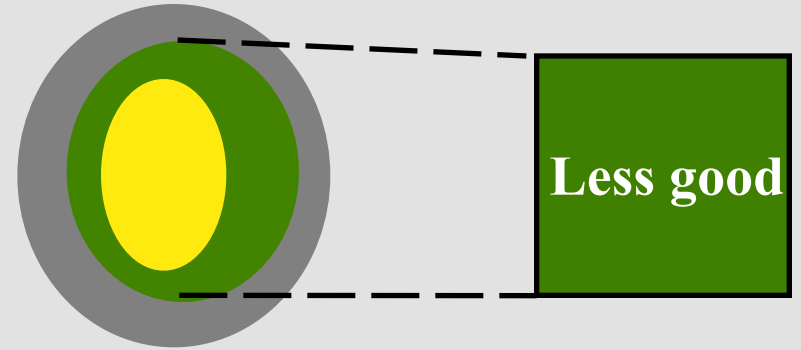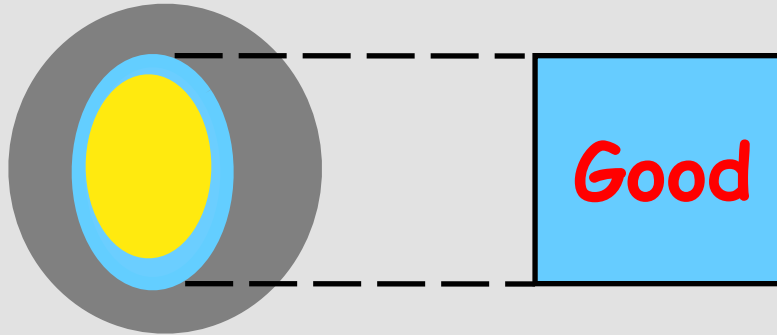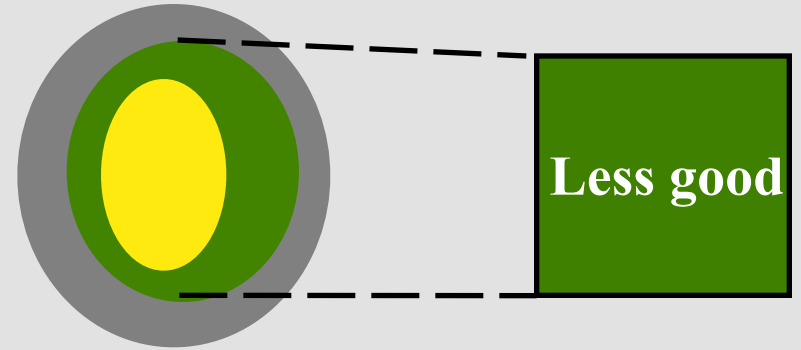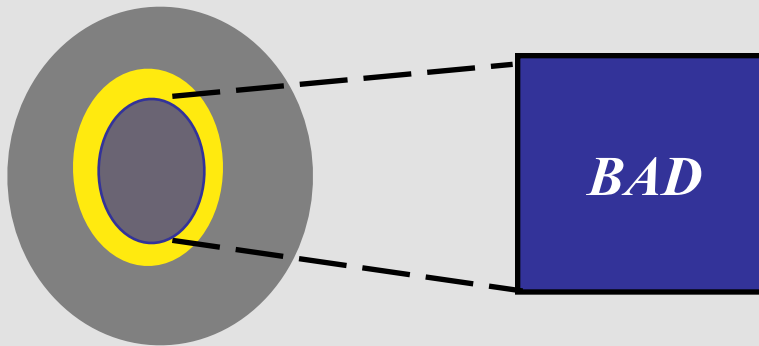Max precision, low correctness

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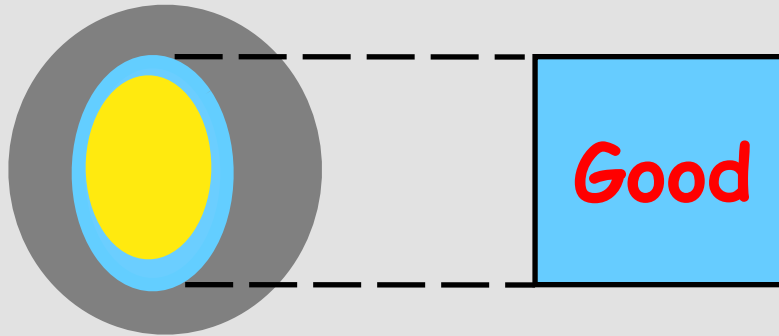


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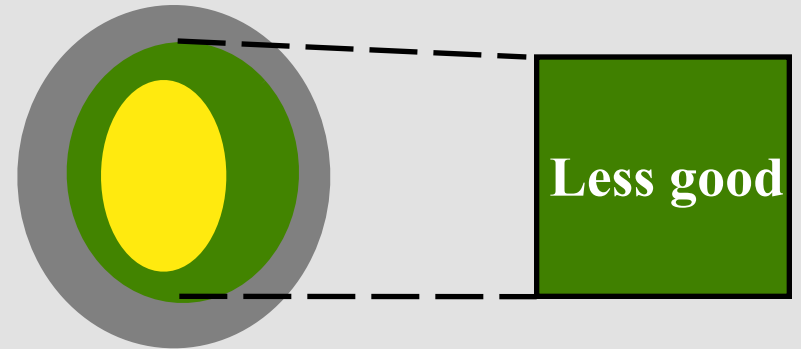
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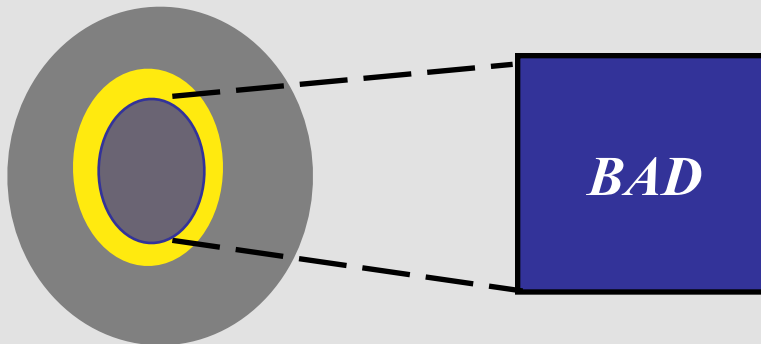
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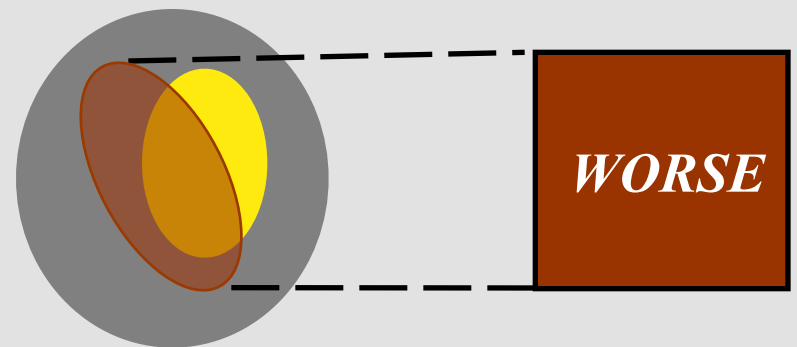
Low precision, low correctness

# Why ontological precision is important

# Database A: keeping track of fruit stock



| Variety | Quantity |
| --- | --- |
| Granny Smith | 12 |
| Golden delicious | 10 |
| Stark delicious | 15 |

# Database B: keeping track of juice stock



| Variety | Quantity |
|---|---|
| Granny Smith | 12 |
| Golden delicious | 10 |
| Stark delicious | 15 |

# SALES

## Availability at: 05-02-2014

## Wholesale

| Varieties | Fresh | Available | industrial use: purée | industrial use: juice |
|---|---|---|---|---|
| Golden Delicious | √ | yes | --- | --- |
| Red Delicious | √ | yes | --- | √ |
| Gloster | √ | no | --- | --- |
| Morgenduft | √ | no | --- | --- |
| Jonagold | √ | no | --- | --- |
| Royal Gala | √ | yes | --- | --- |
| Braeburn | -- | no | ---- | --- |
| Florina | √ | no | ---- | --- |
| Granny | --- | no | --- | --- |

## Conservation, sorting, packing and shipment directly from our farm - Contact us for actual prices

| Packing | Sorting | Delivery |
|---|---|---|
| Usual packing | Sorting of our apples in foll. size grading: 65- 85 mm. packaging: 13 kg. boxes. | Pallets - (n°.60 boxes/pallet) |
| Other packing | 7 kg plateau - 1 range. | Pallets - 90 pl/pall. |

# Why ontological precision is important



**All interpretations of "apple"**

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All
interpretations
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A - Apple
producer's
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Interpretations allowed by A's ontology

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B - Juice producer's intended interpretations

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Area of false agreement!

B - Juice producer's intended interpretations

Interpretations allowed by B's ontology

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4. When ***mutual understanding*** is more important than interoperability.

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1. *Same domain, same terminology, same conceptualization:* e.g, different processes within a very small, family-managed enterprise (everybody does everything)

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1. *Same domain, same terminology, same conceptualization:* e.g, different processes within a very small, family-managed enterprise (everybody does everything)

2. *Same domain*, *shared terminology*, *different conceptualization*: e.g., different branches of a big company with a strong organization structure..

# The two fundamental scenarios for semantic integration

1. *Same domain, same terminology, same conceptualization:* e.g, different processes within a very small, family-managed enterprise (everybody does everything)

2. *Same domain*, *shared terminology*, *different conceptualization*: e.g., different branches of a big company with a strong organization structure..

   Computational ontologies have been born for 2, but, they are actually used for 1: *just shared data schemes*. The result is the so-called "**data sylos**" **effect.**

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*Idea of Chris Welty, IBM Watson Research Centre, while visiting our lab in 2000*