

# Ontologies meet Contexts

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# Outline

- Opening joke
- Definitions
- Fausto was wrong
  - Why ontologies don't want to meet contexts
- Fausto was right
  - Why ontologies want to meet contexts
- New work on context logic

# Central Motivations

- Reuse
- Sharing
- Interoperation
- Interchange
  
- At all levels
  - technical, logical, semantic ...
- Modern trends in KR to support these
  - RDF, OWL, Common Logic
  - Rely on standard syntax (easy) & semantics (hard)

# Ontologies

- Definition elusive
  - Research area: people, papers, ...
  - Practice: science, engineering
  - Historically, about *existence*
  - Recently, about *meaning*
  - Practically, the schema of a KB
- Formal ontology
  - Basic (logical) building blocks of the universe
  - Logically *prior* to intelligence
    - remove human perspective
  - Is there only one?

# Contexts

- Definition impossible
  - Open-ended
  - Often, a partitioning mechanism for KBs
- Typical uses
  - Prevent sentences from interacting in unintended ways
  - Allow for sentences to be interpreted differently
- Contexts as views
  - Dependent on human perspectives

# Mismatch?

## Ontologies

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## Contexts

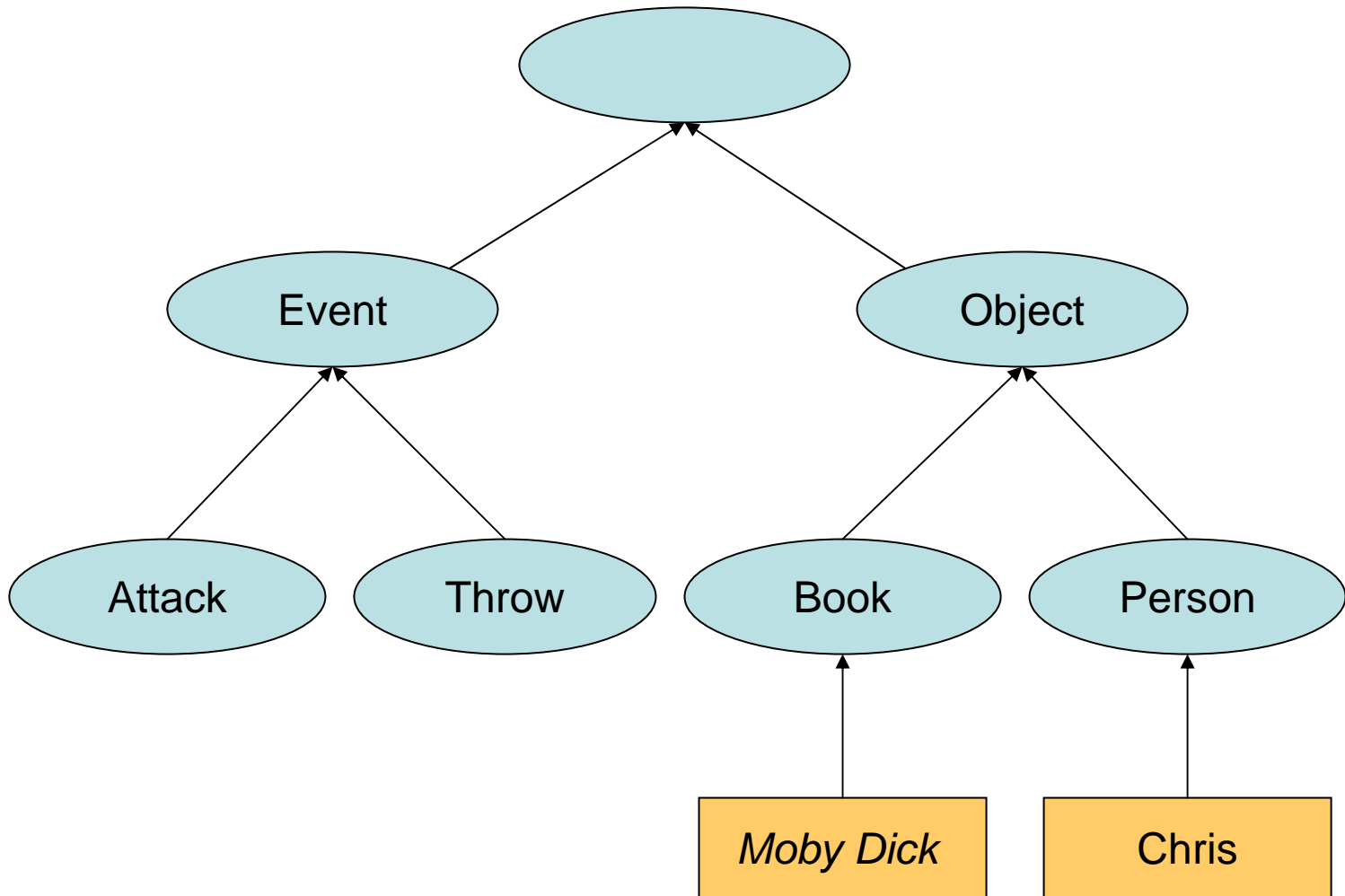
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# Background: OntoClean\*

- Methodology for ontology development
- OntoClean analysis requires identification of the *backbone taxonomy*
  - The *essential* classes
  - Maintain tree properties (ie no multiple inheritance)
  - Every instance must instantiate *one* backbone class (type)

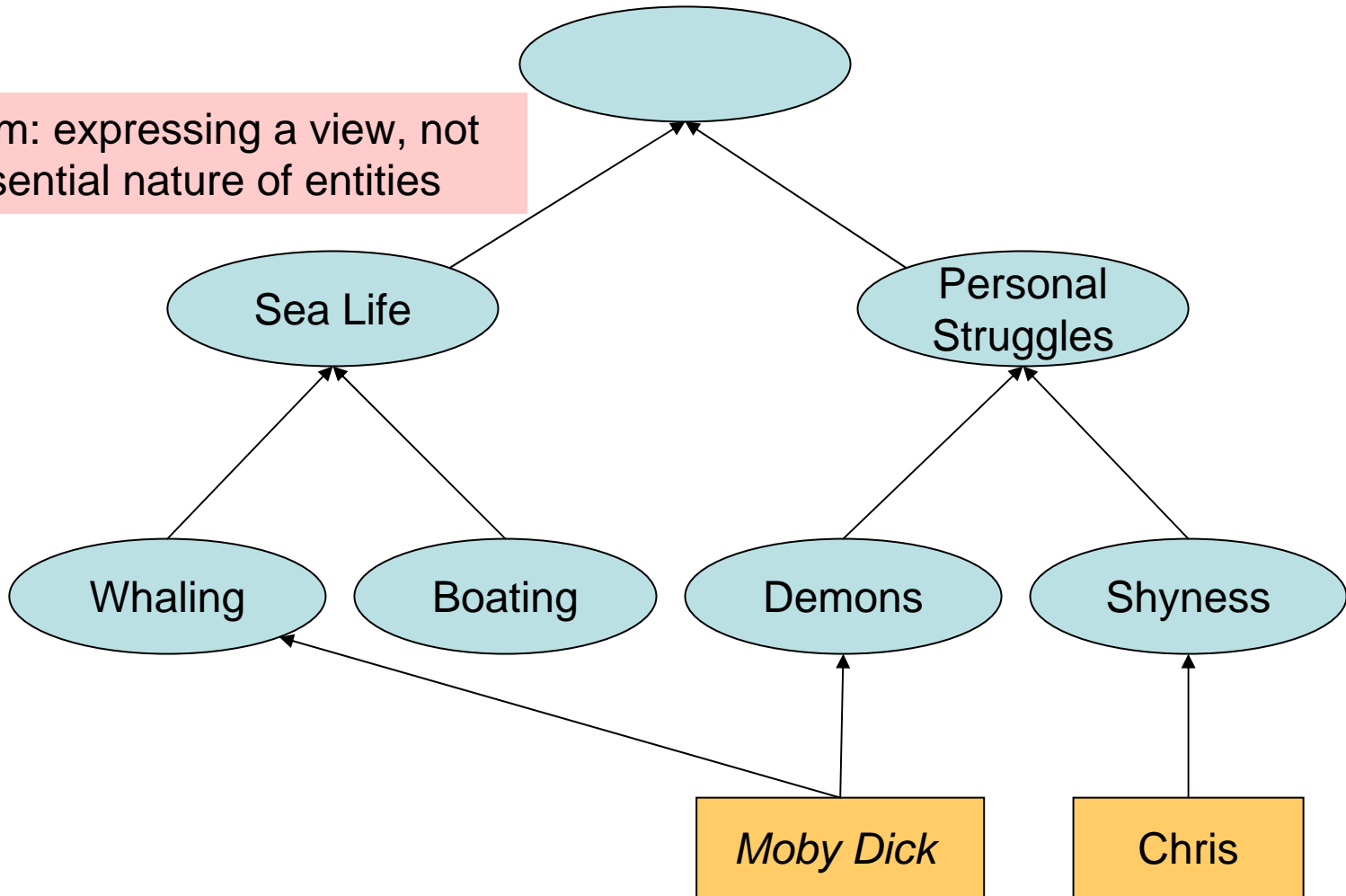
\* Guarino & Welty, 2000.

# Example 1



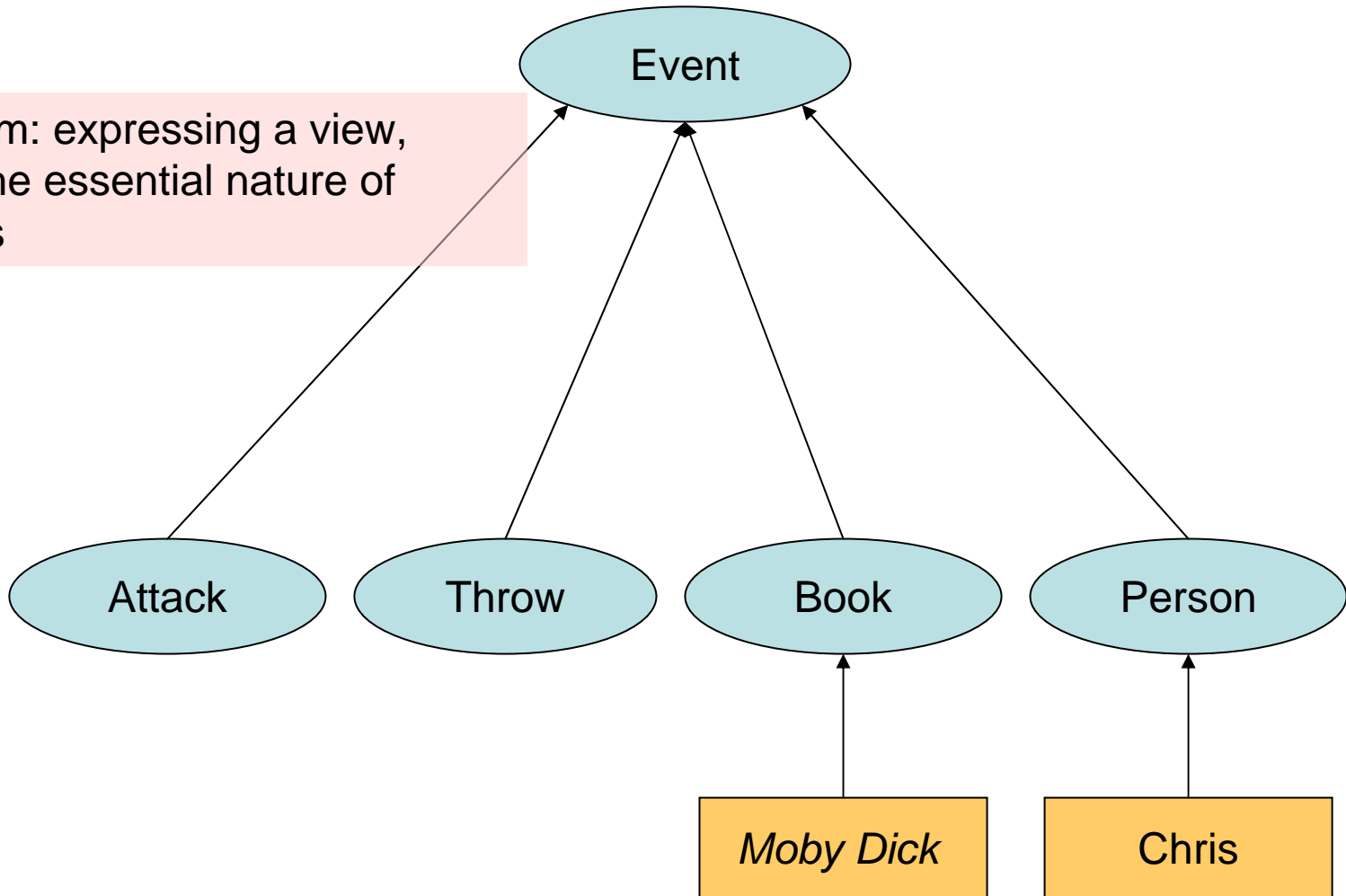
# Example 2

Problem: expressing a view, not the essential nature of entities



# Example 3

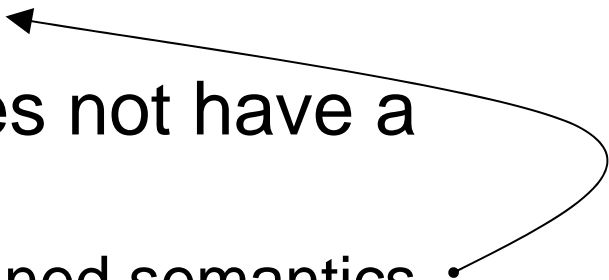
Problem: expressing a view,  
AND the essential nature of  
entities



# Views

- Views make *bad* ontologies
- Views are unavoidable
- Need to minimize the bad effects
  - Make them explicit
  - Prevent them from interacting in unintended ways
  - Allow them to provide their own interpretations
  - E.g. ... use contexts
- Still need formal ontologies to express alignments

# Context Logic

- Good ontologies provide a clear and unambiguous semantics for a domain
  - Requires a clear and unambiguous language (i.e. FOL)
    - Also critical for interoperability
  - Context logic (McCarthy) does not have a semantics
    - Cyc microtheories have no defined semantics
  - New work: extend ISO Common Logic to include semantics for context logic
- 

# Species of $ist^*$

- O:  $ist(c, P \vee Q) \leftrightarrow ist(c, P) \vee ist(c, Q)$
- N:  $ist(c, \neg P) \leftrightarrow \neg ist(c, P)$
- A:  $ist(c, P \wedge Q) \leftrightarrow ist(c, P) \wedge ist(c, Q)$
- C:  $ist(c, \perp) \leftrightarrow \perp$
  
- AO can be encoded in FOL

\* *Makarios, with Fikes, Hayes, Menzel, Welty & Klein in progress.*

# Conclusions

- Ontologies need contexts
- Contexts need ontologies
  
- Reuse & Interoperability