

# Unintended Consequences of Class-based Ontological Commitment

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# Inspiration for this paper

*We particularly welcome papers that raise challenging questions ... and ... can help to promote interesting discussions at the workshop.*

-- from the call for papers of Onto.Com 2011

**Are class-based domain ontologies harmful?**

# Is this a challenging question?

- According to the preface to the papers in the workshop proceedings
  - “Lukyanenko and Parsons elaborate on a rather controversial thesis...”

# Outline

- Context
- What is class-based ontological commitment?
- Intended consequences
- Classes are cognitive, not ontological, constructs
- Unintended consequences
- Toward class-agnostic ontological commitment

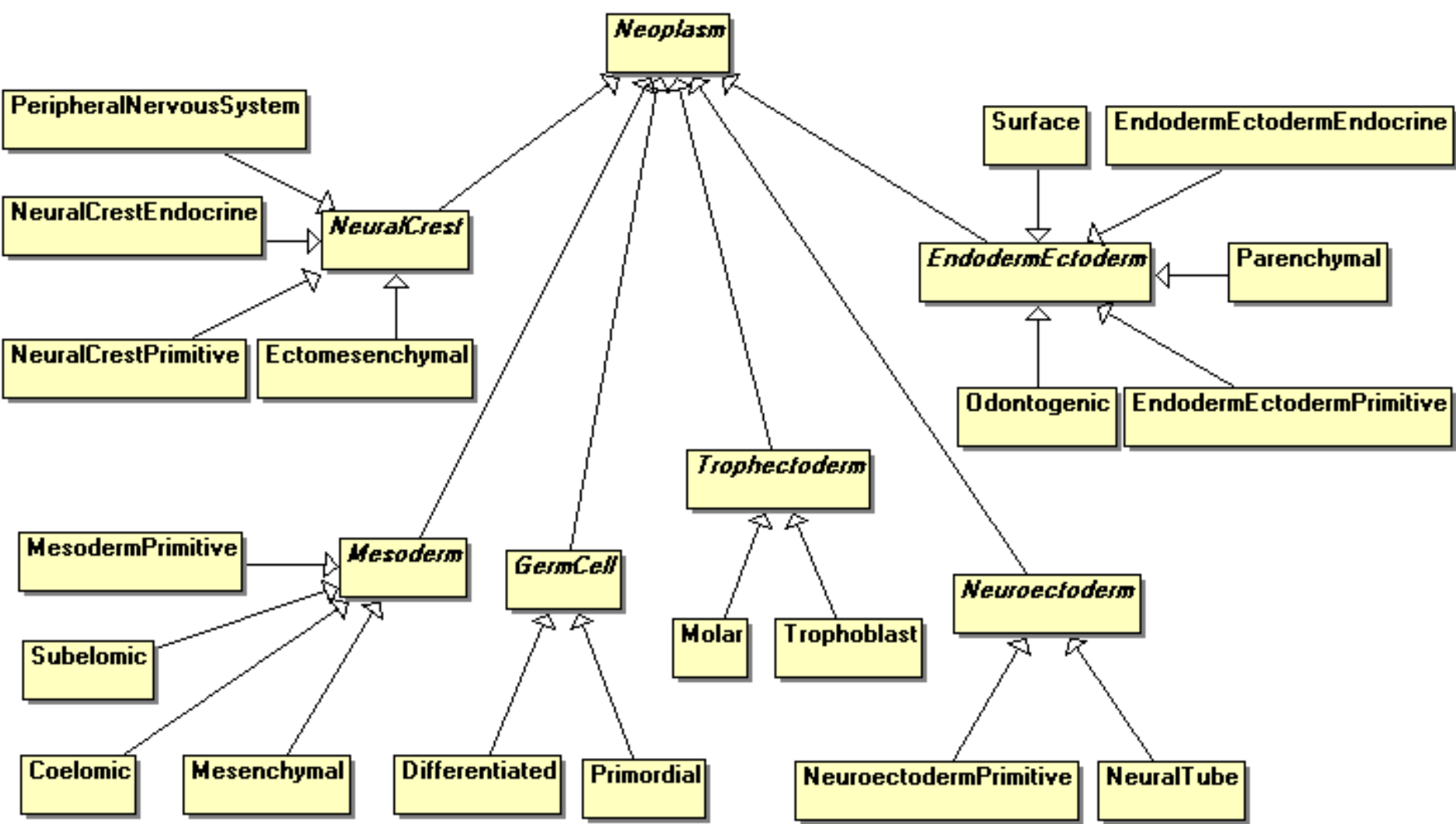
# Context

- Developing domain ontologies to express the constructs of interest in a domain and their relationships
- Used to understand and reason about a domain in an information systems context
- Used to integrate information from diverse sources by mapping to the domain ontology

# What is class-based ontological commitment?

- A requirement to express a domain ontology in terms of **classes of interest** and relationships among them
- “Ontologies are often equated with taxonomic hierarchies of classes” (Hansen et al., 2001)
- “specific classes of objects and relations that exist in some domain” claimed to be the “main contribution” of ontologies (Chandrasekaran et al., 1999)







# Intended Consequences

- Classification is a process of abstraction that highlights similarities among phenomena of interest
- Mapping heterogeneous sources to common constructs supports a shared understanding of a domain
- Shared understanding supports sharing of information on a large scale

# Classes are not ontological constructs

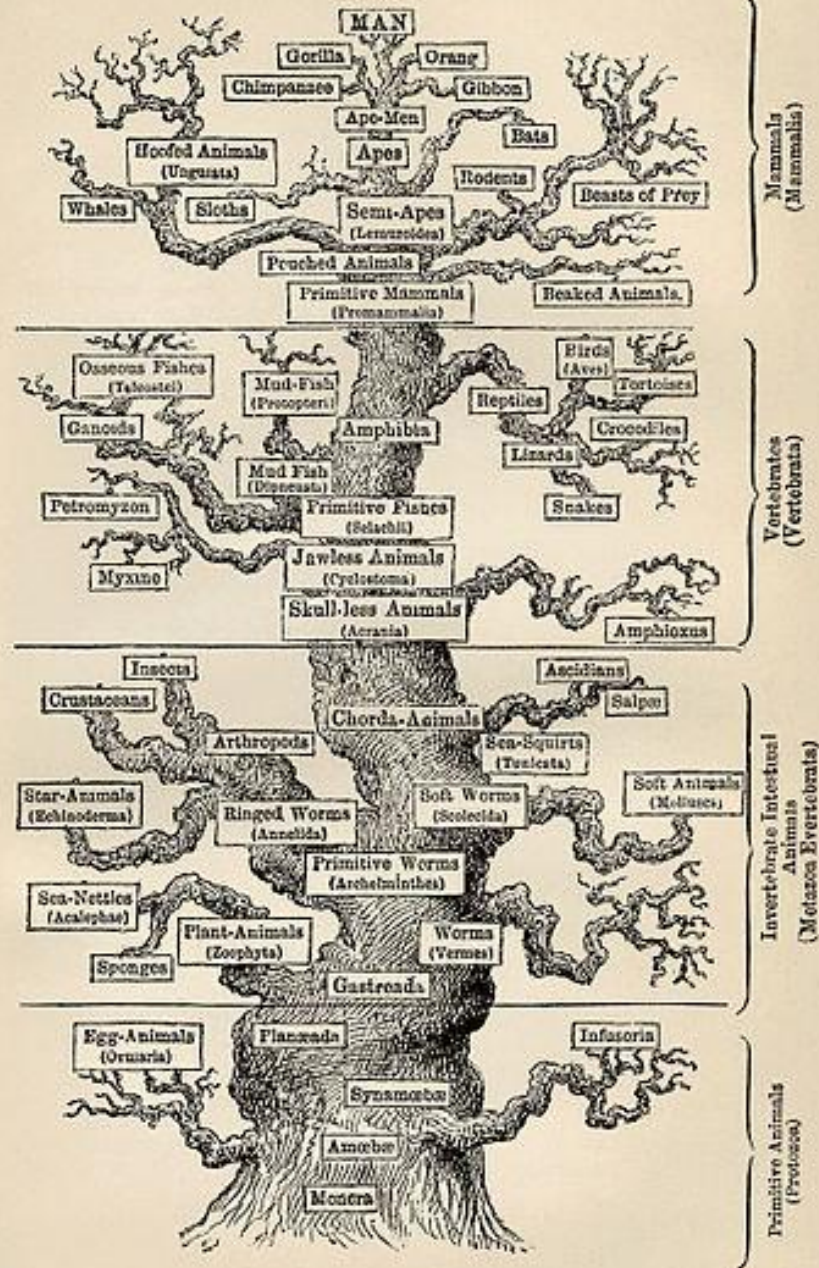
- Classes are useful fictions – they do not “exist”
- We classify phenomena in the world by abstracting similarities among instances
- We do this for cognitive economy and inference (usefulness)
- Different uses are possible
- Classification is a cognitive phenomenon

# Unintended Consequences

- A domain ontology “privileges” one view of a domain over other (valid and useful) views
- Conveys the false impression that classes are somehow “real” and that instances “belong” to them
- Different uses may favor different classification schemes over a common domain of phenomena
- Limits the potential usefulness of information about the phenomena in a domain

**Proposition:** Domain understanding is necessarily limited whenever classes are used to represent information about individual phenomena (instances)

PEDIGREE OF MAN.

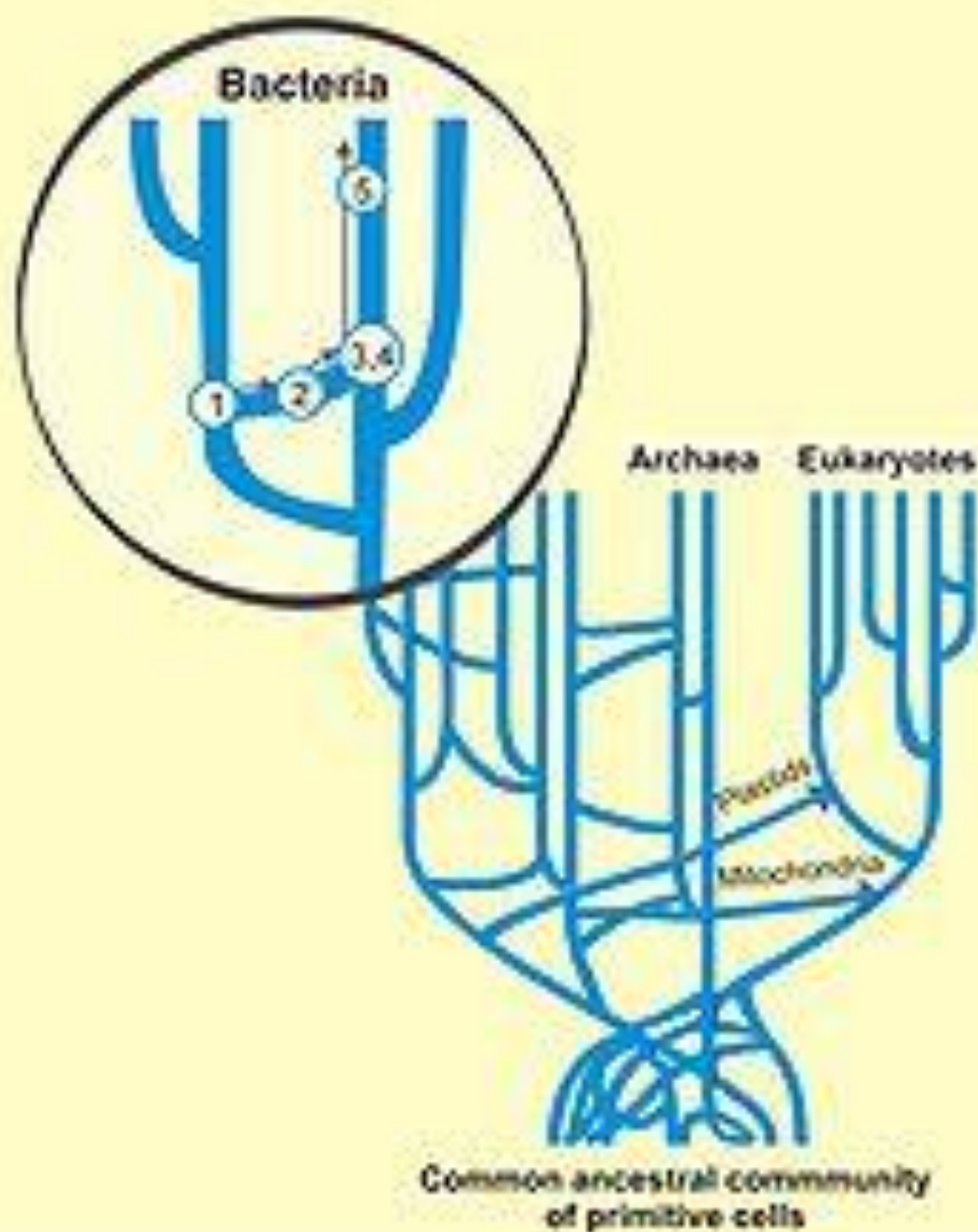


Mammals (Mammalia)

Vertebrates (Vertebrata)

Invertebrate Intestinal Animals (Metazoa Evertibrata)

Primitive Animals (Protozoa)



Common ancestral community  
of primitive cells

# Unintended Consequences

- A class-based domain ontology generally assumes that instances belong to one class
- Classes abstract what is common about sets of instances
- No collection of classes is adequate to represent what is known about instances of interest

**Proposition:** An instance can never be fully represented by a class



Common murre (**Uria aalge**)



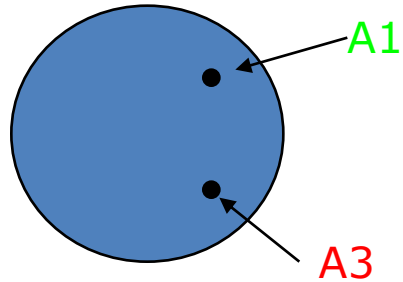


# Toward Class-agnostic Ontological Commitment

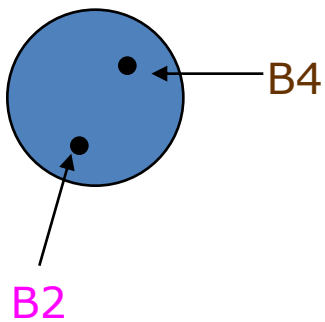
- “Thing” and “property” are primitive ontological constructs
- “The world is made of things that possess properties” (Bunge, 1977)
- Different class-based **usage ontologies** (classification structures) can coexist over the same domain of instances and properties, each useful for different purposes

# Class-based

CLASS-A (P1, P2, P3)



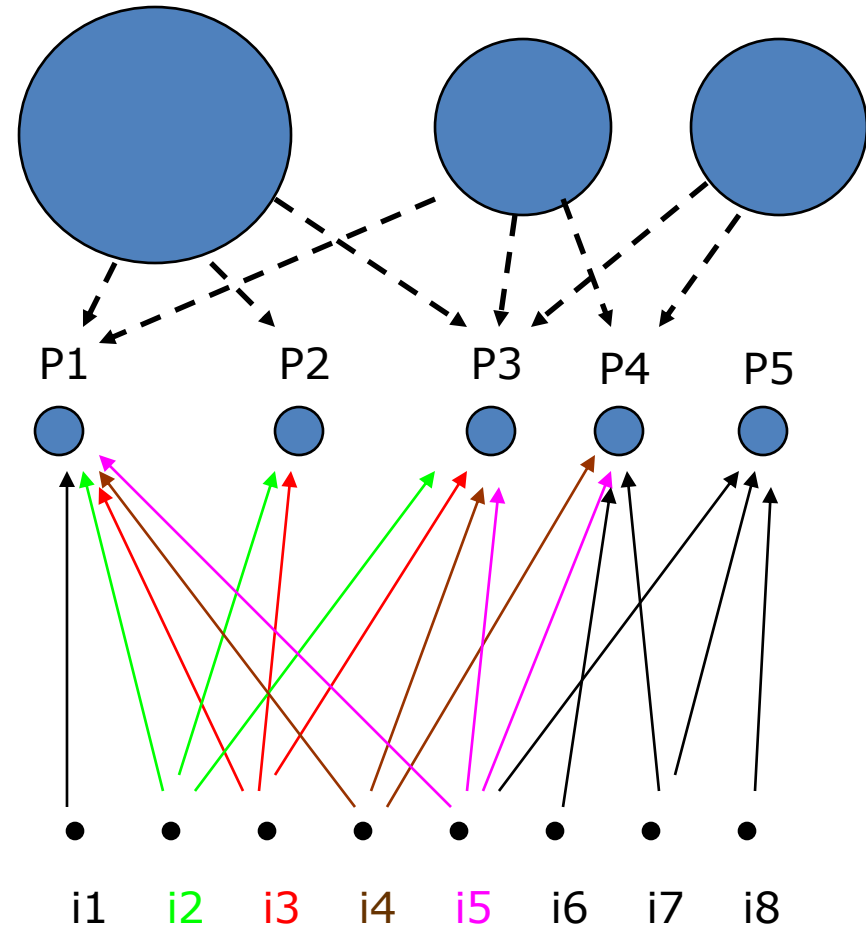
CLASS-B (P1, P3, P4)



# Instance-based

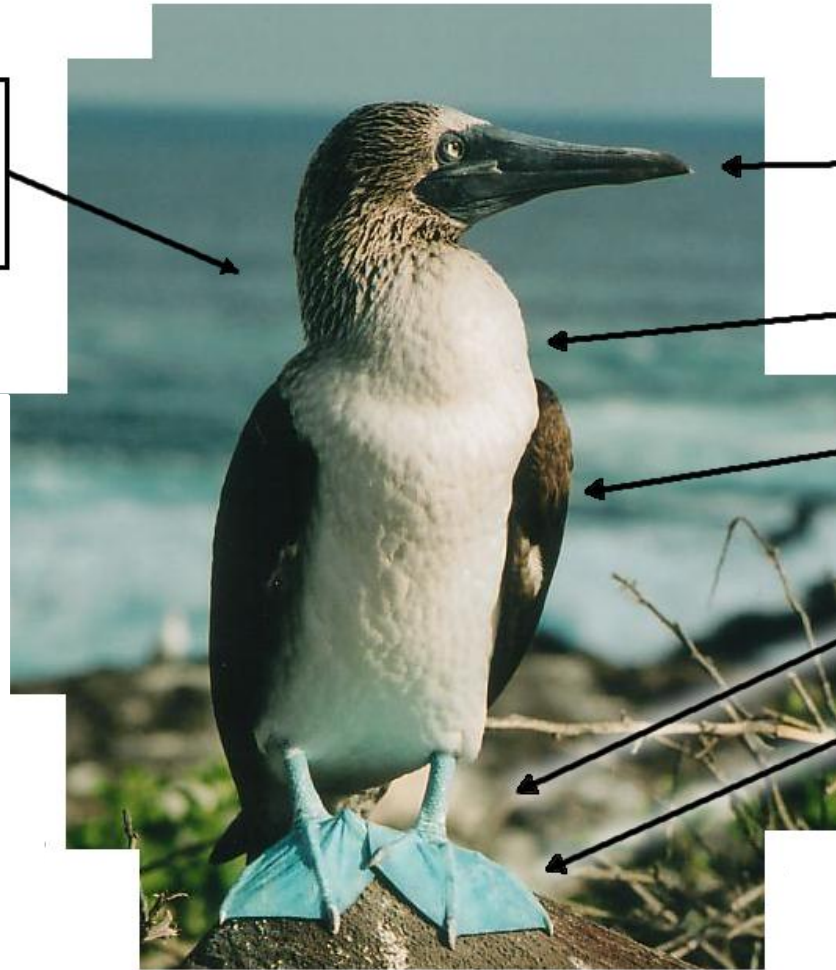
CLASS-A

CLASS-B



## Traditional

Species: *Sula nebouxii*  
(Blue-footed Booby)



## Attribute-based

Long beak

White breast

Black wings

Blue feet

Webbed feet

# Conclusions

- Information loss is inherent in any class-based ontology
- Focusing on instances and properties minimizes potential information loss
- Multiple and evolving classification structures are supported
- We are exploring implications of this approach in crowdsourcing applications such as citizen science