Fred Freitas
Informatics Center - Federal University of Pernambuco, Brazil
KR & KM group - University of Mannheim, Germany
fred@cin.ufpe.br

Stefan Schulz
Institut of Medical Biometry and Medical Informatics
Freiburg University Medical Center, Germany
stschulz@uni-freiburg.de

Zulma Medeiros
Aggeu Magalhães Research Center, Oswaldo Cruz Foundation (CPqAM/FIOCRUZ), Recife, Pernambuco, Brazil
medeiros@cpqam.fiocruz.br

NEGLECTED TROPICAL DISEASES - A CHALLENGE TO BIOMEDICAL ONTOLOGY ENGINEERING

SUMMARY

- Domain description
  - Diseases, actions, institutions involved
- Use cases envisaged
- Ontologies and their connections
- Challenges

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NEGLECTED TROPICAL DISEASES (NTDs)

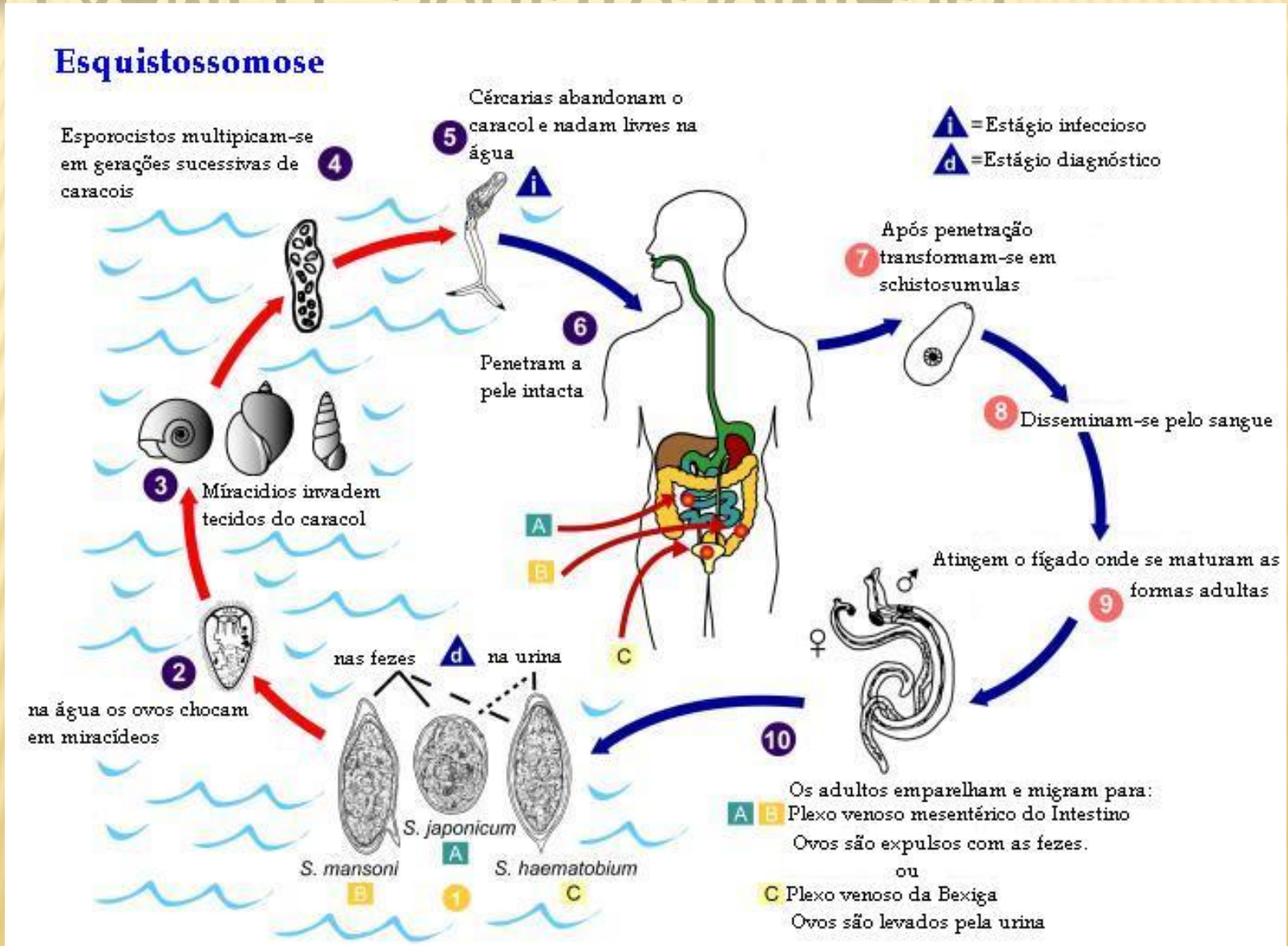
- They have been hardly heard of in richer countries …
- … but cause severe disability in the world's poorest regions in over **1 billion people** [WHO]

- Lymphatic filariasis,
- Onchocerciasis,
- Schistosomiasis,
- Leishmaniasis
- Chagas disease(American trypanosomiasis)
- Trachoma
- Dengue
- Malaria
- …

COMMON FEATURES OF THESE DISEASES

- In most (if not all) of them, biological organisms play these different roles:
  - Pathogens: complicated organisms with different relevant lifecycles that cause disabilities in humans
  - Vectors: transmit the pathogens if their habitat is comfortable for them to reproduce
  - Hosts: are also a means of transmission (e.g. dogs)
- Each of them possess their own set of :
  - manifestations,
  - symptoms,
  - phases,
  - prophylactic, detection and treatment actions

AN EXAMPLE: SCHISTOSOMIASIS



ACTIONS AGAINST NTDs IN BRAZIL

- Prophylactic: To prevent their transmission
  - Improvement of basic sanitation (long term)
  - Educational programs
  - Field operations
    - In the environment, by avoiding a comfortable habitat for the organisms
      - E.g. cover river parts with small polystyrene balls
    - Against vectors, to reduce heir population
      - E.g., a chemical smoke to kill dengue's mosquitoes
- Detection: To check individuals' and populations' prevalence
- Treatments

INVOLVED INSTITUTIONS

- Municipalities
  - Actions, treatment, registration
- States
  - Inter-municipality action coordination, policy and guidelines definitions, database analysis
- Federal Government
  - State coordination of the actions, policy and guidelines definitions, database analysis
- Oswaldo Cruz Foundation's instances
  - Study, research on the disease as well as its actions, campaign planning and creation of treatment and diagnosis new methods

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INTENDED USE CASES FOR THE ONTOLOGIES I

- Decision support systems (DSS) for neglected diseases
  - Stakeholders: governments on the 3 levels
  - Phase 1: ontology-based information integration that allows querying heterogeneous neglected diseases-related databases from different governmental sources (county, state and country).
    - Integration with OTICSSS [], an emerging health information integration initiative in Brazil.
  - Phase 2: Diagnoses of the situation
  - Phase 3: Assessment of actions' effectiveness

INTENDED USE CASES FOR THE ONTOLOGIES II

- A search engine for information on NTDs in biomedical documents
  - Averbis GmbH (www.averbis.de)
  - Semantic search: takes advantage not only of keywords, but also from the ontological relations, structure, axioms, etc
- Intelligent agents/ decision support systems
  - provide support on diagnosis and prognosis of the neglected diseases in patients and populations.
  - serve for instruction

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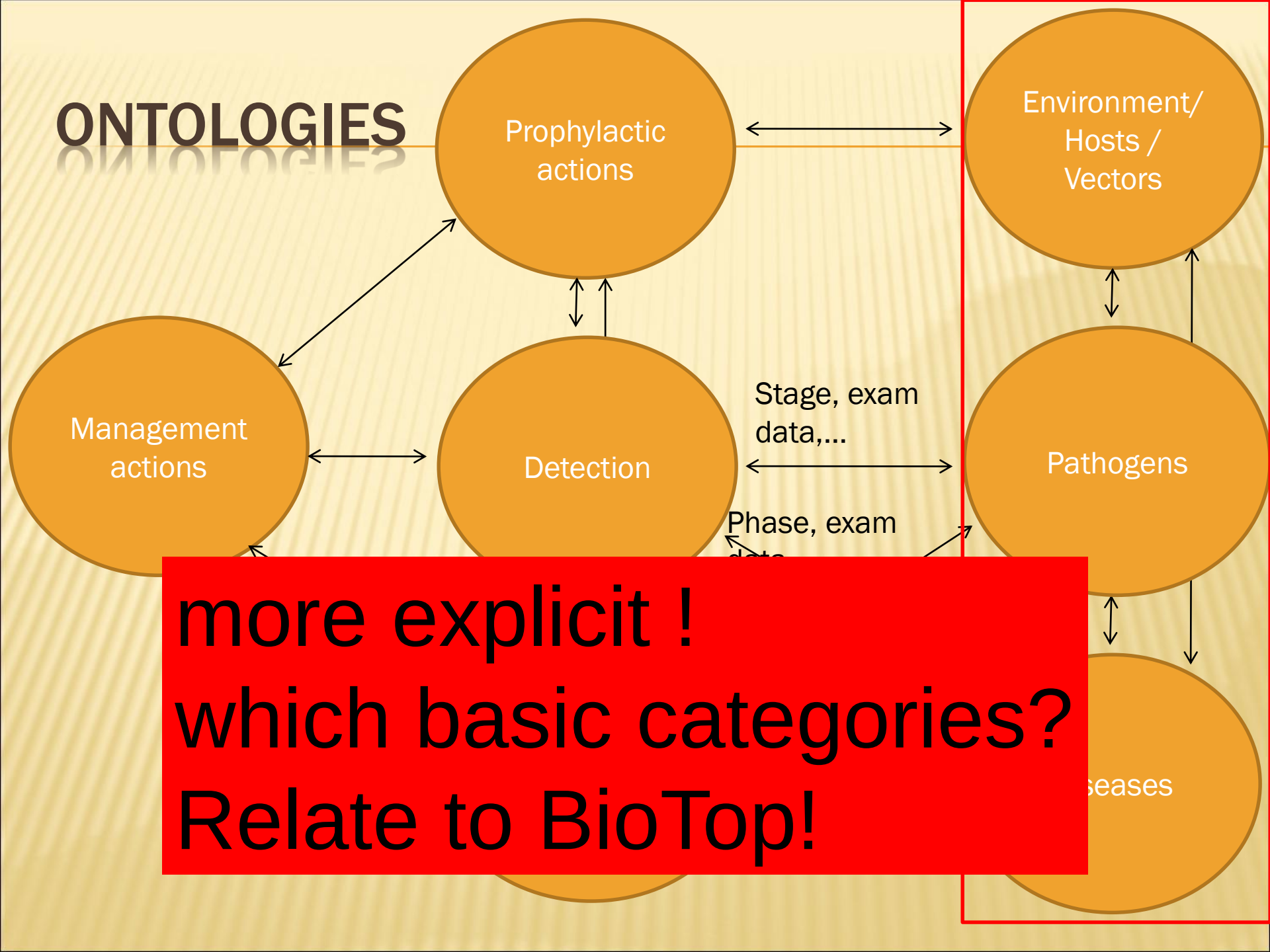
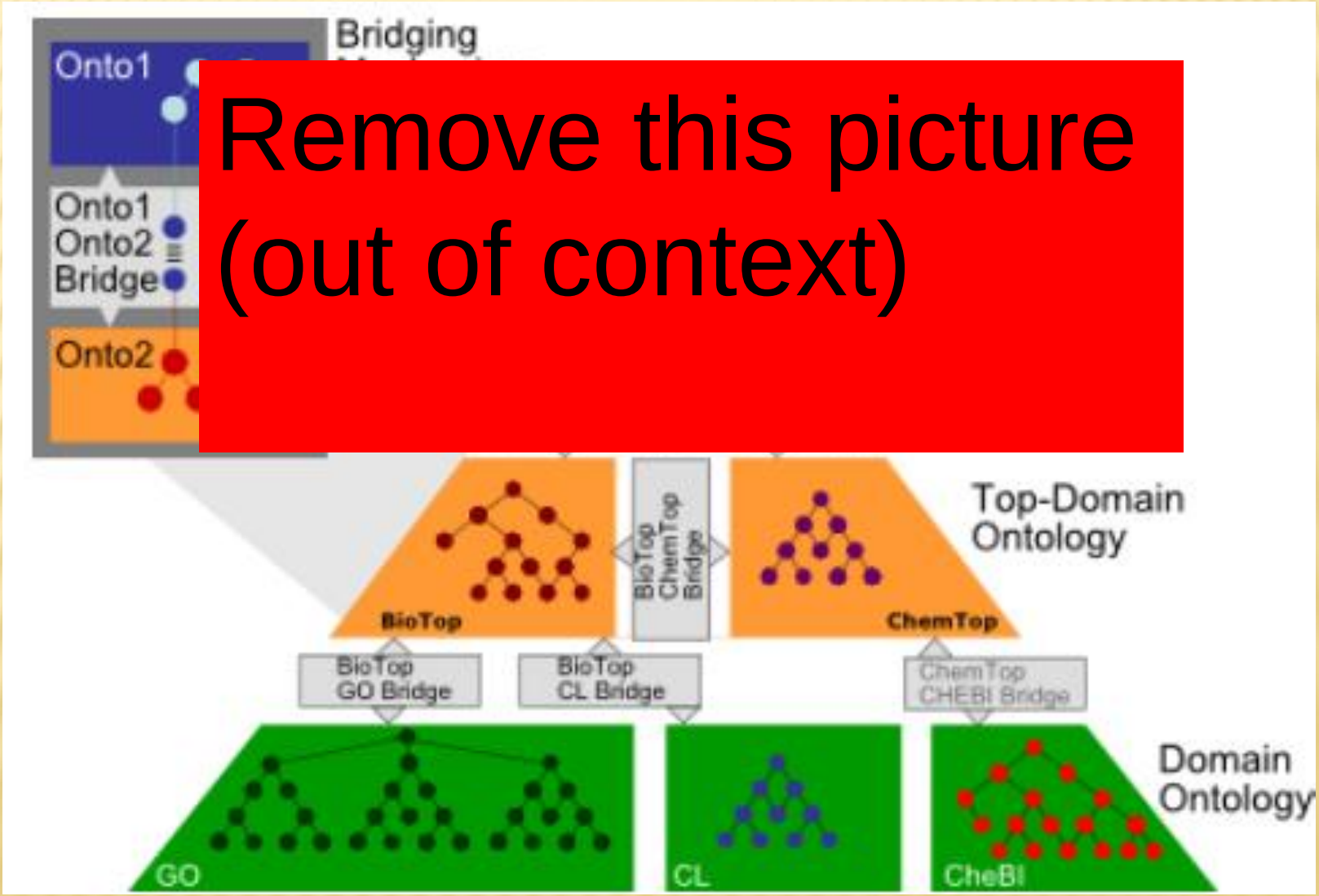
ONTOLOGIES



more explicit !
which basic categories?
Relate to BioTop!

BIOLOGICAL PART STRUCTURE



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POLITICAL X VECTORS' HABITATS

- Regions are politically defined for management pu…ns
- Th… ve…
- Ac… th…
- They vary according to the disease
  - Schistosomiasis: hydrographic basins
  - Dengue/Malaria/Filariasis: sources of still water
  - Bubonic plague: mounts
  - …

we need an ontology of habitats and geographical entities

what do you mean by "mounts" ?

MODELING CHALLENGES

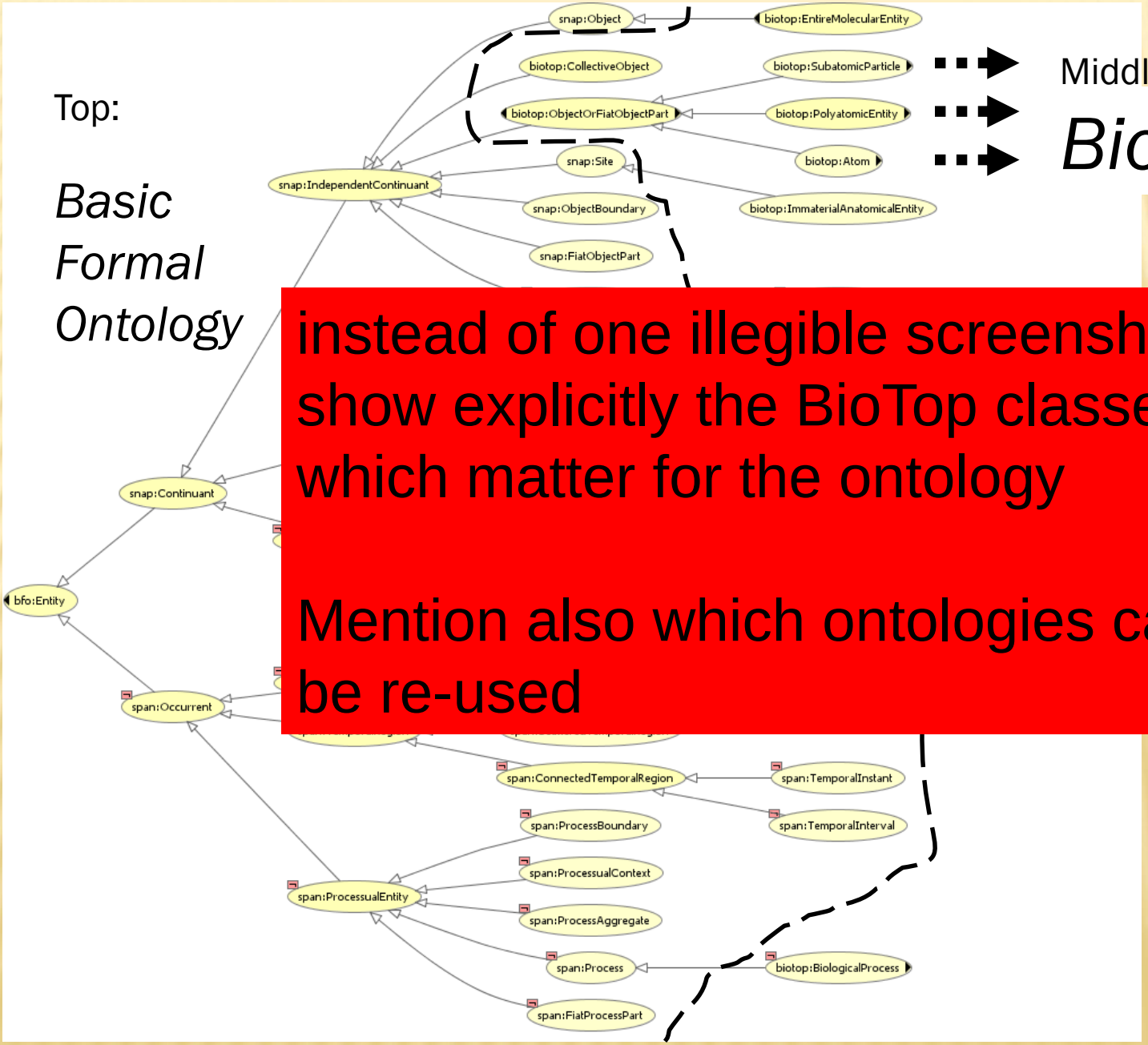
- Different granularities
  - individual disease vs. affected populations
- Linking very different types of entities (e.g., socioeconomic factors, housing, mobility,…)
- Public health authorities and their roles in the process
- Temporal management of data, according to what is defined in the ontology (phases, stages, action sequences, …)
- Complicated organisms with different relevant lifecycles
- Broad spectrum of disease manifestations

- Benefit: the different standpoints (health researchers, managers, workers) hopefully can live in harmony

REFERENCES

Top:

Basic Formal Ontology



Middle downwards:

Biotop

instead of one illegible screenshot show explicitly the BioTop classes which matter for the ontology

Mention also which ontologies can be re-used