

POC tutorial #1: Introduction

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Introduction

- A. What is an ontology?**
- B. Why do we need ontology?**
- C. What are Bio-Ontologies? What is the Gene Ontology?**
- D. Goals of the Plant Ontology Consortium**
- E. What is the plant ontology?**

What is an ontology?

- **In philosophy, ontology is the study of being or existence and forms the basic subject matter of metaphysics**
- **In the context of knowledge sharing and reuse, “ontology” term is borrowed from philosophy to describe the concepts and relationships about certain knowledge domains; for practical reason, ontology is written as a set of definitions of controlled vocabularies with given hierarchical relationships to one another, and can easily be dealt with by computers**

Why do we need ontology?

Need: The ability to make cross database/species queries such as "What mutations affect inflorescences in tomato, rice, maize and Arabidopsis?"

Problem: Terminology between databases and taxa is heterogeneous (e.g. an inflorescence can be called an ear, tassel, raceme, cyme, etc.)

Solution: Create a set of controlled vocabularies that are used by databases to describe biological data from different organisms.

What are Bio-Ontologies?

Biological Ontologies (Bio-ontologies) can be defined as a complex hierarchical structure in which biological concepts are described by their meanings (definitions) and relationships to each other.

There are many bio-Ontologies available and in use by databases.

The Plant Ontology, along with other ontologies such as the Gene Ontology, are included in the open source [Open Biological Ontologies](#) project at Sourceforge.

The Gene Ontology

The most well-known example of a bio-ontology is the Gene Ontology (GO; <http://www.geneontology.org>) which describes three biological domains: cellular component (where the gene product locates), molecular function (what the gene product does) and biological process (the cellular, developmental or physiological events the gene product is involved in).

GO are used to describe gene products. Because these descriptions are independent of species-specific nomenclature and uniformly applied, it is possible to make meaningful and efficient comparisons of genes across diverse taxa.

How ontology can help?



KIPK



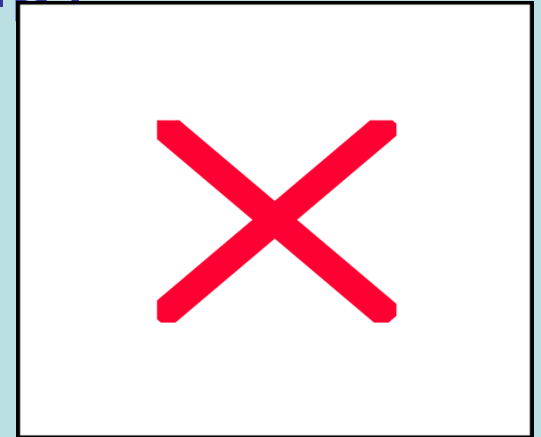
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Activity

The Plant Ontology Consortium

Plant Ontology Consortium (POC) was formed in response to the need for a set of uniform terms to describe plant structures and developmental stages. The POC is a collaboration among plant genome databases and plant systematists to create, maintain and use controlled vocabularies to describe phenotypes and expression patterns of plant genes .

What are the goals of the Plant Ontology Consortium?

- 1) Develop a set of controlled vocabularies (ontologies) to describe anatomy/morphology and developmental stages for Arabidopsis, rice, maize and other angiosperms.**
- 2) To use this common language to describe gene expression and phenotypes in experimentally and agronomically important plants.**
- 3) To create a semantic framework for comparative plant genomics.**
- 4) To actively involve researchers, breeders and systematists in the development and application of the plant ontologies.**

What is the plant ontology?

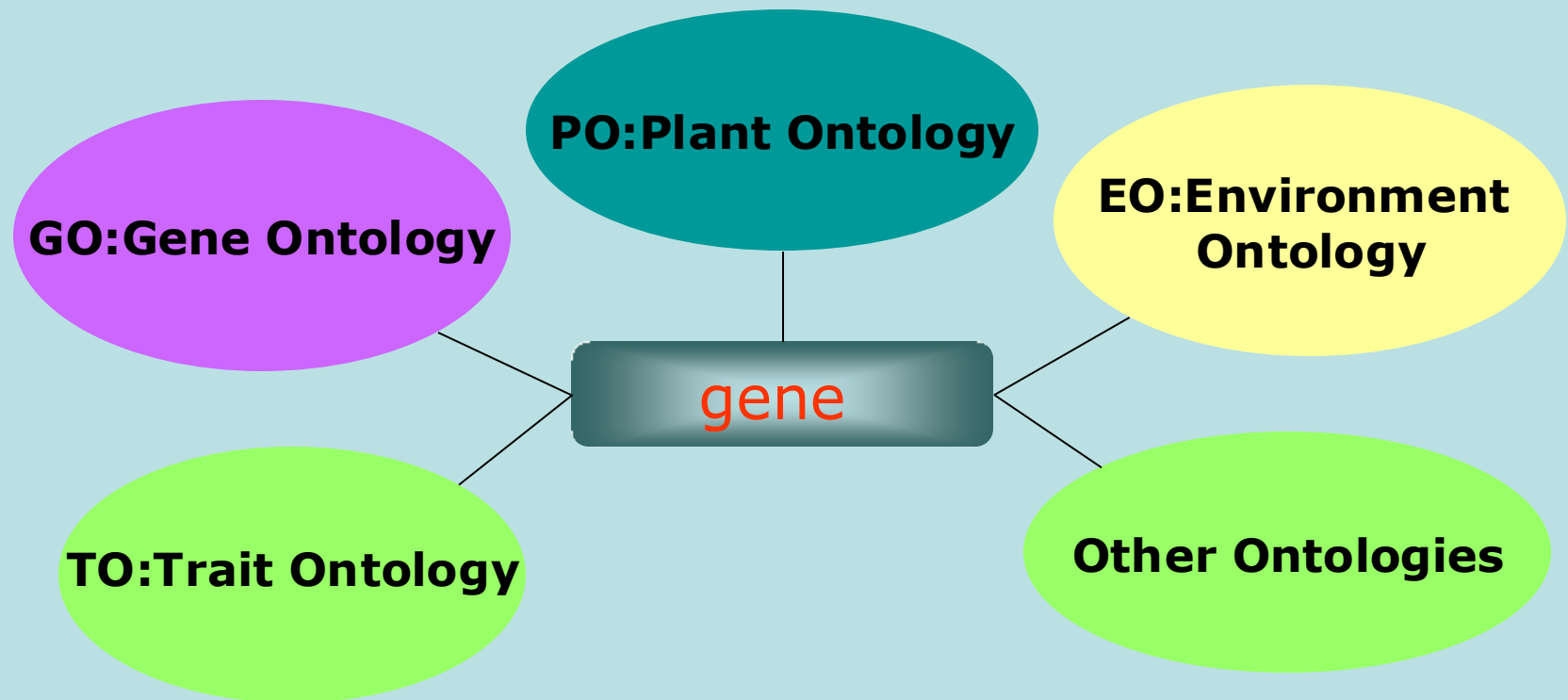
The plant ontology comprises terms covering two biological domains:

Plant Structure: Terms that describe morphological/anatomical structures of plants including organs, tissues and cell types.

Plant Development: Terms that describe stages in the growth and development of an entire plant including development of individual organs, tissues and tissue systems.

The relationship of PO to other ontologies

The plant ontology complement and do not overlap with other ontologies that describe characteristics of gene products.



Using ontologies to describe gene products

Environment/treatment

EO: Environment ontology

Function/Role

GO:molecular function

GO:biological process

gene

Phenotype

PO: structure and growth

GO: biological process

TO:trait ontology

Expression/Protein localization

PO:structure and growth stage

GO:cellular component

What the plant ontology is

To facilitate the description/annotation of genes, gene products, gene expression, protein localization and phenotypes.

To provide a vocabulary for relating genes from different organisms. The vocabulary will only be as complex required to make detailed annotations.

At this moment, the Plant Ontology is not ready to use for taxonomic description.

End of tutorial