A tale of genome, annotations, metabolism and phylogenomics: the pea aphid genome resources
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CycADS: the Cyc Annotation Database System

The CycADS pipeline has proven to be useful in the generation of the AcypiCyc database and we plan to use the same metabolism genes annotation strategy for other arthropods sequenced genomes.

**WORKFLOW** : from CycADS to AcypiCyc, and beyond...

Data from GenBank and different gene annotation tools (such as KAAS, PRIAM, Blast2GO, PhyloDB, etc.) are collected in an ad-hoc SQL database, the core component of CycADS.

A set of Java programs allows the data upload from the different annotation sources.

Each annotation receives an evidence score and a specific filter is applied to extract the best annotation that is then included in the “Pathlogics” file (PF) used by Pathway Tools to generate a filtered and enriched Cyc database.

The CycADS pipeline allows automated updates of a given BioCyc database as soon as new gene/protein annotation data are available.

AcypiCyc, as all BioCyc databases, offers a framework for the analysis of the integrated metabolic network and different query tools allow the user to visualize different metabolic reactions and pathways. Thanks to CycADS several supplementary specific links can be added to complement the classic existing ones. This feature is most valuable for newly sequenced genomes that are kept in community based repository (such as AphidBase for the pea aphid).

Not only enzymes, but all genes are present in AcypiCyc. All gene pages include an annotation summary with an associated score and a set of hyperlinks to different information resources including genomics (AphidBASE and GenBank), phylogenomics (PhyloDB) and metabolism (KEGG orthology, BRENDA, ENZYME) database.

AcypiCyc: a CycADS powered database

AphidBase is a comprehensive information system set up to safely centralize, manage, mine, disseminate and promulgate data generated by the International Aphid Genomics Consortium.

It allowed an international broad community dispersed at many sites to produce a robust and comprehensive annotation of the pea aphid genome by curating gene models and gathering manual and functional annotations, which is an essential step to attain a basal data quality.

**URL:**
- CycADS : [http://www.inra.fr/cycads_eng](http://www.inra.fr/cycads_eng)

A gene based phylogenetic analysis was performed for the pea aphid using the Phylome pipeline and the results are stored in the PhylomeDB database. Links to the database are provided both from AcypiCyc and AphidBase.

The phylome analysis has also allowed the transfer of GO annotation from Drosophila melanogaster to the pea aphid.

**URL:**
- [http://www.phylomedb.org](http://www.phylomedb.org)
- [http://apridb.org](http://apridb.org)
- [http://aphidbase.org](http://aphidbase.org)
- [http://www.aphidatlas.org](http://www.aphidatlas.org)

Chado Module : a Java middleware for Chado

For connecting applications or scripts handling or presenting data stored into our GMOD-Chado databases, we developed two middleware, in Perl and in Java.

We used JAVA J2EE and a model-driven-architecture system (AndroMDA) for automatically generating the Hibernate classes from a Chado UML (A). Using these layers, we implemented 2 applications deployed on a Tomcat server : GMOD reports, a configurable reports builder for browsing gene, transcript or proteins (B,C) and navigating into the ontologies (D), and Chado search for accelerated database querying (E).

**URL:**
- [http://cycads-irisa.genebio.cnrs.fr](http://cycads-irisa.genebio.cnrs.fr)
- [http://www.aphidbase.org](http://www.aphidbase.org)
- [http://www.aphidatlas.org](http://www.aphidatlas.org)
- [http://www.lbbv.inra.fr](http://www.lbbv.inra.fr)