

# Annotation and down-stream analysis

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# AnnotationDbi

The *org.\** packages

- ▶ Curated data base of model organism annotations, e.g., *org.Dm.eg.db* annotates *Drosophila melanogaster*
- ▶ Gene-centric

Bimaps of 'Lkeys' and 'Rkeys' (values)

- ▶ Each package has a central 'Lkey': *org.Dm.eg.db* uses **entrez** gene identifiers as the Lkey
- ▶ Each bimap describes the mapping between the Lkey and its Rkey / value. E.g., *org.Hs.egENSEMBL* maps between Entrez and Ensembl gene identifiers

Metadata describing the content, e.g., `org.Dm.eg()` and `?org.Dm.egENSEMBL`

# *AnnotationDbi*: how it works

## Loading / available maps

- ▶ `library(org.Dm.eg.db)`
- ▶ `ls("package:org.Dm.eg.db")`

## Common operations

- ▶ Subset `[]`; subset-extract `[[`
- ▶ Interrogation: `mappedLkeys`, `mappedRkeys`
- ▶ Coercion: `toTable` (data frame), `as.list` (named list)
- ▶ Reverse mapping: `revmap`

# *AnnotationDbi*

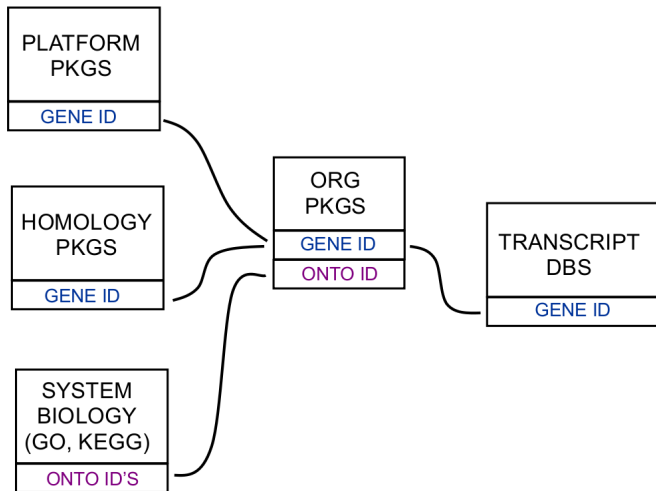
Other *AnnotationDbi* packages

- ▶ Pathways: KEGG, GO
- ▶ Homology
- ▶ Microarray

See [http:](http://)

[//bioconductor.org/packages/release/data/annotation/](http://bioconductor.org/packages/release/data/annotation/)

# Under the hood: SQLite



# Biomart

## Biomarts

- ▶ Collection of data bases with common interface
- ▶ Explorable at <http://biomart.org>

## *biomaRt*

- ▶ Discover: `listMarts`, `listDatasets`, `listFilters`,  
`listAttributes`
- ▶ Select: `useMart`, `useDataset`, ...
- ▶ Retrieval: `getBM`

## *AnnotationDbi* or *biomaRt*?

- ▶ current, stable, versioned versus up-to-the-minute, extensive, whims of internet availability

## Via *rtracklayer*

- ▶ import and export common formats, e.g., bed, wig, from / to *GRanges* instances
- ▶ Start a browser session: `session <- browserSession("UCSC")`
- ▶ Lay a track: `track(session, "targets") <- targetTrack`
- ▶ Retrieve a track: `ensGene <- track(session, "ensGene")`
- ▶ See `browseVignettes("rtracklayer")`

## Via *GenomicFeatures*

- ▶ Later in presentation

# GEO, ArrayExpress

- ▶ Previous experiments as very rich source of data

e.g., *GEOquery*

- ▶ Search, e.g.,
- ▶ Retrieve
- ▶ End result: *ExpressionSet*, a standard *Bioconductor* representation of a microarray experiment



# GenomicFeatures

- ▶ Structural information about genes: exon, transcript, coding sequence coordinates
- ▶ Uses *GenomicRanges*, so fits well with sequence analysis tools
- ▶ Created by querying, e.g., UCSC for *ensGene* track
- ▶ Saved as SQLite data bases
- ▶ 'Forge' to create packages, e.g., to share in a working group