



Creating the Kidney and Urinary Pathways Ontology (KUPO)

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Simon Jupp
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UNIVERSITÉ
DE GENÈVE



e-LICO

e-Laboratory for Interdisciplinary Collaborative research
in data-mining and data-intensive sciences

What?

FP7 european project

What for?

Create a laboratory for efficient data-mining in KUP diseases

KUP Ontology (KUPO)

What?

Focused and detailed description of the kidney from its anatomy to protein functionality.

What for?

Controlled vocabulary for annotating data; allow richer querying over annotated data.

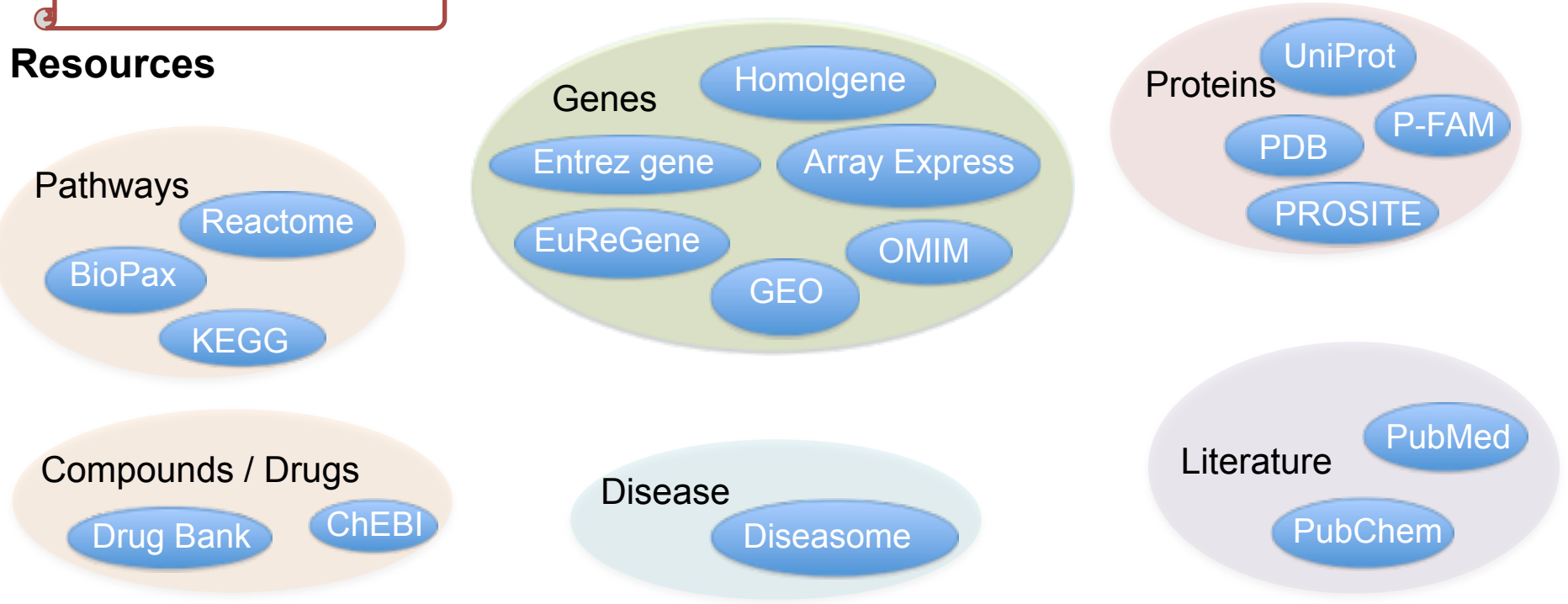
Many but sparsed disposable resources

Ontologies



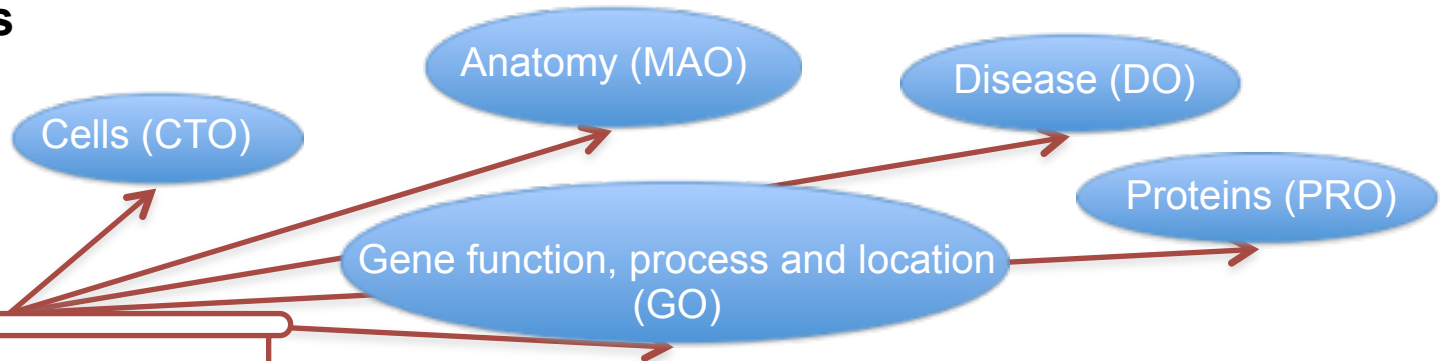
**Kidney specific dataset
(e.g. urinary proteins)**

Resources



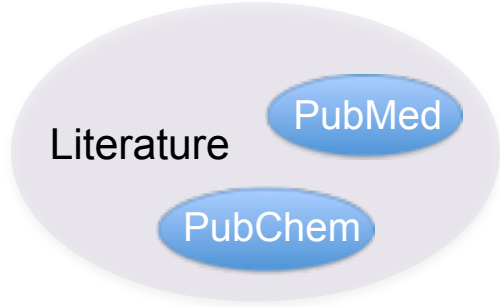
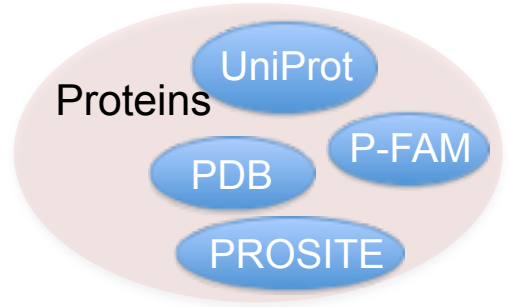
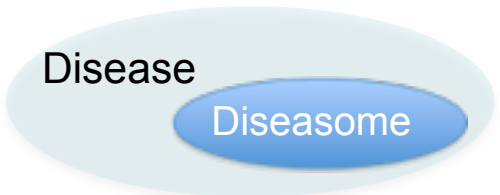
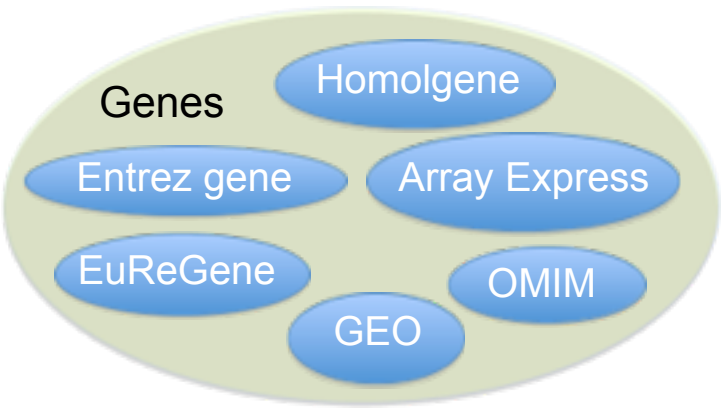
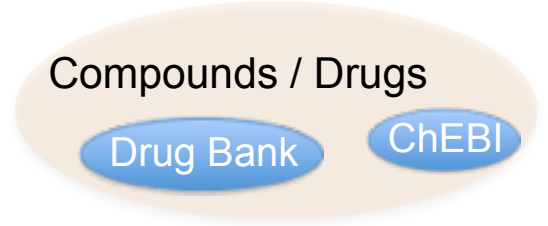
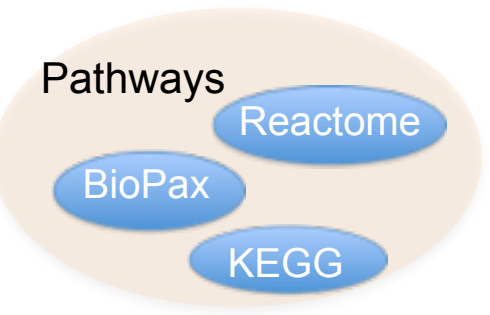
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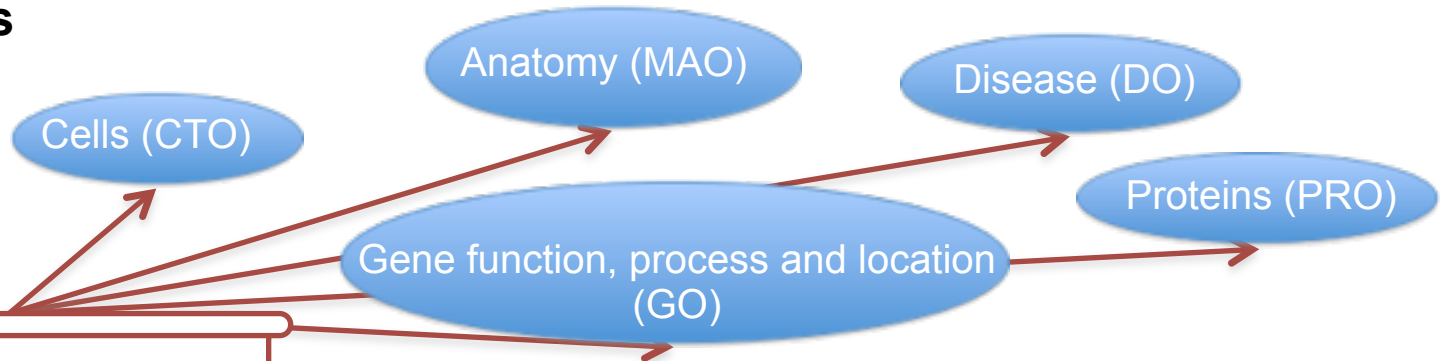
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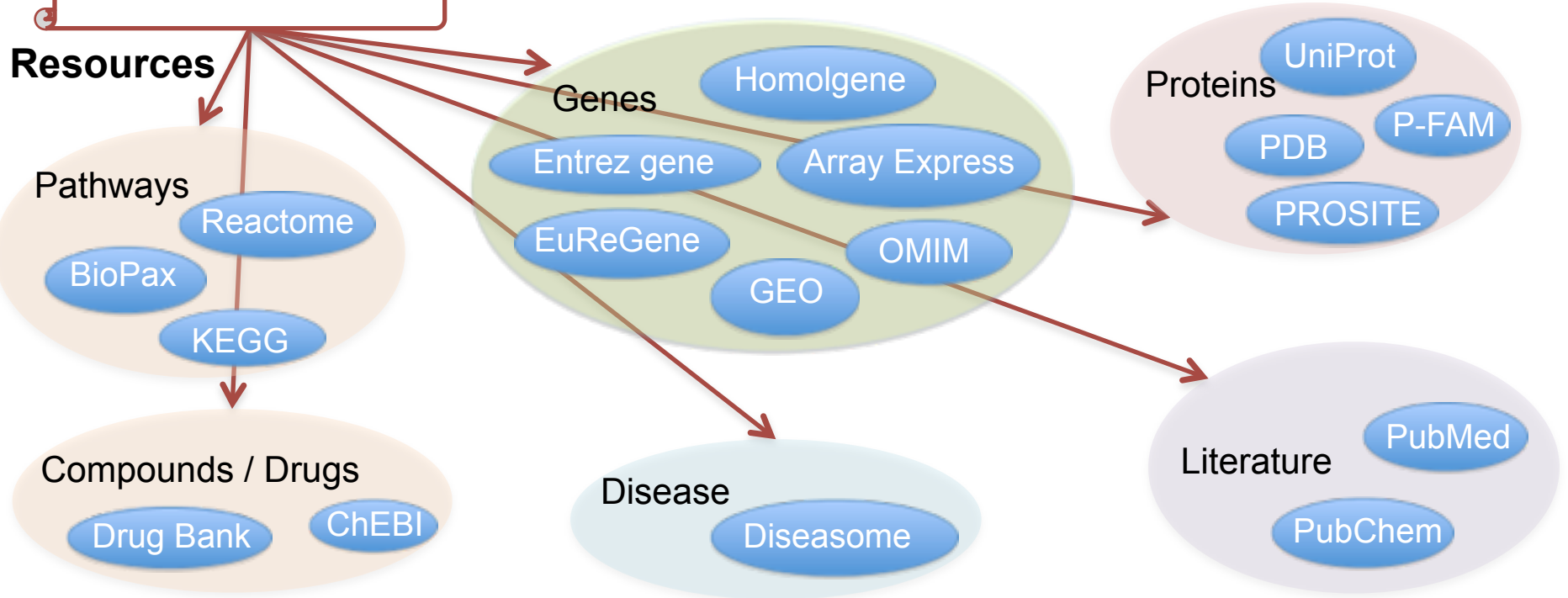


Many but sparsed disposable resources

Ontologies



Resources

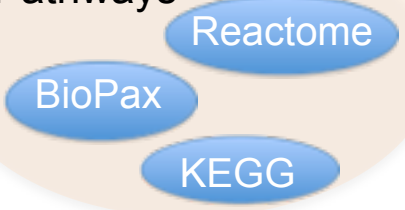


Connecting resources



Resources

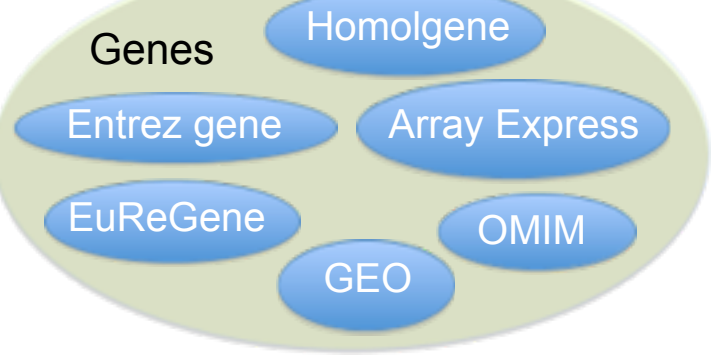
Pathways



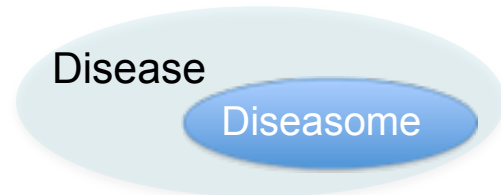
Compounds / Drugs



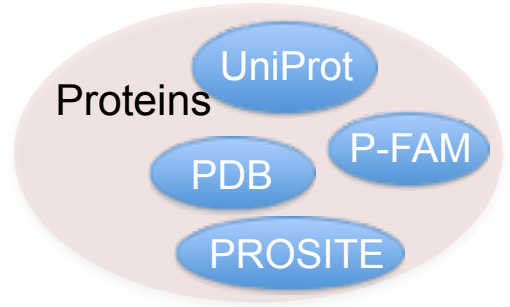
Genes



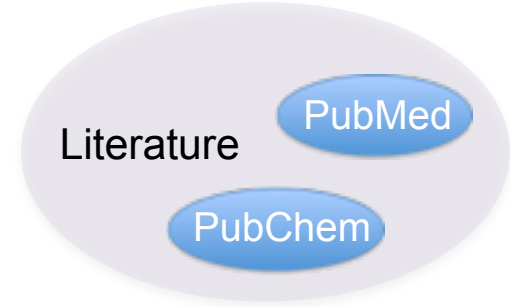
Disease



Proteins

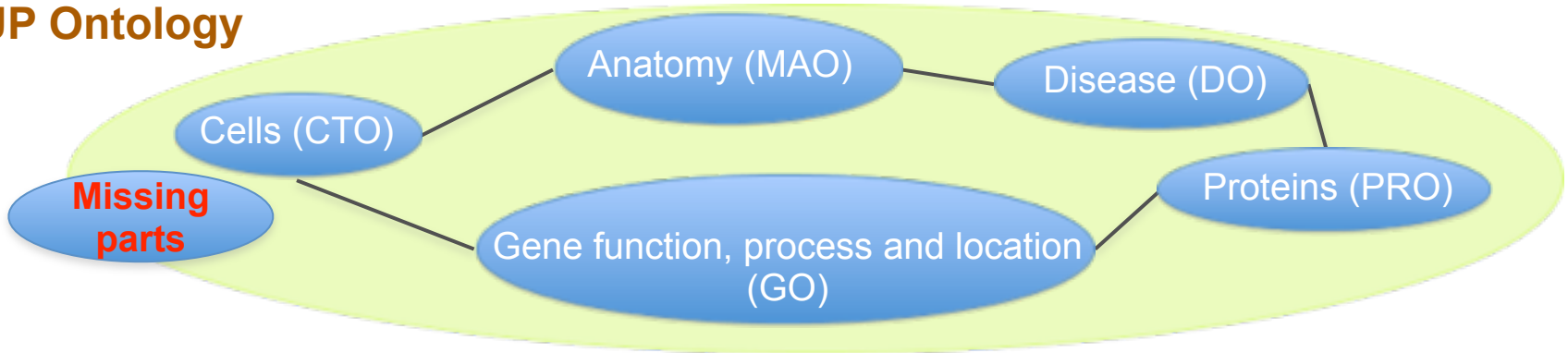


Literature



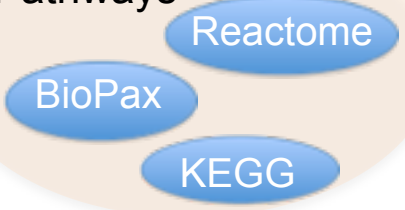
Connecting resources

KUP Ontology



Resources

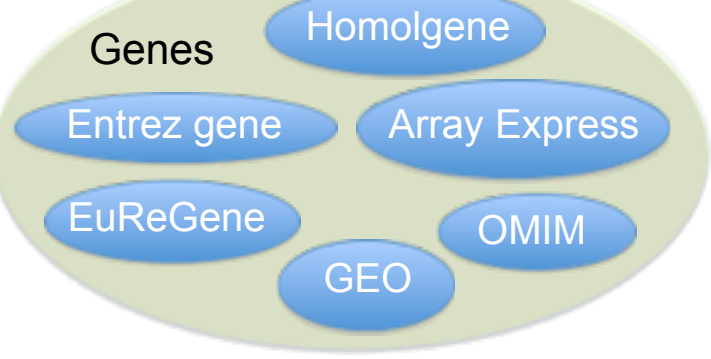
Pathways



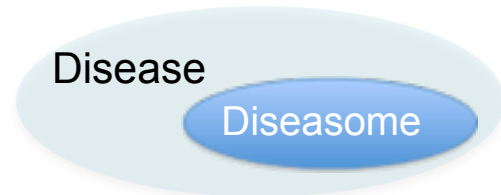
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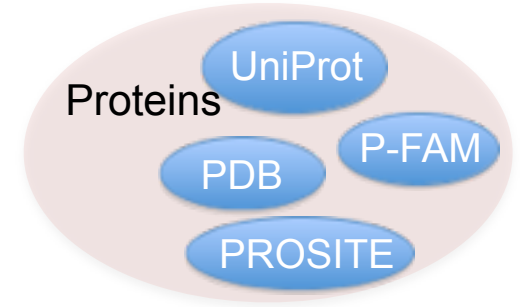
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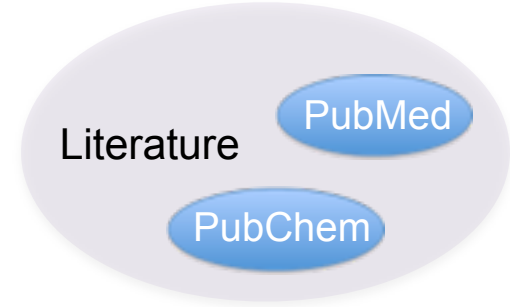
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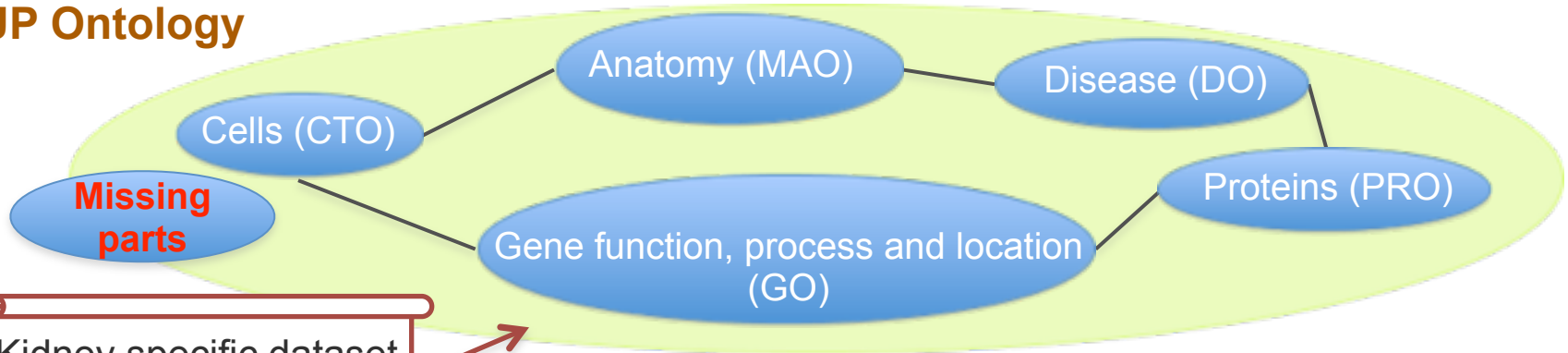


Literature



Connecting resources

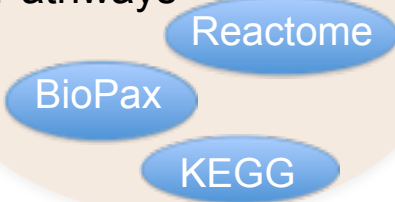
KUP Ontology



Kidney specific dataset
(e.g. urinary proteins)

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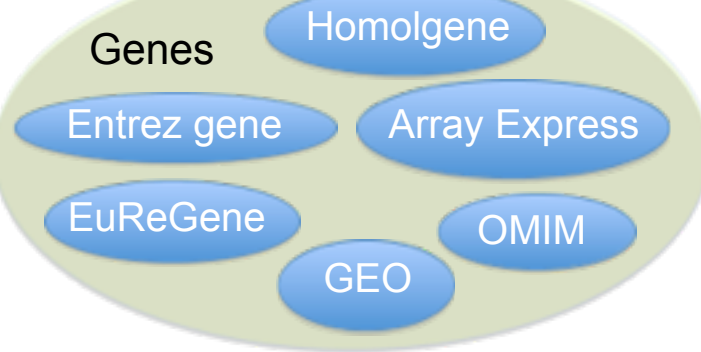
Pathways



Compounds / Drugs



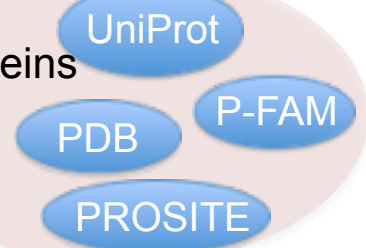
Genes



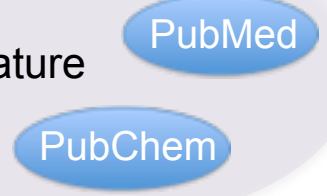
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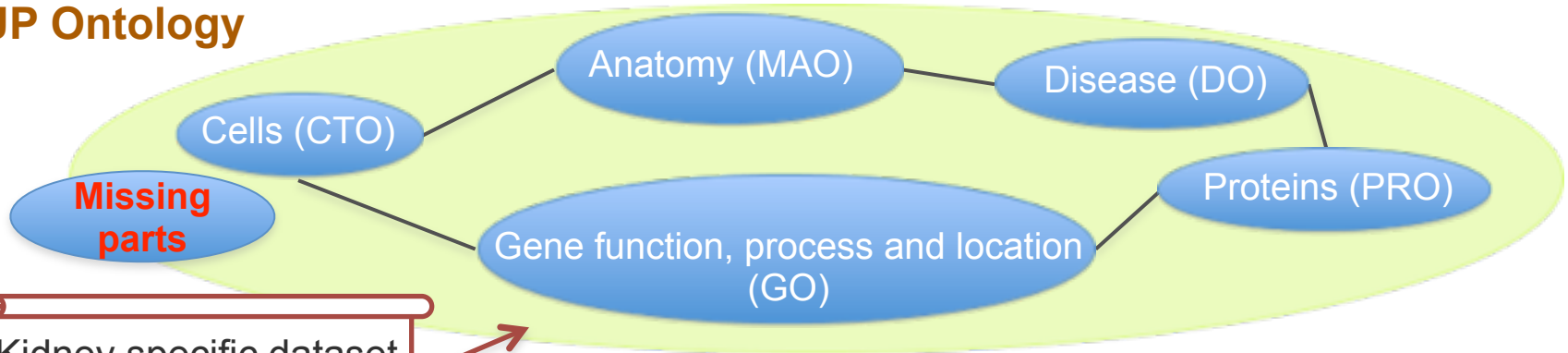


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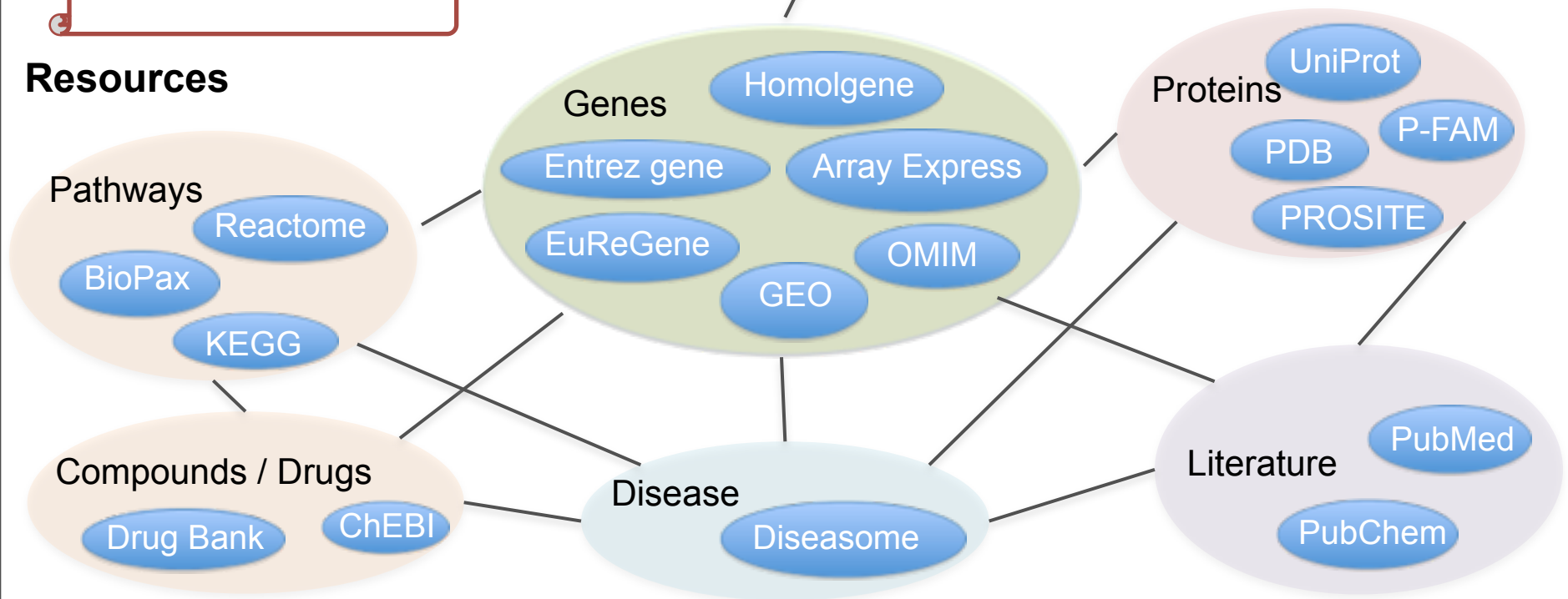
Connecting resources

KUP Ontology

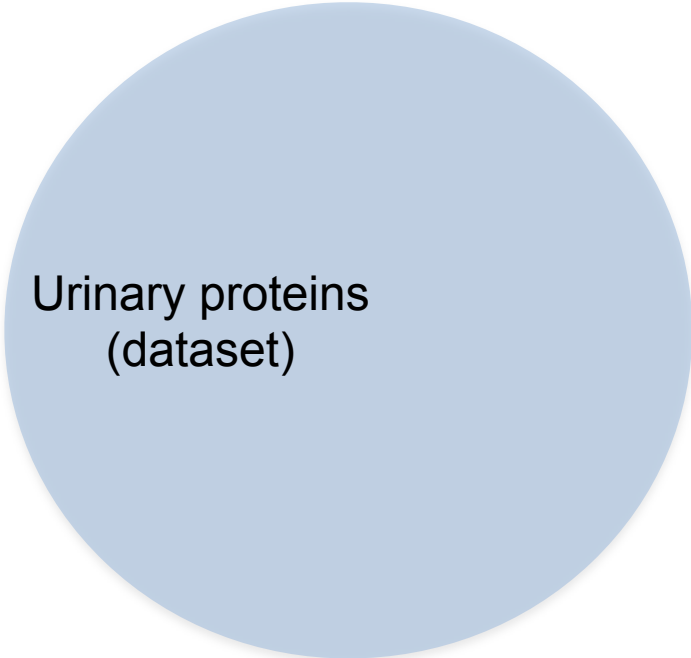


Kidney specific dataset
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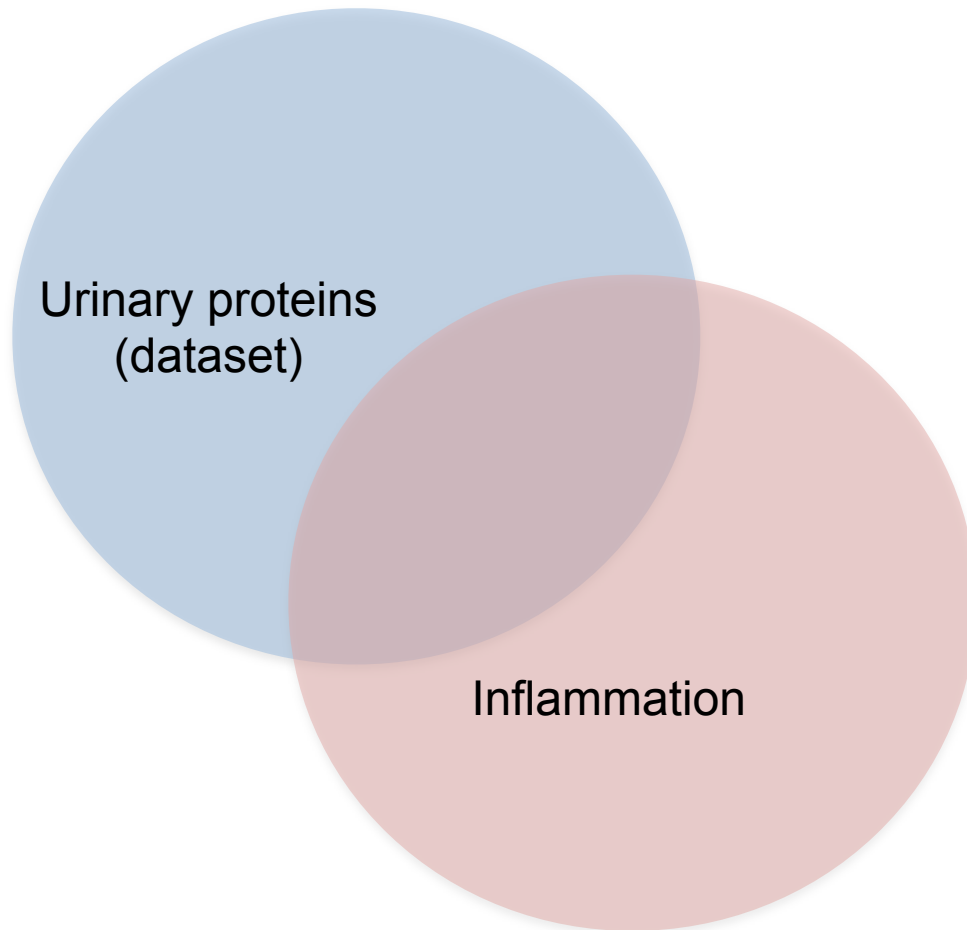


Richer queries

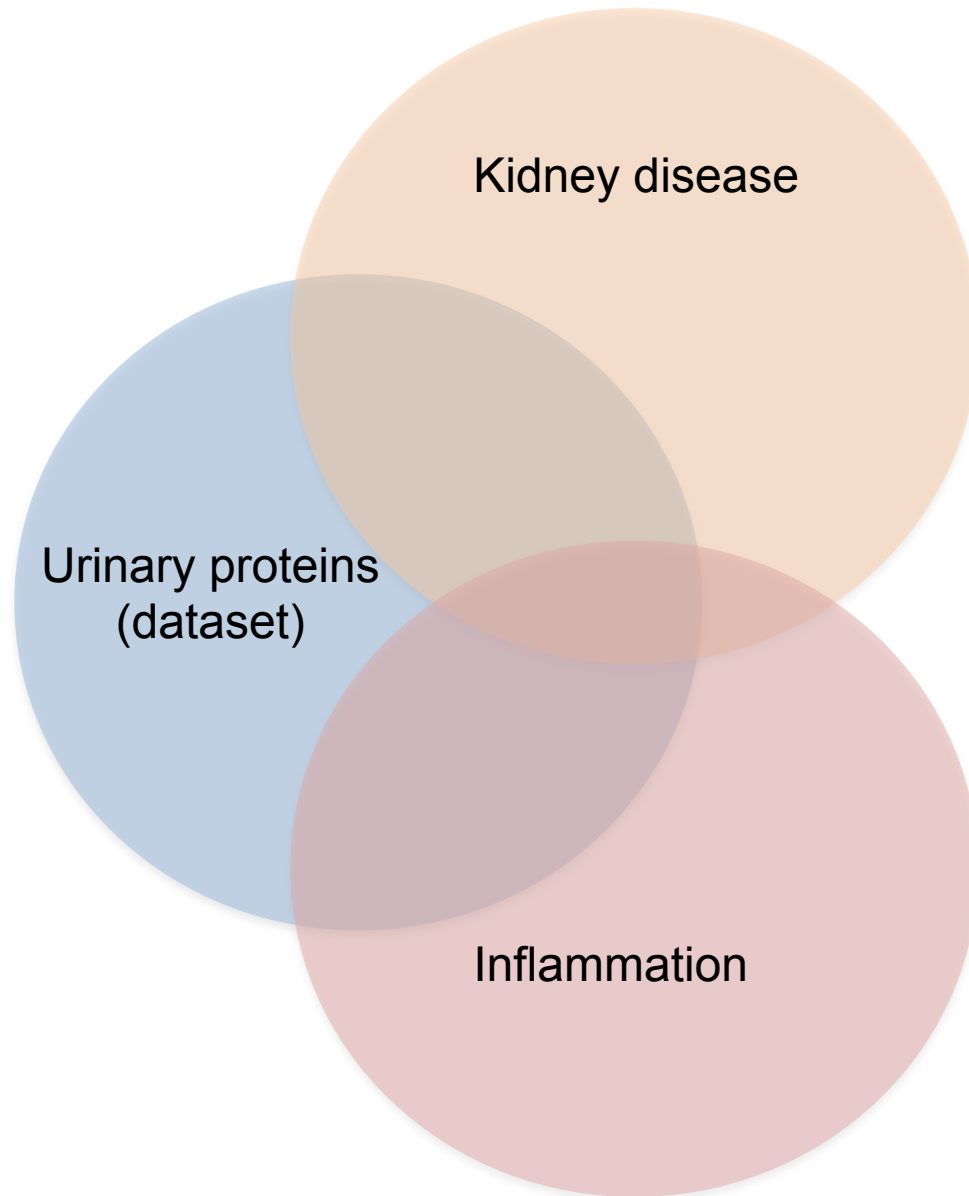


Urinary proteins
(dataset)

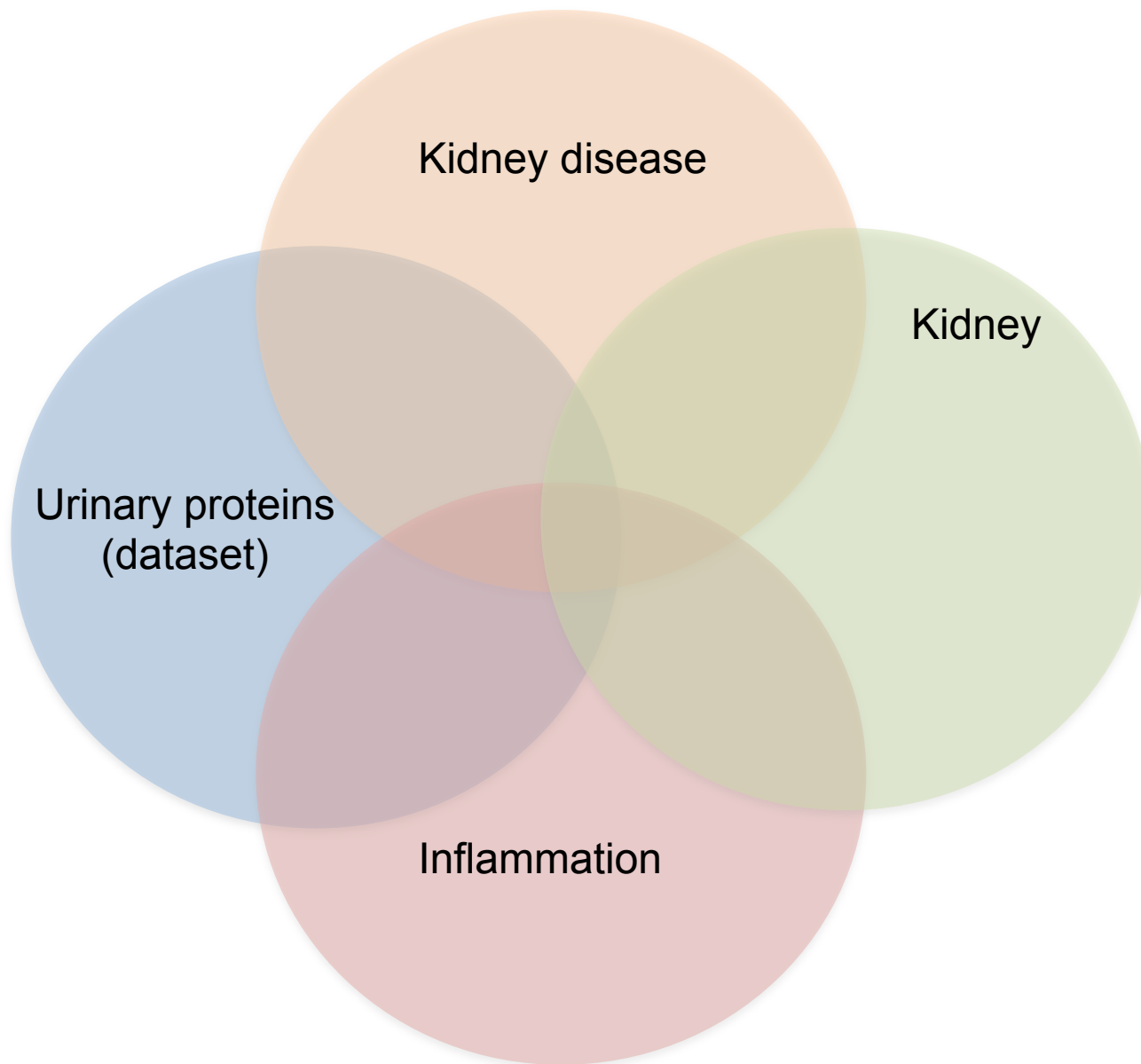
Richer queries



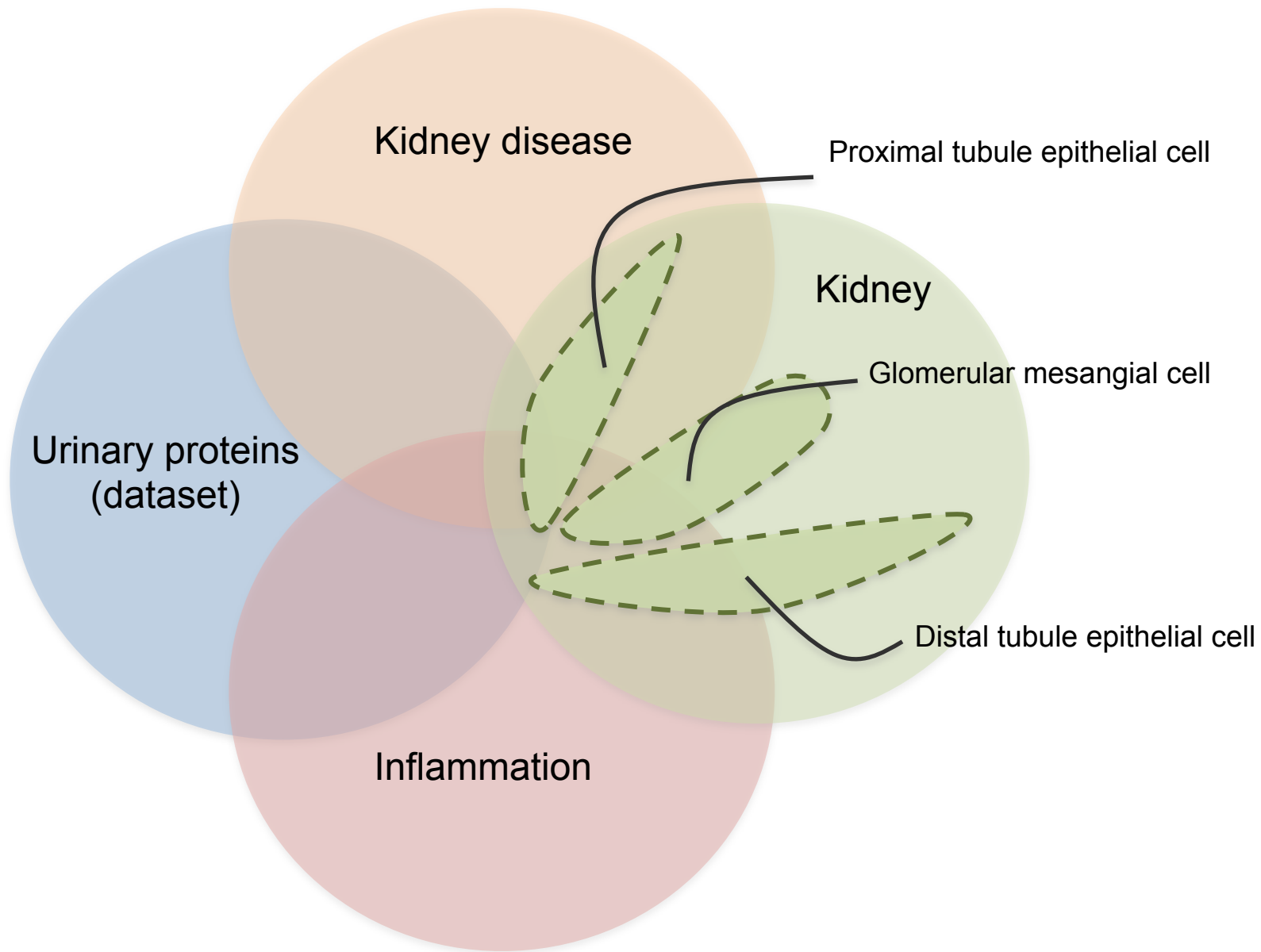
Richer queries



Richer queries

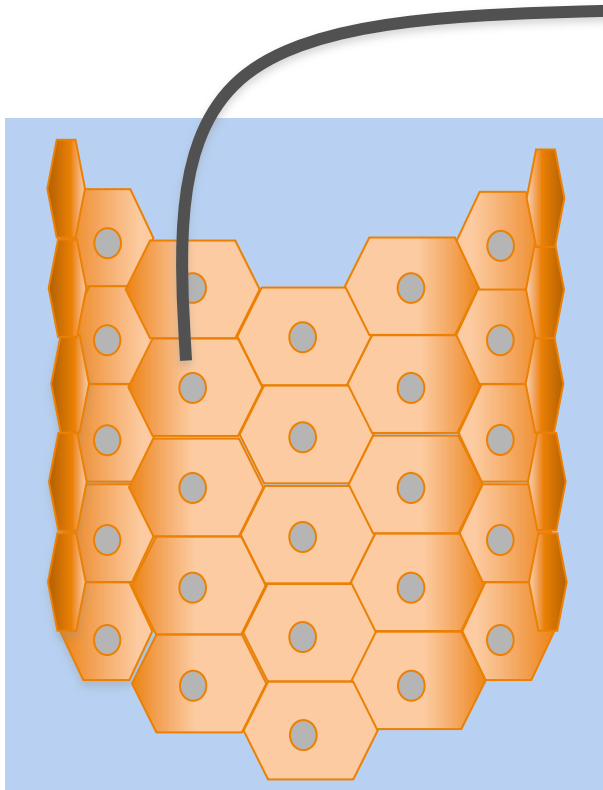


Richer queries



KUPO: Renal cell type part

Proximal convoluted tubule epithelial cell



Is_a

epithelial cell (CTO)
proximal tubule epithelial cell (new)
kidney cortex cell (new)

Participates_in

renal sodium ion absorption (GO)
renal water absorption (GO)
renal potassium ion absorption (new)
renal chloride ion absorption (new)
renal calcium ion absorption (new)
renal magnesium ion absorption (new)
renal urea absorption (new)
renal peptide absorption (new)
renal glucose absorption (new)
renal bicarbonate ion absorption (new)
renal drug secretion (new)
renal acid secretion (new)
renal base secretion (new)
cytokine production (GO)
epithelial to mesenchymal transition (GO)

Terms and labels

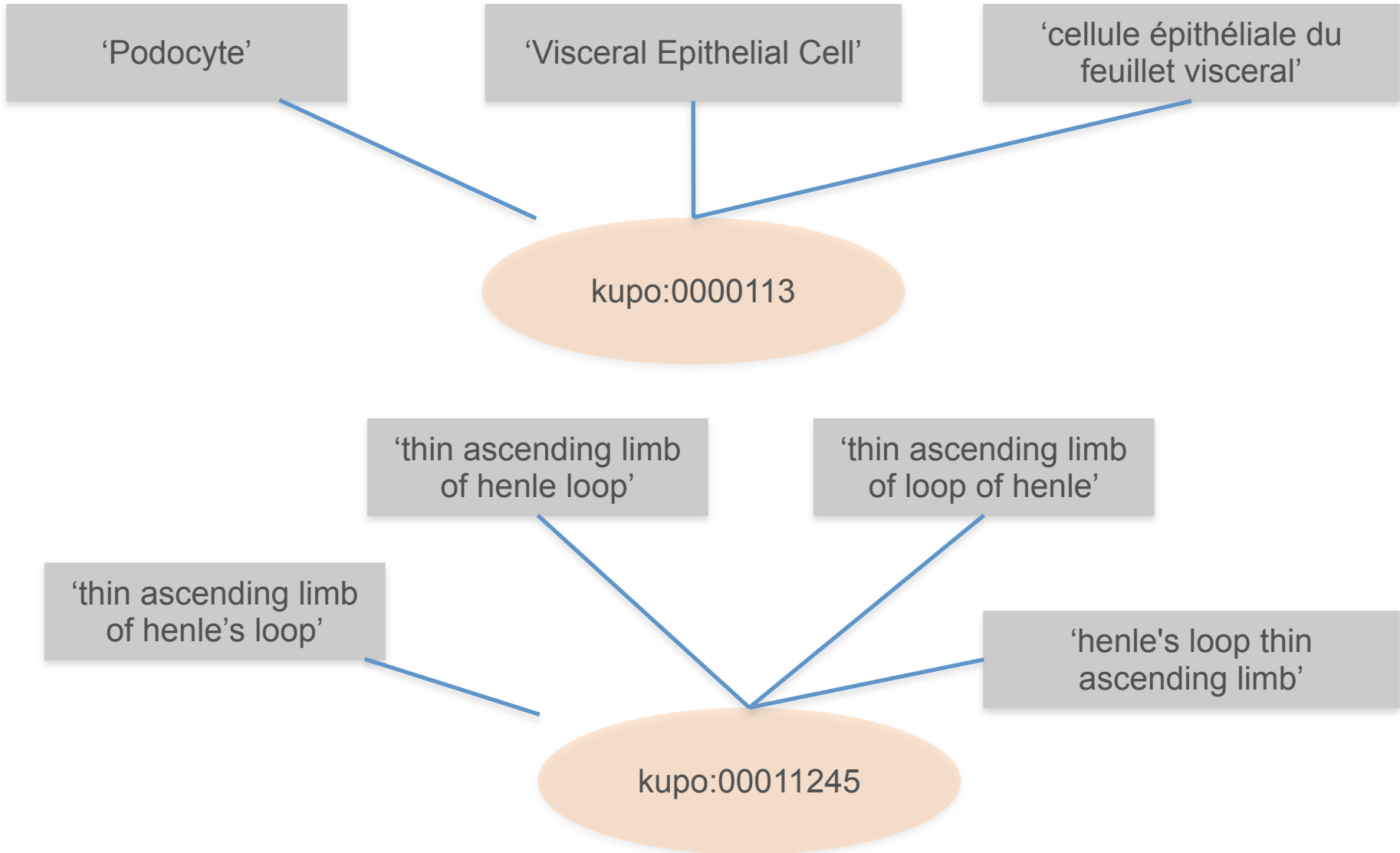
'Podocyte'

kupo:0000113

'thin ascending limb
of henle's loop'

kupo:00011245

Terms and labels



KUPO Ontology

Proximal tubule epithelial cell

PTEC

kupo:002444

Part_of

MA:00345

Proximal Tubule

KUPO Ontology

Proximal tubule epithelial cell

PTEC

kupo:002444

Part_of

MA:00345

Proximal Tubule

Localization database

Protein X

Expressed_in

MA:00345

Proximal Tubule

Pubmed

“Protein X is induced in PTEC”

KUPO Ontology

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Proximal Tubule

Current Fashion

Query: What are the proteins (in my dataset) related to
Transport proteins in **Proximal Tubule Epithelial Cell**?



Protein dataset

Current Fashion

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Protein dataset



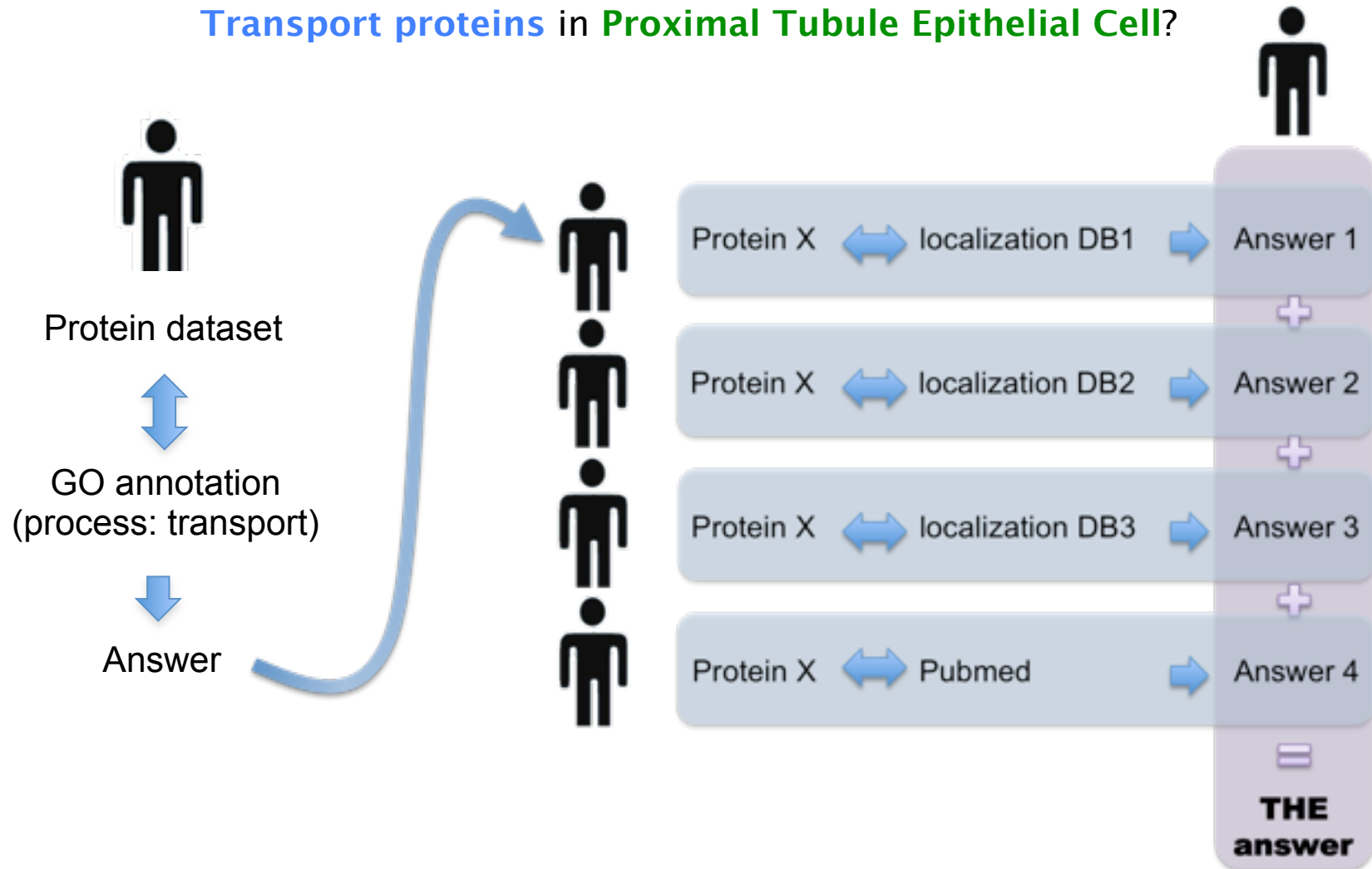
GO annotation
(process: transport)



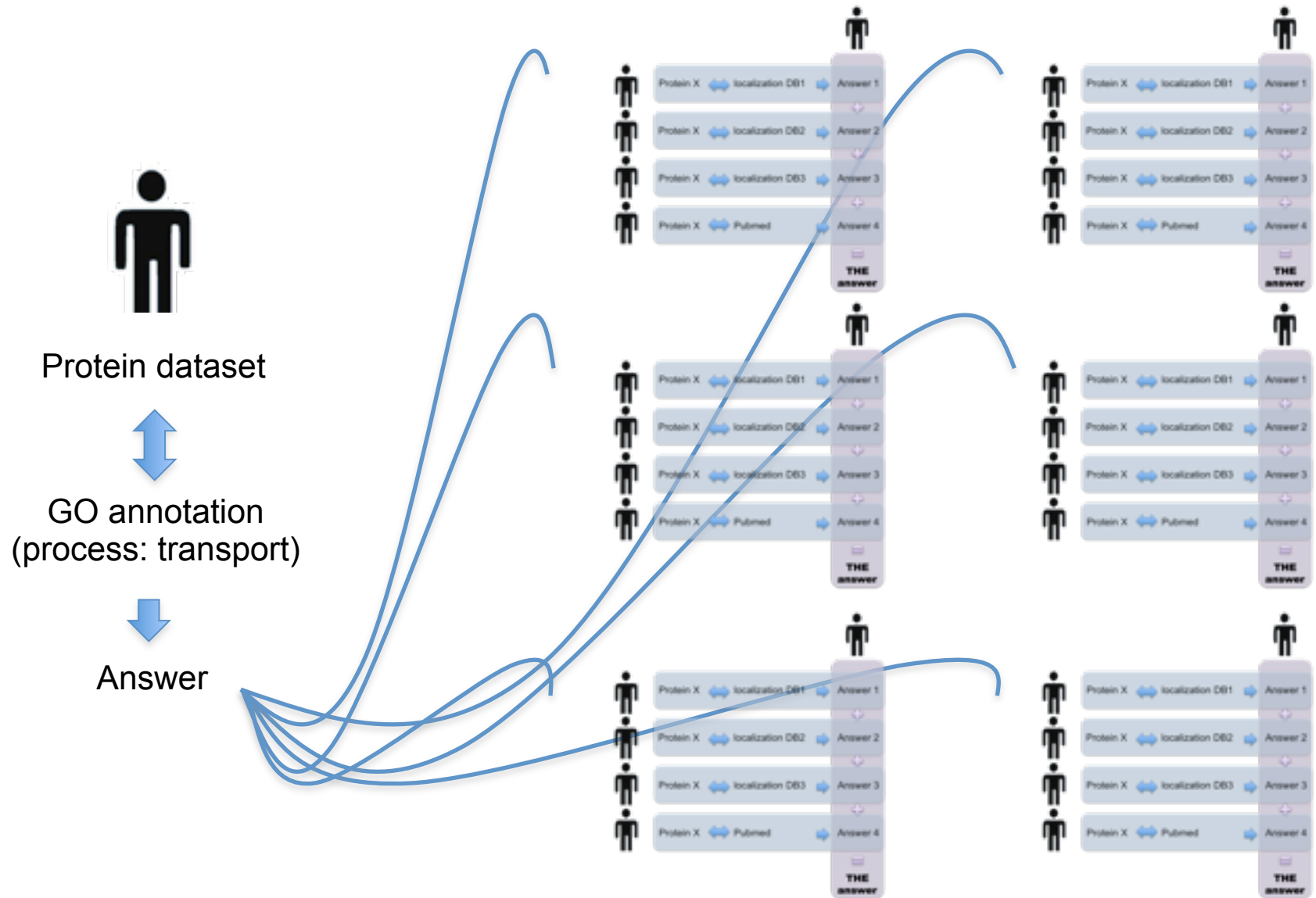
Answer

Current Fashion

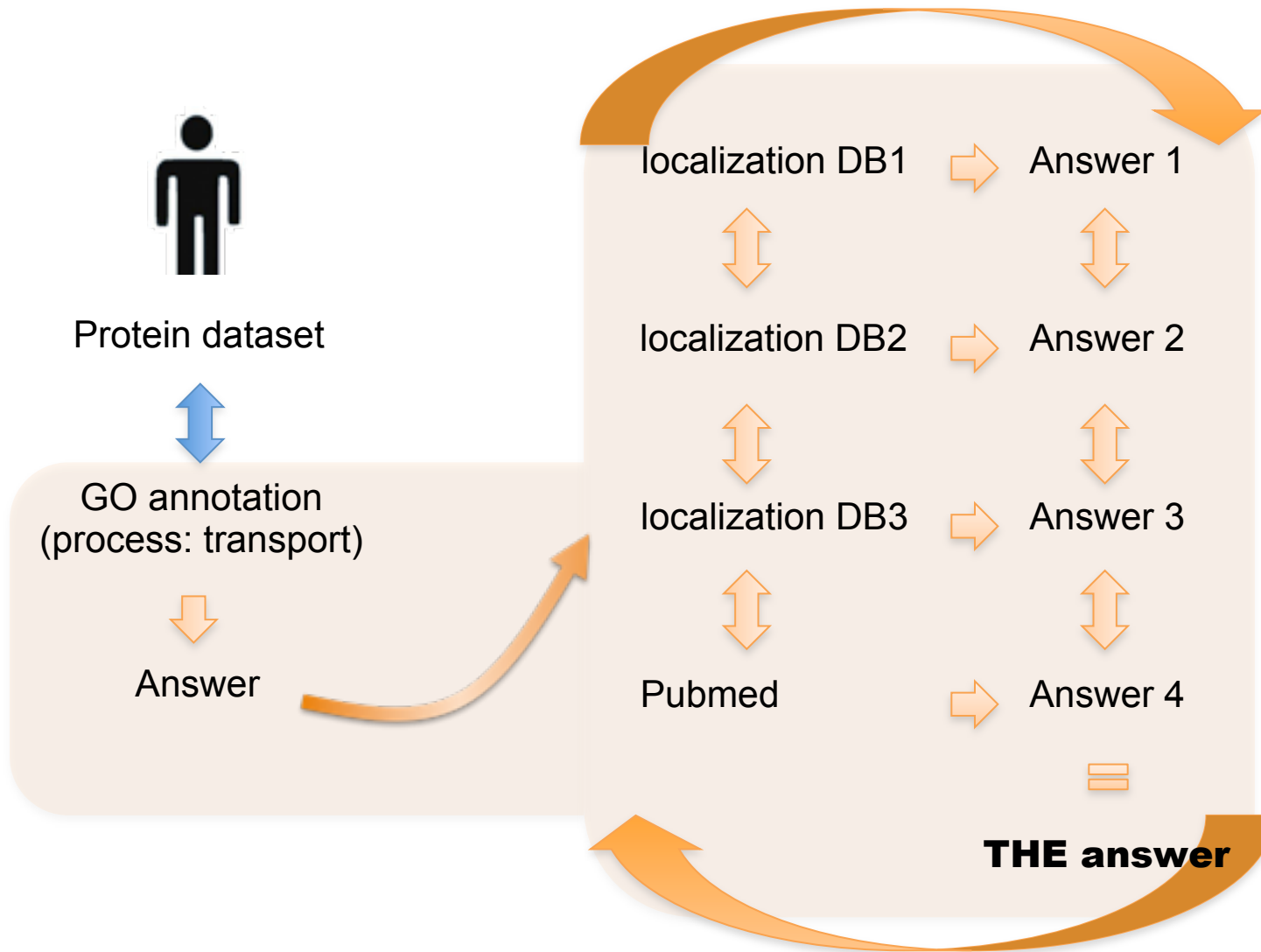
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Current Fashion



New Fashion?



Query: What are the proteins (in my dataset) related to
Transport proteins in **Proximal Tubule Epithelial Cell**?

GO Annotation DB

KUPO Ontology

EuReGene Dataset

Query: What are the proteins (in my dataset) related to
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```
SELECT ?protein WHERE  
{?proteinX go:biological_process GO:0054426 .  
?proteinX kupo:expressed_in ?mouse_anatomy .  
CTO:002444 ro:part_of ?mouse_anatomy}
```

GO Annotation DB

KUPO Ontology

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GO Annotation DB

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ANSW

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GO Annotation DB

Protein X

GO:0054426

go:biological_process

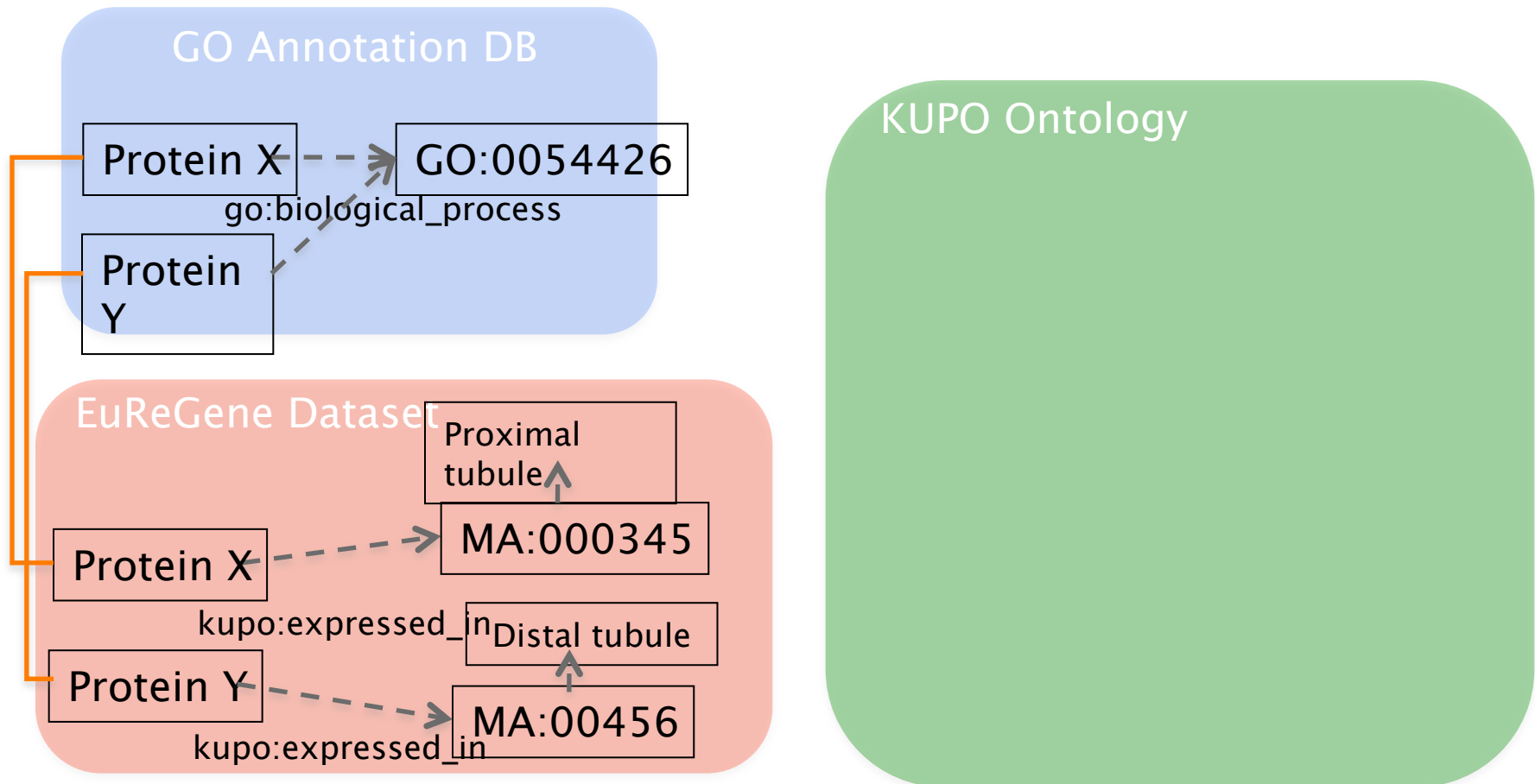
Protein
Y

EuReGene Dataset

KUPO Ontology

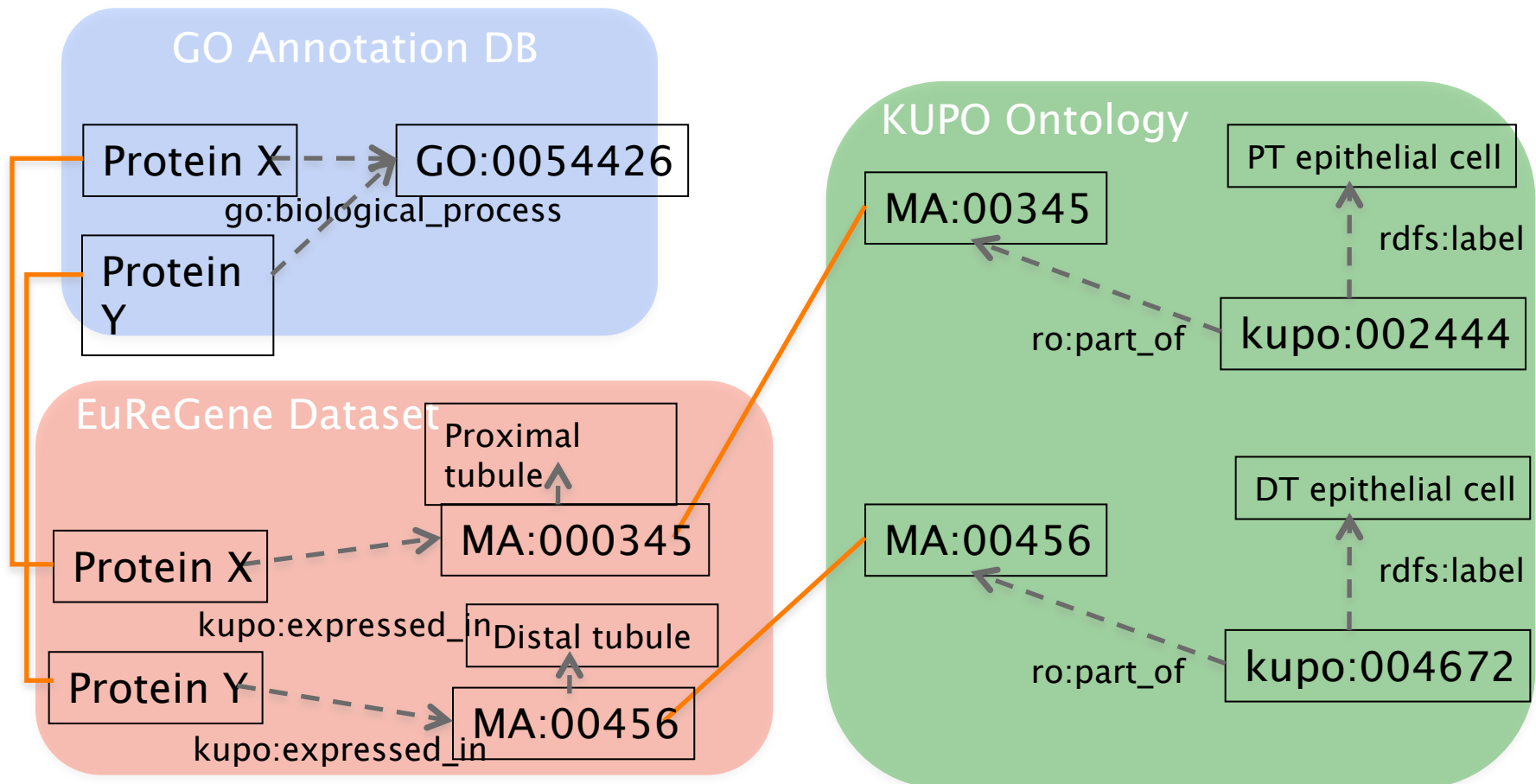
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```



Some statistics

- Cell types: 90 currently described
 - >80 new terms not in CTO
- Anatomical terms: Kidney sub-tree from Mouse Anatomy
 - ~10 new anatomical terms created
- GO Biological Process: ~30 new terms created
 - Submit to Renal GO working group
- KUPO: 182 classes, 340 sub class axioms.
 - 21,792 classes including imported ontologies

Download development version:

http://www.e-lico.eu/public/kupo_28_10_09.owl

What's next?

KUPO day:

Enrich the KUPO with a number of EuroKUP members.

Terri Atwood

Erik Bongcam-Rudloff

Aris Charonis

Hassan Dihazi

Harry Holthofer



Franck Molina

Alberto Ortiz

Marta Sánchez-Carbayo

Dimitar Vassilev

Antonia Vlahou

