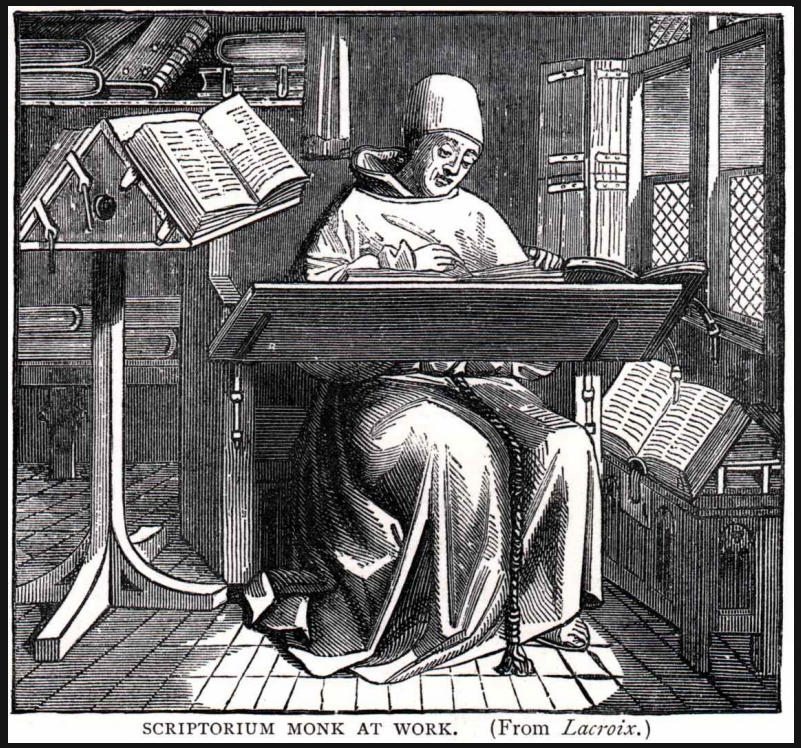
How we assist knowledge collection

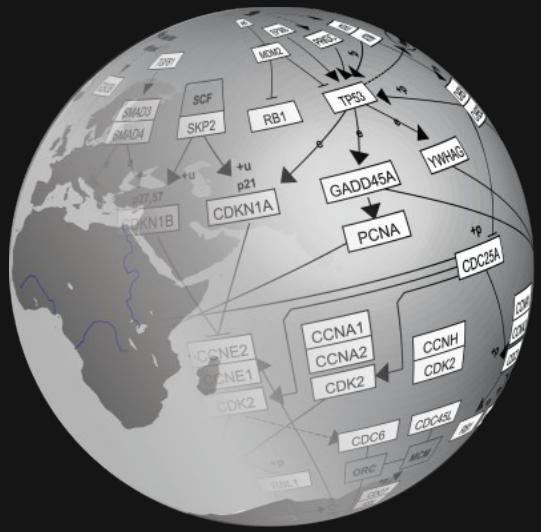


SCRIPTORIUM MONK AT WORK. (From *Lacroix.*)

Chris Evelo

Dept of Bioinformatics – BiGCaT
Maastricht University

Serving
the monks



WIKIPATHWAYS

Paper:
WikiPathways: Pathway Editing for the People. Alexander R. Pico, Thomas Kelder, Martijn P. van Iersel, Kristina Hanspers, Bruce R. Conklin, Chris Evelo. **PLoS Biology** 2008: 6: 7. e184

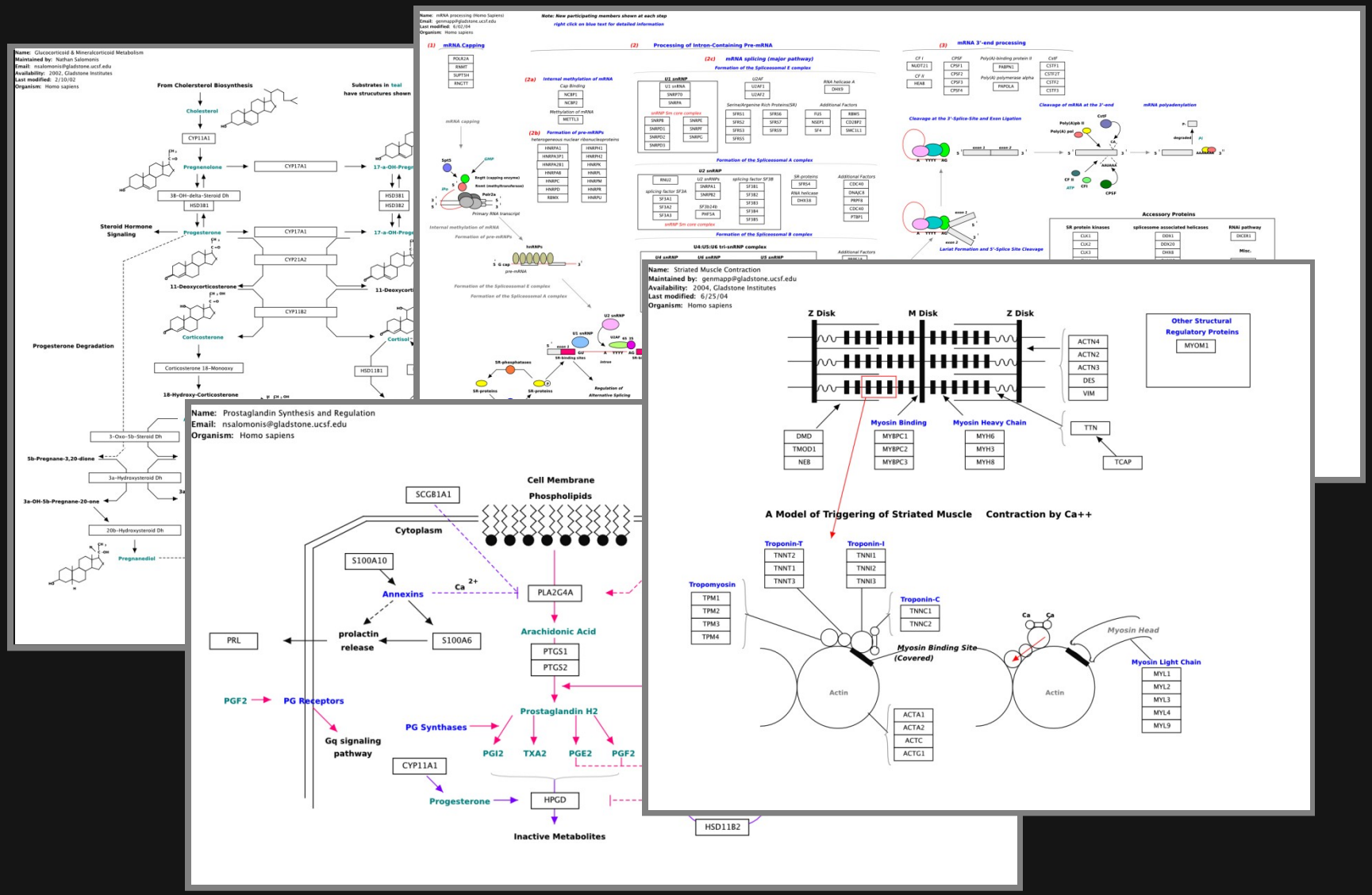
Commentaries:
Big data: Wikiomics. Mitch Waldrop. **Nature** 455, 22-25 (2008)
We the curators. Allison Doerr. **Nature Methods** 5, 754 - 755 (2008)

WikiPathways

- Public resource for biological pathways
- Wiki:
  - Anyone can contribute and curate

- More up-to-date representation of biological knowledge

What are biological pathways?

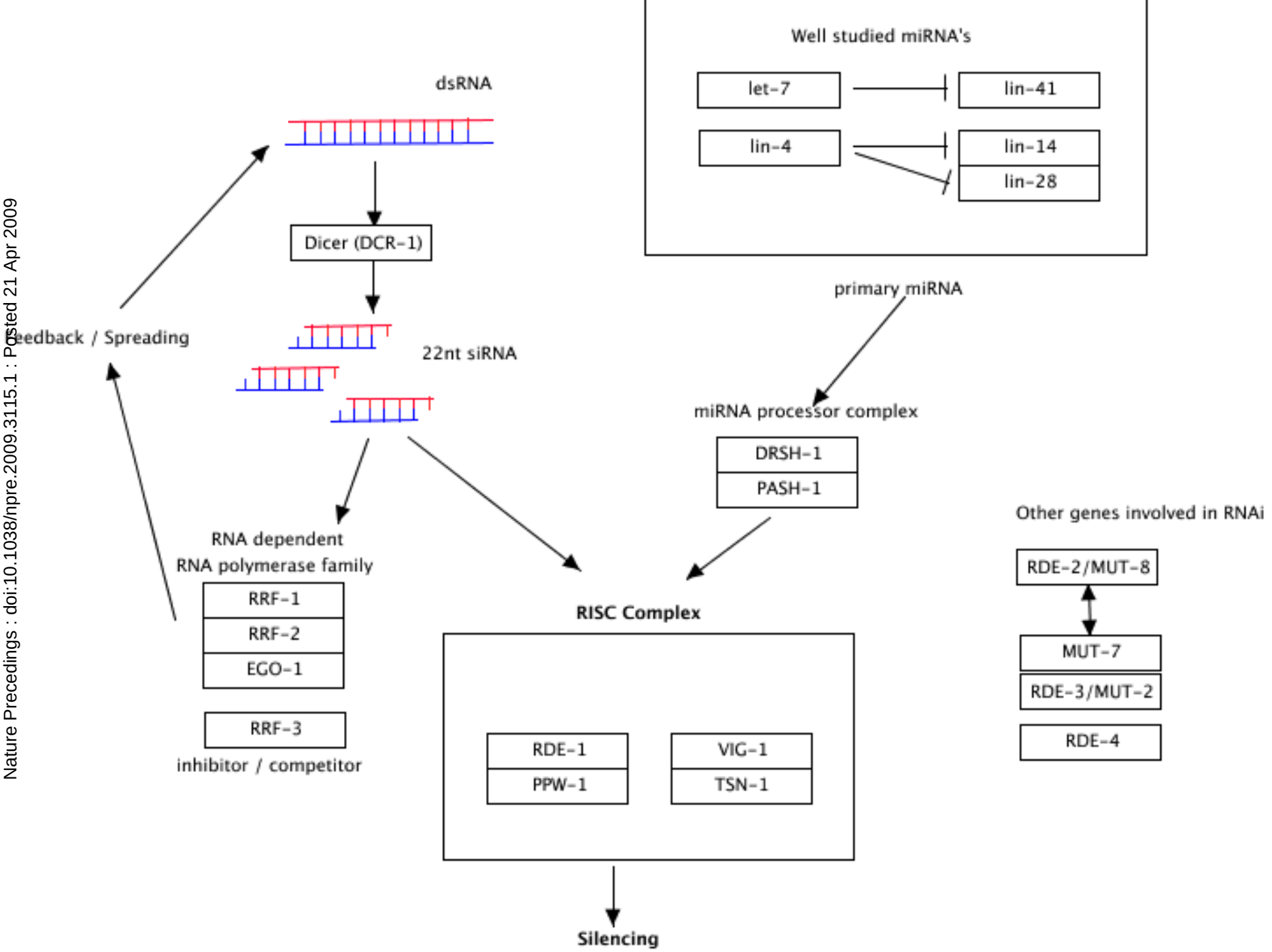


Nature Precedings : doi:10.1038/npre.2009.3115.1 : Posted 21 Apr 2009

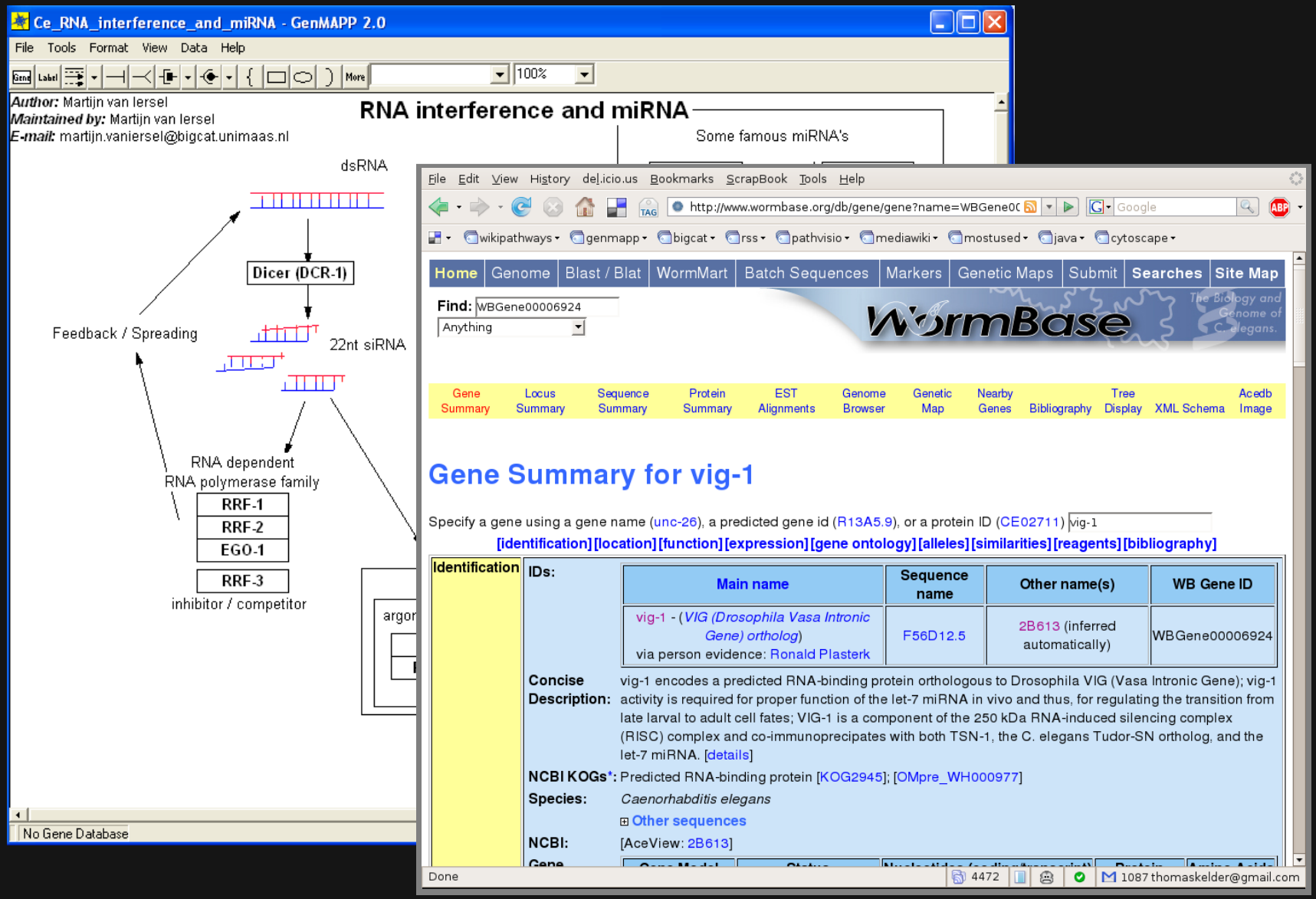
How are Pathways used?

- Example: RNA interference in *C. elegans*

The nematode *C. elegans*

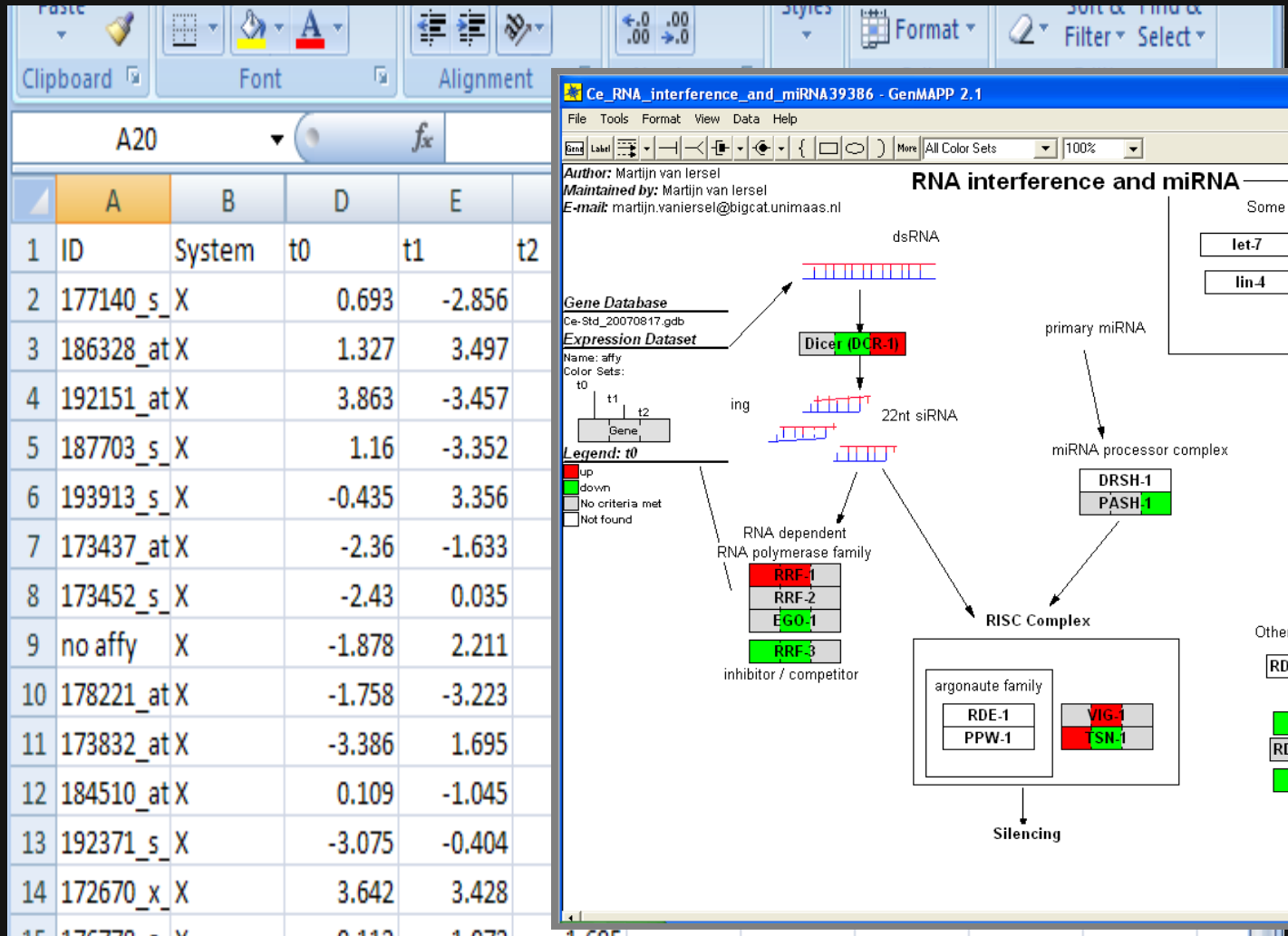


Connect to Genome Databases



Nature Precedings : doi:10.1038/npre.2009.3115.1 : Posted 21 Apr 2009

Data Visualization



	A	B	D	E	t2
1	ID	System	t0	t1	
2	177140_s_	X	0.693	-2.856	
3	186328_at	X	1.327	3.497	
4	192151_at	X	3.863	-3.457	
5	187703_s_	X	1.16	-3.352	
6	193913_s_	X	-0.435	3.356	
7	173437_at	X	-2.36	-1.633	
8	173452_s_	X	-2.43	0.035	
9	no affy	X	-1.878	2.211	
10	178221_at	X	-1.758	-3.223	
11	173832_at	X	-3.386	1.695	
12	184510_at	X	0.109	-1.045	
13	192371_s_	X	-3.075	-0.404	
14	172670_x_	X	3.642	3.428	
15	176778_s_	X	-0.112	1.072	-1.695

On to the real thing…
Fasten seat belts!

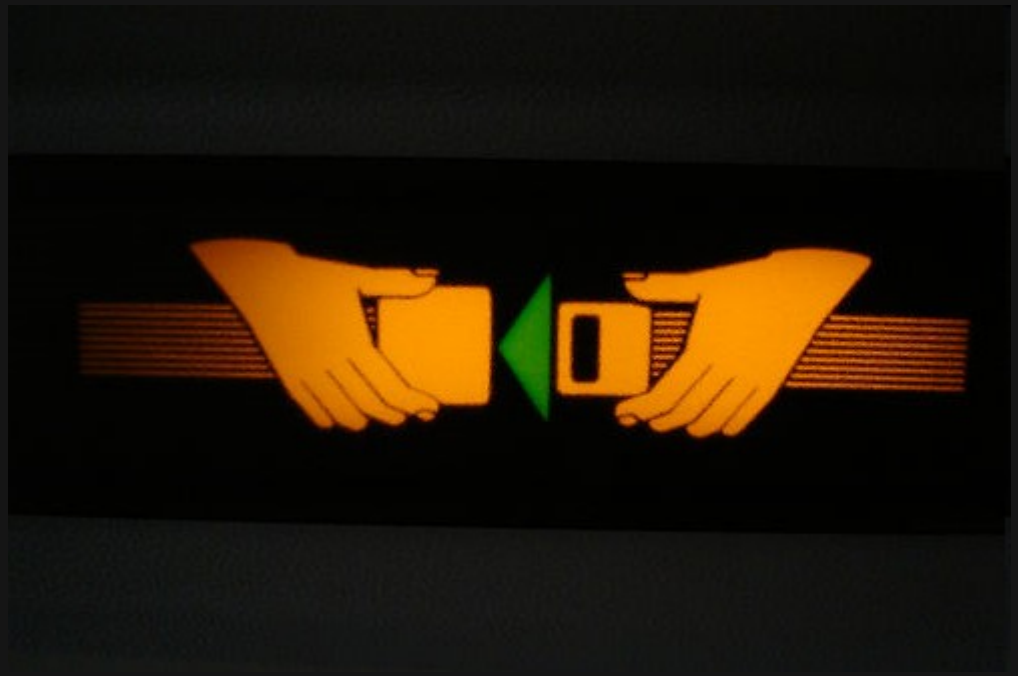


Photo by Timo Arnall

BETA

WIKIPATHWAYS
Pathways for the People

navigation
- Home
- Help

pathway
- Create
- Browse
- Wish List
- Download
- About Us

overview
- Recent Changes
- Most Viewed
- Most Edited
- New Pathways

links
- GenMAPP
- PathVisio

search
Google Custom Search
Titles only

toolbox
- What links here
- Related changes
- Special pages
- Printable version
- Permanent link

Welcome to WikiPathways BETA

In the new tradition of Wikipedia, WikiPathways is an open, public platform dedicated to the curation of biological pathways by and for the scientific community. More about WikiPathways...

Finding Pathways

Search

Google Custom Search

Search

You can search by:

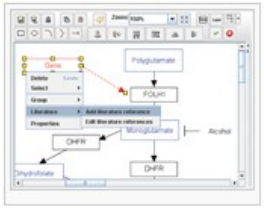
- Pathway name *(Apoptosis)*
- Gene or protein name *(p53)*
- Any page content *(cancer)*

Browse

Browse by species and category

Contributing New Pathways

Create



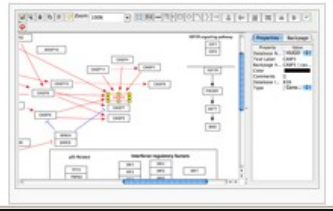
Create a new pathway page

Suggest

Add a pathway to the wish list

Sample Pathway Pages

Sandbox



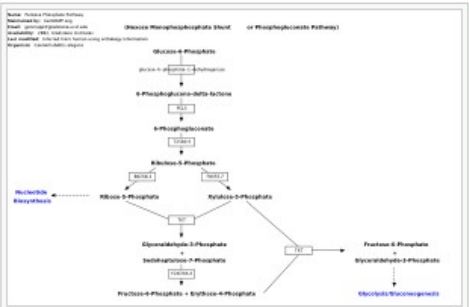
Check out the following pages:

- Show recent changes
- Show new pathways
- Show most edited pathways
- Show most viewed pathways

For more information see the Help pages

Today's featured pathway

Pentose Phosphate Pathway (Caenorhabditis elegans)



Pentose Phosphate Pathway

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- Pathway Wish List
- New embedded pathway editor
- Batch download page
- Visual diff tool for comparing pathway versions

Coming Soon...

- Converted content from KEGG and Reactome
- Tagging pathways with terms from Gene Ontology and other biological ontologies

Statistics

- There are **497** pathways
- Number of **pathways** *(and unique genes)* per species:

Homo sapiens:	**103** *(3436)*
Rattus norvegicus:	**105** *(3049)*
Mus musculus:	**109** *(3725)*
Drosophila melanogaster:	**27** *(553)*
Caenorhabditis elegans:	**23** *(367)*

http://www.wikipathways.org/index.php/WikiPathways

ThomasKelder my talk my preferences my watchlist my contributions log out

article discussion view source history watch

BETA
WIKIPATHWAYS
Pathways for the People

navigation
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pathway
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- Gene or protein name *(p53)*
- Any page content *(cancer)*

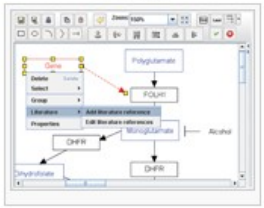
Browse

Browse by species and category

Search: “ One carbon”

Contributing New Pathways

Create



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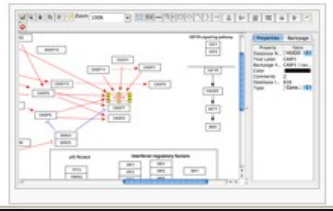
Sandbox



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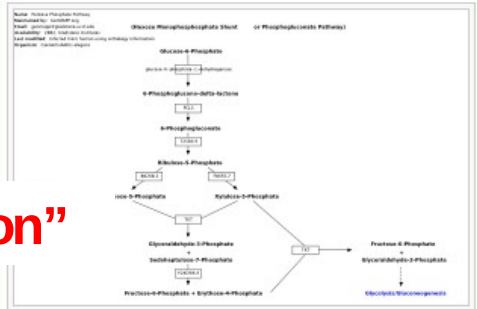

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Drosophila melanogaster:	**27**	*(553)*
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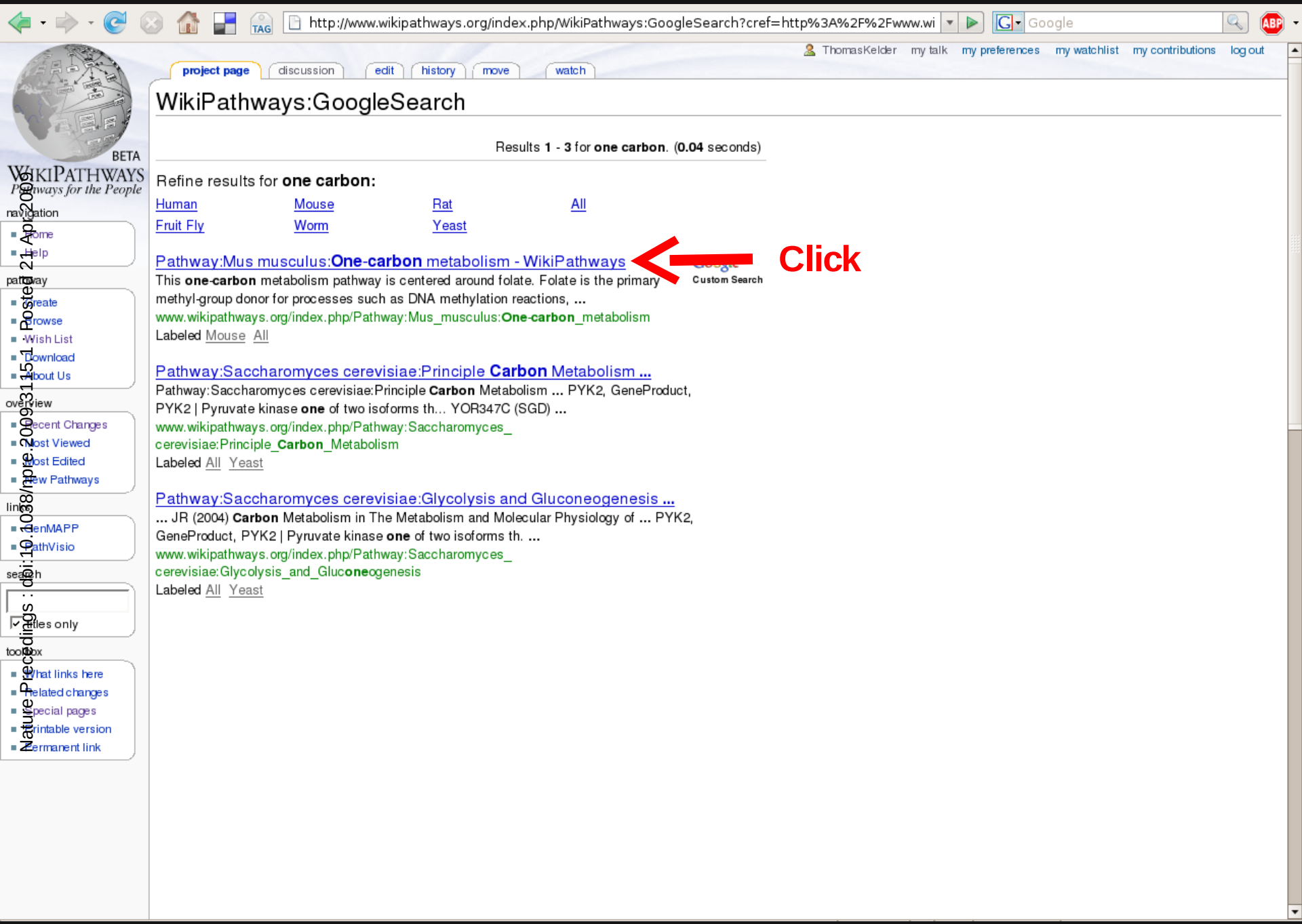

Pathway:Homo sapiens:One-carbon metabolism

BETA WikiPathways Pathways for the People

navigation
- Home
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- Download
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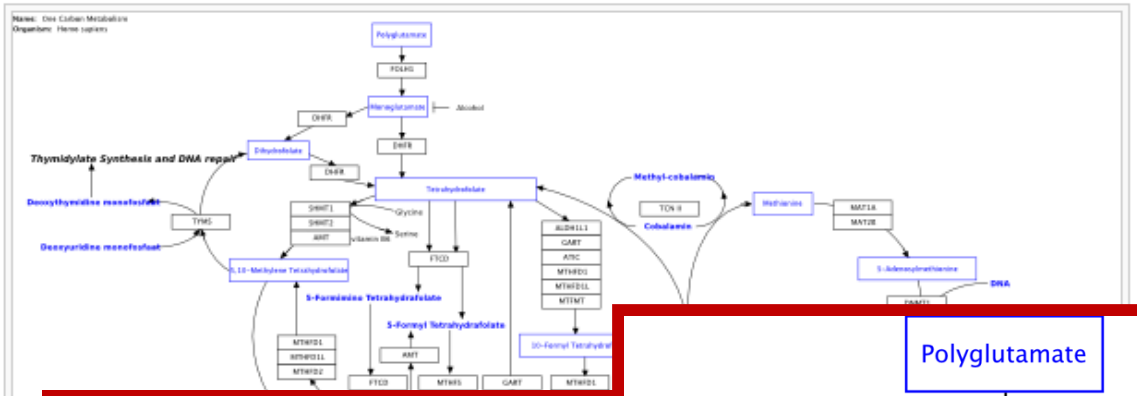
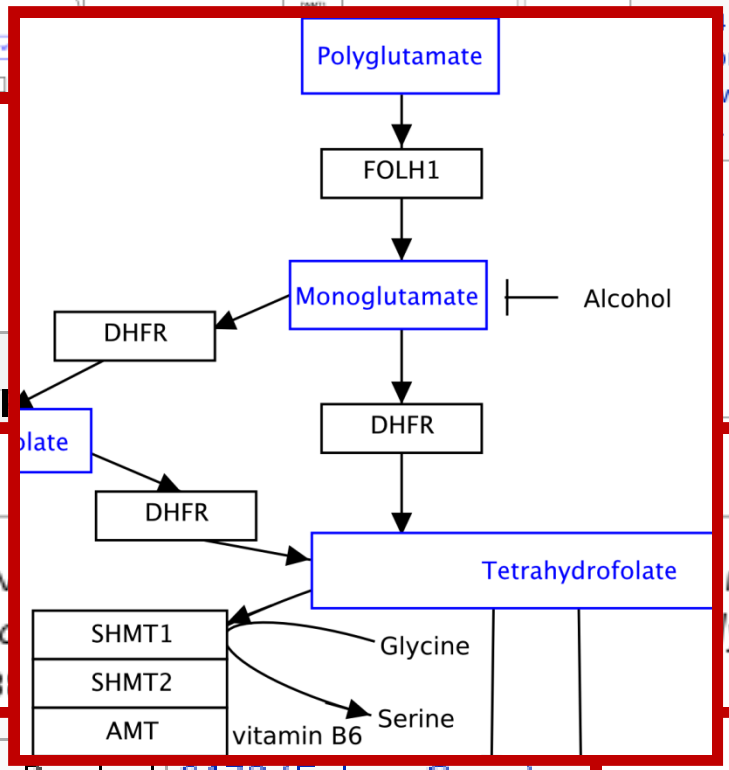


Contents [hide]

DataNodes

View all 40 DataNodes

Name	Ty
SHMT2	GeneProduct 6472 (Entrez Gene)



Bibliography

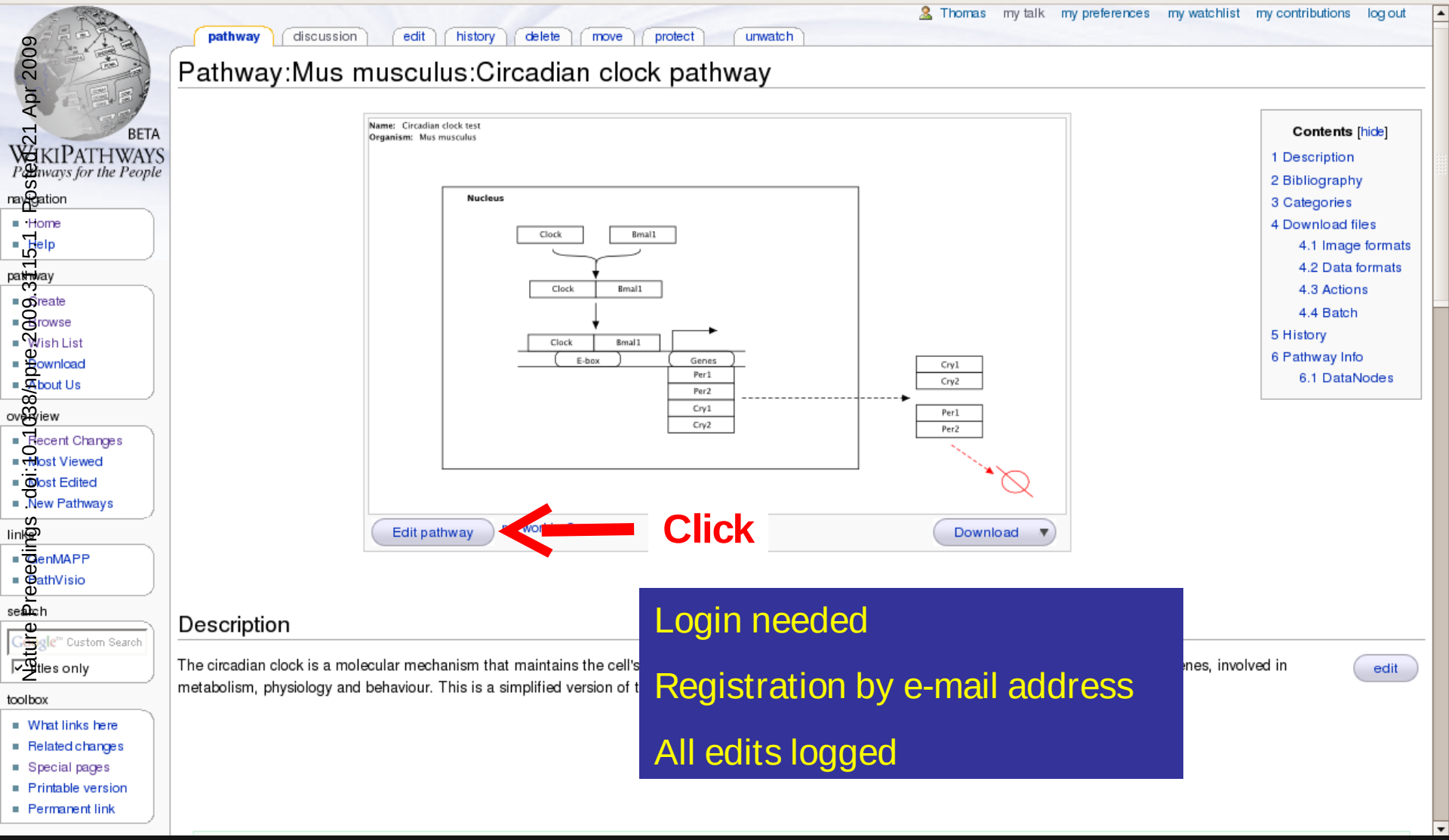
1. Hazra A, Wu K, Kraft P, Fuchs CS, Giov
metabolic pathway and risk of colored
doi:10.1093/carcin/bgm062 pmid:173

edit

Bibliogra

1. Hazra A, Wu K, Kraft P, Fuchs CS, Giovannucci EL, and Hunter DJ. *Twenty-four non-synonymous polymorphisms in the one-carbon metabolic pathway and risk of colorectal adenoma in the Nurses' Health Study*. Carcinogenesis 2007 Jul; 28(7) 1510-9.

Editing

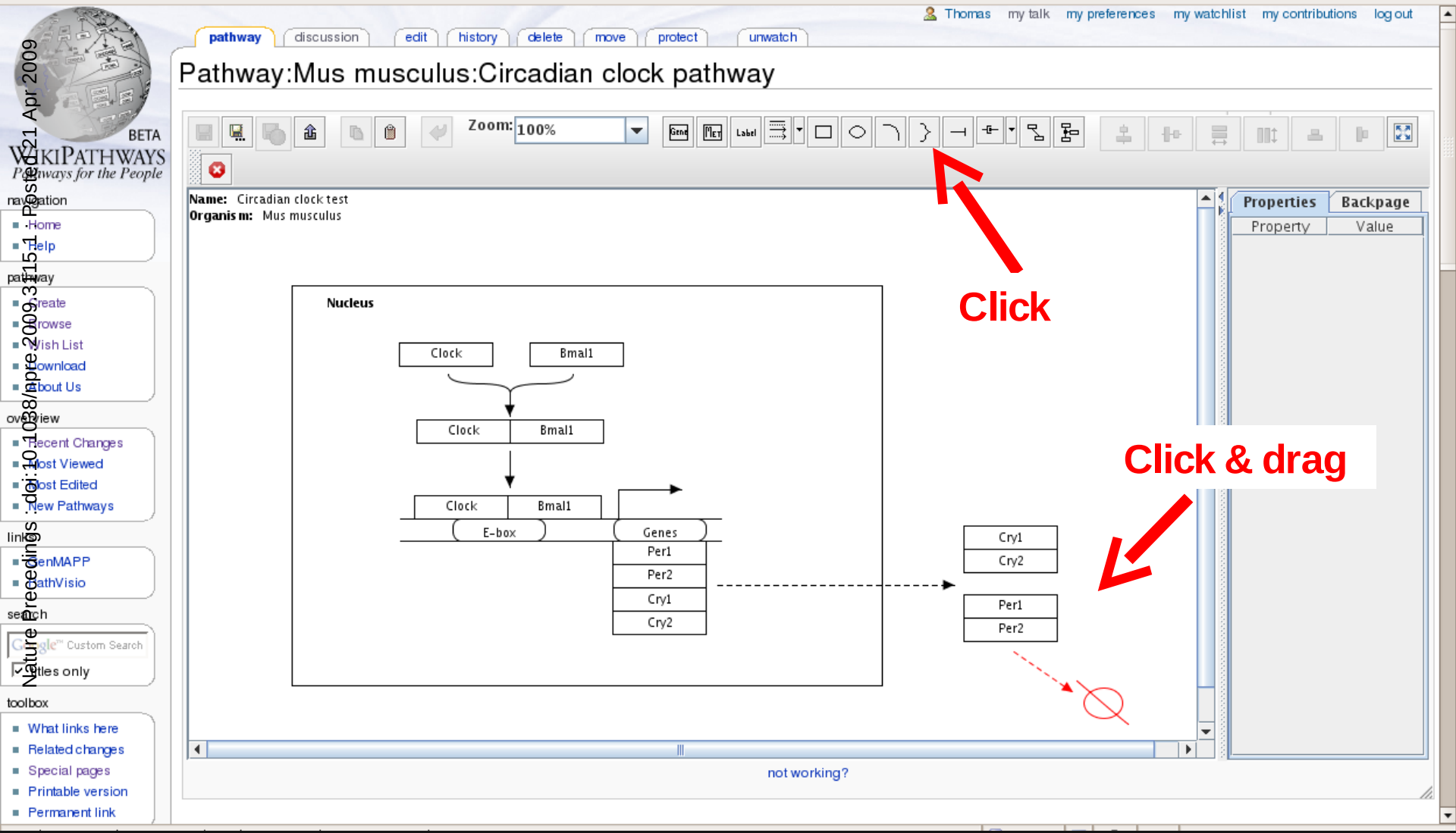


Login needed

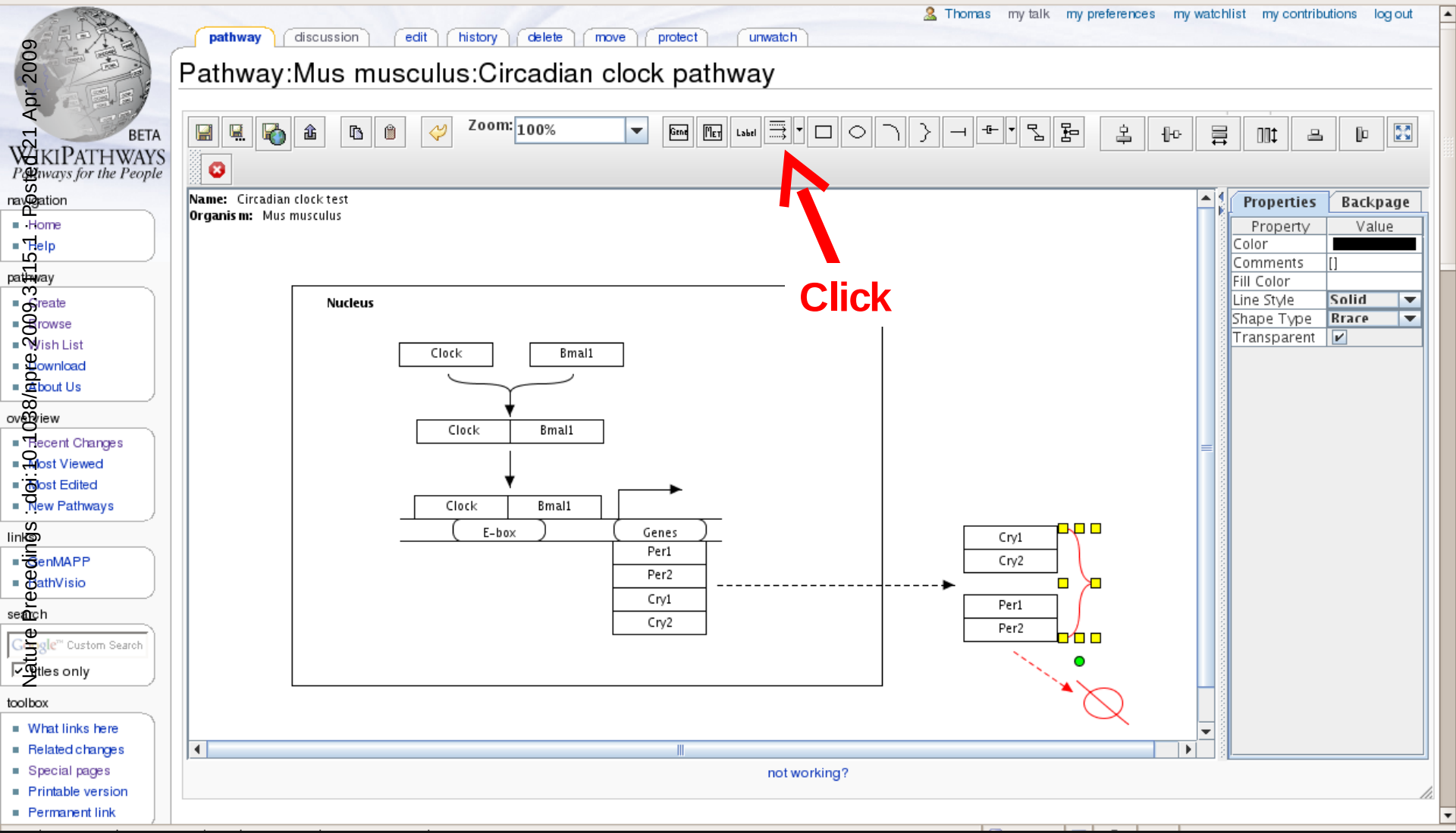
Registration by e-mail address

All edits logged

Draw the proteins and interactions

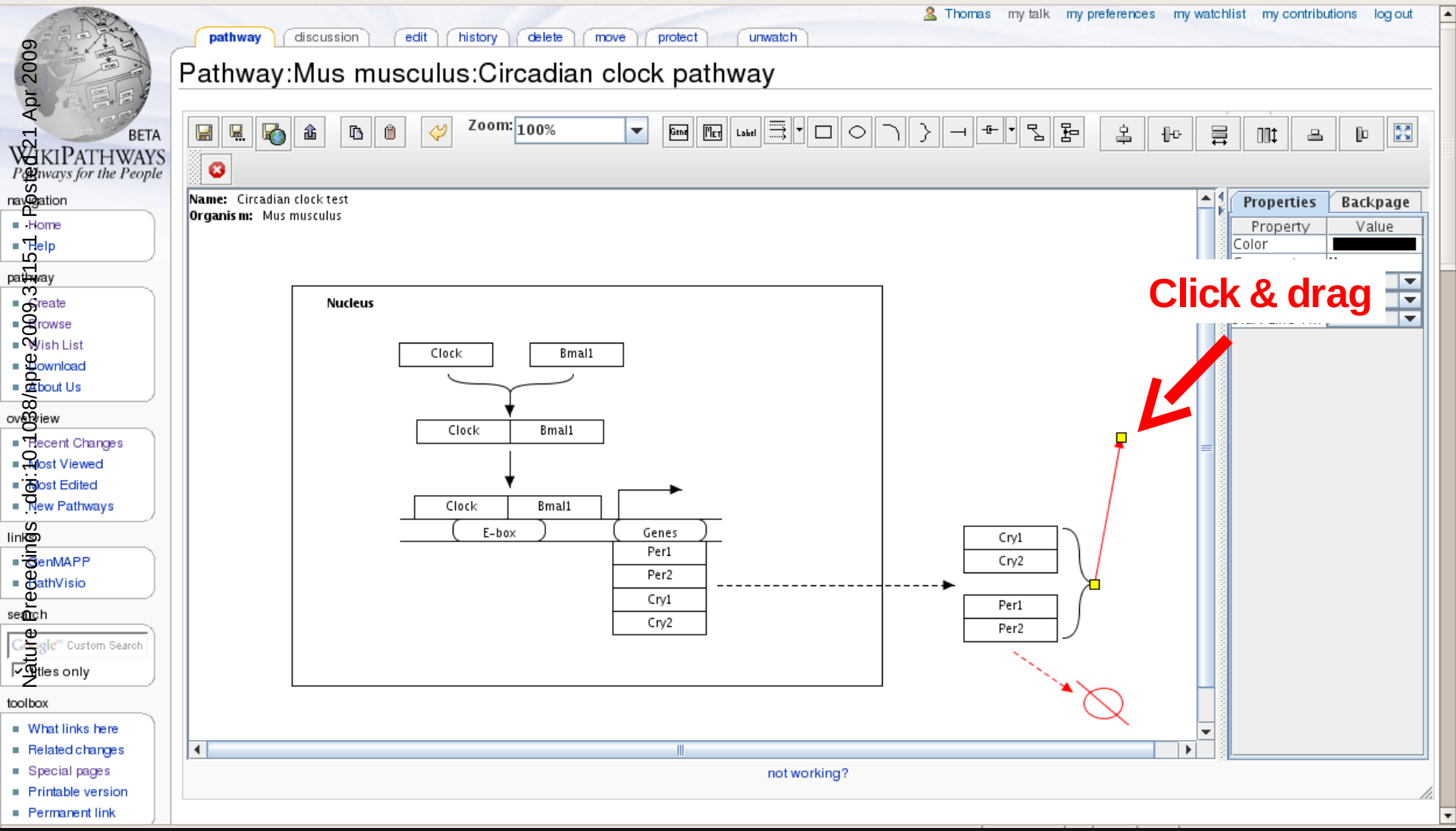


Draw the proteins and interactions



Nature Precedings : doi:10.1038/npre.2009.3415.1 Posted 21 Apr 2009

Draw the proteins and interactions



Nature Precedings : doi:10.1038/npre.2009.3515.1 Posted 21 Apr 2009

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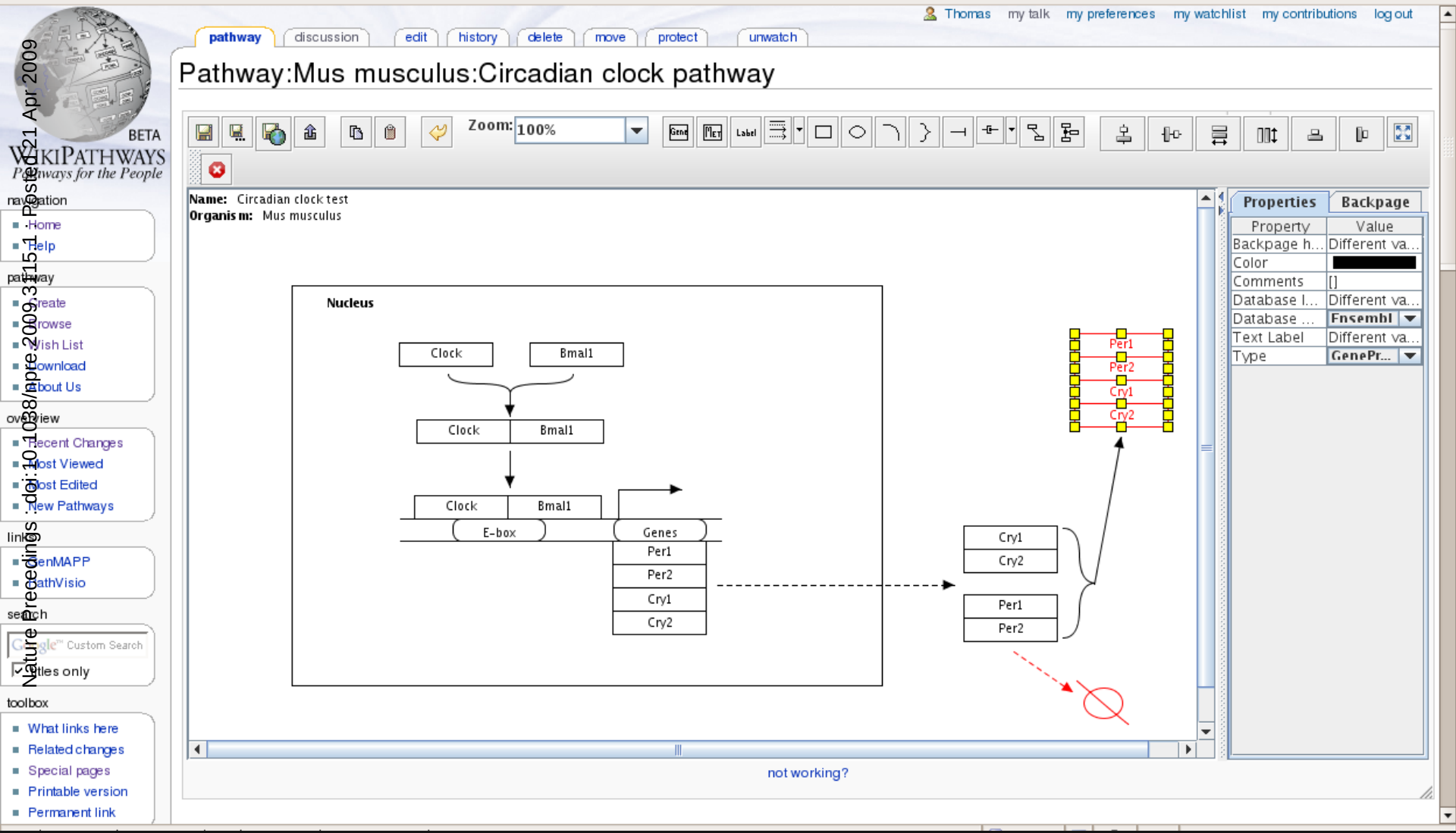

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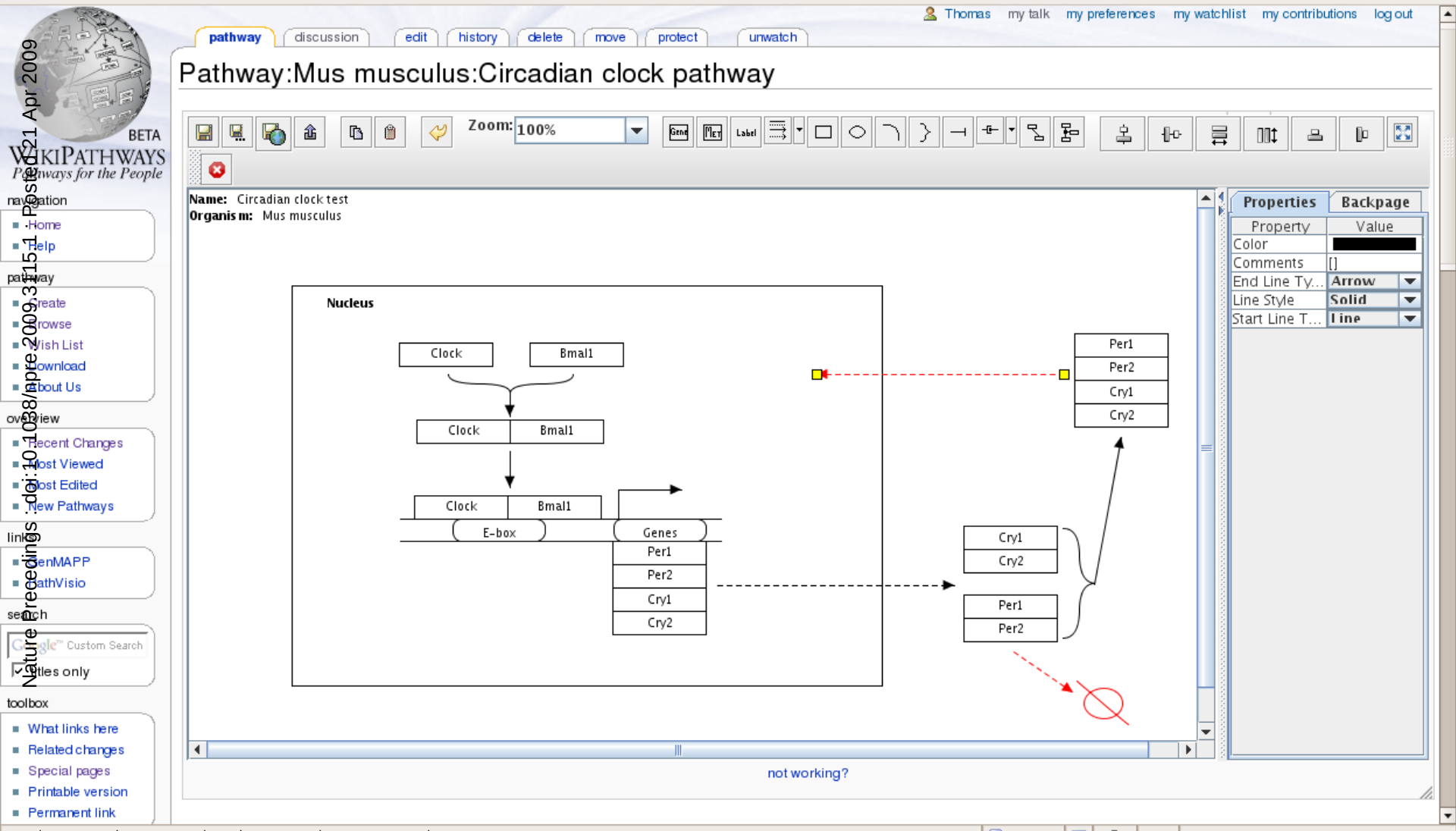
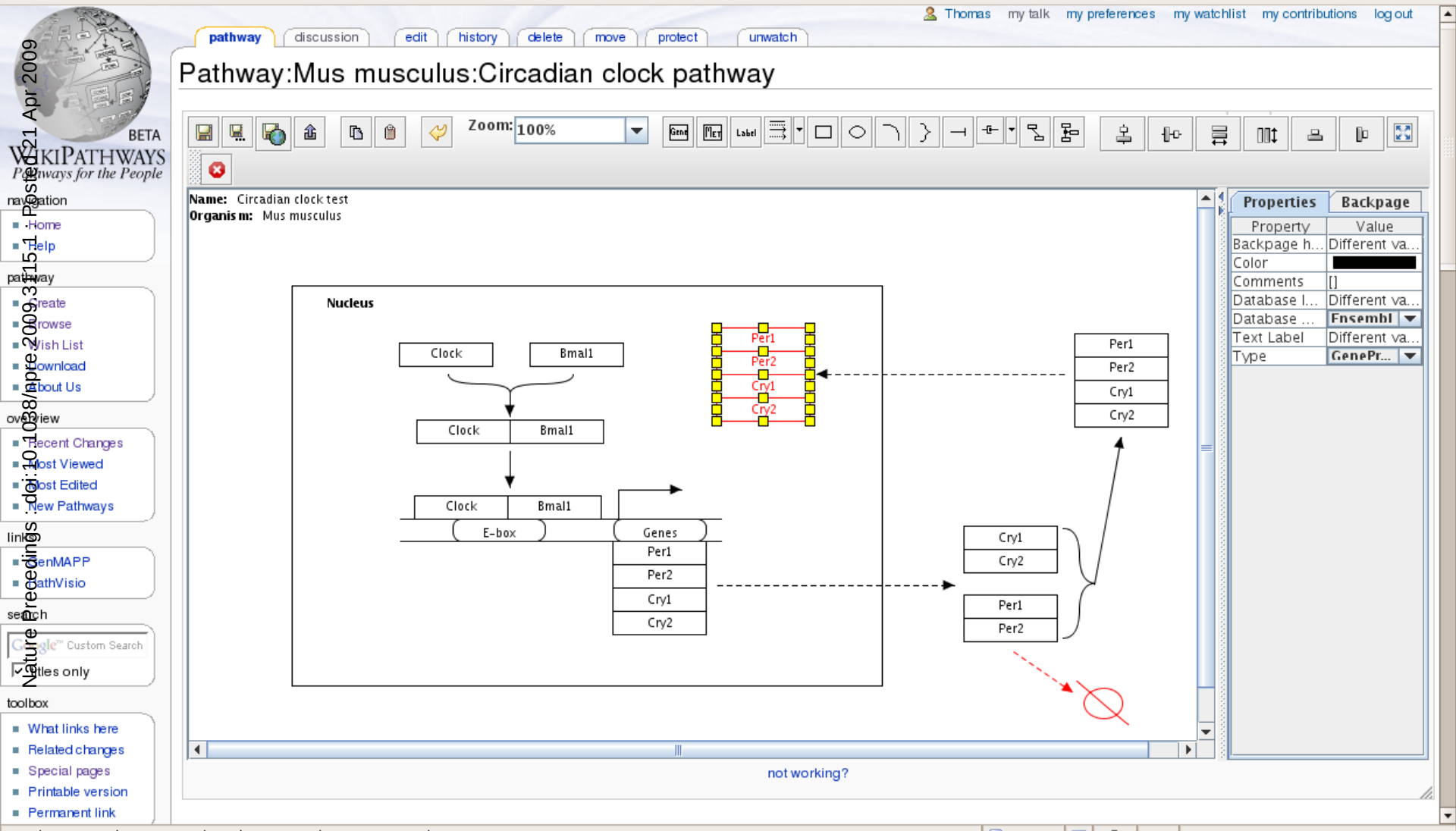
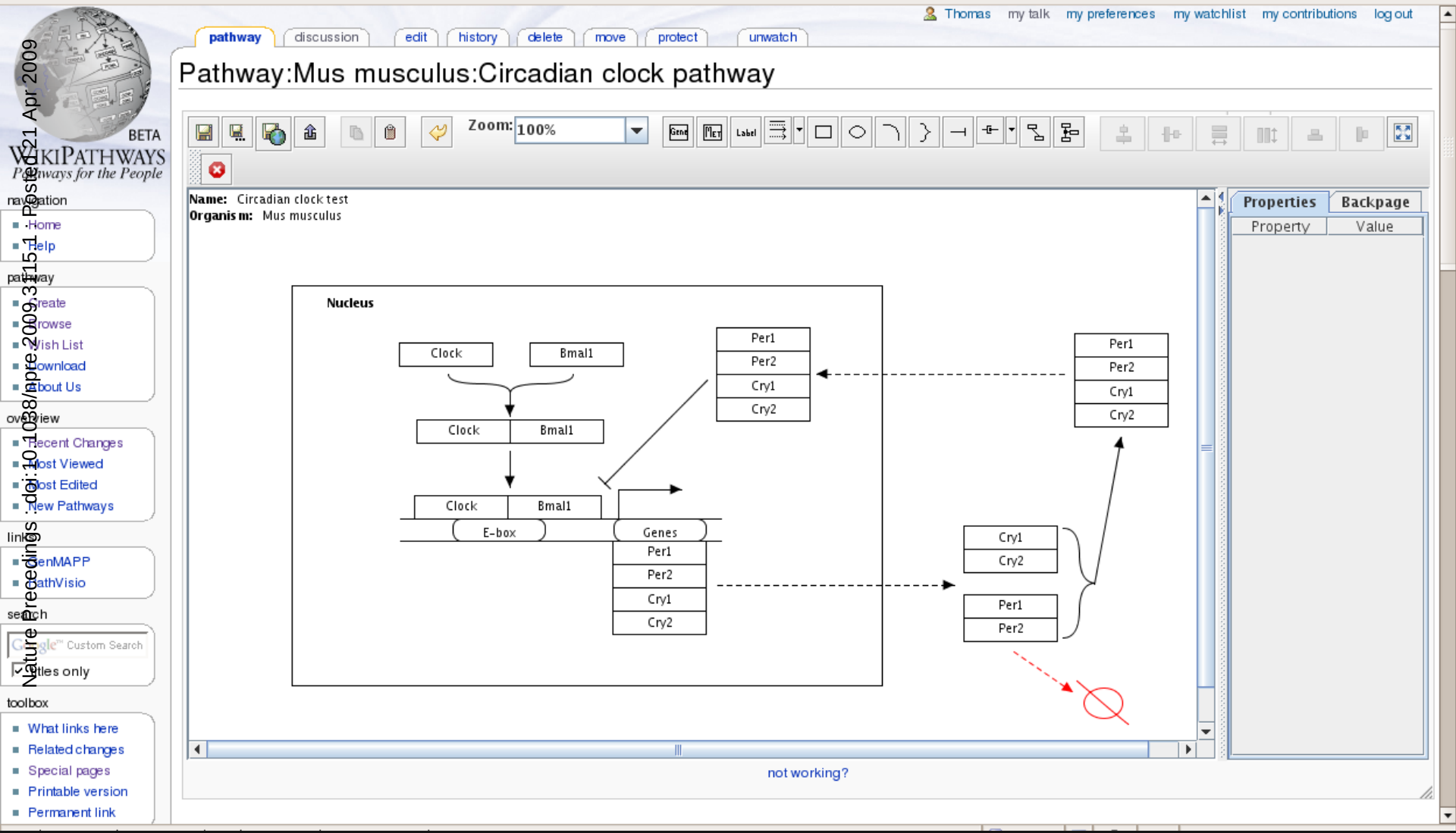


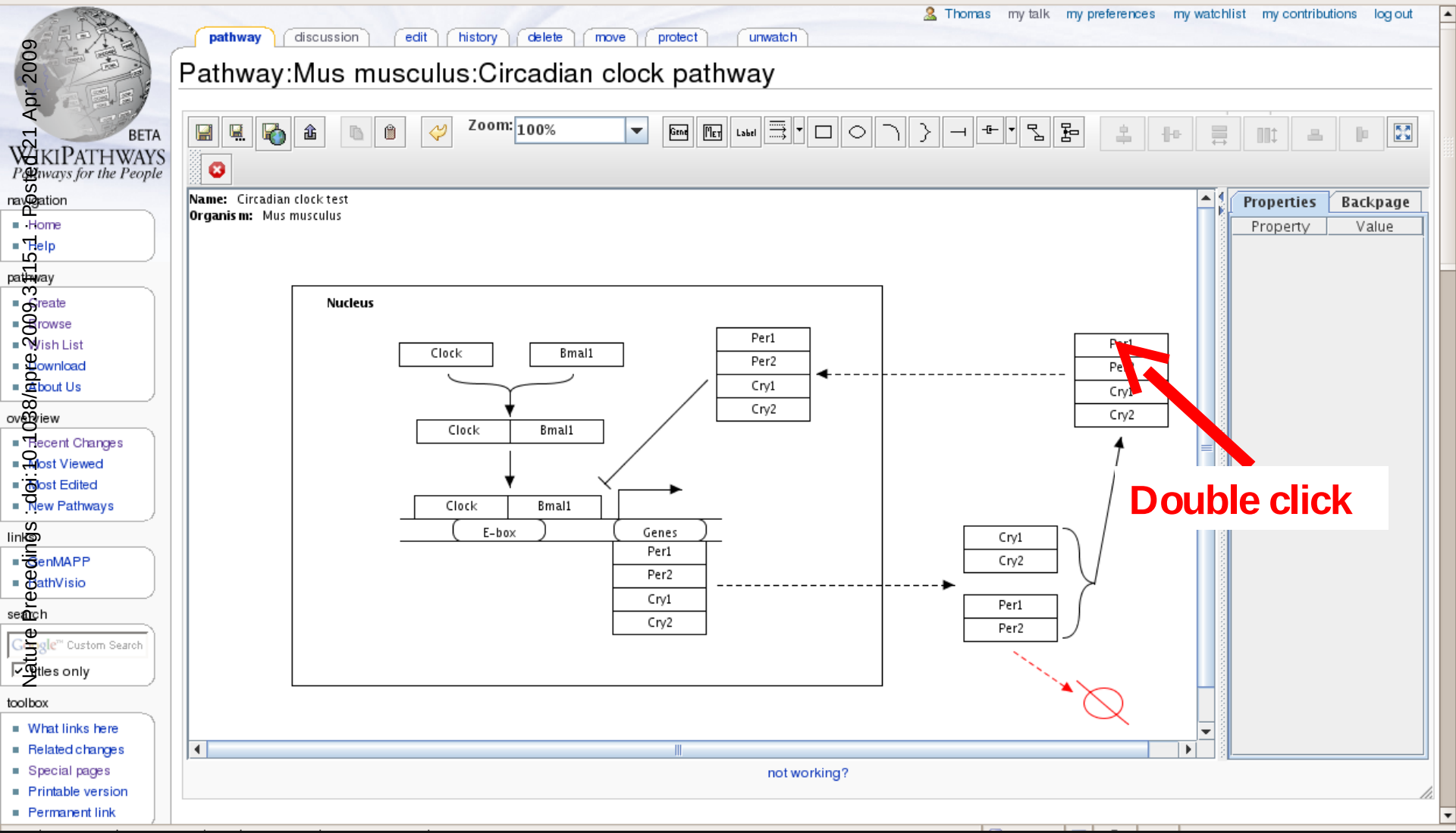
Draw the proteins and interactions



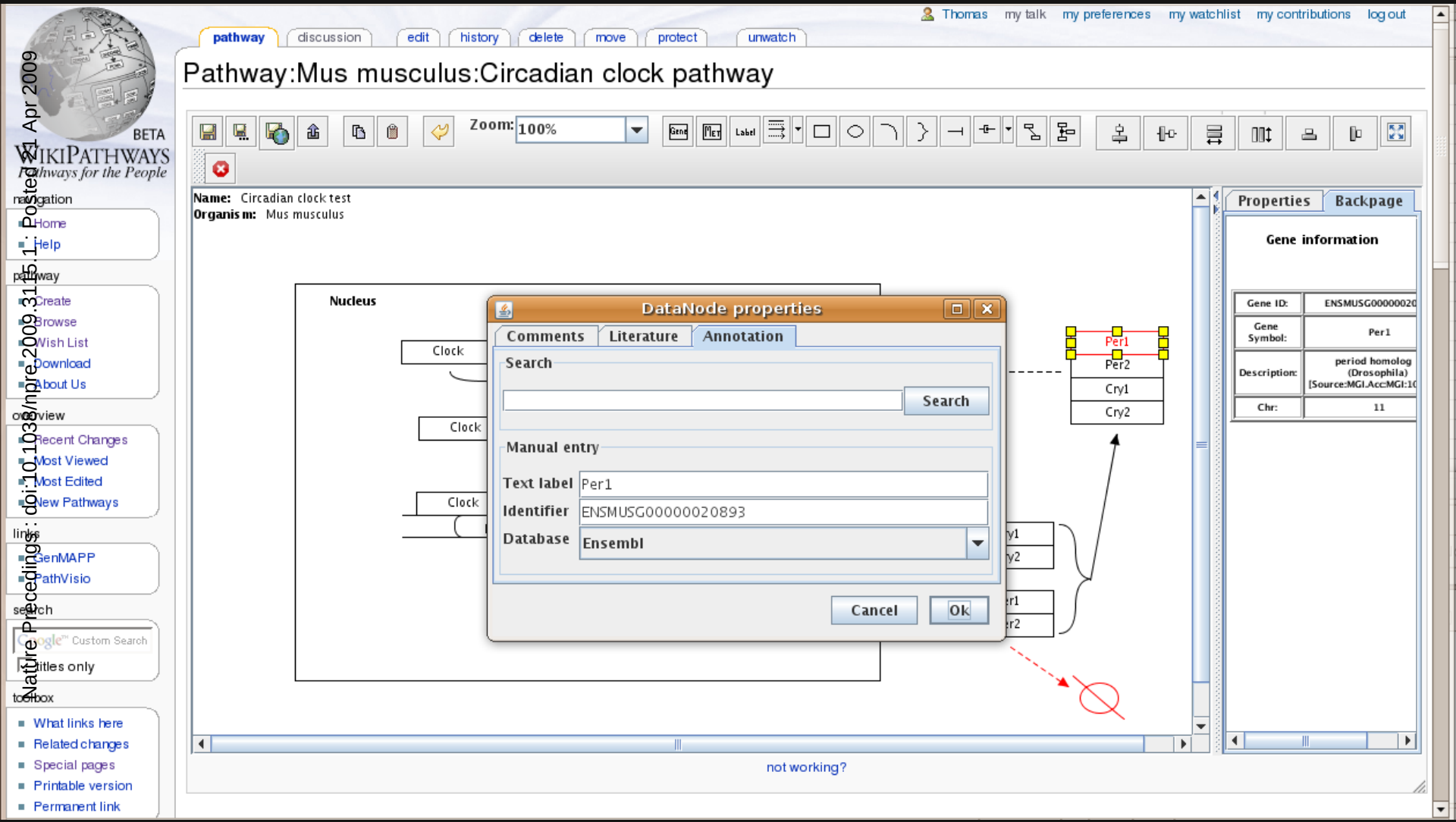
Draw the proteins and interactions



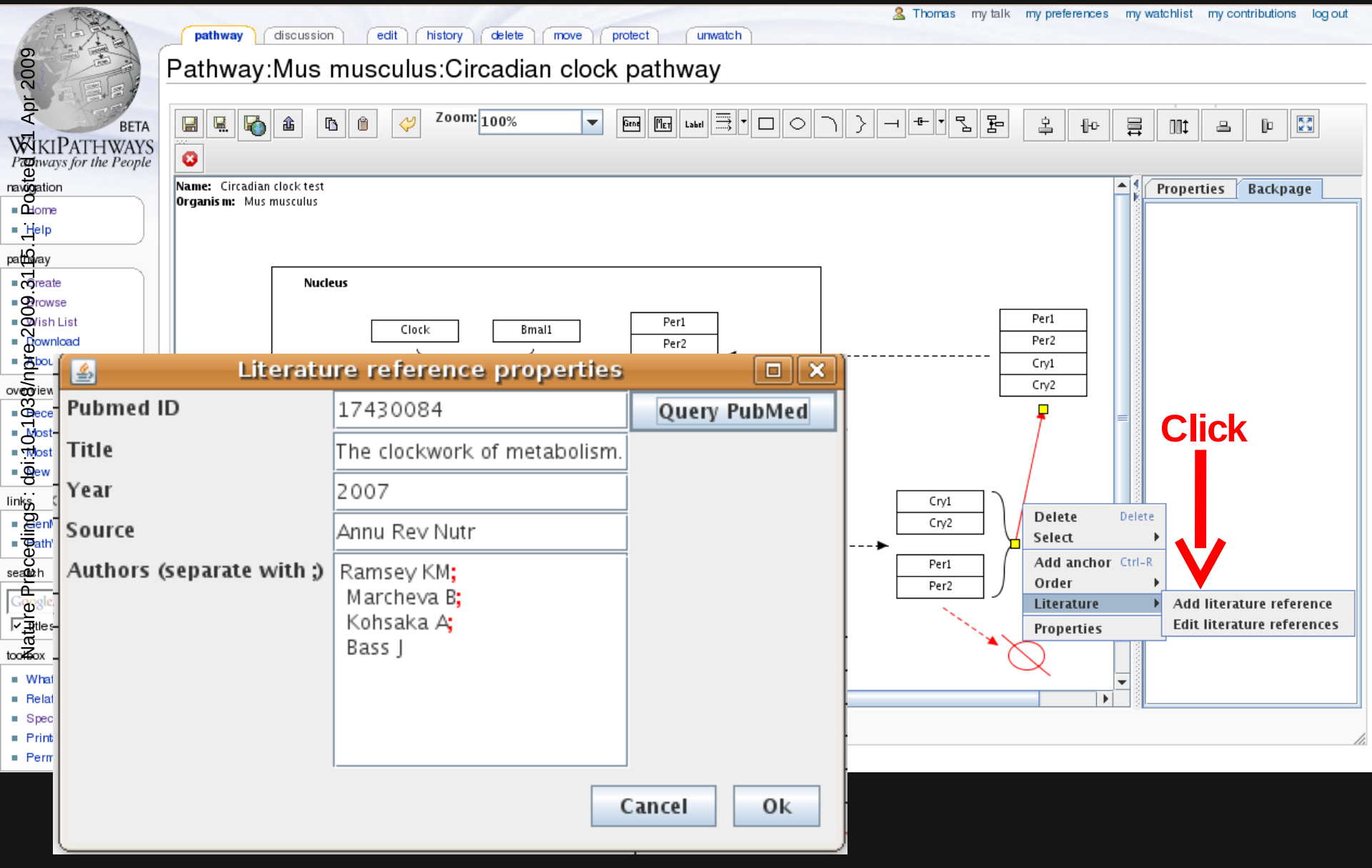
Annotate the proteins



Annotate the proteins

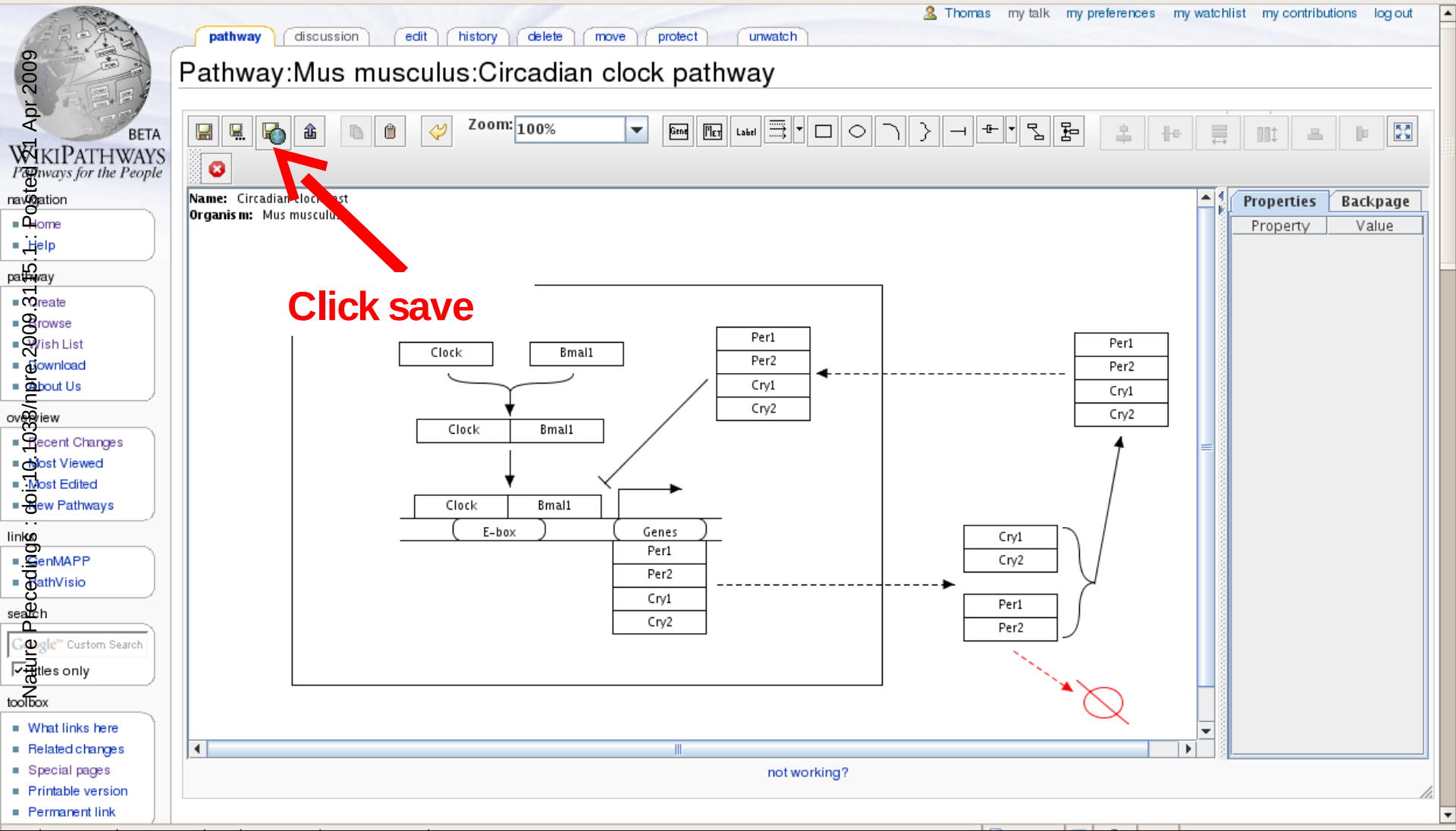


Add reference to literature



Nature Precedings : doi:10.1038/npre.2009.3175.1 : Posted 21 Apr 2009

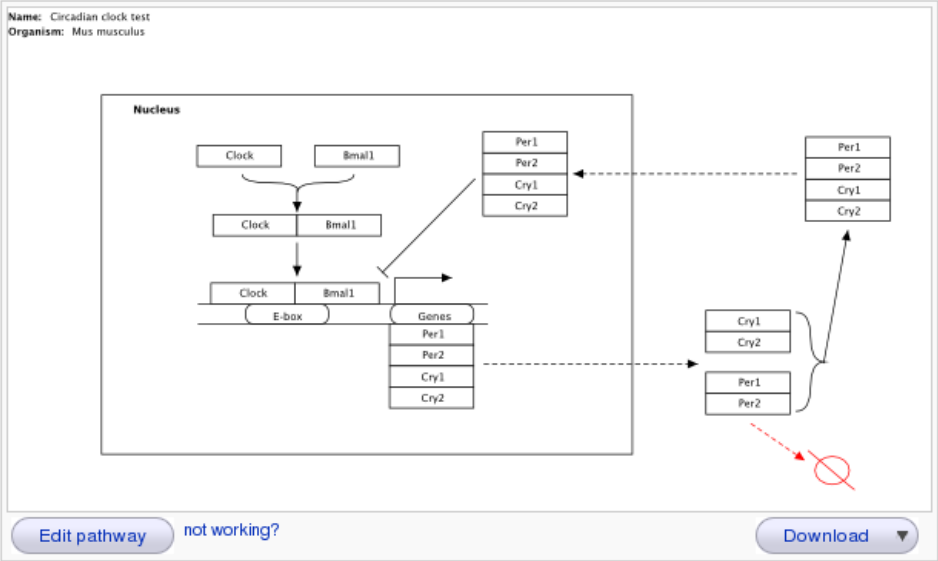
Save the pathway



Updated pathway page

BETA WIKIPATHWAYS *Pathways for the People*

Pathway:Mus musculus:Circadian clock pathway



Contents [hide]

Description

edit

The circadian clock is a molecular mechanism that maintains the cell's 24-hour molecular rhythm by driving the rhythmic expression of a wide range of genes, involved in metabolism, physiology and behaviour. This is a simplified version of the pathway, restricting to the mPer/mCry feedback loop

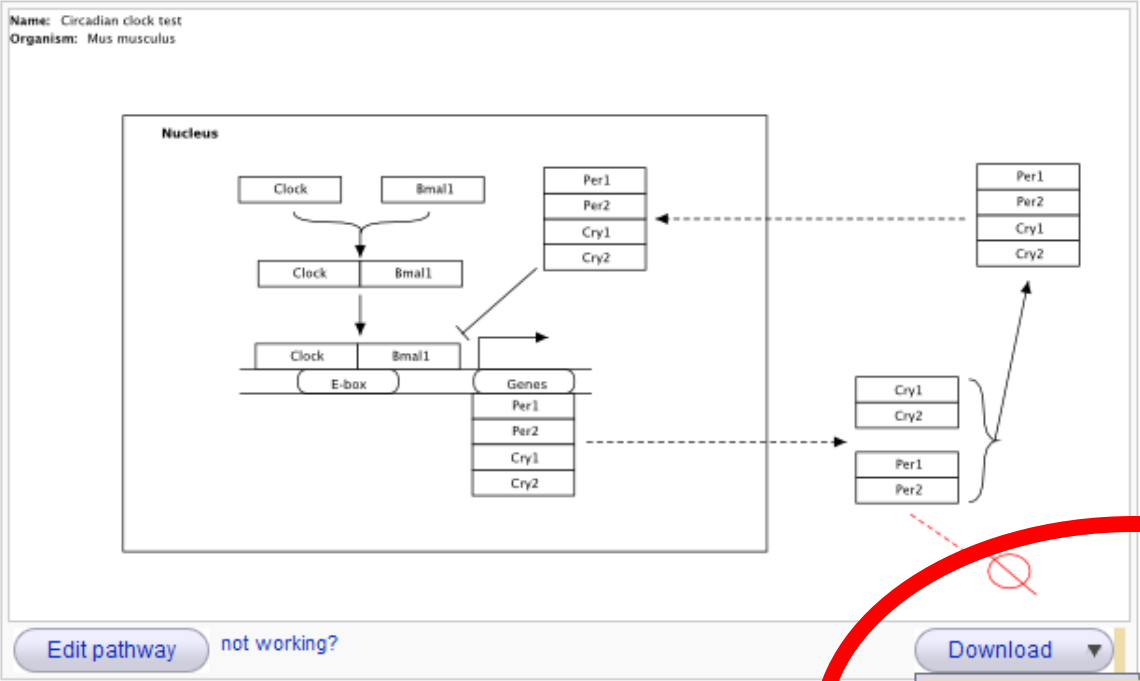
Bibliography

1. Ramsey KM, Marcheva B, Kohsaka A, and Bass J. *The clockwork of metabolism.* Annu Rev Nutr 2007; 27 219-40. doi:10.1146/annurev.nutr.27.061406.093546 pmid:17430084. PubMed HubMed [dcb]

Download

WikiPathways BETA
Pathways for the People

Pathway:Mus musculus:Circadian clock pathway



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“ Wiki’ s work because it is easier to undo damage than to create it.
Imagine what cities would look like if it was easier to clean graffiti than to create it”
– Clay Shirkey

Division by zero - Wikipedia, the free encyclopedia - Mozilla Firefox

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http://en.wikipedia.org/w/index.php?title=Division_by_zero&diff=187679646&oldid=1

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article discussion edit this page history

Division by zero

From Wikipedia, the free encyclopedia

(Difference between revisions)

Revision as of 07:12, 29 January 2008 (edit)
Adam1213 (Talk | contribs)
(Undid revision 187649938 by Spoofergirl (talk))
← Older edit

Revision as of 12:34, 29 January 2008 (edit) (undo)
71.235.33.246 (Talk)
(→Historical accidents)
Newer edit →

Line 148:

```
==Historical accidents==

* On [[September 21]], [[1997]], a divide by zero error in the [[USS Yorktown (CG-48)]] ''Remote Data Base Manager'' brought down all the machines on the network, causing the ship's propulsion system to fail. <ref>{{cite news|url=http://www.wired.com/news/technology/0,1282,13987,0
by Windows NT|date=[[1998-07-24]]|work=[[Wired News]]}}</ref>
```

Line 148:

```
==Historical accidents==

* On [[September 21]], [[1997]], a divide by zero error in the [[USS Yorktown (CG-48)]] ''Remote Data Base Manager'' brought down all the machines on the network, causing the ship's propulsion system to fail. <ref>{{cite news|url=http://www.wired.com/news/technology/0,1282,13987,0
by Windows NT|date=[[1998-07-24]]|work=[[Wired News]]}}</ref>
+
+ * It is a well knows fact that on [[December 20]] [[2007]], a student divided by zero on his [[TI-81]] [[Graphing calculator]] which caused a [[portal]] to open and suck in the school. it is also well known that the only way to get rid of these portals is to multiply by 1.

== Footnotes ==
```

Revision as of 12:34, 29 January 2008

navigation
- Main Page
- Contents
- Featured content
- Current events
- Random article

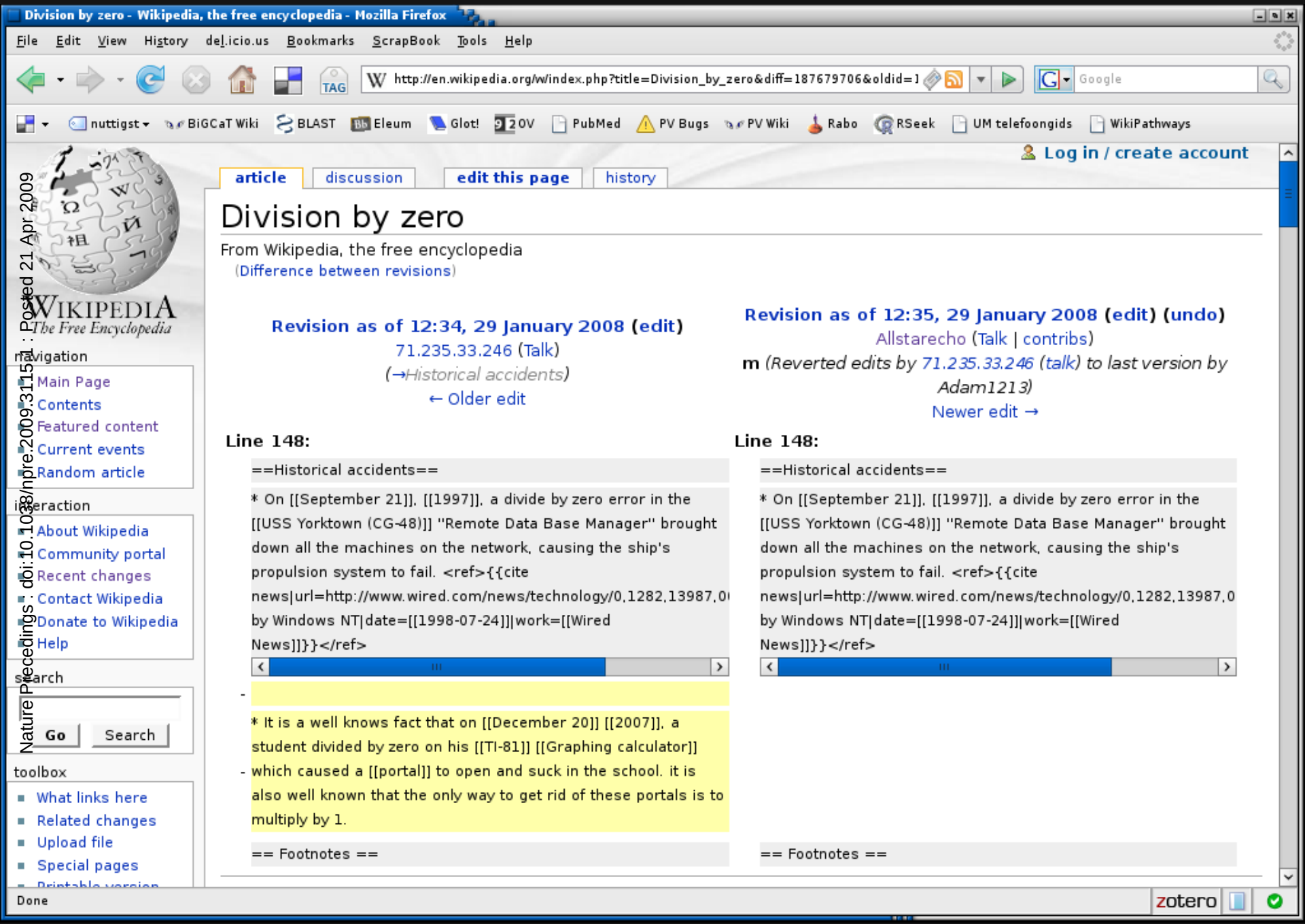
interaction
- About Wikipedia
- Community portal
- Recent changes
- Contact Wikipedia
- Donate to Wikipedia
- Help

search
Go Search

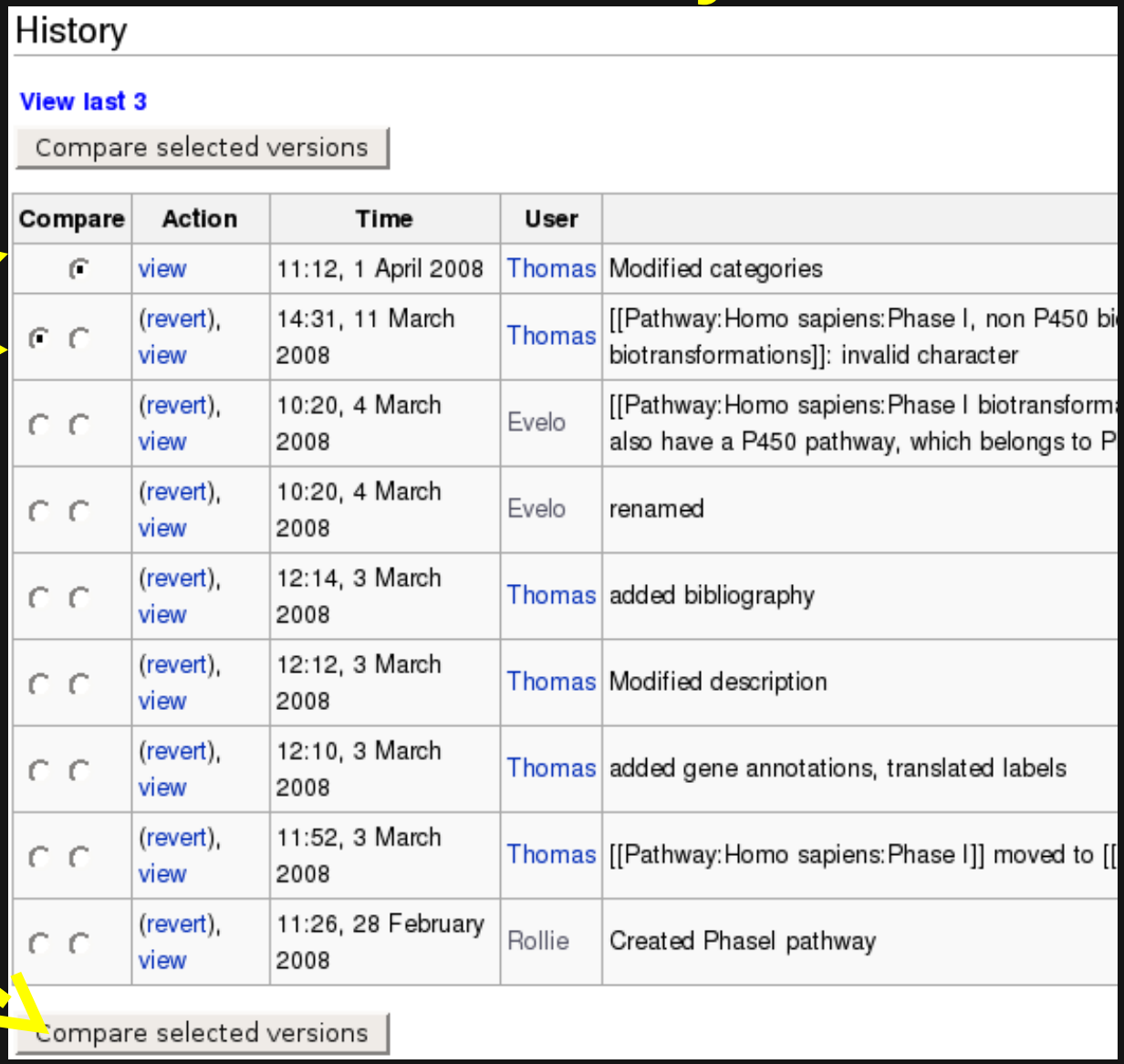
toolbox
- What links here
- Related changes
- Upload file
- Special pages

Done

zotero



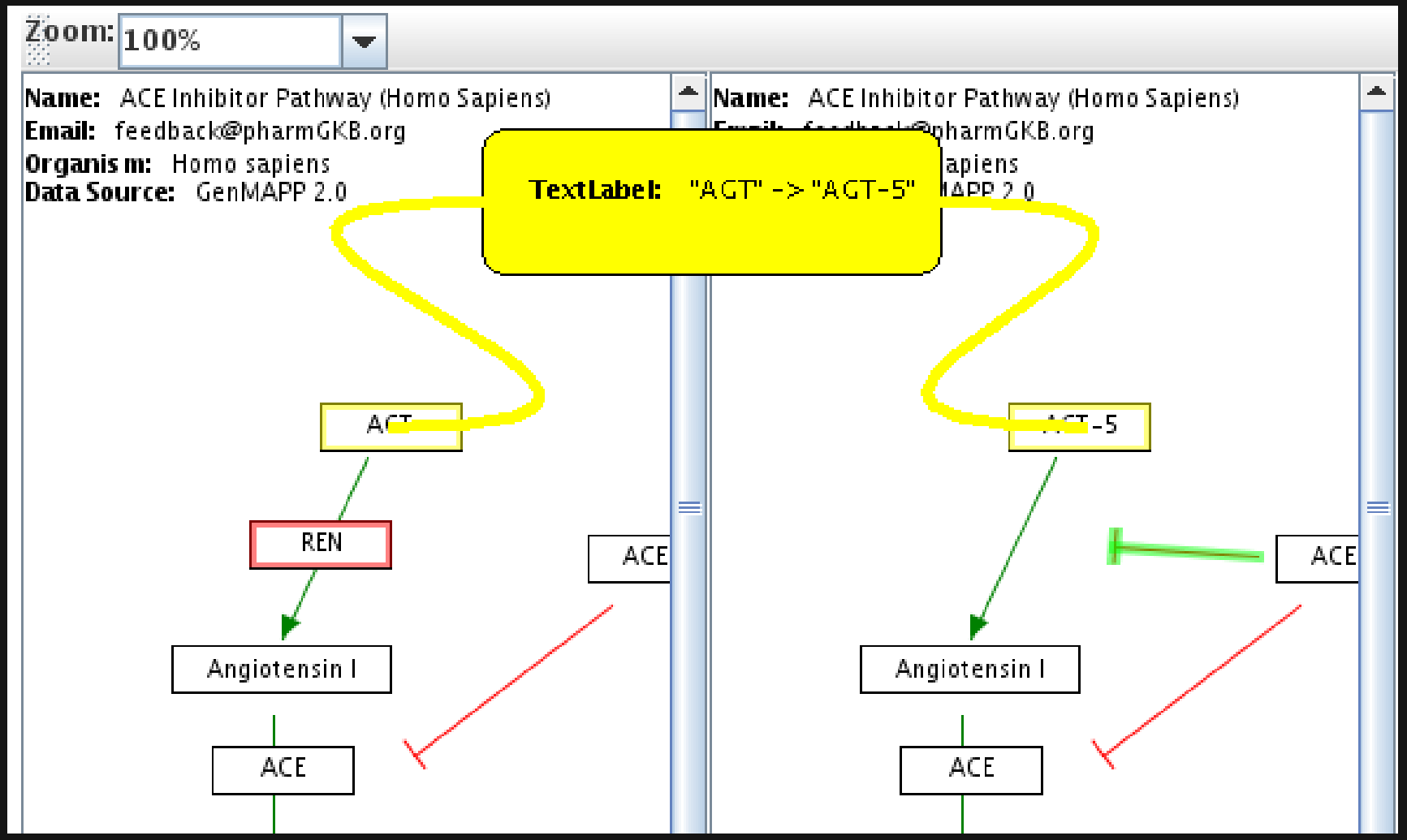
Revision history



Select two versions

Click

Diff tool



Growth

More users, species, pathways, genes

September 2008

Statistics

- There are **497** pathways
- Number of **pathways** *(and unique genes)* per species:

Homo sapiens:	**103**	*(3436)*
Rattus norvegicus:	**105**	*(3049)*
Mus musculus:	**109**	*(3725)*
Drosophila melanogaster:	**27**	*(553)*
Caenorhabditis elegans:	**23**	*(367)*
Saccharomyces cerevisiae:	**132**	*(1000)*

- There are **182** registered users

February 2009

Statistics

- There are **589** pathways
- Number of **pathways** *(and unique genes)* per s

Homo sapiens:	**137**
Rattus norvegicus:	**116**
Mus musculus:	**117**
Drosophila melanogaster:	**28**
Caenorhabditis elegans:	**28**
Saccharomyces cerevisiae:	**132**
Danio rerio:	**25**
Arabidopsis thaliana:	**4**
Oryza japonica:	**2**

- There are **650** registered users

Statistics

- There are **597** pathways
- Number of **pathways** *(and unique genes)* per species:

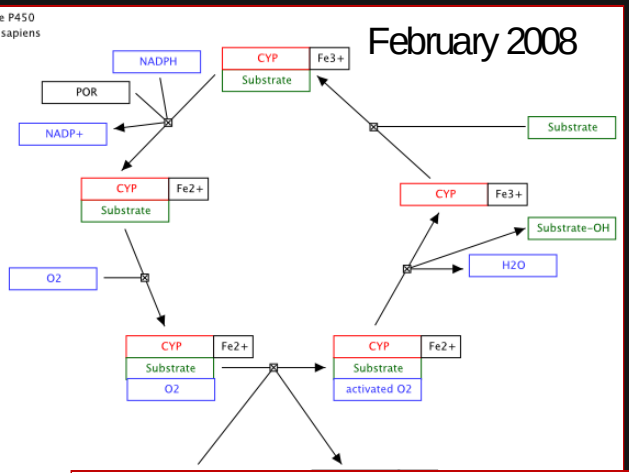
Homo sapiens:	**142**	*(3711)*
Rattus norvegicus:	**115**	*(3147)*
Mus musculus:	**118**	*(3696)*
Drosophila melanogaster:	**28**	*(558)*
Caenorhabditis elegans:	**27**	*(490)*
Saccharomyces cerevisiae:	**134**	*(1014)*
Danio rerio:	**24**	*(925)*
Arabidopsis thaliana:	**6**	*(62)*
Oryza sativa:	**3**	*(0)*

- There are **742** registered users

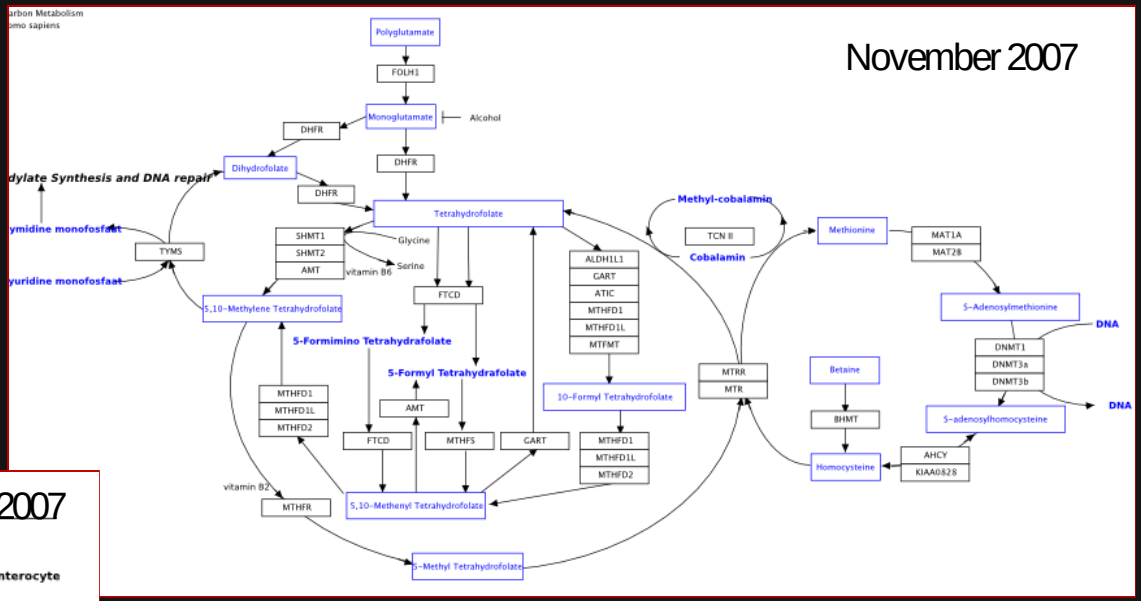
April 2009

Contributions – new pathways

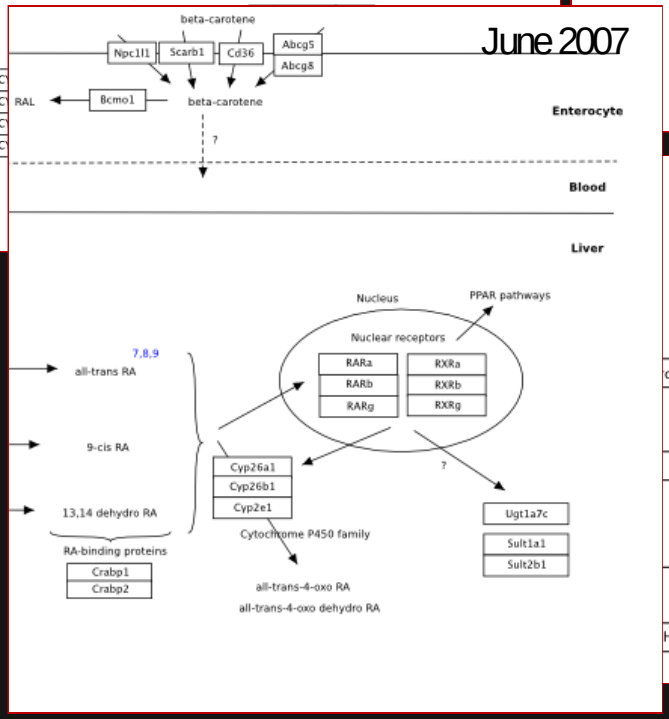
February 2008



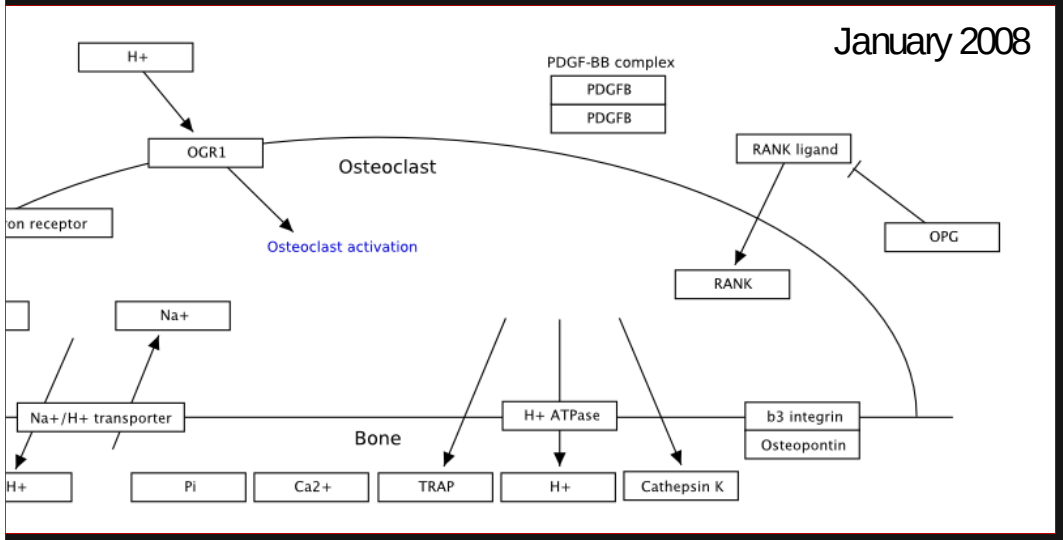
November 2007



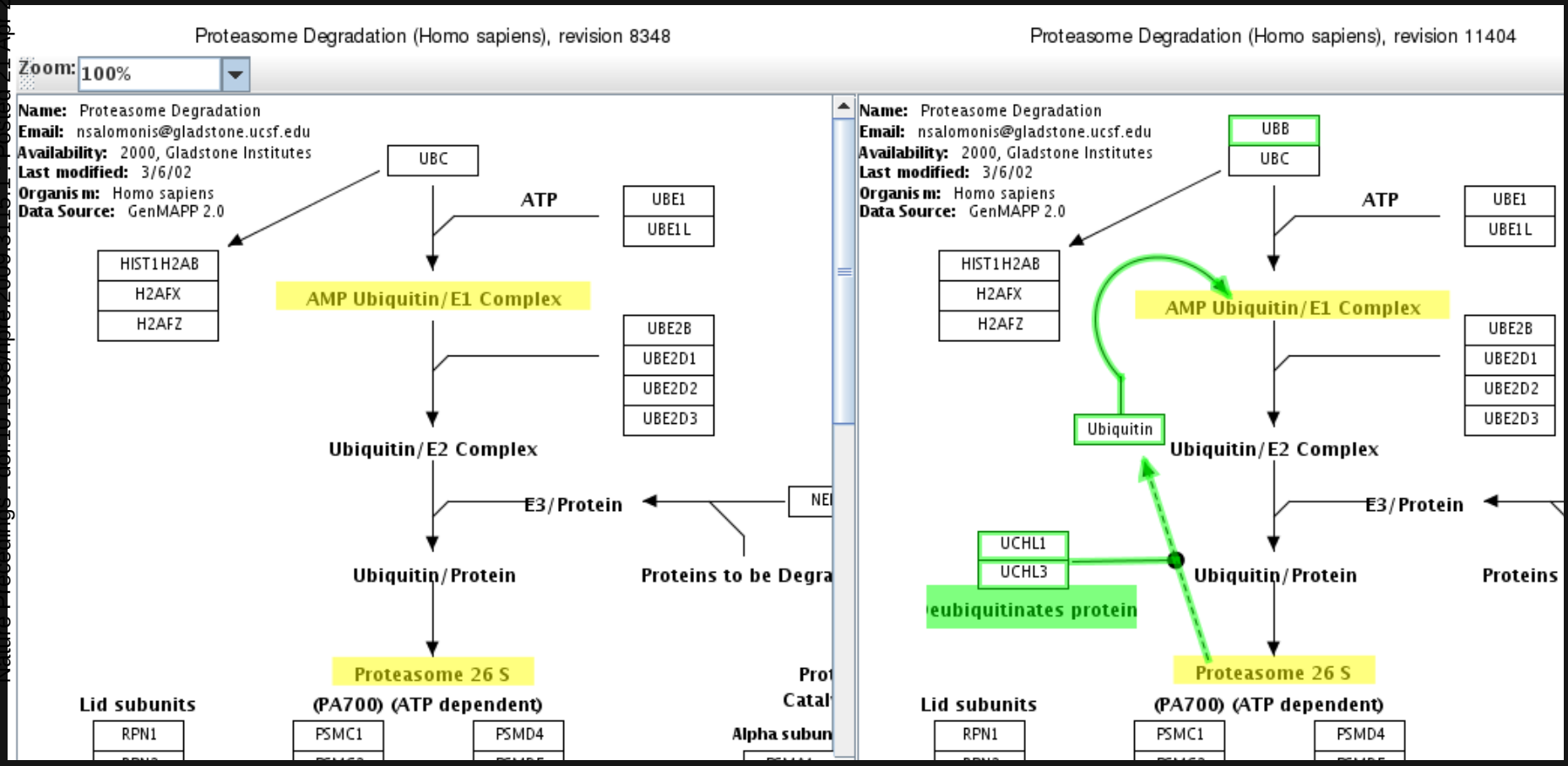
June 2007



January 2008



Contributions – small edits



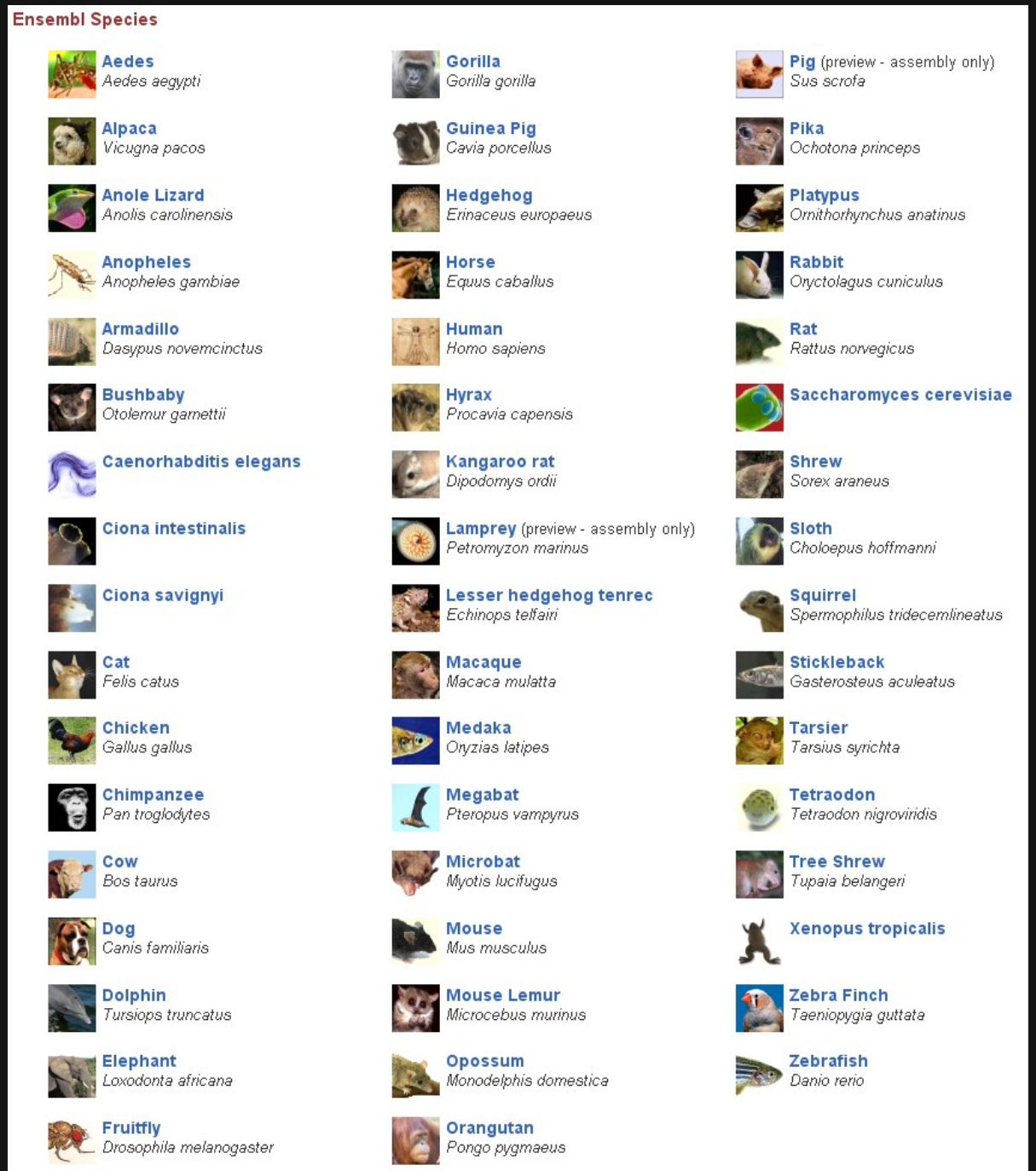
Species

- We can add any species that is in ENSEMBL
- Or anything where you create an ENSEMBL like DB
- Just ask!


Escherichia coli K12
EB1


Bacillus subtilis
EB1

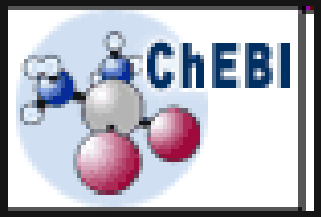

Mycobacterium tuberculosis H37Rv
EB1



Metabolomics

Visualization and statistics fully supported

HMDB



Chebi

NuGOwiki

Automatic content generation

GO: gene ontology visualization

- Automatic pathway (table) generator for any GO level
- Ask for tool or pathways

- Go statistics in GenMAPP, Go_Elite, R (through webservice)

Automatic content generation

KEGG

- Automatic pathway converter
- Ask for tool or pathways

- We need two versions:
  - Original
  - Community updated

Automatic content generation

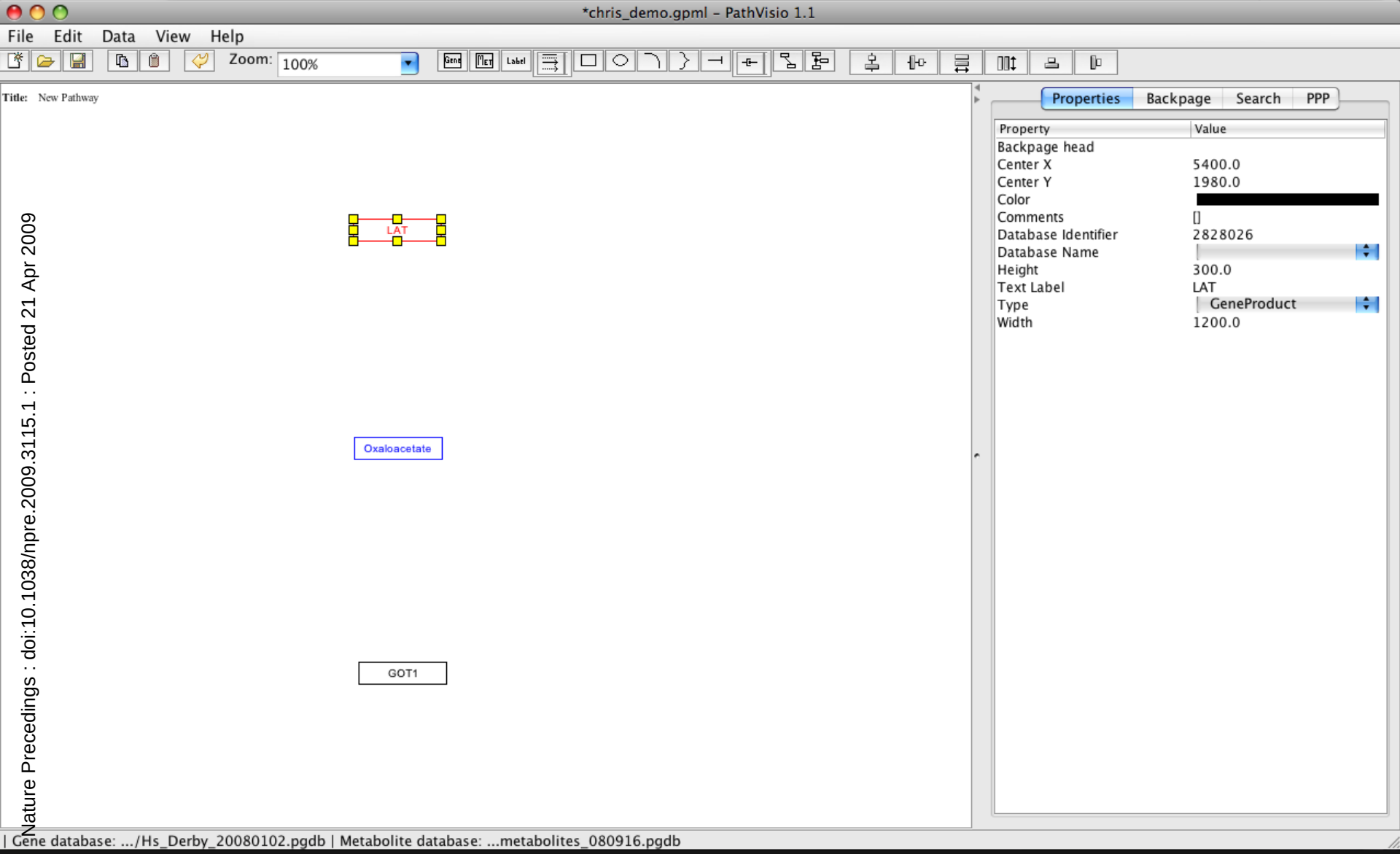
BioPAX

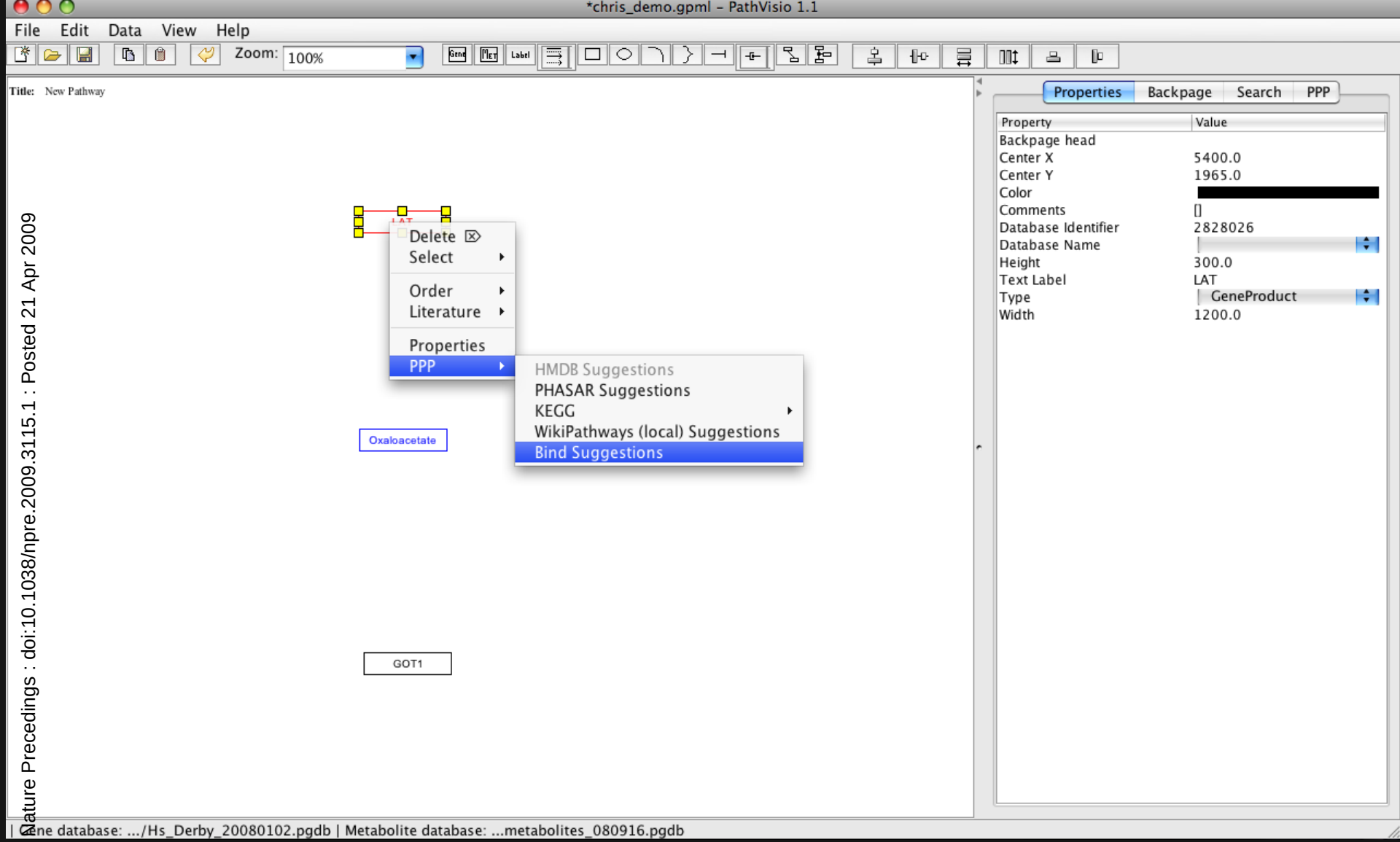
- Part of BioPAX already implemented
- Full converter in development using Paxtools
- Can also be used for Reactome (round trip)

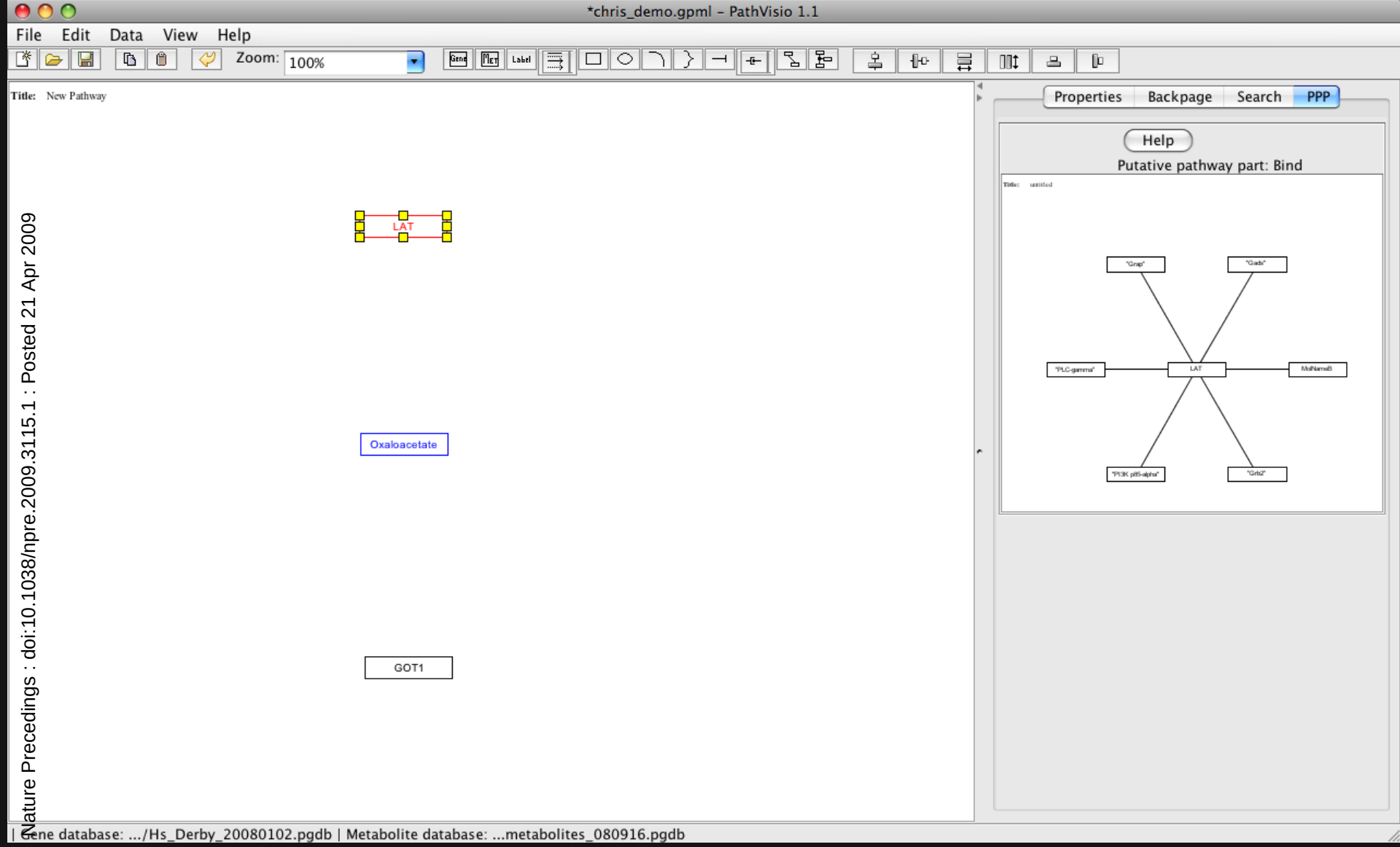
Assisted content generation

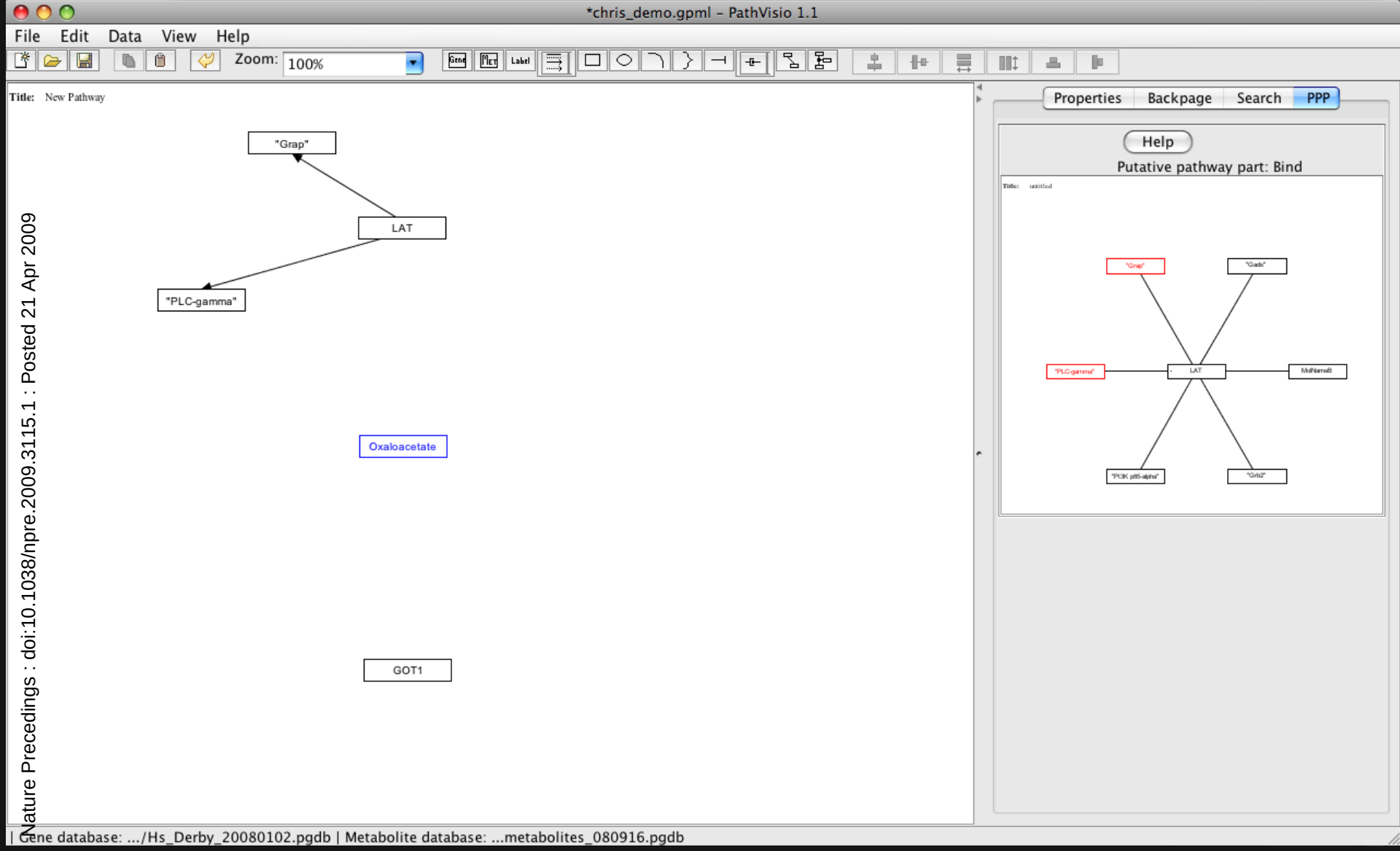
Suggestions from:

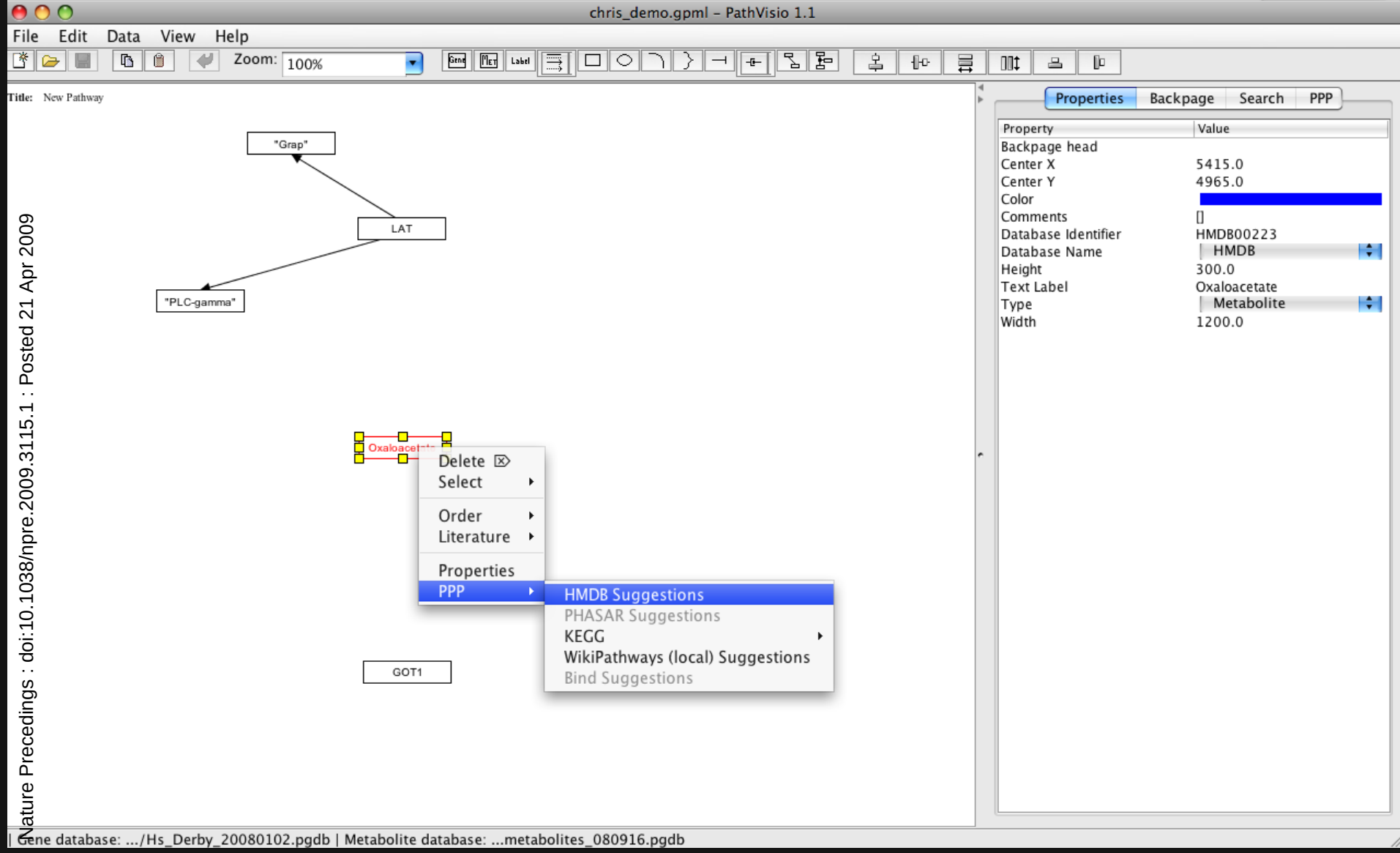
- HMDB
- KEGG
- BIND
- Text mining (Phasar)

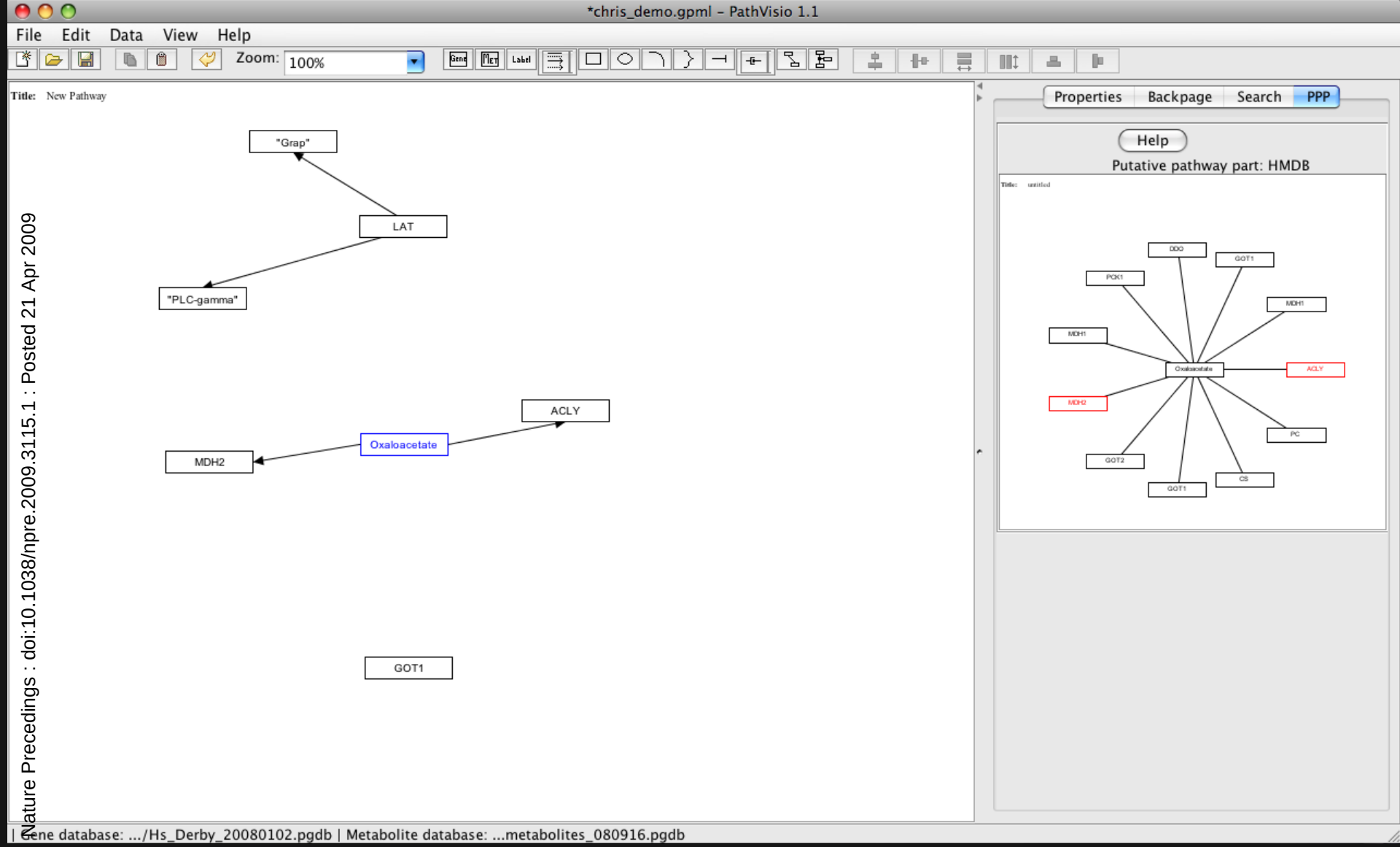












Portal:Micronutrient - WikiPathways - Mozilla Firefox

File Edit View History Delicious Bookmarks Tools Help

http://www.wikipathways.org/index.php/Portal:Micronutrient

Google

Portal:Micronutrient

Micronutrients at WikiPathways

Welcome to the Micronutrient portal at wikipathways. From this page, you can access and collaborate in the construction of pathways and networks focused on the biological activity of micronutrients

About the micronutrient portal Essentially, the micronutrient genetics project aims at identifying all relevant genetic variations related to the biological activity on a specific micronutrient. In doing so, we information in a biological perspective, i.e. pathway and biological network oriented visual browsers. Controversially, for many micronutrients the biological knowledge is still fragmented. Thus, a flexible an with both a wiki-editable and a permanent interface will be implemented. The genetic variation on specific genes will be derived from the basic databases embedded in the human variome project. A bioinfor established that will construct and maintain these web-based interfaces.

News

edit

June 6 2008: The Micro-Nutrient Portal has started!

Aug 1 2008: 2 new networks have been created: the Selenium network and the Folic acid network.

Pathway contributors

edit

Pathways
- Folate (One carbon metabolism)
- Selenium
- Carotenoids and retinol
- Selenium network
- Folic acid network

Contributors
- Ben van Ommen
- Suzan Wopereis
- Susan Coort
- Michiel Adriaens
- Estibaliz Goyenechea
- Jildau Bouwman

Portals
Need one?

About the Micronutrient Genomics project

edit

Featured Pathway

One-carbon metabolism (Homo sapiens)

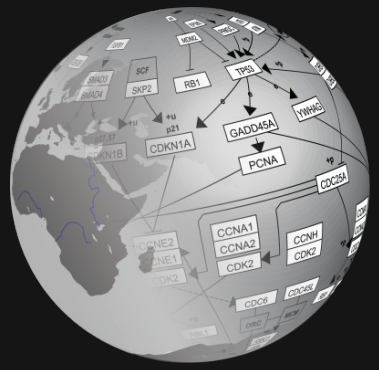
One-carbon metabolism

View all Featured Pathways for this Portal

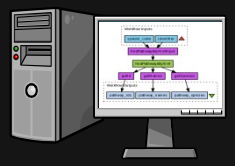
Statistics

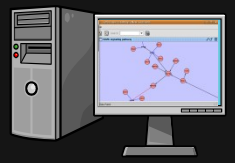
Micronutrient pathway stats coming soon!

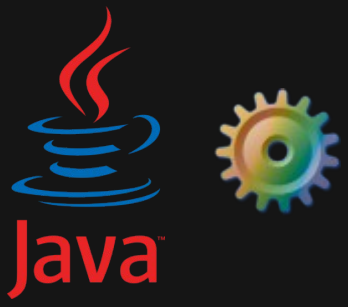
Webservice

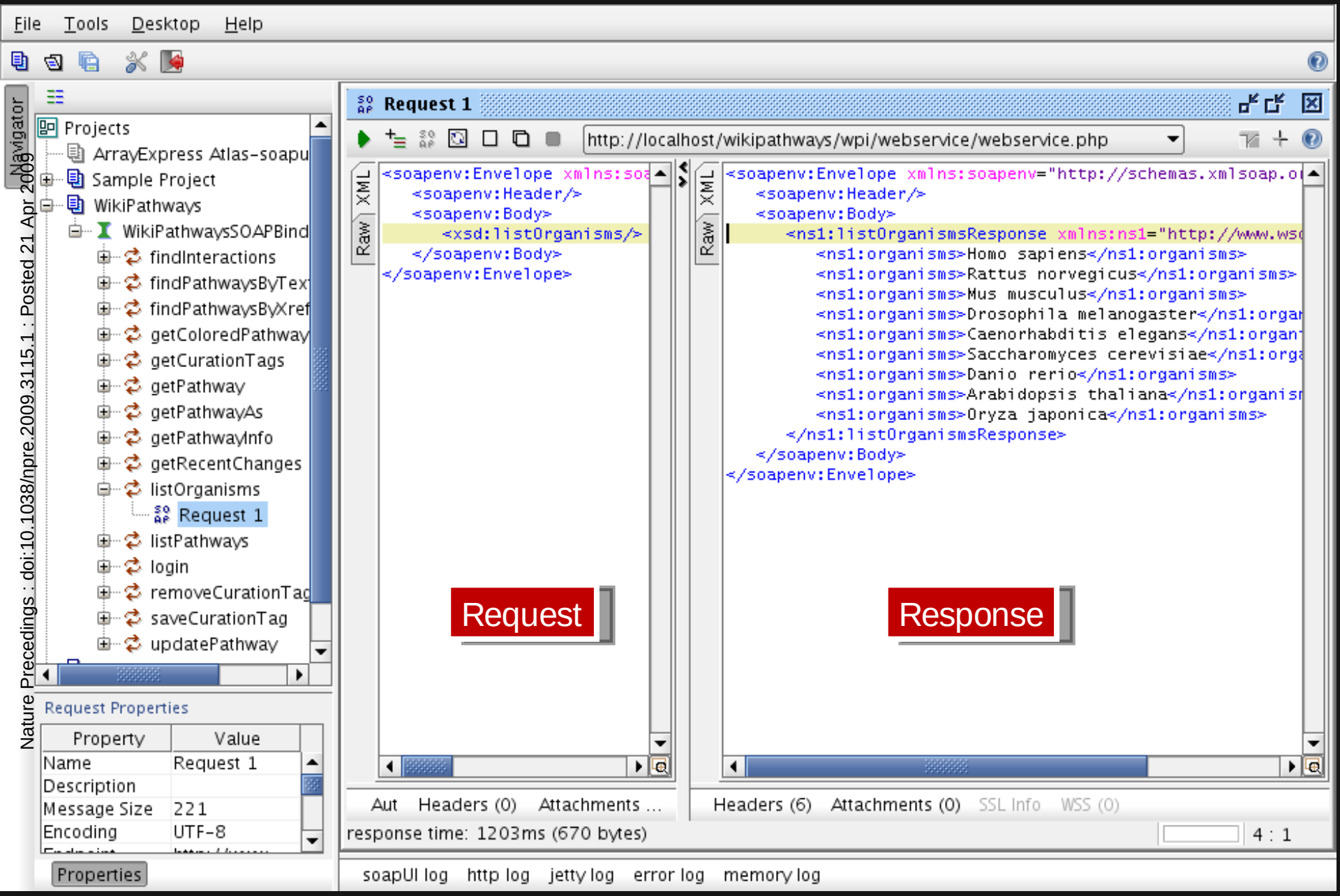


Web service









What for?

- Build web applications
- Extend existing applications
- Include in workflows / analysis pipelines

Available services

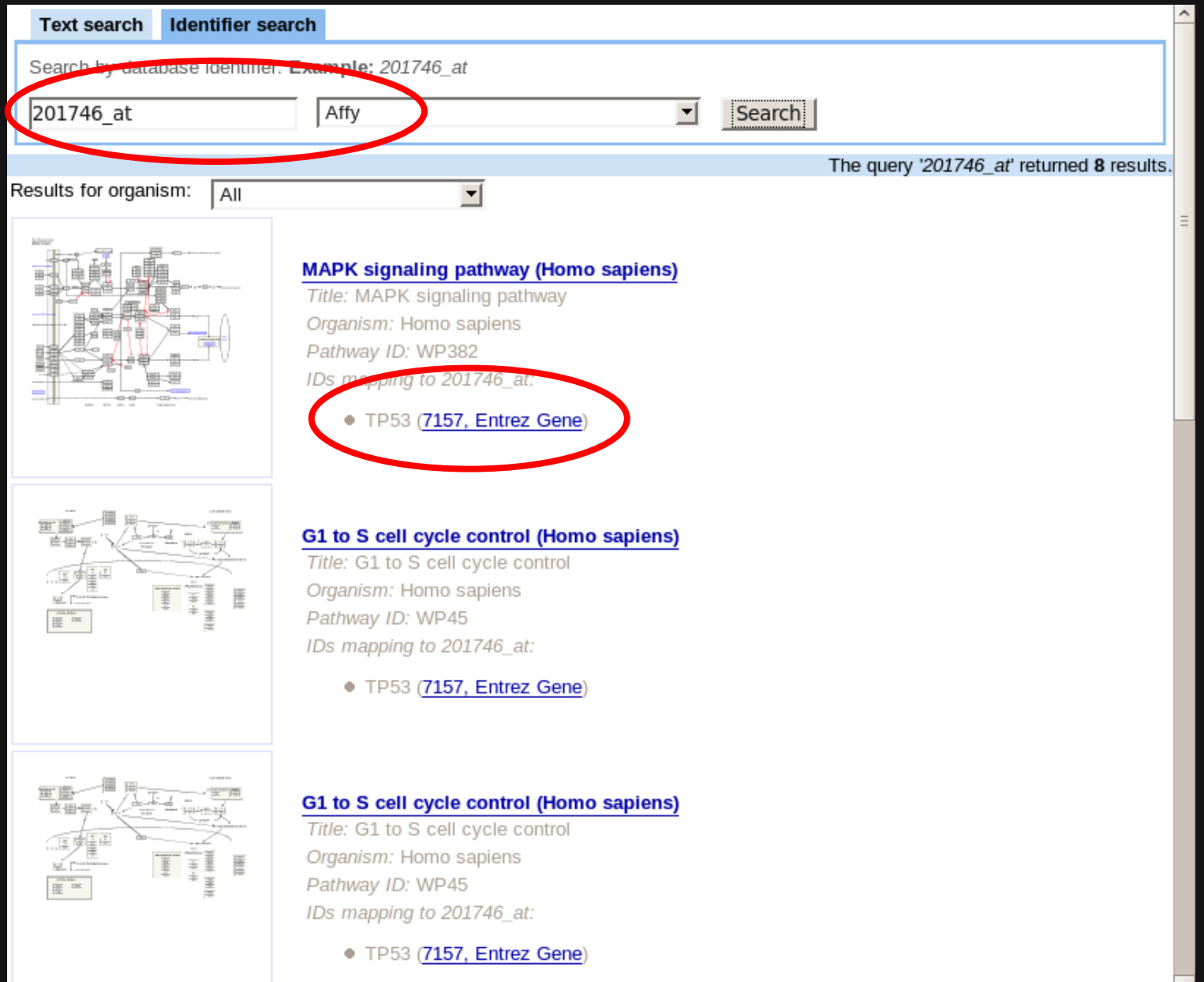
- Download
  - All pathway information in various formats
  - Pathway metadata
  - Colored pathway images
  - Gene lists
- Find
  - By keyword searches
  - By gene / protein / small molecule identifier
  - Interactions by gene / protein

Available services

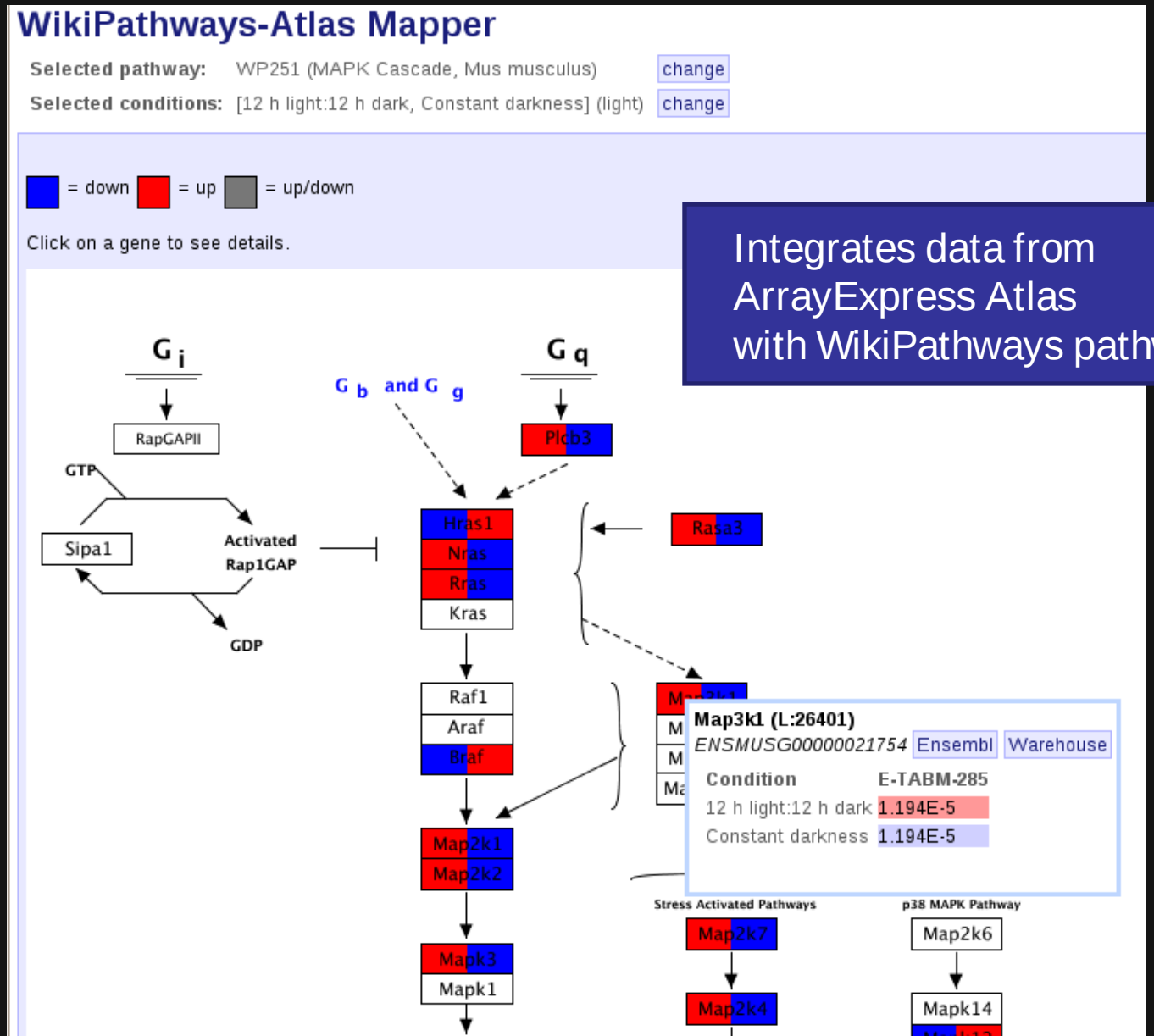
- Update
  - Notify community by curation tags
  - Update pathway content
  - Create new pathways

- Write access upon request

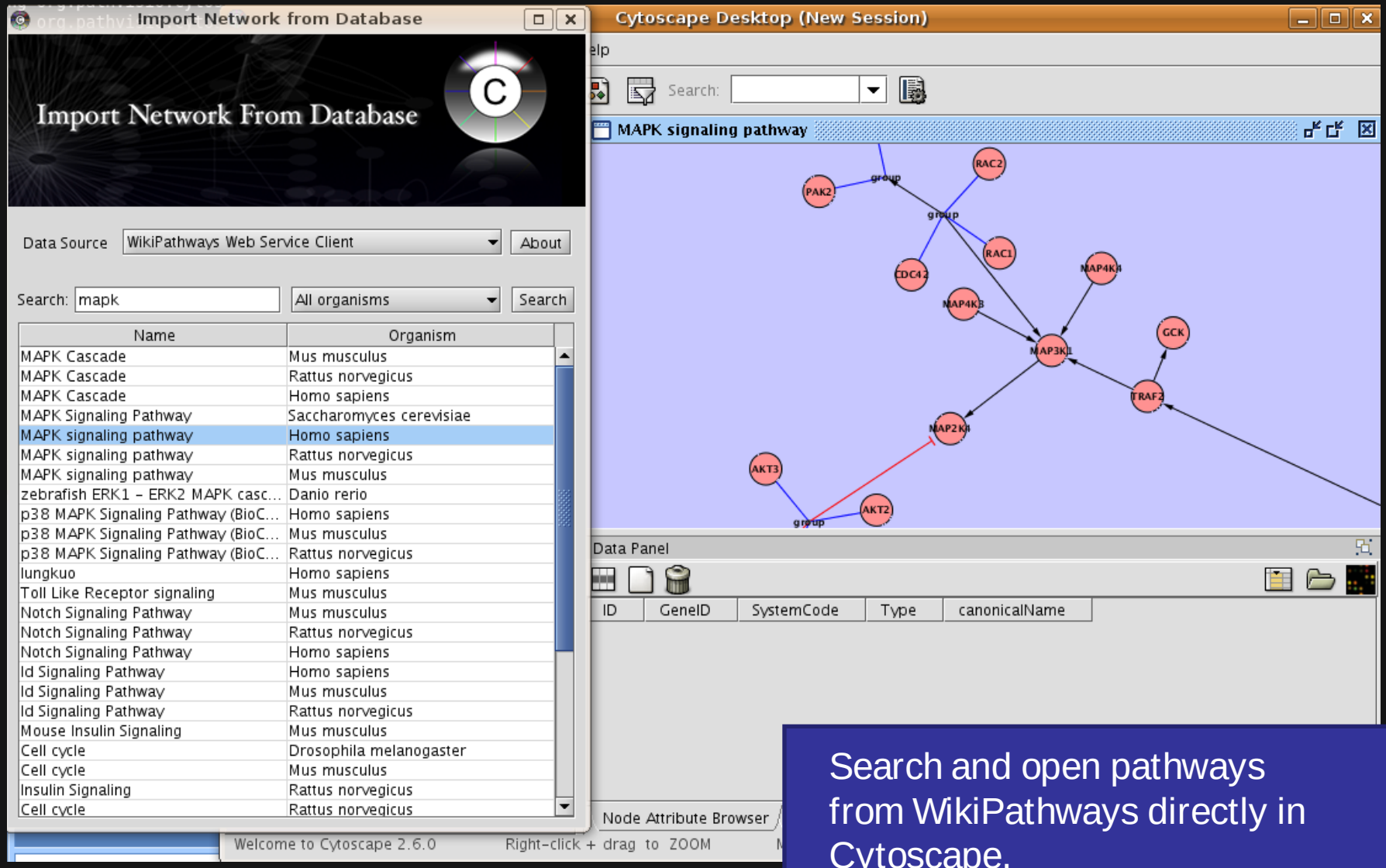
Search engine



Visualizing gene expression

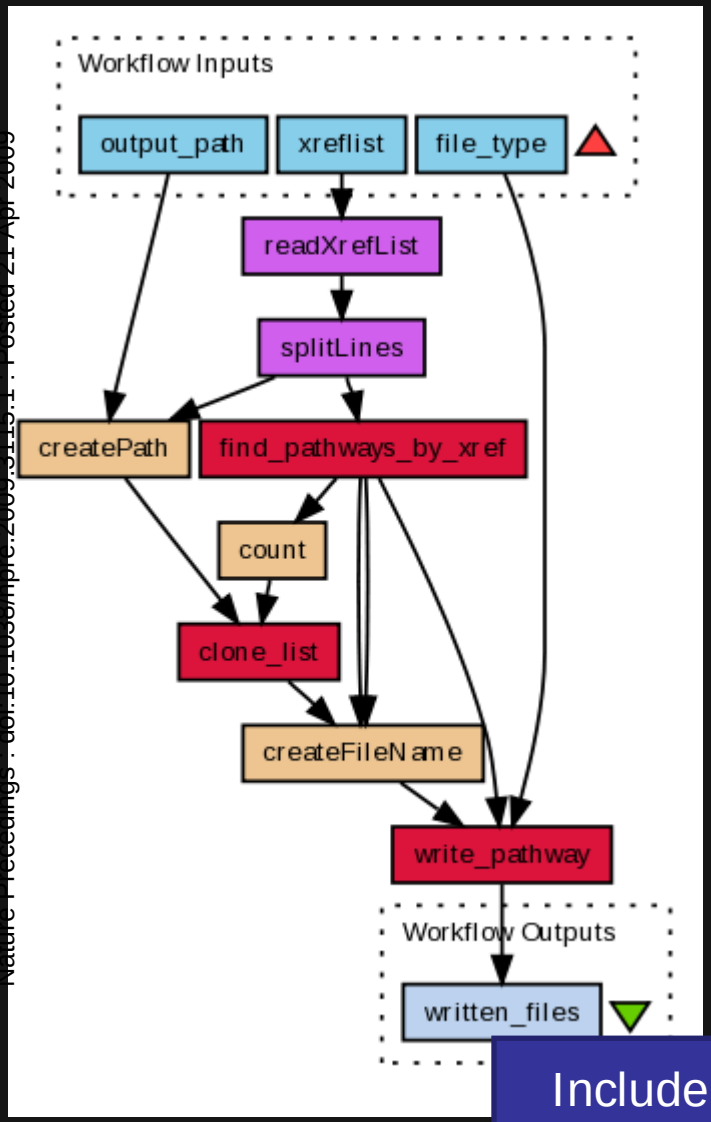


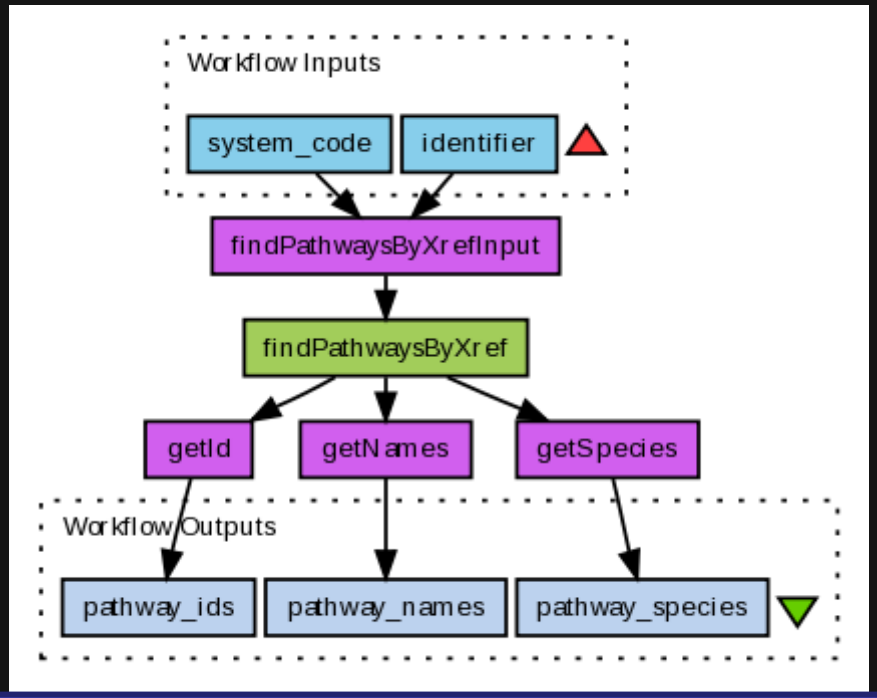
Cytoscape plugin



Search and open pathways from WikiPathways directly in Cytoscape.

Taverna workflows





Include pathway information in Taverna workflows.

http://www.myexperiment.org/packs/40

R Example

- SSOAP

  http://www.omegahat.org/SSOAP/

```
## Install SSOAP from Bioconductor ##
source("http://bioconductor.org/biocLite.R")
biocLite("SSOAP")

## Load the SSOAP library ##
library(SSOAP)
```

R- example: GSEA

- Get all human pathways as gene lists
- Download a GEO dataset
  (on papillary renal cell carcinoma)
- Perform Parametric Gene Set Enrichment


```
# Load the required libraries
library(SSOAP)       #To use WikiPathways web service
library(GEOquery)    #To download GEO experiments
library(GSEABase)    #Gene Set data structures
library(PGSEA)       #Parametric Gene Set Enrichment
```

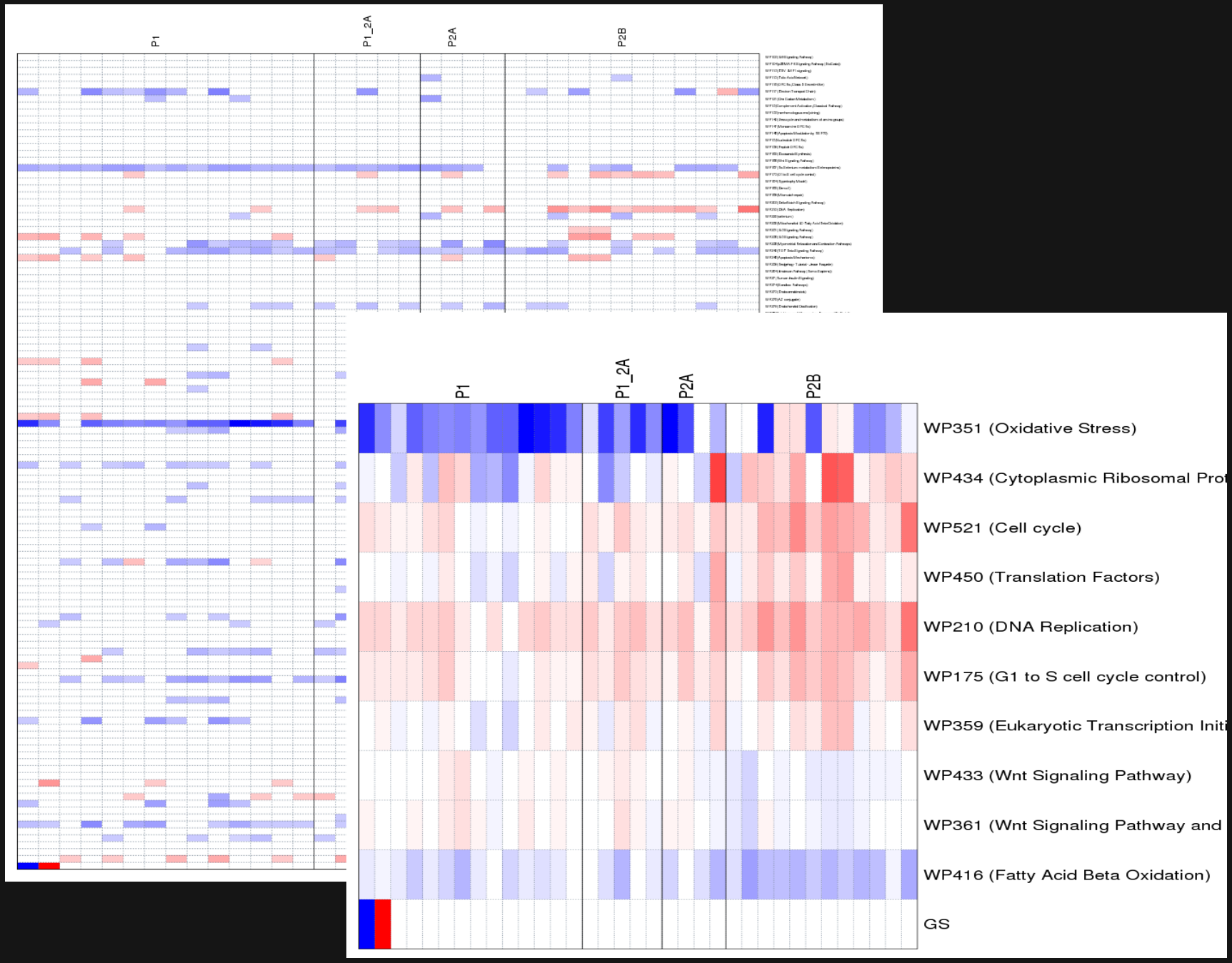
Enrichment analysis


```
# Get an expression set from GEO
gse = getGEO("GSE7023", GSEMatrix = TRUE)
eset = gse[[1]]

# Reformat the phenotype labels
subtype = gsub("subtype: ", "", phenoData(eset)$characteristics_ch1)
subtype = gsub("\\.", "_", subtype)

# Run the PGSEA calculation (reference sample is 'NO')
pg = PGSEA(eset, geneSetCollection, ref = which(subtype == "NO"), p.value=0.005)

# Plot the result matrix
smcPlot(
    pg, factor(subtype), scale=c(-15,15), show.grid = TRUE, margins = c(1, 1, 4, 10),
    col = .rwb, r.cex = 0.35
)
```



- WikiPathways web service:
  - Programmatic interface to WikiPathways data
  - Language-independent
  - Latest pathway information

- Powerful tool when combined with other web services and libraries

http://www.wikipathways.org/webservice

Credit system

Nature Precedings : doi:10.1038/npre.2009.3115.1 : Posted 21 Apr 2009

BETA
WIKIPATHWAYS
Pathways for the People

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titles only

navigation
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- Help

pathway
- Create
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- Wish List
- Download

overview
- Recent Changes
- Most Viewed
- Most Edited
- New Pathways

community
- About us
- Contact us
- How to cite
- GenMAPP Portal
- BiGCaT Portal
- Micronutrient Portal

toolbox
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17. Susan ★☆☆☆☆ *6.63*
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19. SFGKrens ★☆☆☆☆ *6.14*
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32. Wopereiss ☆☆☆☆☆ *1.72*

www.wikipathways.org

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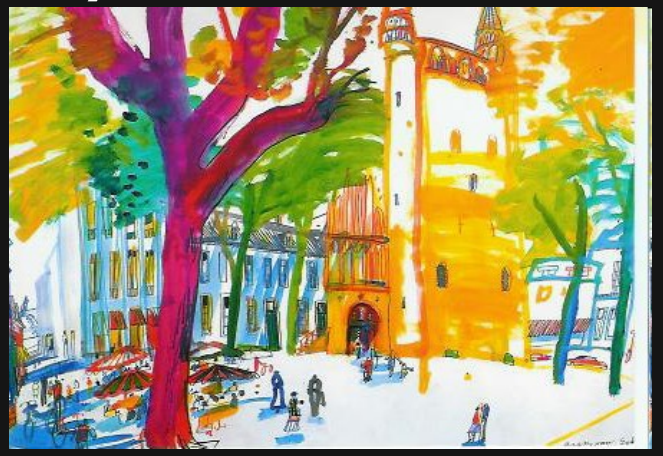

Enjoy!