First Annual Symposium of the
Luxembourg BioInformatics Network
LuciLinX

16th October 2008 - 09.00 - 18.00

Chamber of Commerce - Conference Centre - LUXEMBOURG - KIRCHBERG

WikiPathways, using community knowledge to understand genomics

Chris Evelo

Department of Bioinformatics - BiGCaT
Maastricht University

WikiPathways

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

Overview

- Why Pathways
- Navigation
- Editing
- Curation
- Current status
- Usage

Overview

- Why Pathways
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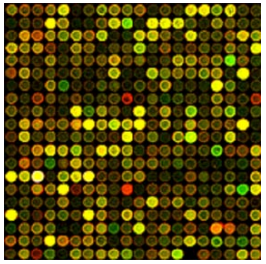
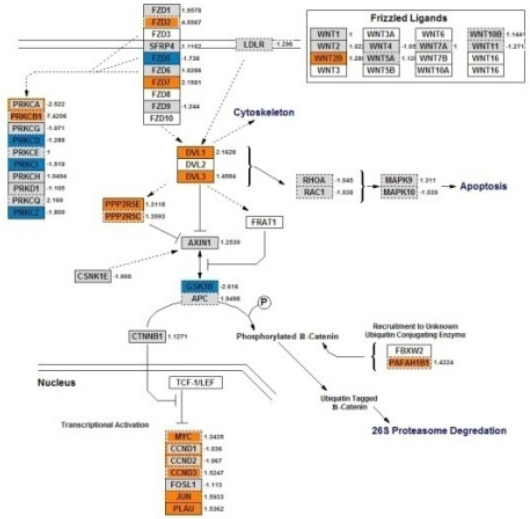
Why Pathway Analysis?

Intuitive to Biologists

- Provide a biological context for results
- More efficient than searching databases gene-by-gene
- Intuitive data display for sharing data





- Why pathways
- Navigation
- Editing
- Curation
- Current status
- Usage

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:

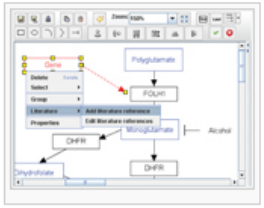
- Pathway name *(Apoptosis)*
- Gene or protein name *(p53)*
- Any page content *(cancer)*

Browse

Browse by species and category

Contributing New Pathways

Create



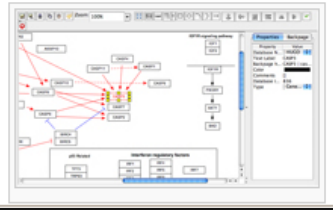
Create a new pathway page

Suggest

Add a pathway to the wish list

Sample Pathway Pages

Sandbox



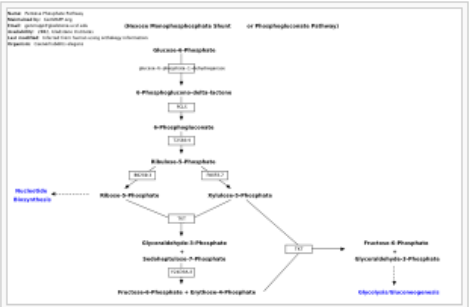
Check out the following pages:

- 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

New!

- WikiPathways won the application showcase at the NBIC BioRange Consortium Meeting!
- 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)*

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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
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- What links here
- Related changes
- Special pages
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You can search by:

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

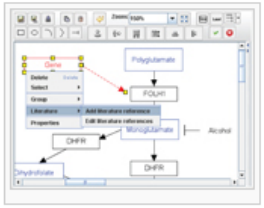
Browse

Browse by species and category

Search: “One carbon”

Contributing New Pathways

Create



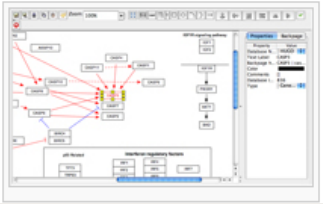
Create a new pathway page

Suggest

Add a pathway to the wish list

Sample Pathway Pages

Sandbox



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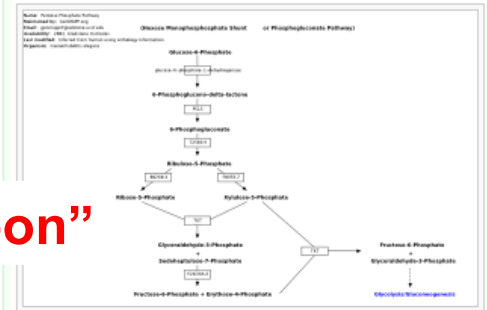

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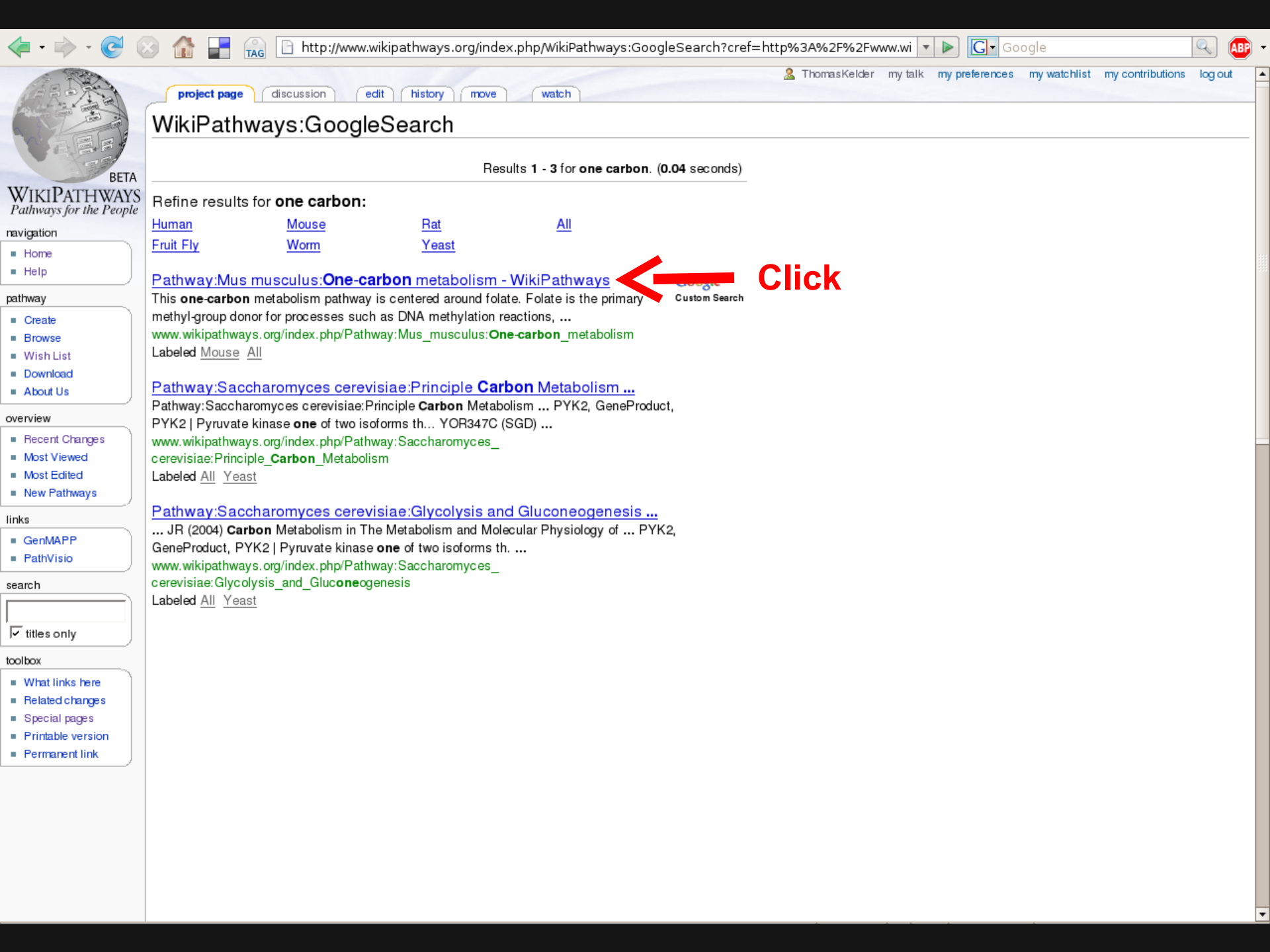
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Google
ThomasKelder my talk my preferences my watchlist my contributions log out
project page discussion edit history move watch
BETA
WIKIPATHWAYS
Pathways for the People
navigation
Home
Help
pathway
Create
Browse
Wish List
Download
About Us
overview
Recent Changes
Most Viewed
Most Edited
New Pathways
links
GenMAPP
PathVisio
search
titles only
toolbox
What links here
Related changes
Special pages
Printable version
Permanent link
WikiPathways:GoogleSearch
Results 1 - 3 for one carbon. (0.04 seconds)
Refine results for one carbon:
Human Mouse Rat All
Fruit Fly Worm Yeast
Pathway:Mus musculus:One-carbon metabolism - WikiPathways
Custom Search
Click
This one-carbon metabolism pathway is centered around folate. Folate is the primary methyl-group donor for processes such as DNA methylation reactions, ...
www.wikipathways.org/index.php/Pathway:Mus_musculus:One-carbon_metabolism
Labeled Mouse All
Pathway:Saccharomyces cerevisiae:Principle Carbon Metabolism ...
Pathway:Saccharomyces cerevisiae:Principle Carbon Metabolism ... PYK2, GeneProduct, PYK2 | Pyruvate kinase one of two isoforms th... YOR347C (SGD) ...
www.wikipathways.org/index.php/Pathway:Saccharomyces_cerevisiae:Principle_Carbon_Metabolism
Labeled All Yeast
Pathway:Saccharomyces cerevisiae:Glycolysis and Gluconeogenesis ...
... JR (2004) Carbon Metabolism in The Metabolism and Molecular Physiology of ... PYK2, GeneProduct, PYK2 | Pyruvate kinase one of two isoforms th. ...
www.wikipathways.org/index.php/Pathway:Saccharomyces_cerevisiae:Glycolysis_and_Gluconeogenesis
Labeled All Yeast

Pathway:Homo sapiens:One-carbon metabolism

WikiPathways BETA
Pathways for the People

navigation
- Home
- Help

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

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

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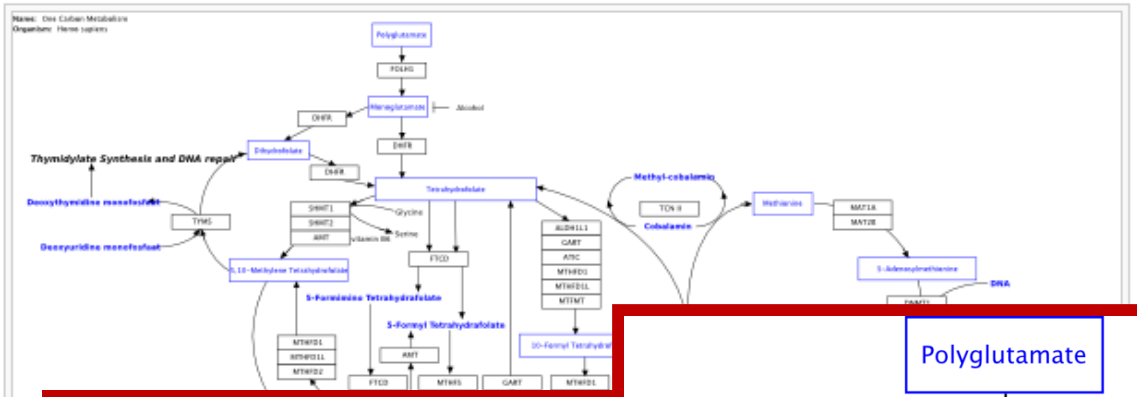


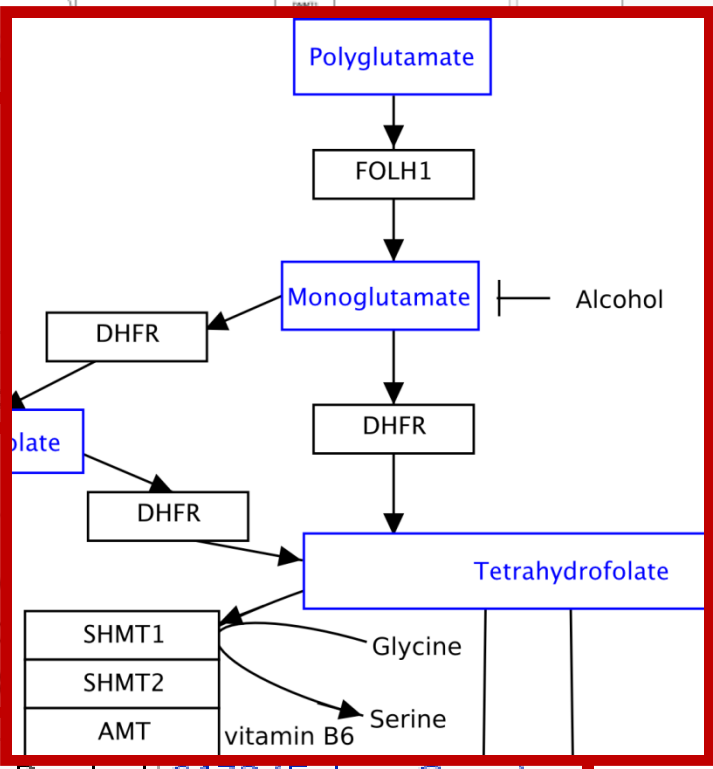
Contents [hide]

1 Description
2 Bibliography
3 Categories
4 Download files
4.1 Image formats
4.2 Data formats
4.3 Actions
Batch
ory
way Info
DataNodes

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

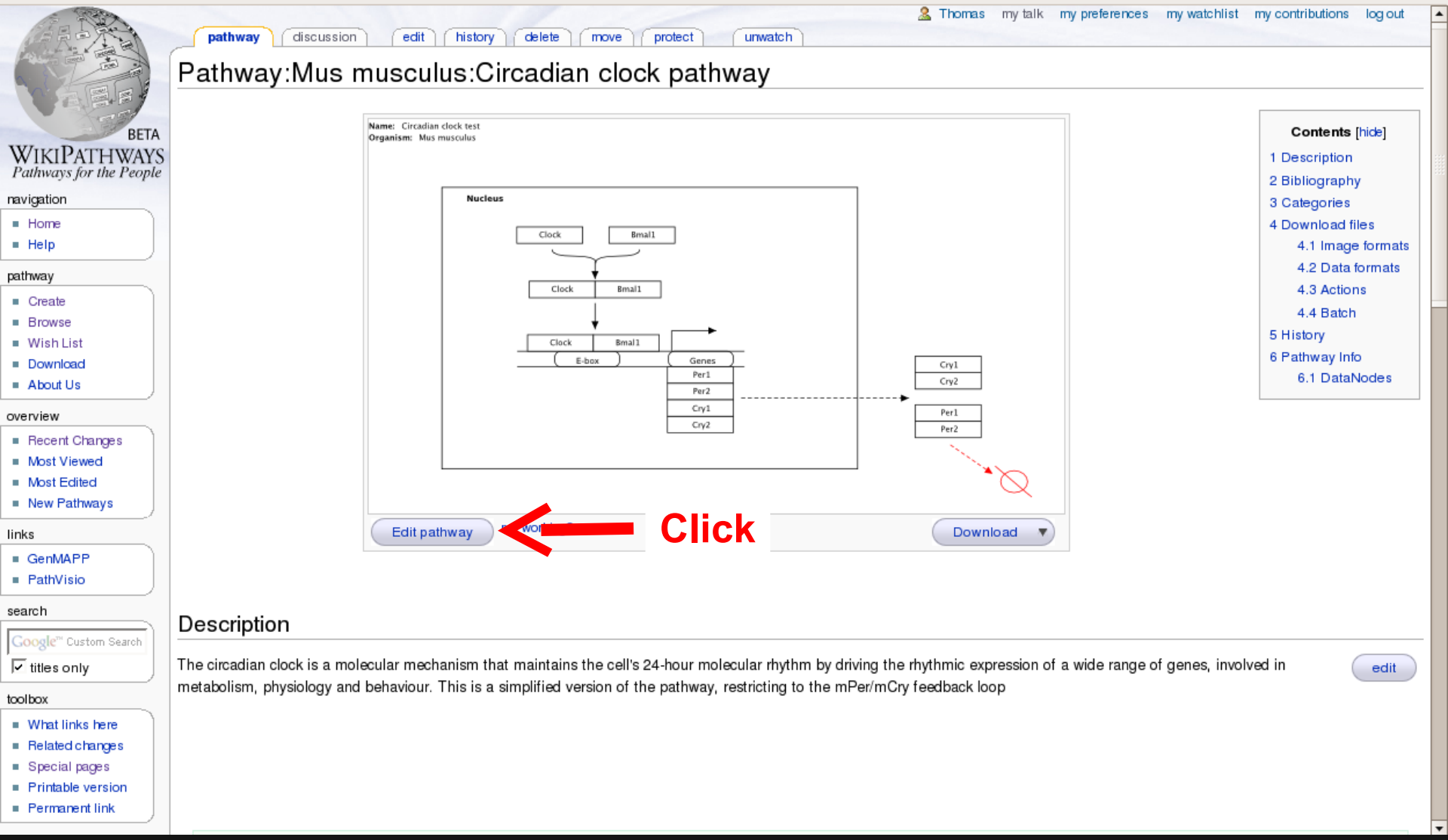
edit

Bibliogra

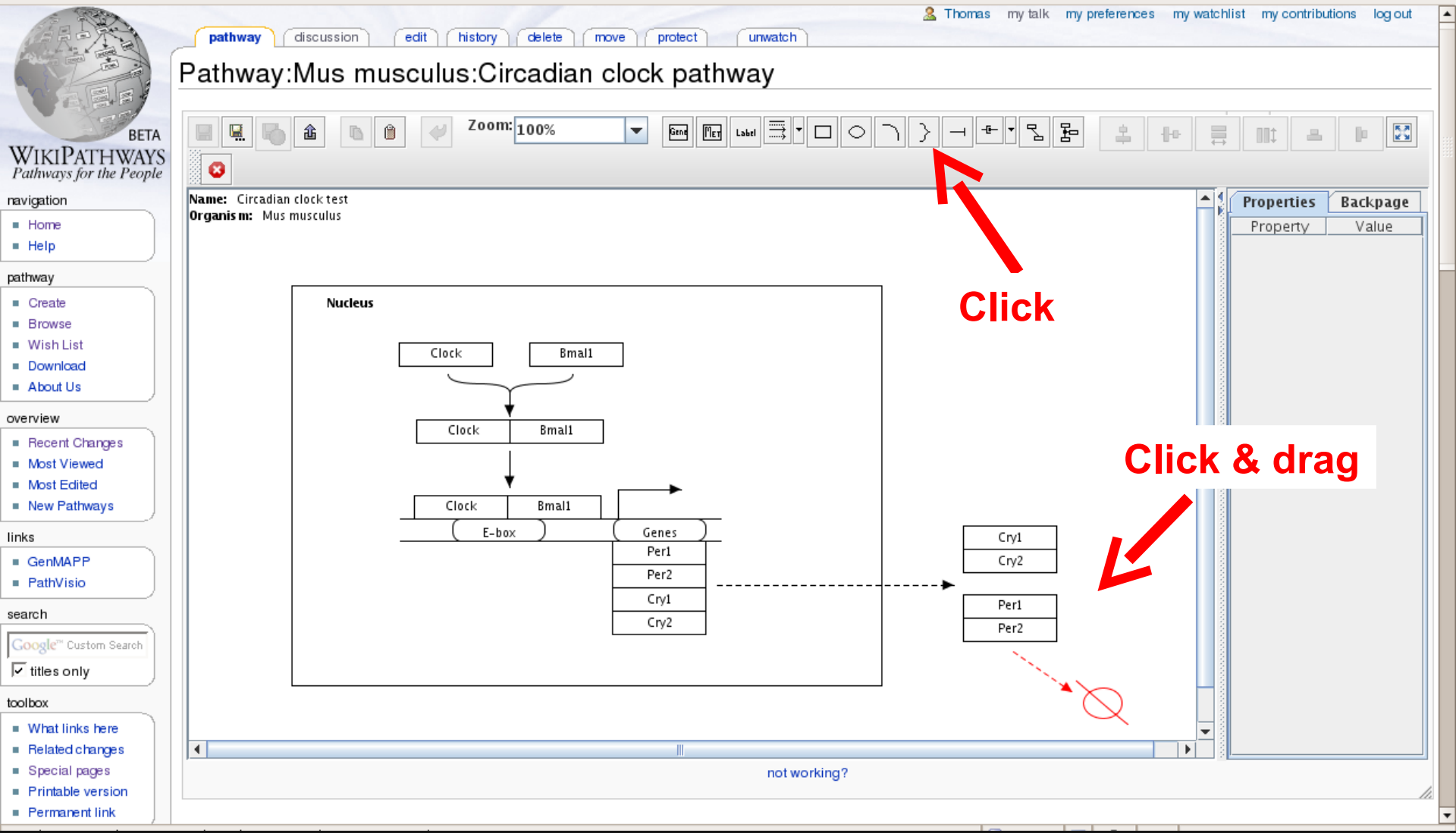
1. Hazra A, Wu K, Kraft P, Fuchs CS, Giovannucci EL, and Hunter DJ. *Twenty-four non-synonymous polymorphisms in the one-carbon metabolic pathway and risk of colorectal adenoma in the Nurses' Health Study*. Carcinogenesis 2007 Jul; 28(7) 1510-9.

- Why pathways
- Navigation
- Editing
- Curation
- Current status
- Usage

1. Start the editor



2. Draw the proteins and interactions



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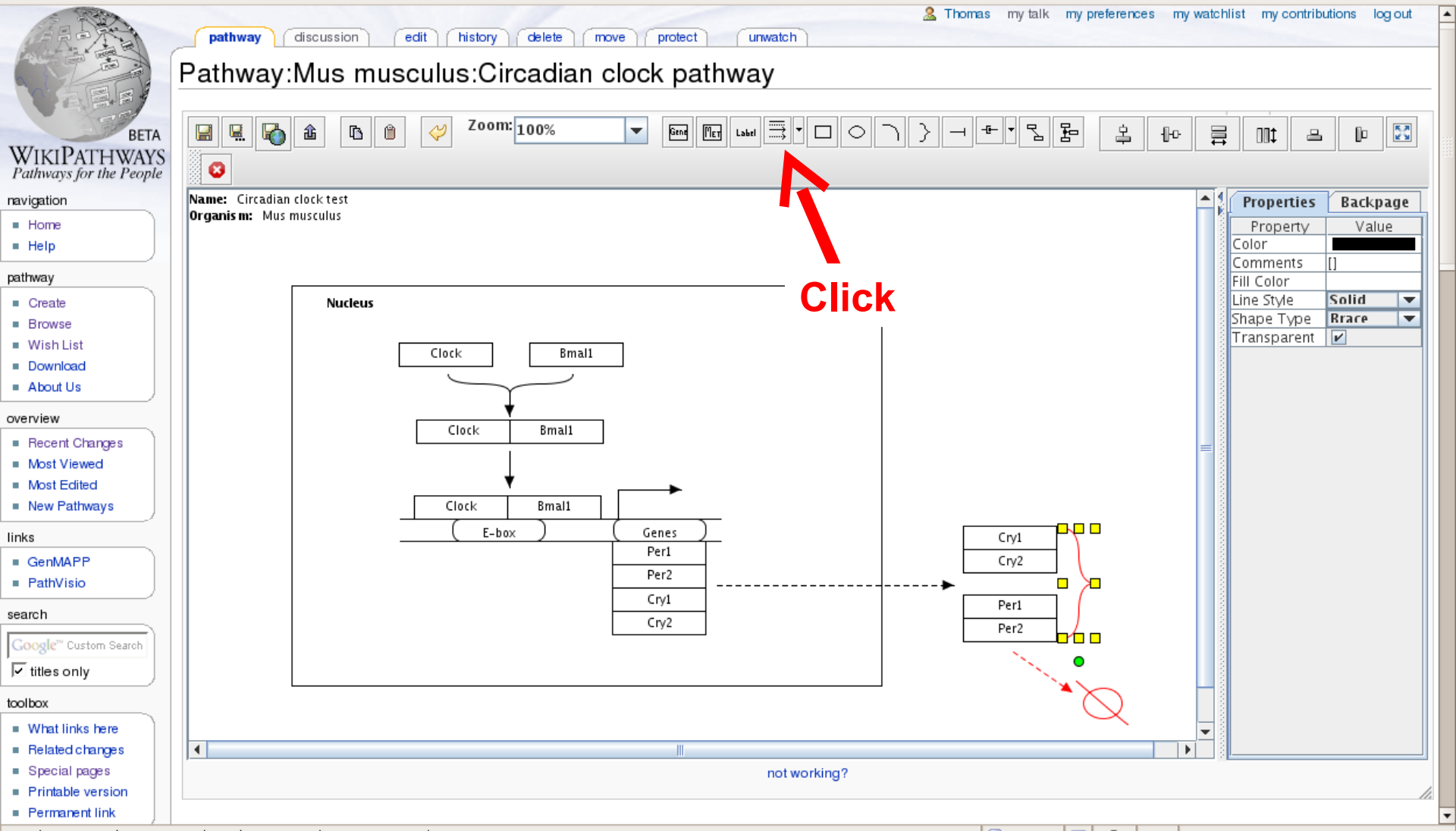

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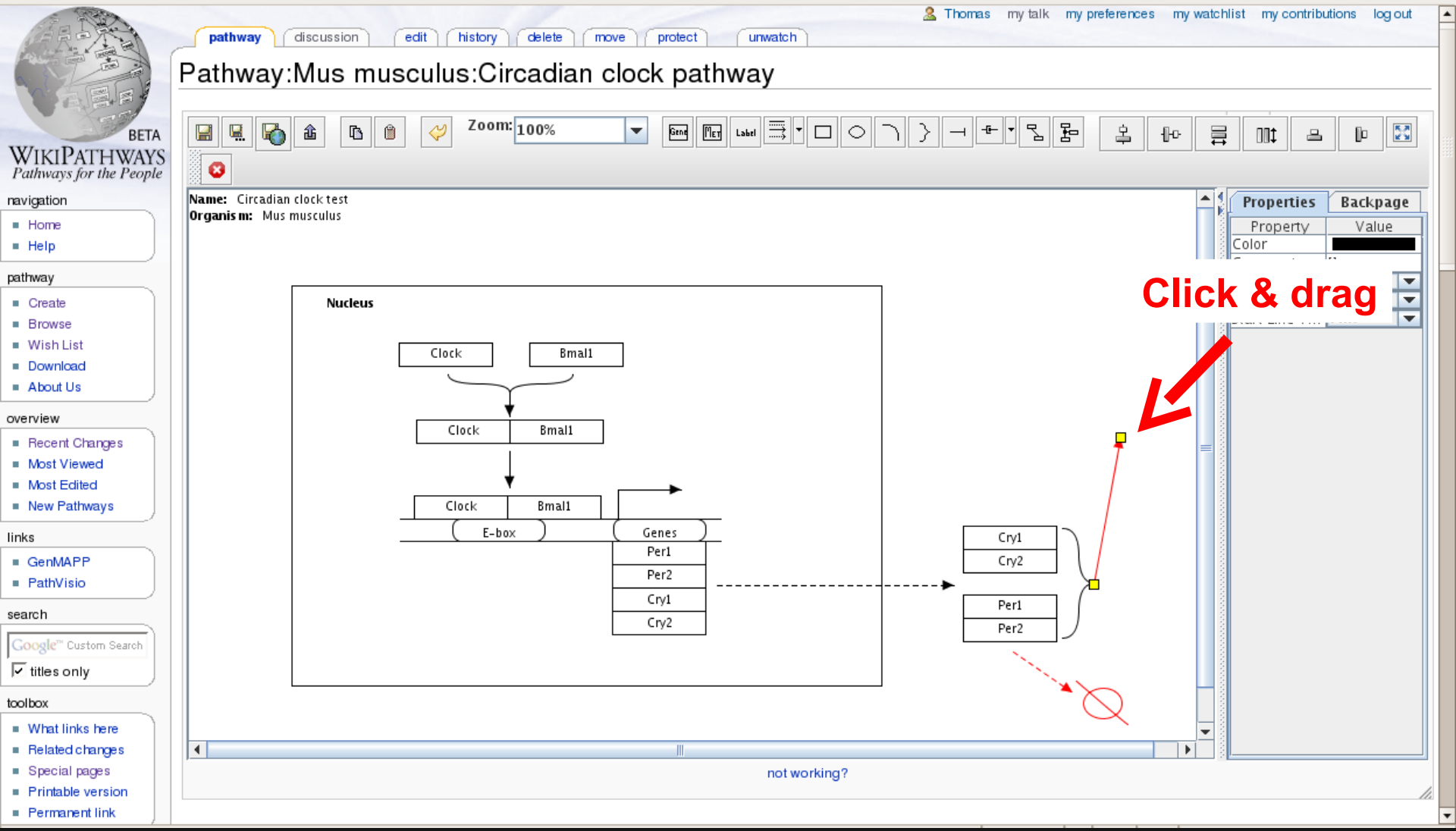

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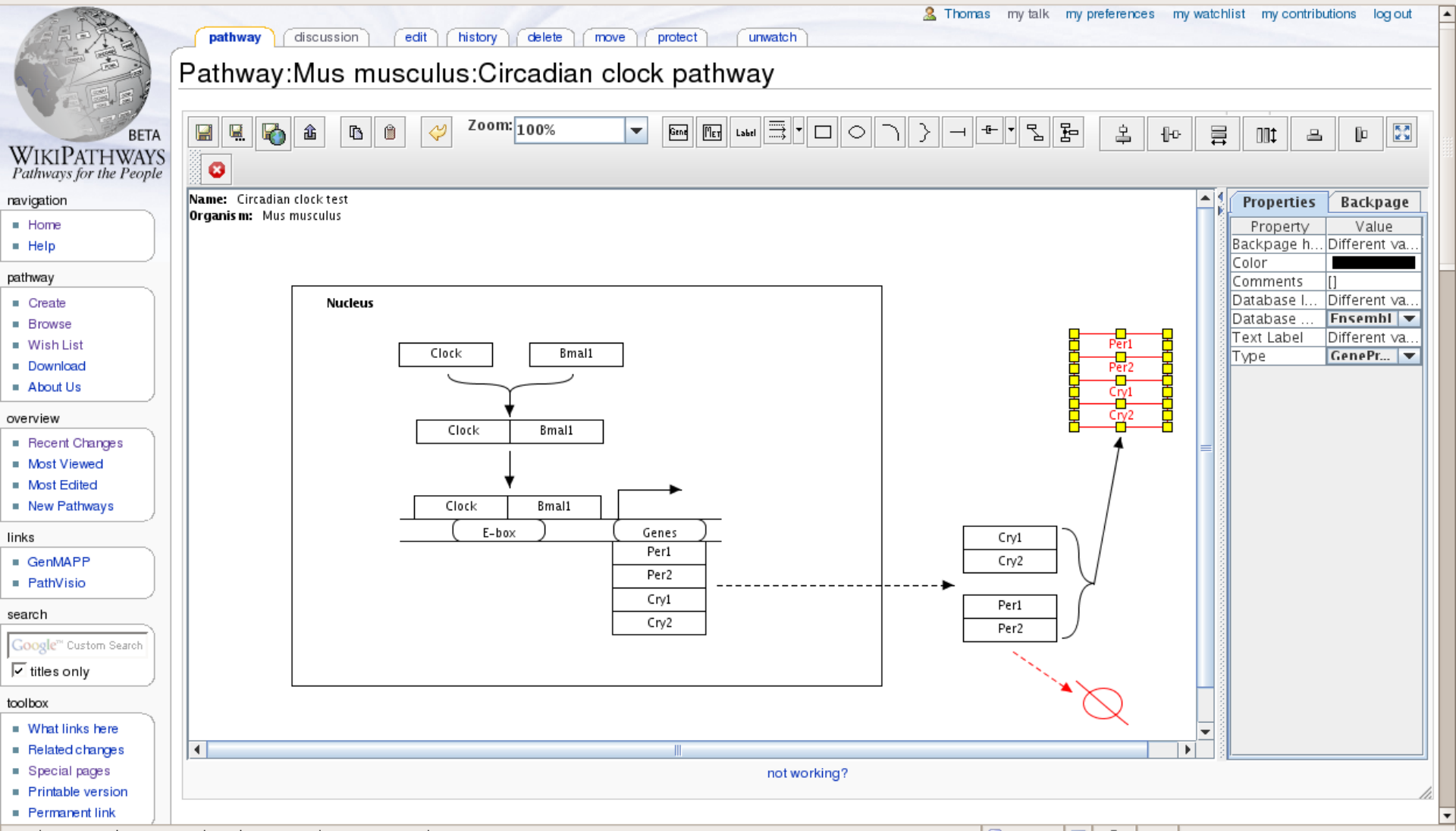

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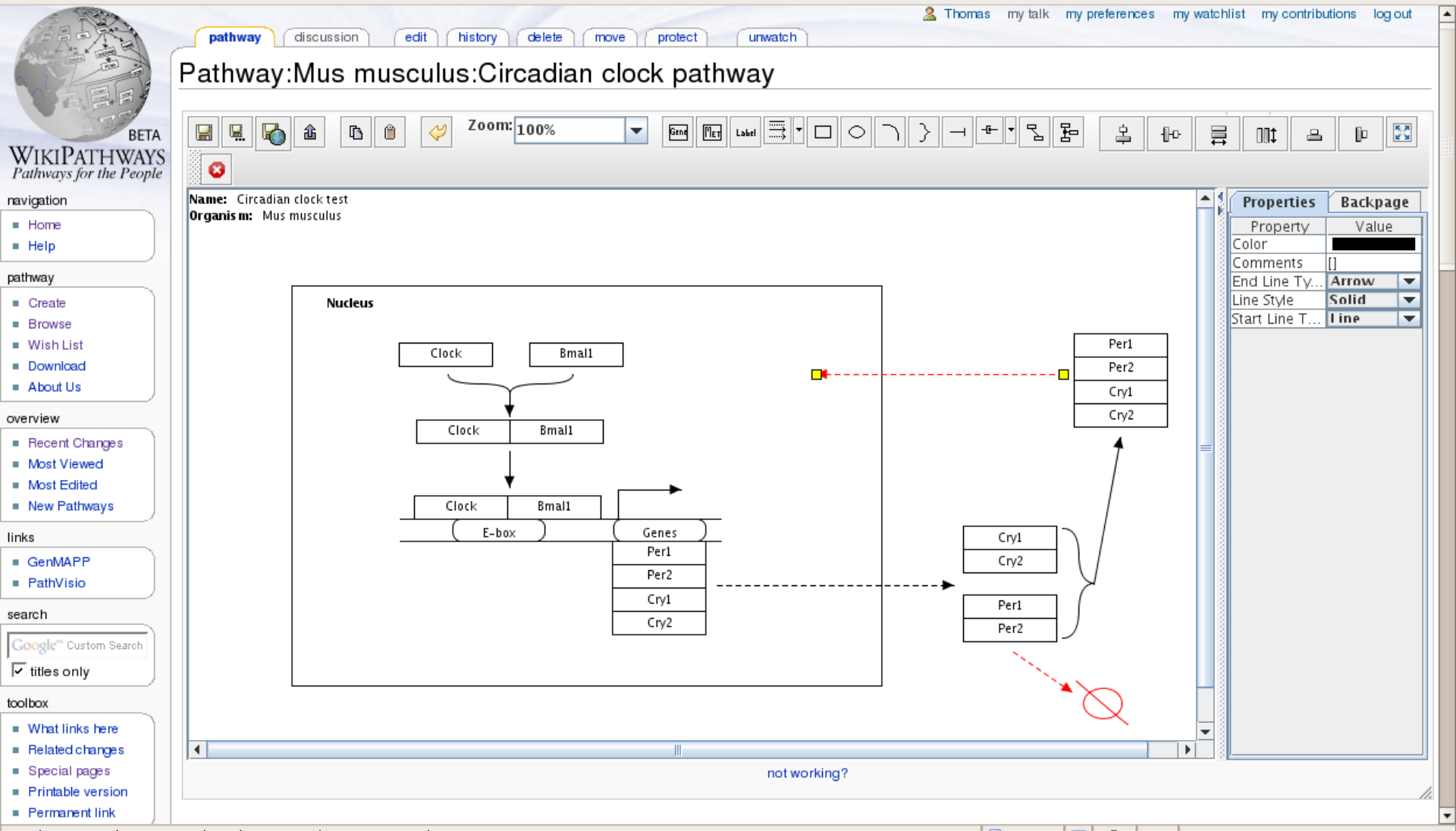

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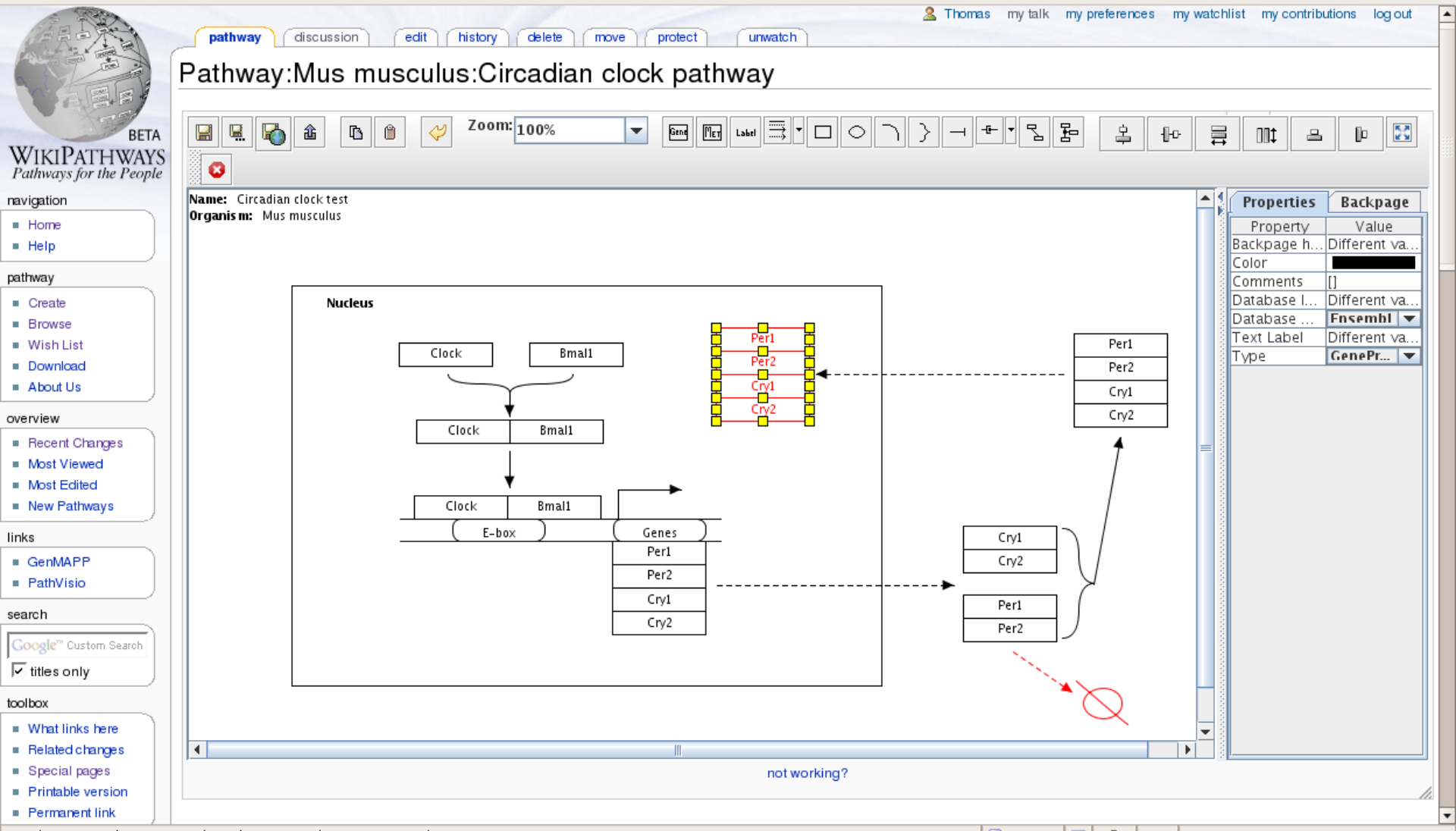

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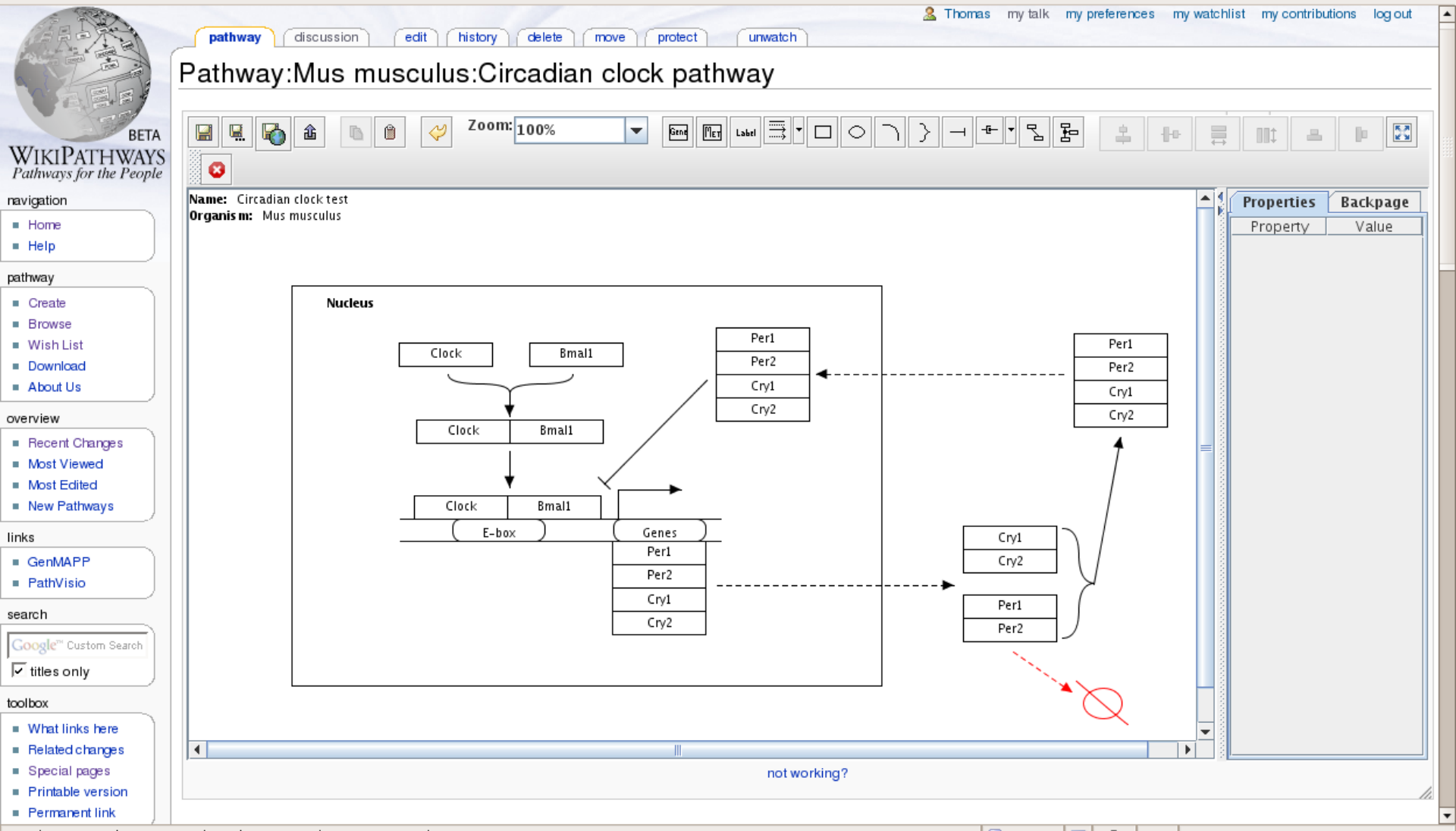
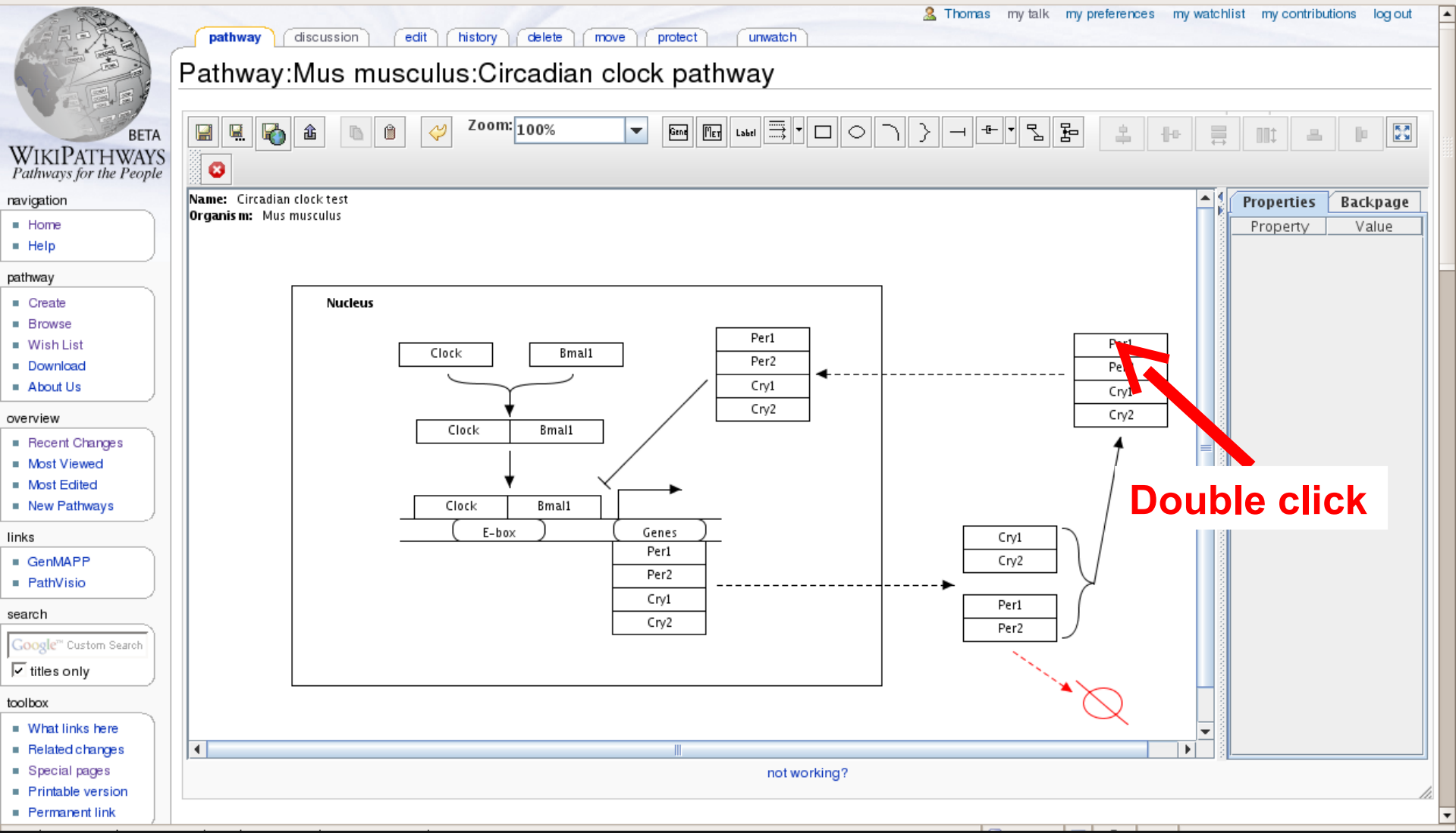


3. Annotate the proteins



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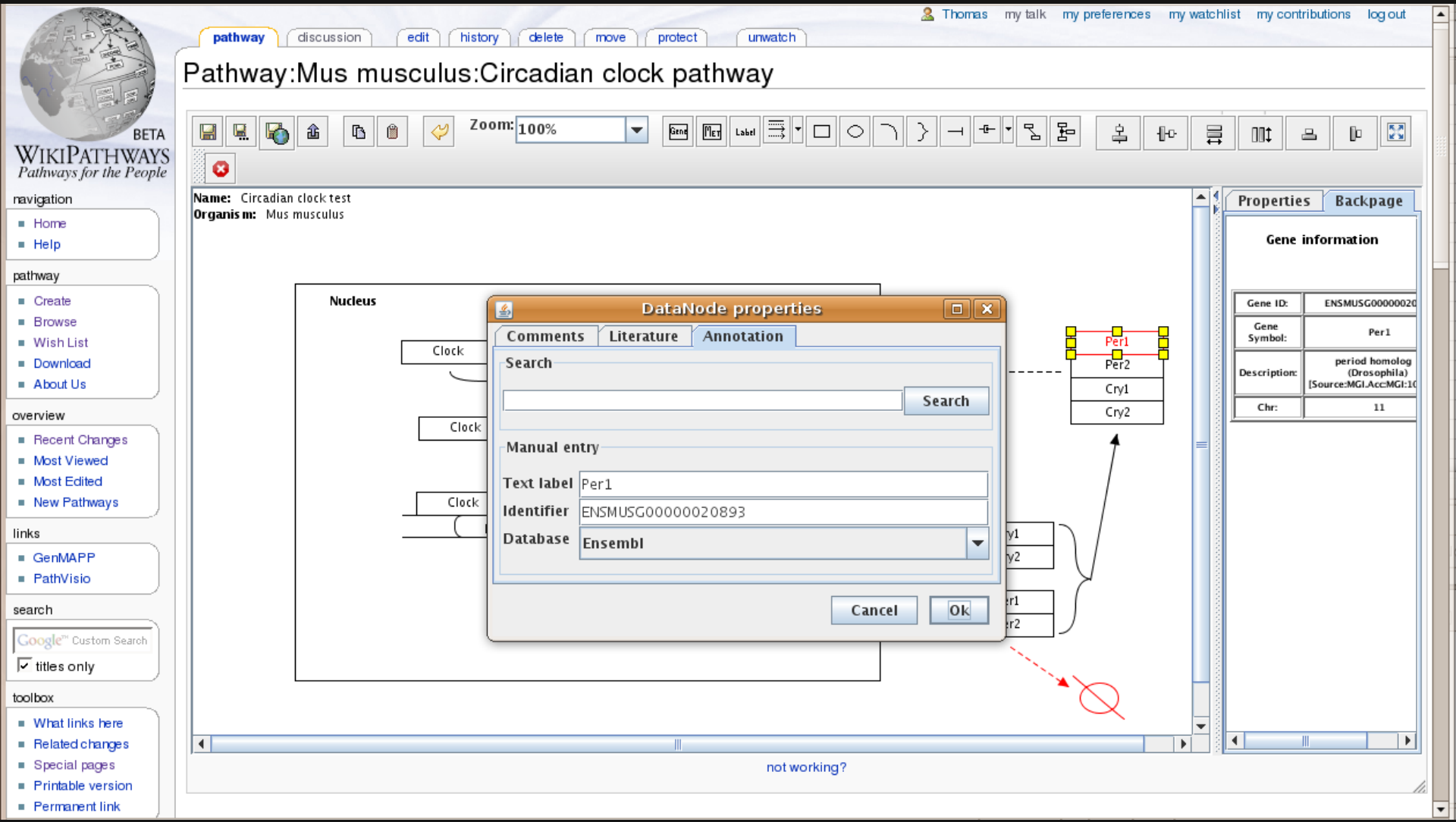
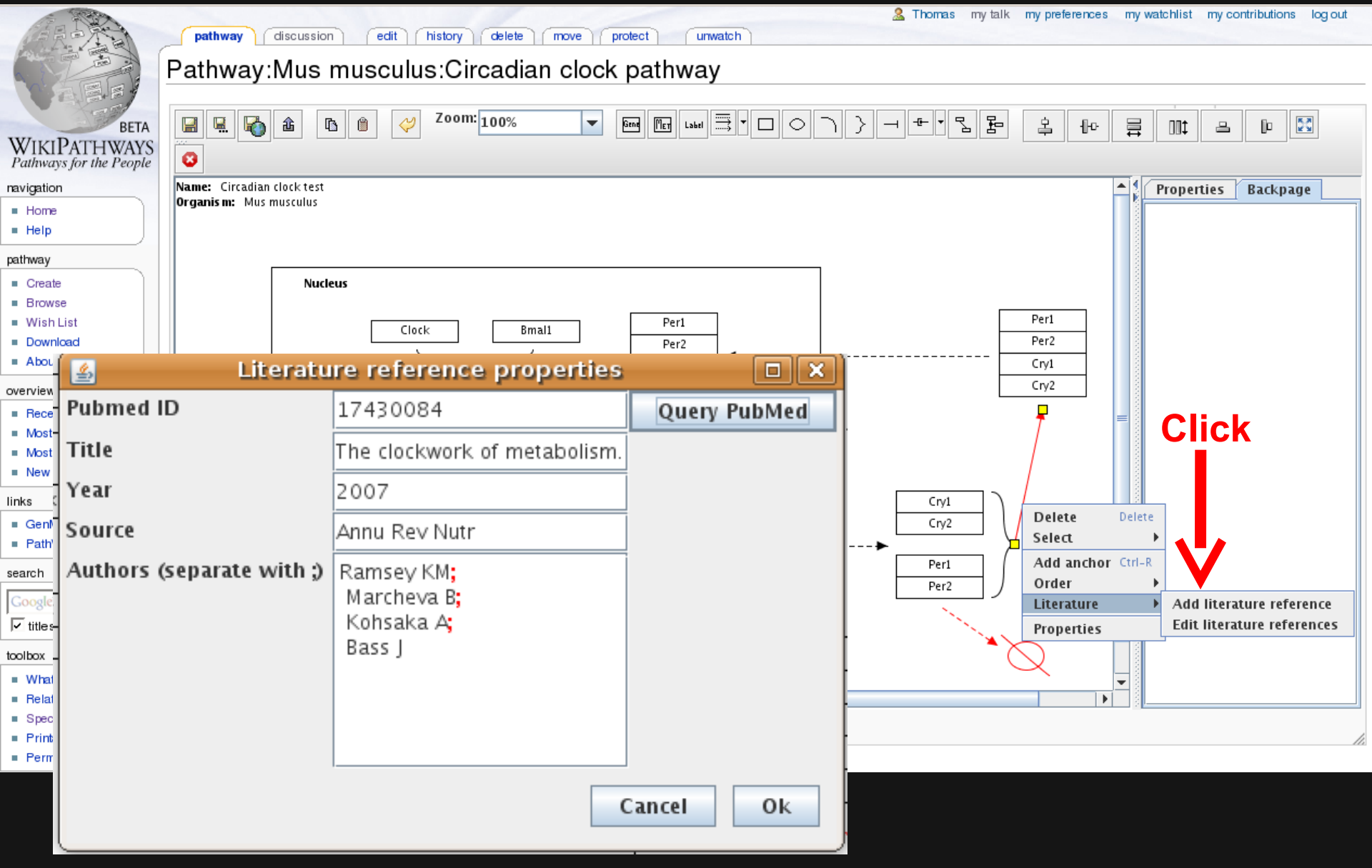
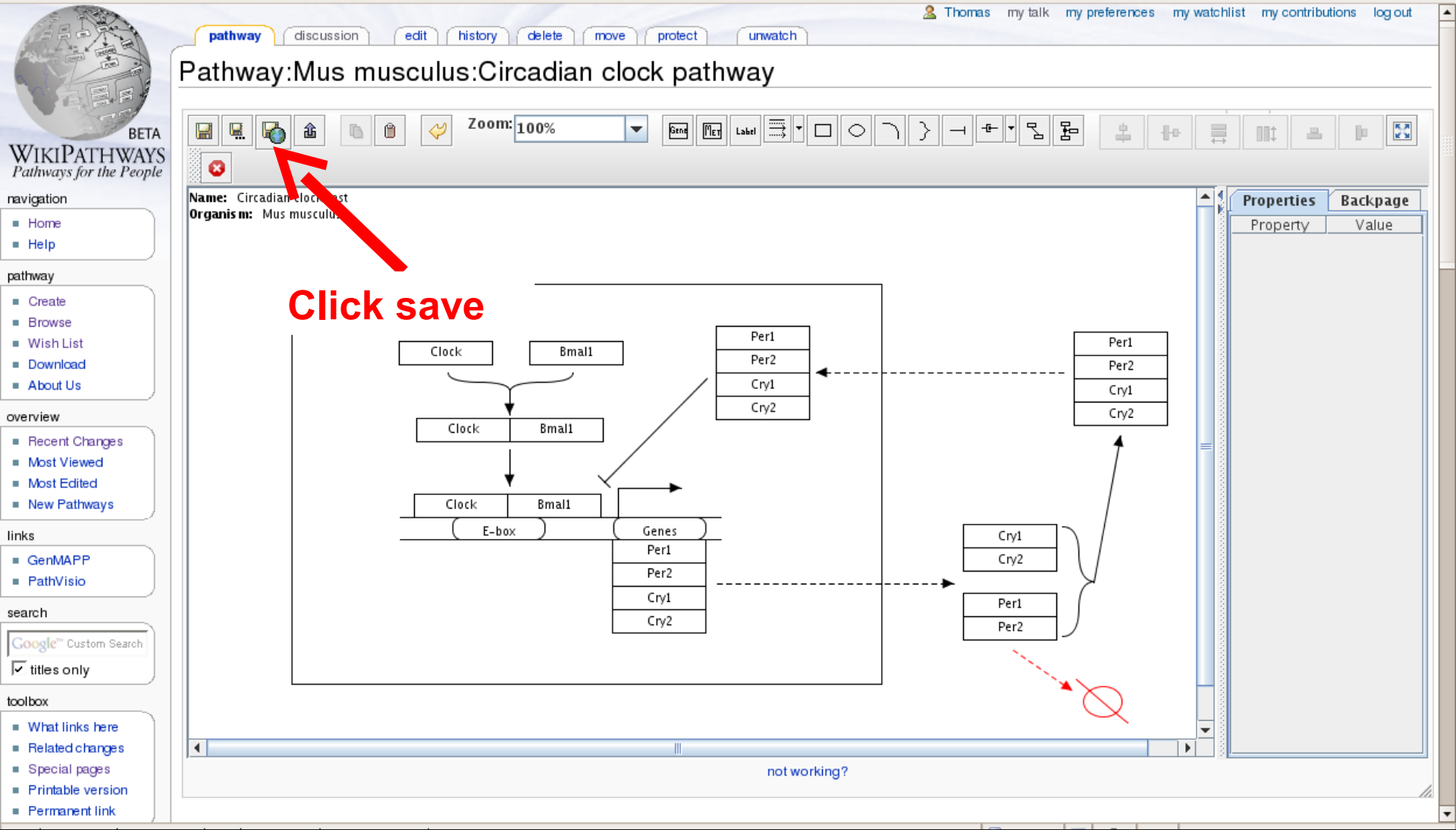


4. Add reference to literature



5. Save the pathway



Updated pathway page

BETA
WIKIPATHWAYS
Pathways for the People

navigation
- Home
- Help

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

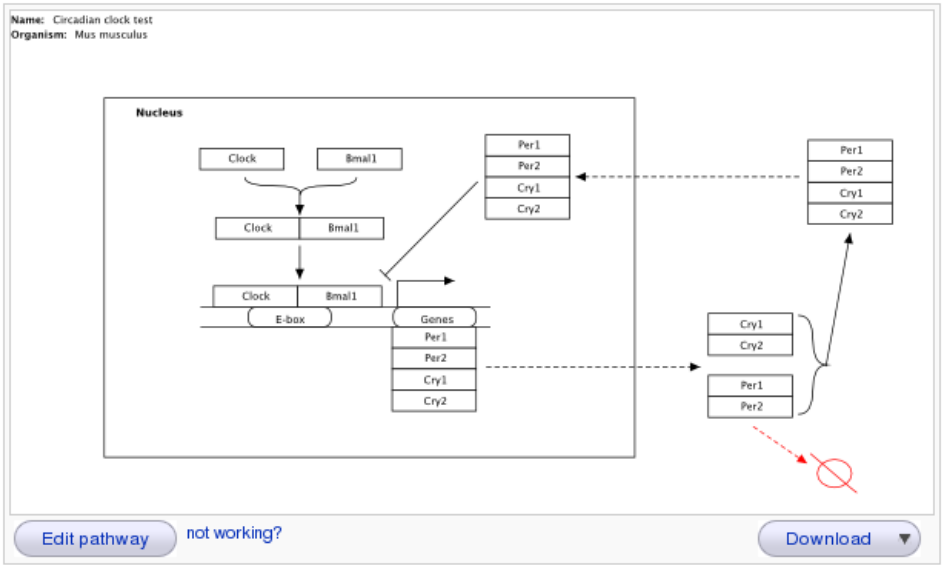
overview
- Recent Changes
- Most Viewed
- Most Edited
- New Pathways

links
- GenMAPP
- PathVisio

search
Google™ Custom Search
titles only

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

Pathway:Mus musculus:Circadian clock pathway



Contents [hide]
1 Description
2 Bibliography
3 Categories
4 Download files
4.1 Image formats
4.2 Data formats
4.3 Actions
4.4 Batch
5 History
6 Pathway Info
6.1 DataNodes

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]

- Why Pathways
- Navigation
- Editing
- Curation
- Current status
- Usage

- *“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

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(Difference between revisions)

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

== Footnotes ==
```

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>

+

+ * 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

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File Edit View History del.icio.us Bookmarks ScrapBook Tools Help
http://en.wikipedia.org/w/index.php?title=Division_by_zero&diff=187679706&oldid=1
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71.235.33.246 (Talk)
(→Historical accidents)
← Older edit

Revision as of 12:35, 29 January 2008 (edit) (undo)
Allstarecho (Talk | contribs)
m *(Reverted edits by 71.235.33.246 (talk) to last version by Adam1213)*
Newer edit →

Line 148:

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Line 148:

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WIKIPEDIA
The Free Encyclopedia

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

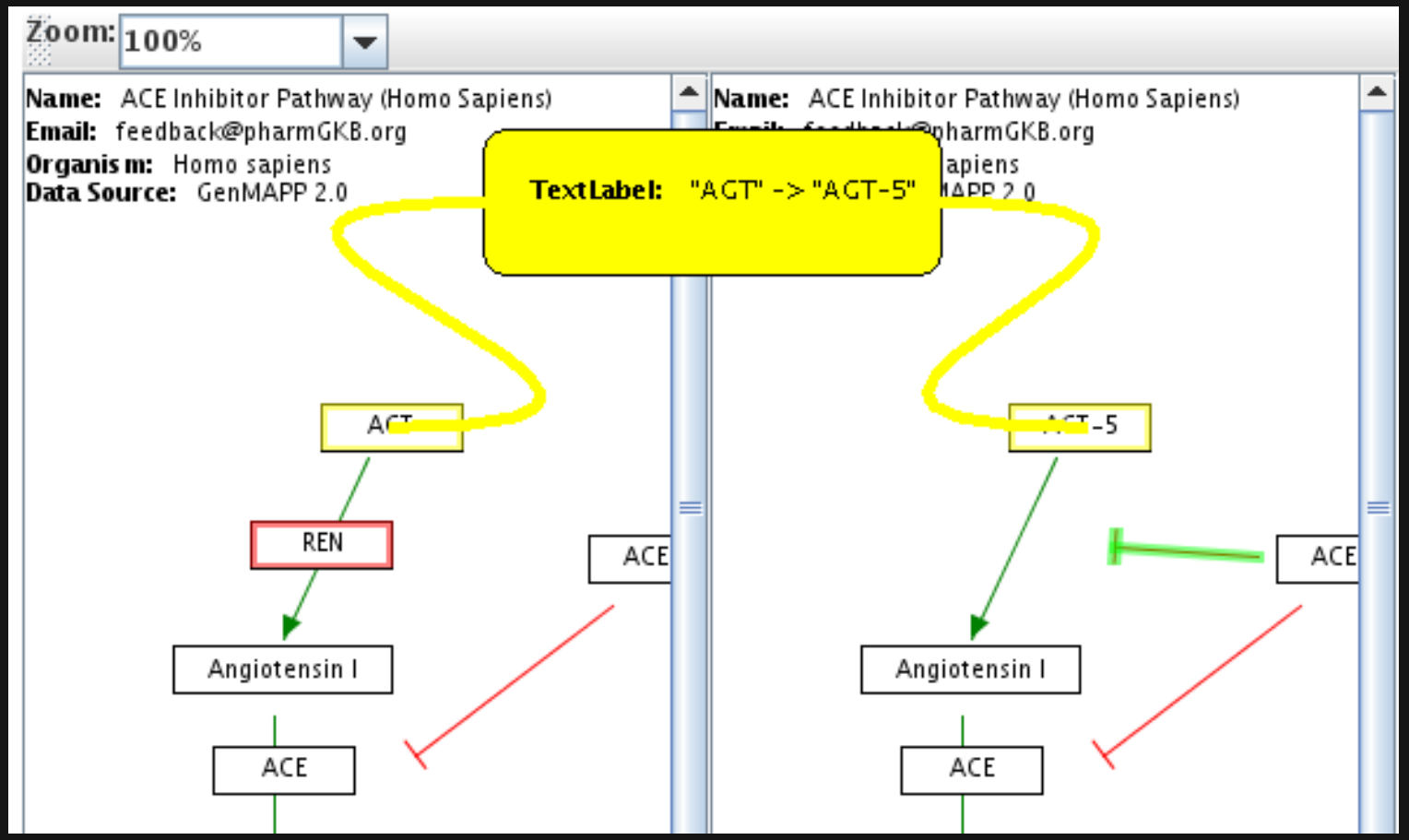
History

View last 3

Compare selected versions

Compare	Action	Time	User	
◉	view	11:12, 1 April 2008	Thomas	Modified categories
◉ ○	(revert), view	14:31, 11 March 2008	Thomas	[[Pathway:Homo sapiens:Phase I, non P450 bi biotransformations]]: invalid character
○ ○	(revert), view	10:20, 4 March 2008	Evelo	[[Pathway:Homo sapiens:Phase I biotransform also have a P450 pathway, which belongs to P
○ ○	(revert), view	10:20, 4 March 2008	Evelo	renamed
○ ○	(revert), view	12:14, 3 March 2008	Thomas	added bibliography
○ ○	(revert), view	12:12, 3 March 2008	Thomas	Modified description
○ ○	(revert), view	12:10, 3 March 2008	Thomas	added gene annotations, translated labels
○ ○	(revert), view	11:52, 3 March 2008	Thomas	[[Pathway:Homo sapiens:Phase I]] moved to [[
○ ○	(revert), view	11:26, 28 February 2008	Rollie	Created Phase1 pathway

Compare selected versions


Zoom: 100%
Name: ACE Inhibitor Pathway (Homo Sapiens)
Email: feedback@pharmGKB.org
Organism: Homo sapiens
Data Source: GenMAPP 2.0
TextLabel: "AGT" -> "AGT-5"
AGT
REN
ACE
Angiotensin I
ACE
Name: ACE Inhibitor Pathway (Homo Sapiens)
AGT-5
ACE
Angiotensin I
ACE

Curation bots and tags

Pathway:Homo sapiens:Alanine and aspartate metabolism KEGG - WikiPathways - Mozilla Firefox

File Edit View History Delicious Bookmarks Tools Help

http://www.wikipathways.org/index.php/Pathway:Homo_sapiens:Alanine_and_aspartate_metabolism_KEGG

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- What links here
- Related changes
- Special pages
- Printable version
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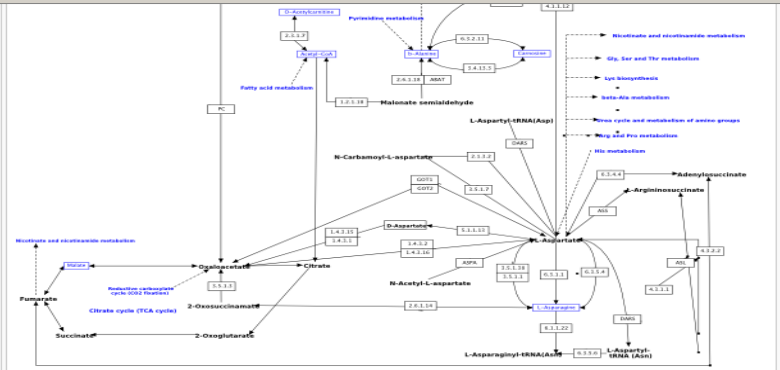
6.1 DataNodes



Log in to edit pathway not working? Download

Curation Tags

hide

This pathway is missing a proper description.
Please help improve this pathway by editing the description section.

This pathway contains genes, proteins or metabolites with missing database annotations
Comment: *32 out of 49 DataNodes have an incorrect or missing external reference: 1.2.1.18, 1.4.3.1, 1.4.3.15, ...*
Please help improve this pathway by annotating the annotations. See the tutorial for help.

Description

No description

Comments

GenMAPP notes
Converted from rat to human using ortholog information. Link to original KEGG map: http://www.genome.ad.jp/dbget-bin/show pathway?rno00252

GenMAPP remarks
Edited by Sebastien Burel.

Bibliography

No bibliography

- Why Pathways
- Navigation
- Editing
- Curation
- Current status
- Usage

Statistics

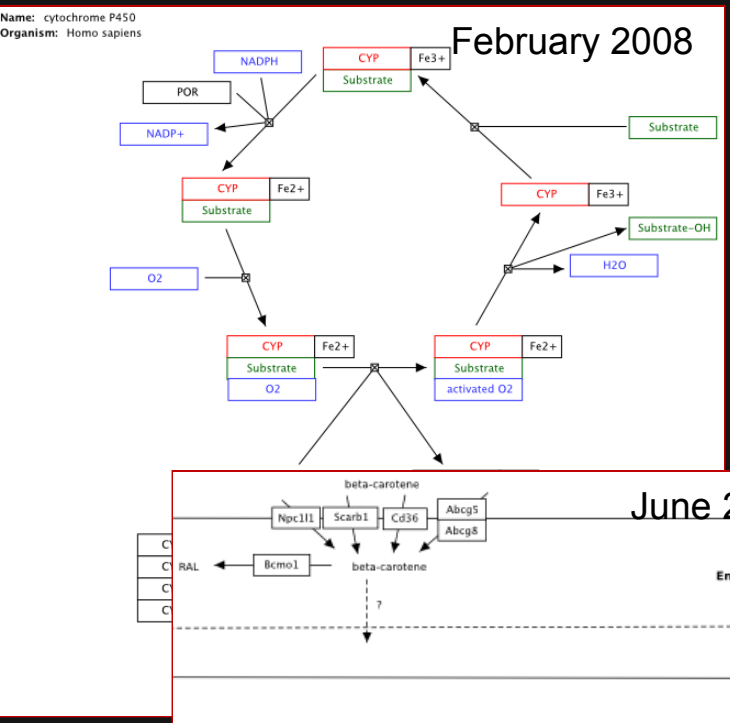
- There are **497** pathways
- Number of **pathways** *(and unique genes)* per species:

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

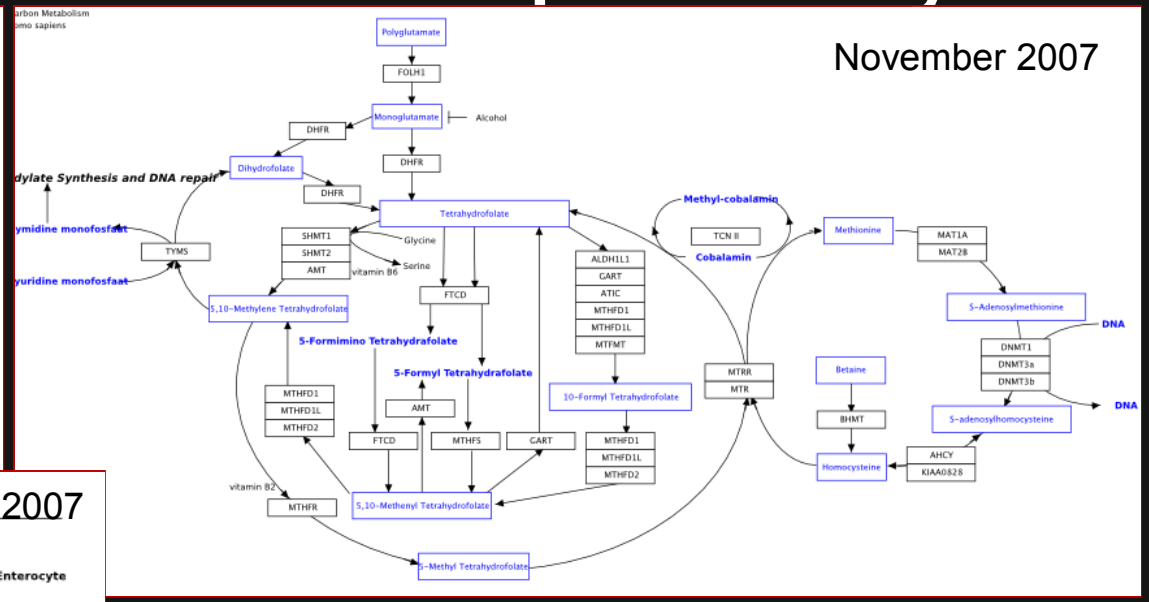
- There are **182** registered users

We can add any organism that's in Ensembl

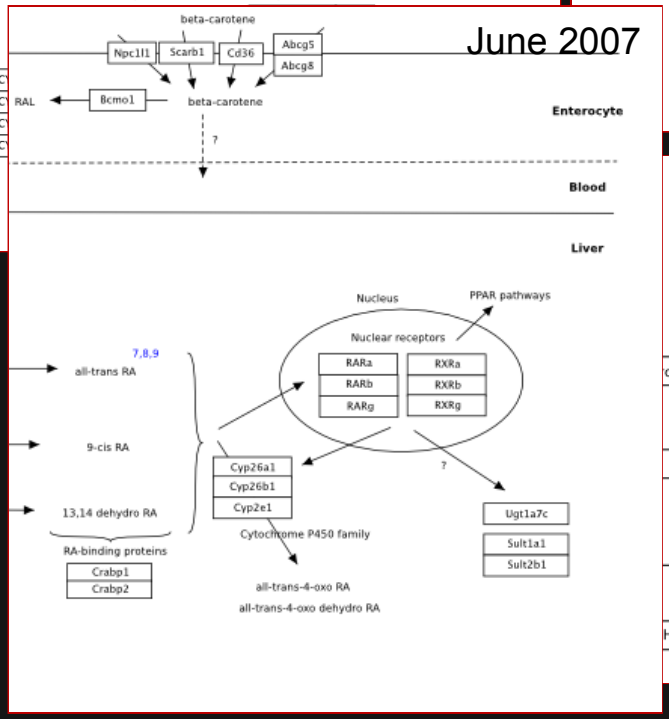
Contributions – new pathways



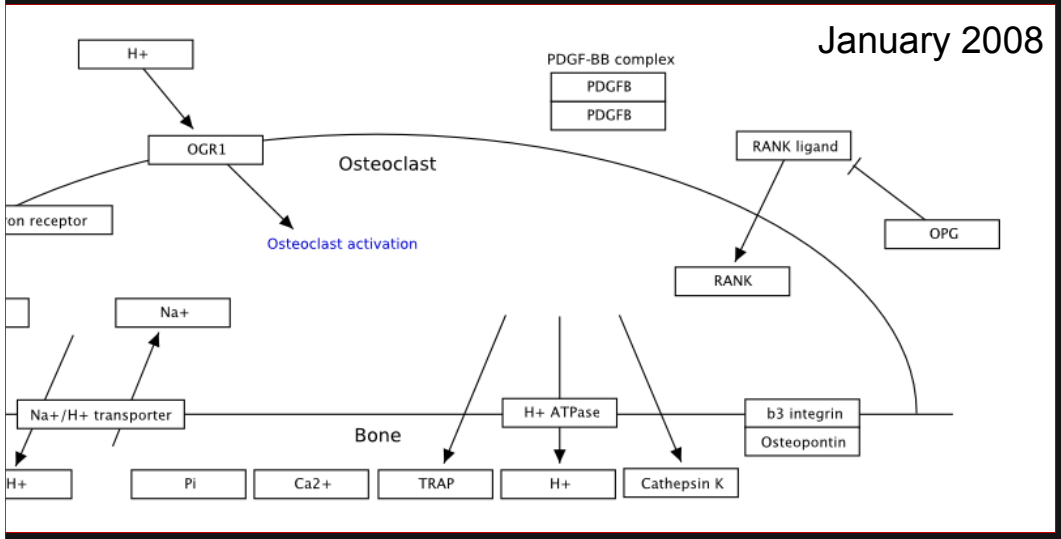
February 2008



November 2007

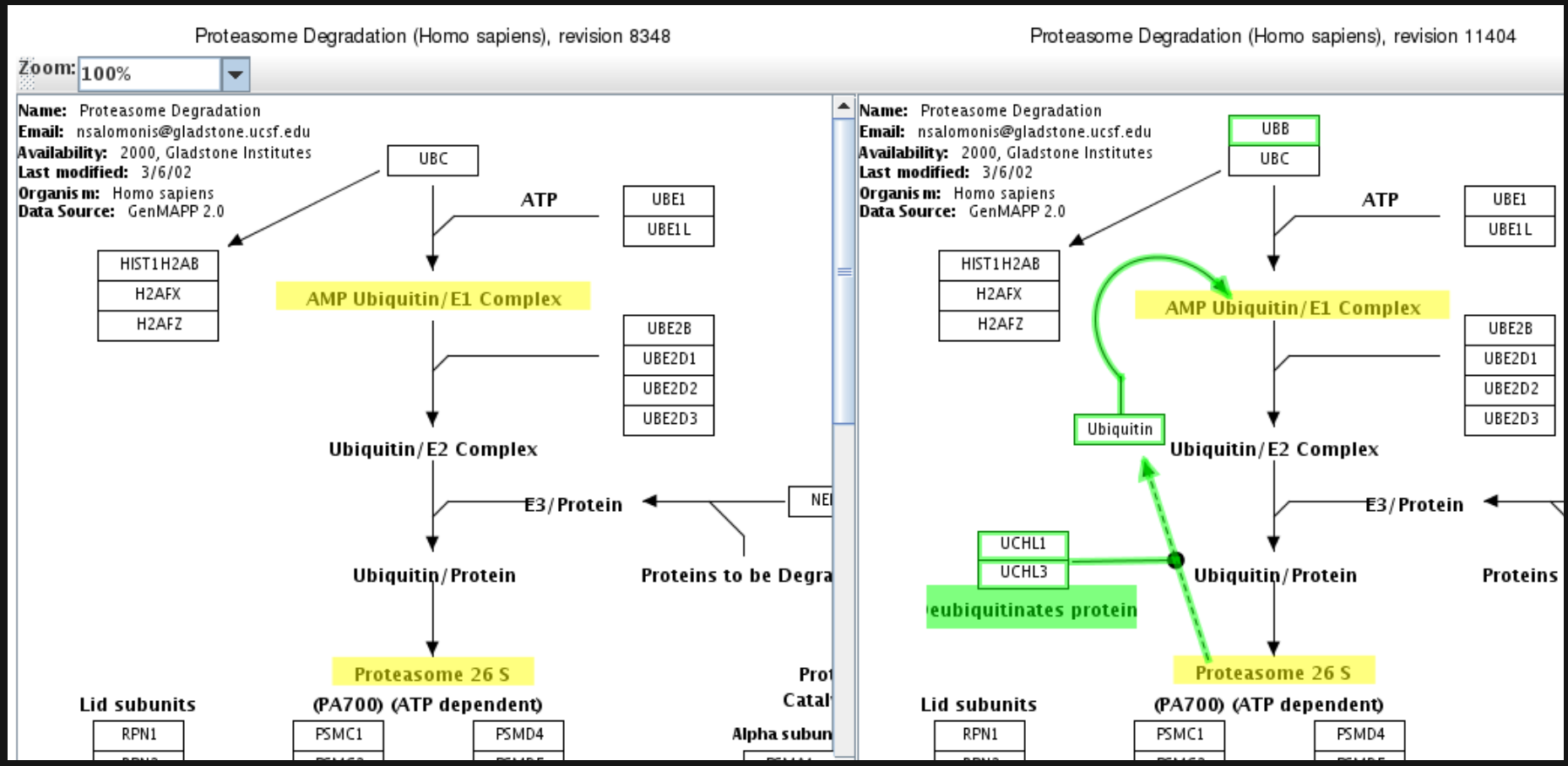


June 2007



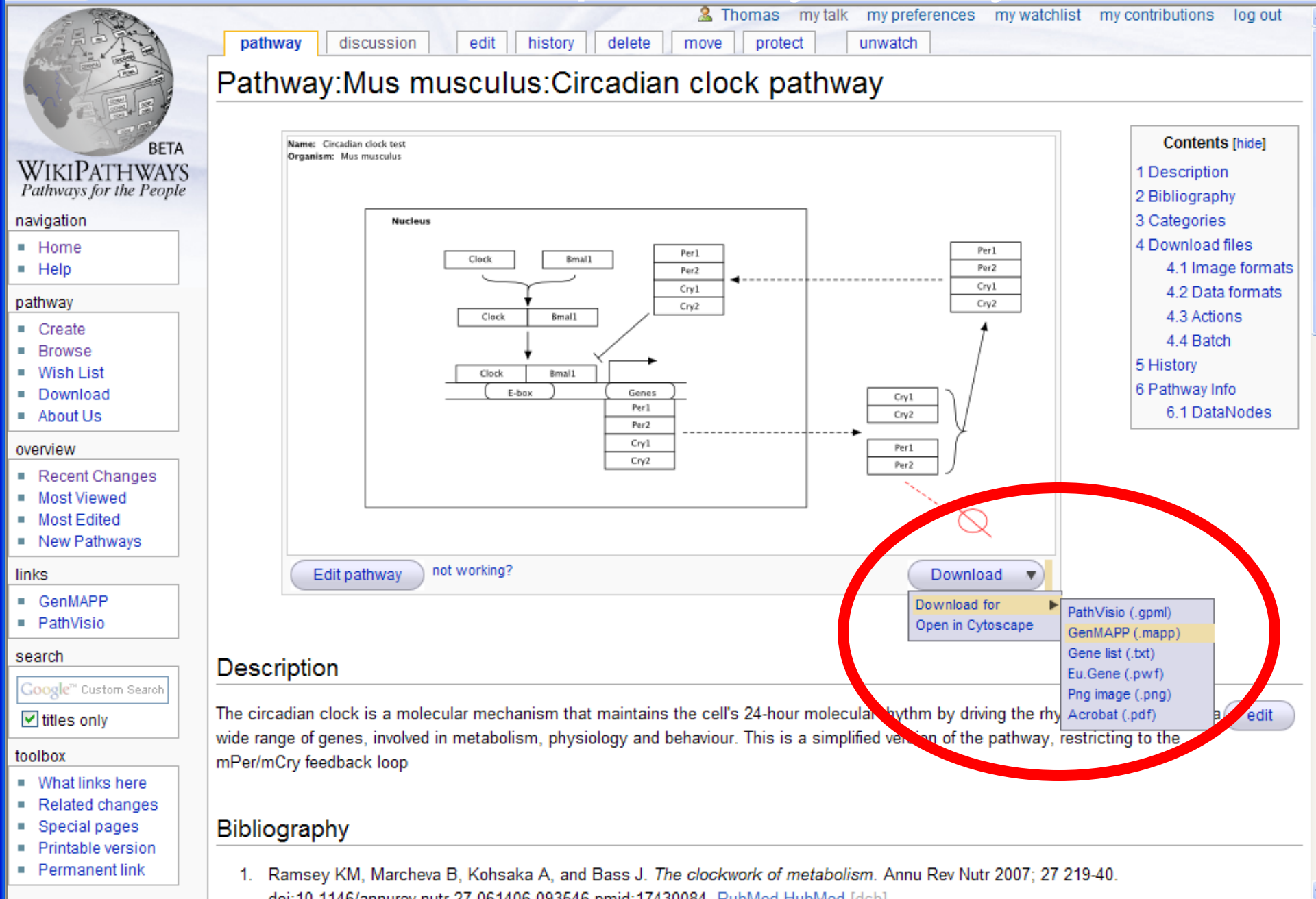
January 2008

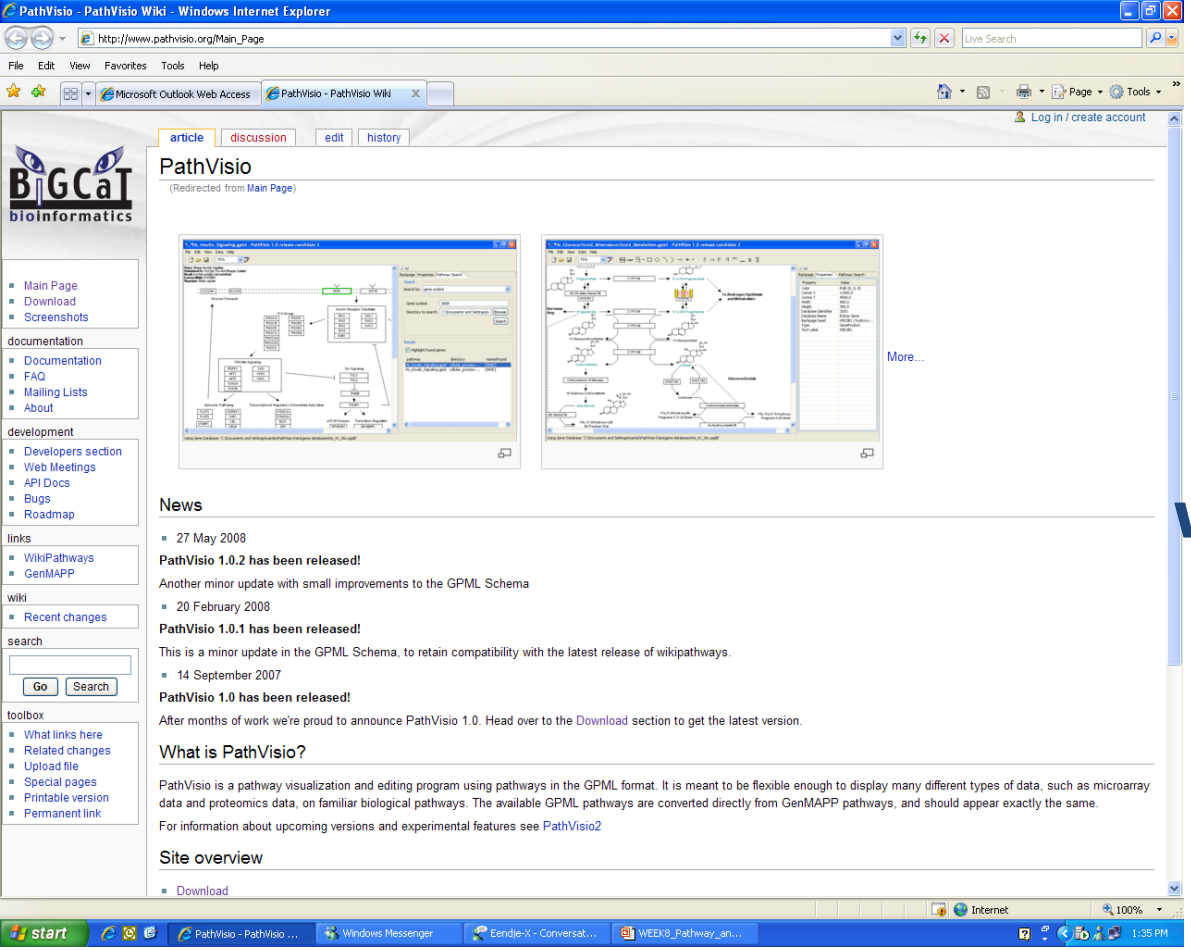
Contributions – small edits



- Why Pathways
- Navigation
- Editing
- Curation
- Current status
- Usage

Save the pathway locally





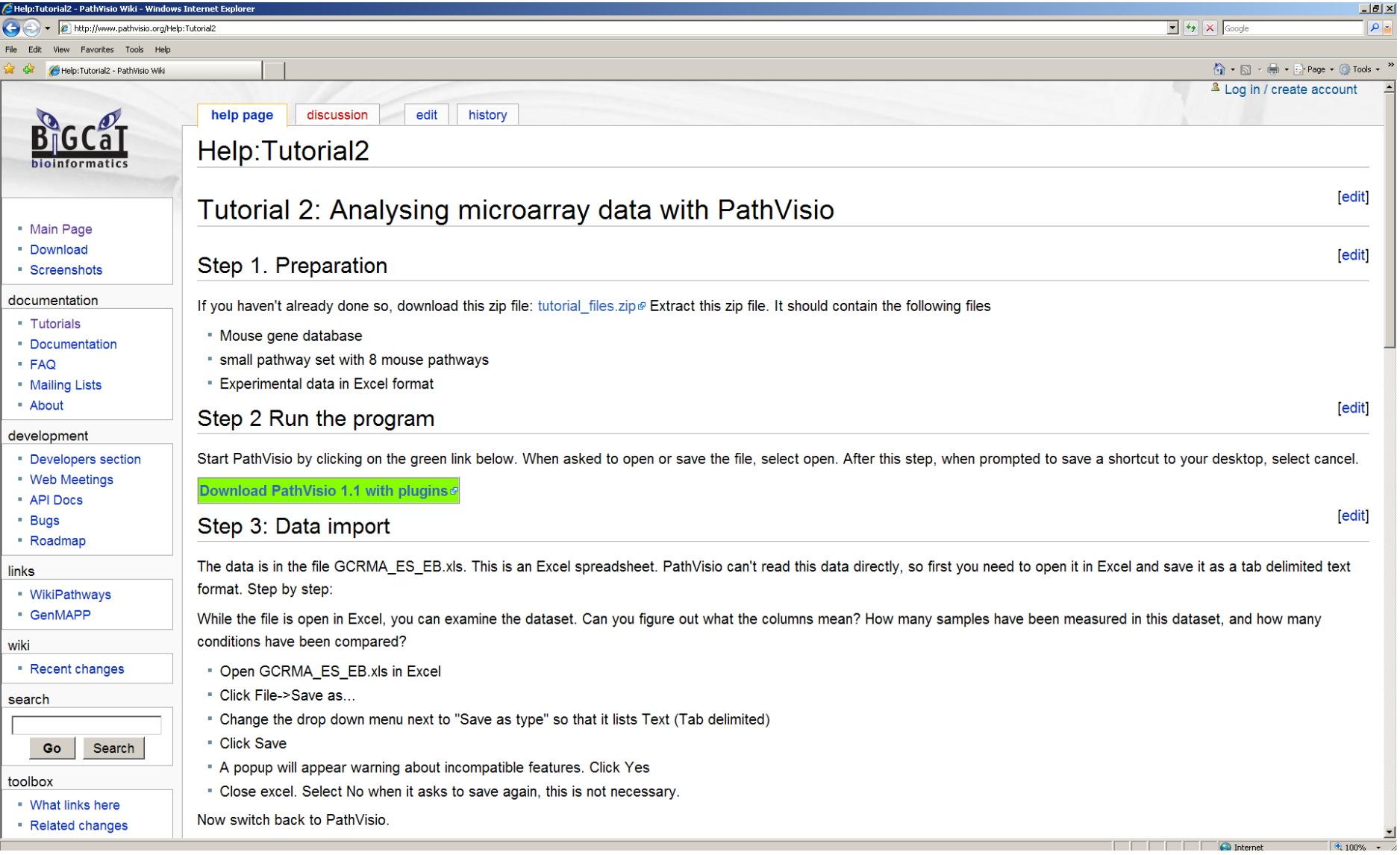
PathVisio

www.pathvisio.org

- Visualize gene expression on biological pathways
- We can also use proteomics and metabolomics data
- Identify significantly changed processes

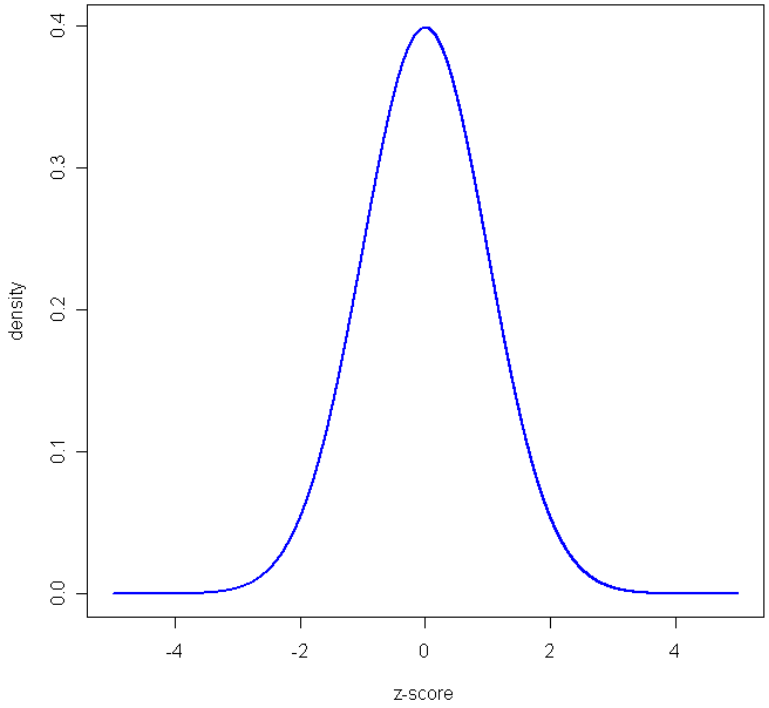
Martijn P van Iersel, Thomas Kelder, Alexander R Pico, Kristina Hanspers, Susan Coort, Bruce R Conklin, Chris Evelo (2008) Presenting and exploring biological pathways with PathVisio. BMC Bioinformatics 9: 399

www.pathvisio.org/Help:Tutorial2



Z-score

The Z-score can be used as a measure for how much a subset of genes is different from the rest



Expected

Measured

$$z_{score} = \frac{(r - n\frac{R}{N})}{\sqrt{n\frac{R}{N}(1-\frac{R}{N})(1-\frac{n-1}{N-1})}}$$

Variance

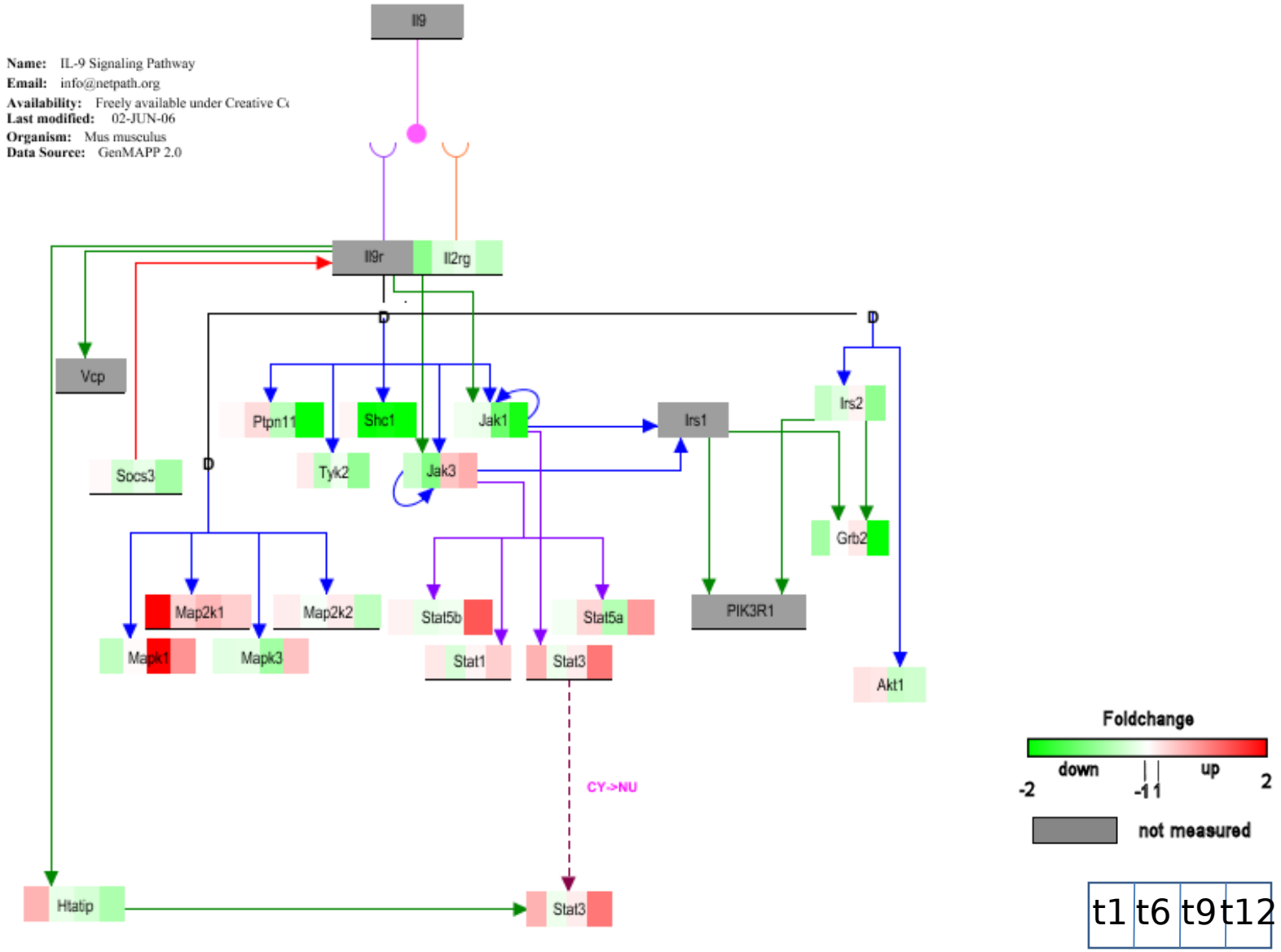
r = changed genes in Pathway
n = total genes in Pathway
R = changed genes
N = total genes

LIVER: regulated genes FC ≤ -1.2 or FC ≥ 1.2 and pvalue ≤ 0.05

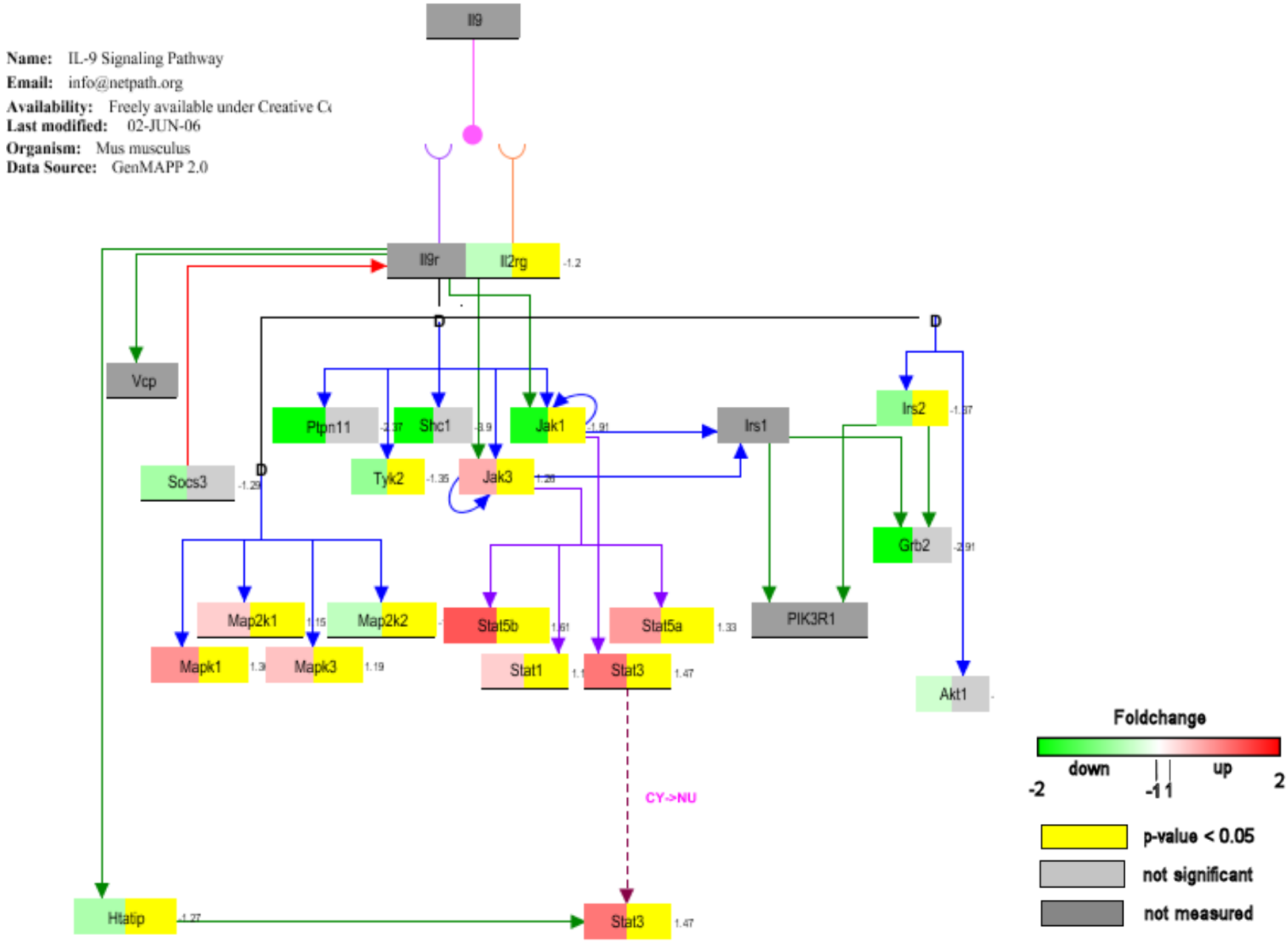
FC: t12 vs t0

Pathway	positive (r)	measured (n)	total	%	Z Score
Androgen Receptor Signaling Pathway	29	87	108	33.33%	2.28
Cholesterol Biosynthesis	6	12	15	50.00%	2.22
Glycogen Metabolism	8	20	24	40.00%	1.8
Genes specific to endocrine and CNS	8	20	47	40.00%	1.8
Genes specific to internal organs	38	128	202	29.69%	1.79
Myometrial Relaxation and Contraction Pathways	35	117	161	29.91%	1.77
Ovarian Infertility Genes	7	18	31	38.89%	1.6
Nucleotide GPCRs	3	6	12	50.00%	1.57
Monoamine GPCRs	4	9	34	44.44%	1.52
Irinotecan Pathway	4	8	13	50.00%	1.39
Acetylcholine Synthesis	2	4	7	50.00%	1.28
Muscle, fat and connective tissue specific genes	4	10	22	40.00%	1.27
TCA Cycle	9	27	29	33.33%	1.27
GPCRs, Class B Secretin-like	3	7	13	42.86%	1.24
Apoptosis Modulation by HSP70	6	17	18	35.29%	1.2
Complement Activation, Classical Pathway	5	14	16	35.71%	1.12
Hypertrophy Model	5	14	21	35.71%	1.12
GPCRs, Other	9	29	210	31.03%	1.02
Fatty Acid Omega Oxidation	2	5	9	40.00%	0.9
Eicosanoid Synthesis	6	19	24	31.58%	0.88
Glutathione metabolism	6	19	38	31.58%	0.88
Oxidative Stress	7	23	29	30.43%	0.84
TGF-beta Receptor Signaling Pathway	34	131	149	25.95%	0.79
Wnt Signaling Pathway	11	39	74	28.21%	0.76
GPCRs, Class A Rhodopsin-like	17	63	231	26.98%	0.74
Heme Biosynthesis	3	9	9	33.33%	0.73
Cell cycle	19	73	88	26.03%	0.6
Pentose Phosphate Pathway	2	6	8	33.33%	0.6
Beta Oxidation of Unsaturated Fatty Acids	2	6	6	33.33%	0.6
Mitochondrial LC-Fatty Acid Beta-Oxidation	4	14	16	28.57%	0.49

ADIPOSE TISSUE



ADIPOSE TISSUE



www.wikipathways.org

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Martijn van Iersel

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The BBC 2008

- BeNeLux Bioinformatics Conference
- Maastricht
- December 14-16 2008
- http://www.nbic.nl/bbc2008

See you in Maastricht