

# WikiPathways & PathVisio

SBGN 5.5, Wittenberg

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# WikiPathways

- Resource for biological pathways
- Free and open source
- Wiki, editable by users



### Latest edits

**Today**

- [Pathways in Cancer \(Homo sapiens\)](#) by Luigi Maiorana

**5 October 2009**

- [Retinol metabolism \(BiGCaT, NuGO\) \(Homo sapiens\)](#) by Andra Waagmeester
- [Insulin Signaling \(Homo sapiens\)](#) by Andra Waagmeester

### Latest discussions

**6 October 2009**

- [Duplicate pathway? \(1\)](#) by Kristina Hanspers

**8 September 2009**

- [Nice pathway, but not categorized \(2\)](#) by Kristina

### Statistics

- There are **1268** pathways
- Number of **pathways** (and unique genes) per species:

Anopheles gambiae:	<b>23</b>	(391)
Arabidopsis thaliana:	<b>5</b>	(62)
Bos taurus:	<b>119</b>	(2876)
Caenorhabditis elegans:	<b>33</b>	(529)
Canis familiaris:	<b>117</b>	(2910)
Danio rerio:	<b>105</b>	(2435)
Drosophila melanogaster:	<b>35</b>	(616)
Equus caballus:	<b>12</b>	(214)
Gallus gallus:	<b>103</b>	(2151)
Homo sapiens:	<b>150</b>	(3881)

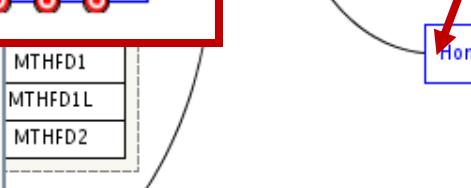
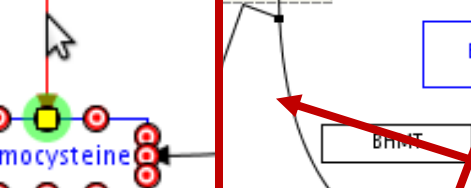
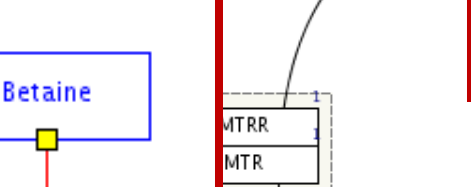
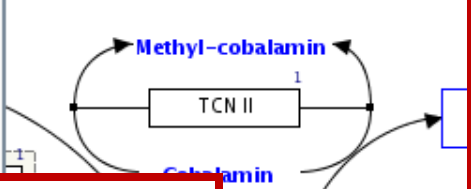
# Pathway editor



pathway discussion edit  
One Carbon Metabolism

Michiel Adriaens, Frank, Thor

Zoom: 100  
Save the pathway to WikiPathways



### DataNode properties

Comments Literature Annotation

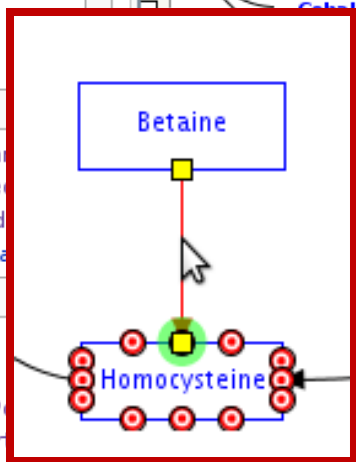
Search

betaine

### Results

Please select one of the references and press Ok

Name	Identifier	Datasource
Betaine	HMDB00043	HMDB
Betaine aldehyde	HMDB01252	HMDB
Proline betaine	HMDB04827	HMDB



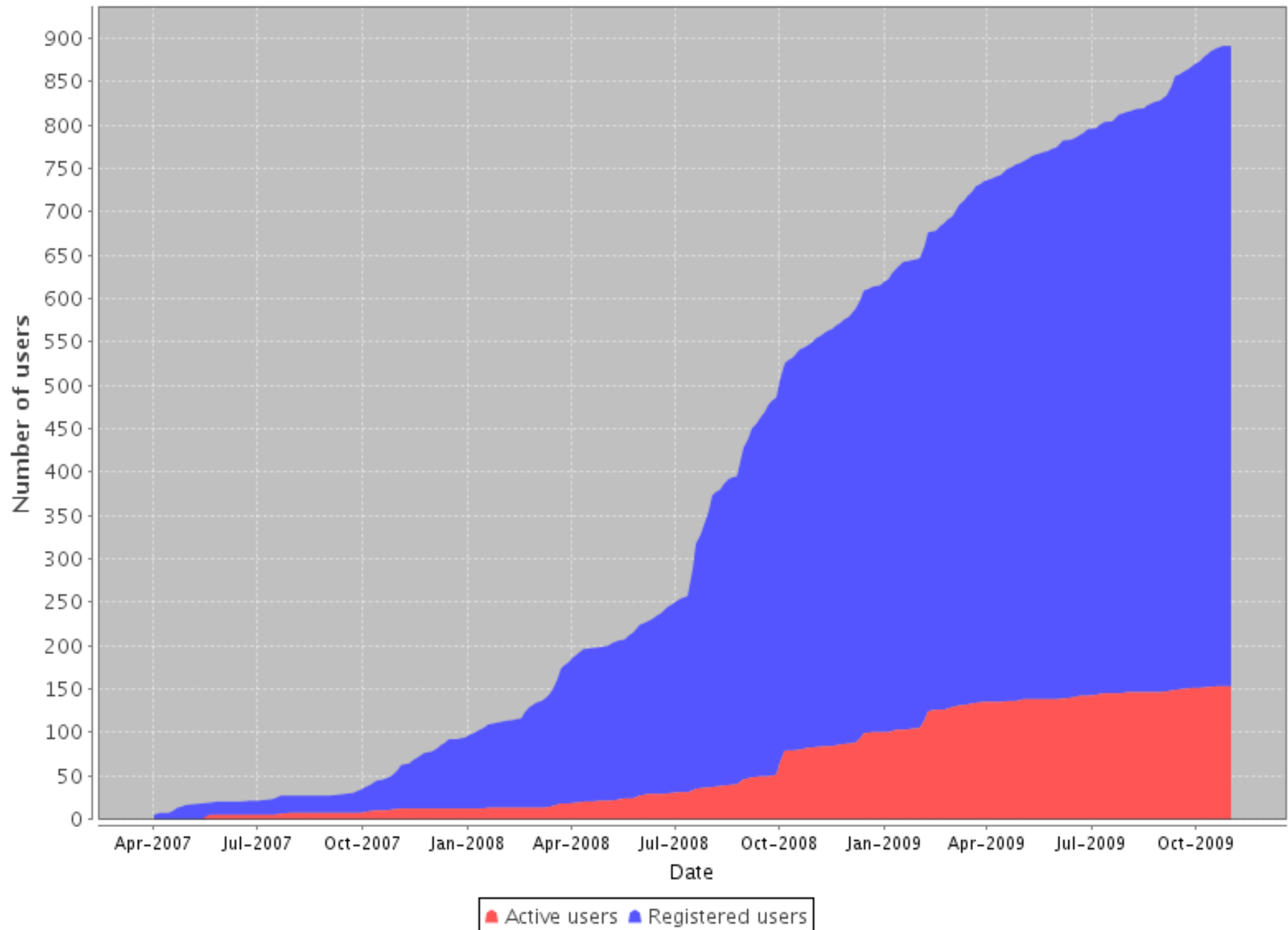
### Element properties

Comments Literature

2: Twenty-four non-synonymous polymorphisms in the one-carbon metabolic pathway and risk of colorectal adenoma in the Nurses' Health Study.; **Hazra A; Wu K; Kraft P; Fuchs CS; Giovannucci EL; Hunter DJ;** *Carcinogenesis*, 2007; [PubMed](#)

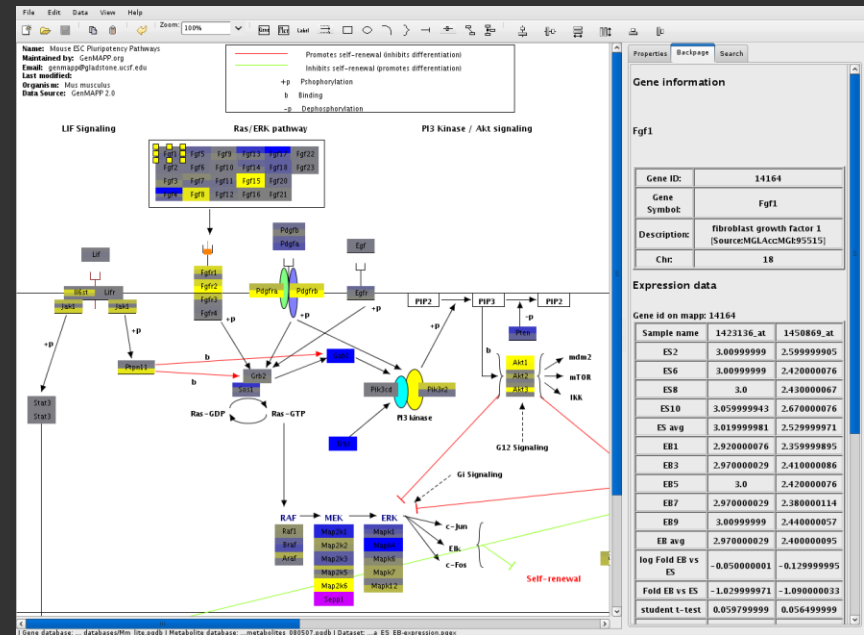
- navigation
- Home
  - Help
- pathway
- Create
  - Browse
  - Wish List
  - Download
- overview
- Recent Changes
  - Most Viewed
  - Most Edited
  - New Pathways
- community
- About us
  - Contact us
  - GenMAPP Portal
  - BiGCaT Portal
  - Micronutrient Portal
- search
- Google Custom Search
- titles only

# WikiPathways users



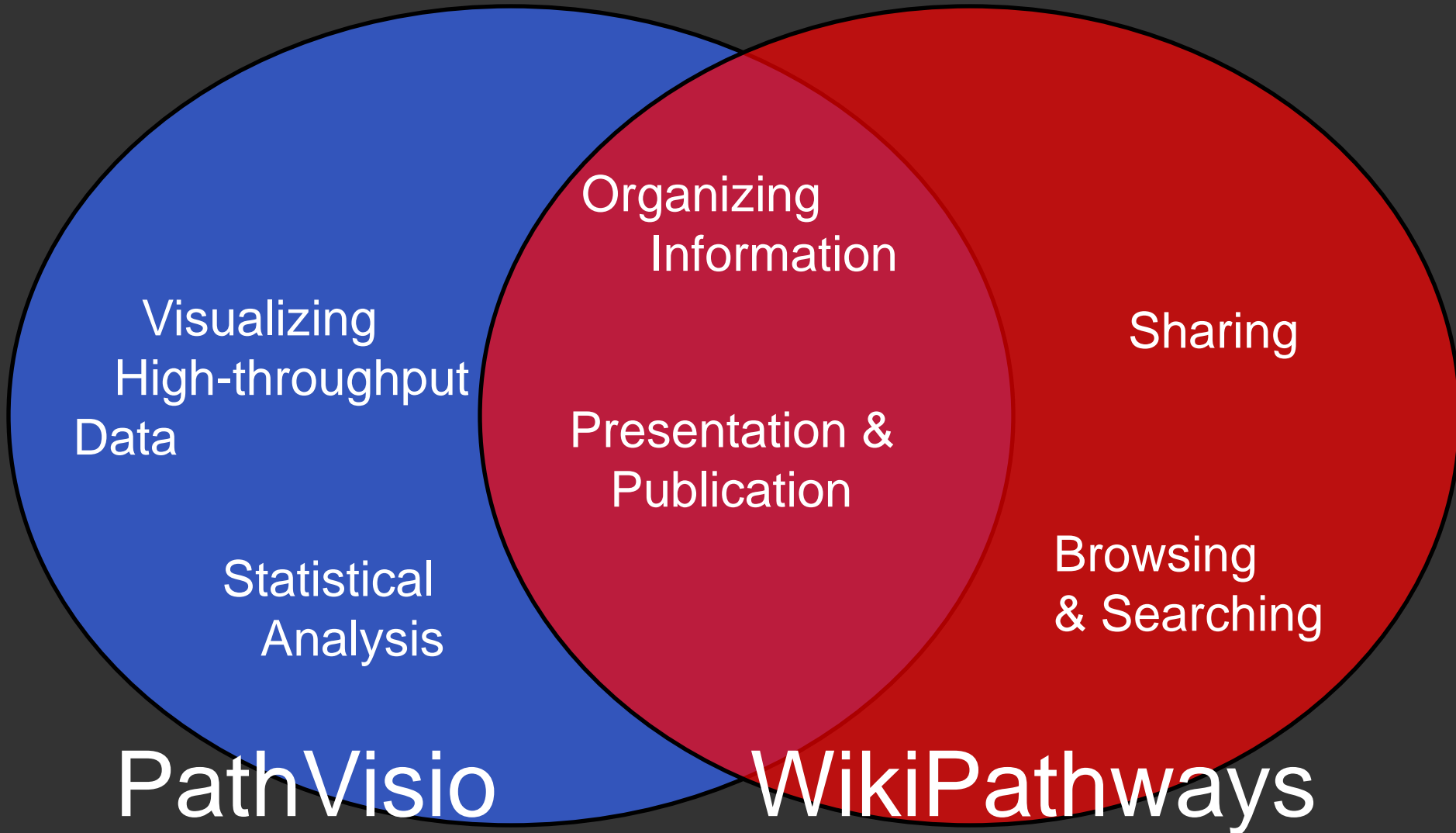
# PathVisio

- Pathway editor
  - High-throughput data visualization
  - Plugin framework
  - Compatible with Cytoscape
- Target audience: Biologists



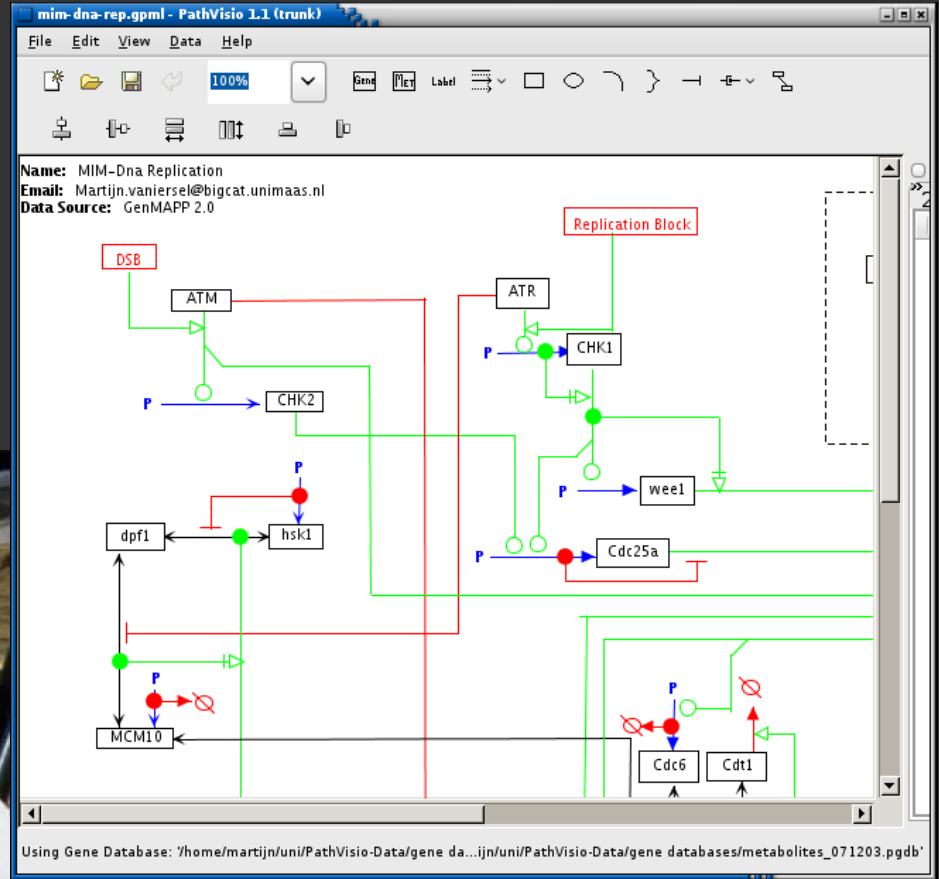
<http://www.pathvisio.org>

# Uses for Pathways

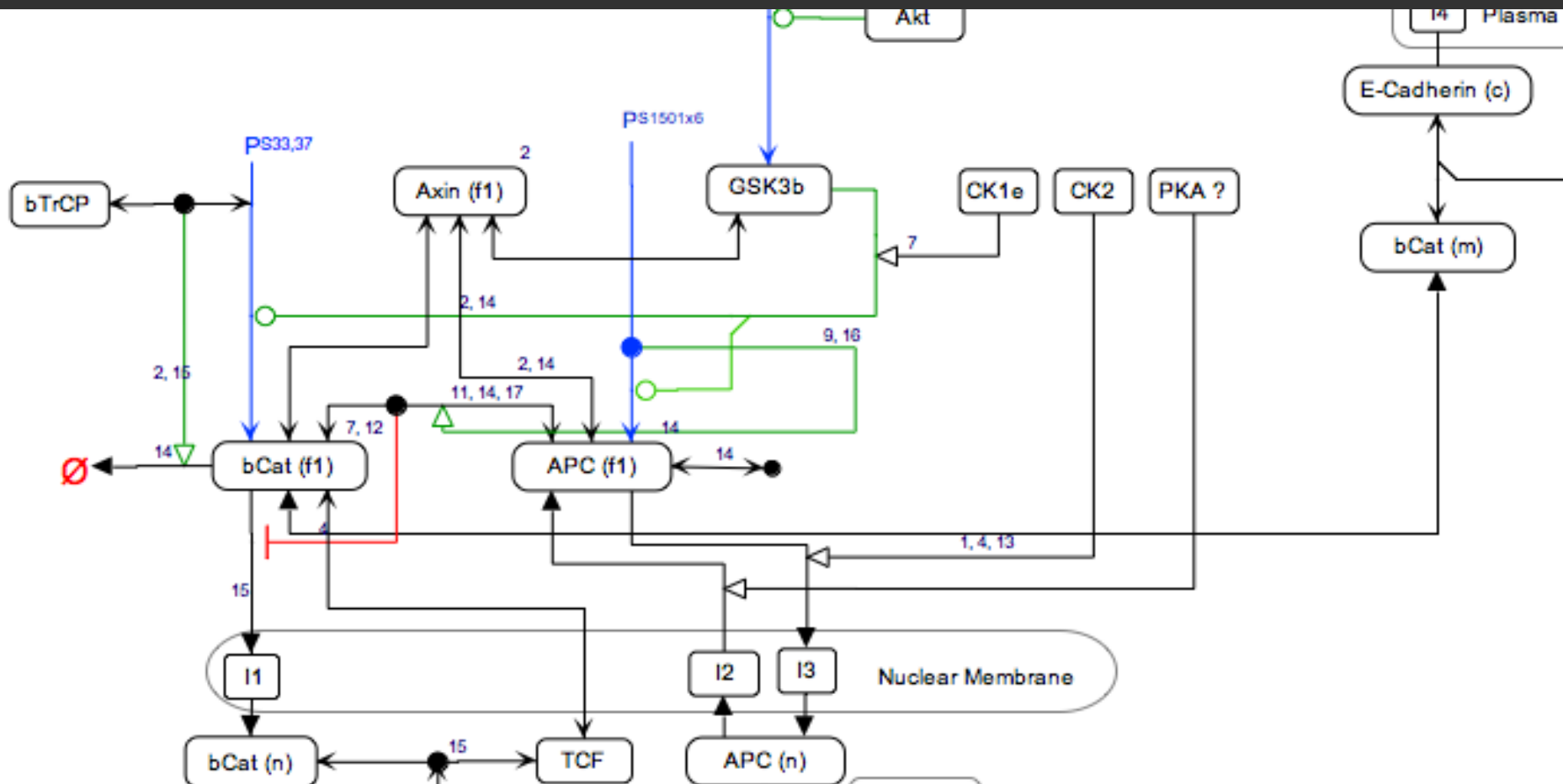


# Graphical Notation

- Free form
- MIM



# Molecular Interaction Maps



AKT-Cyclin D1 Interactions as MIM in Pathvisio

# GPML

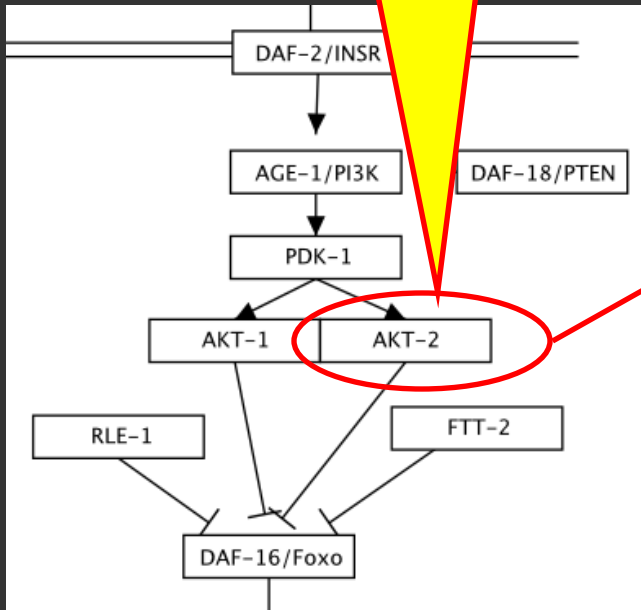
- Custom XML format
- Backwards compatible with GenMAPP
- Graphical presentation and layout
- *Not a standard*

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<Pathway xmlns="http://genmapp.org/GPML/2007" Name="Apoptosis Mechanisms" Data-Source="GenMAP
<Graphics BoardWidth="19989.0" BoardHeight="12267.2" WindowWidth="19304.0" WindowHeight="13
<DataNode TextLabel="TRADD" Type="GeneProduct" BackpageHead="TRADD | TNFRSF1A-associated vi
  <Graphics Color="Transparent" CenterX="1350.0" CenterY="3350.0" Width="900.0" Height="300
    <Xref Database="Entrez Gene" ID="8717" />
  </DataNode>
<DataNode TextLabel="TNFSF10" Type="GeneProduct" BackpageHead="TNFSF10 | tumor necrosis fac
  <Graphics Color="Transparent" CenterX="2550.0" CenterY="1050.0" Width="1000.0" Height="30
    <Xref Database="Entrez Gene" ID="8743" />
  </DataNode>
<Line>
  <Graphics Color="0000ff">
    <Point x="5900.0" y="8800.0" Head="TBar" />
    <Point x="6200.0" y="9200.0" />
  </Graphics>
</Line>
<Shape Type="Oval" GraphId="bfa">
  <Graphics FillColor="Transparent" Color="000000" CenterX="8400.0" CenterY="7000.0" Width=
</Shape>
</Pathway>
```



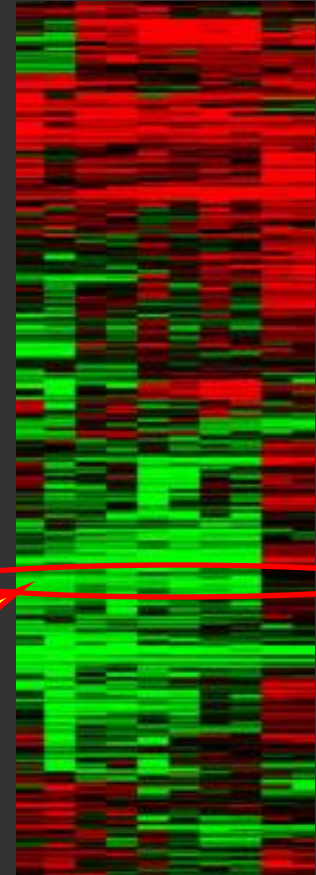
# BridgeDb for ID mapping

Entrez Gene  
3643



BridgeDb

Affymetrix probeset  
100234\_at



# Problem: Which mapping service?

- Ensembl Biomart
- Synergizer
- CRONOS
- DAVID
- AliasServer
- MatchMiner
- OntoTranslate  
*or*
- Local database



# Easy & Flexible Code

```
IDMapper mapper = BridgeDb.connect("idmapper-biomart:" +
    "http://www.biomart.org/biomart/martservice?" +
    "mart=ensembl&dataset=hsapiens_gene_ensembl");

Xref ref1 = new Xref ("3643", BioDataSource.ENTREZ_GENE);
Xref ref2 = new Xref ("1004_at", BioDataSource.AFFY);

// get link to online description
ref1.getUrl();

// find all known cross-references
mapper.mapID (ref1);

// find all cross-references in a specific data source
mapper.mapID (ref1, BioDataSource.UNIGENE);
```

# Easy & Flexible Code

```
IDMapper mapper = BridgeDb.connect("idmapper-synergizer:" +
    "authority=ncbi&species=Homo sapiens");

Xref ref1 = new Xref ("3643", BioDataSource.ENTREZ_GENE);
Xref ref2 = new Xref ("1004_at", BioDataSource.AFFY);

// get link to online description
ref1.getUrl();

// find all known cross-references
mapper.mapID (ref1);

// find all cross-references in a specific data source
mapper.mapID (ref1, BioDataSource.UNIGENE);
```

# Easy & Flexible Code

```
IDMapper mapper = BridgeDb.connect("idmapper-jdbc:" +
    "mysql://localhost/snp?user=bridgedb");

Xref ref1 = new Xref ("3643", BioDataSource.ENTREZ_GENE);
Xref ref2 = new Xref ("1004_at", BioDataSource.AFFY);

// get link to online description
ref1.getUrl();

// find all known cross-references
mapper.mapID (ref1);

// find all cross-references in a specific data source
mapper.mapID (ref1, BioDataSource.UNIGENE);
```

# BridgeDb for ID mapping

- Genes, Proteins and Metabolites
- Combine multiple mapping sources
- Search identifier for symbol
- Identifier type guessing
- **MIRIAM**

`urn:miriam:entrez:3643`

# Collaborative Development



- Google Summer of Code
  - 1125 student and 175 organizations
  - 90 countries represented
  - *9 students and 14 mentors working on GenMAPP, Cytoscape and WikiPathways*

[wikipathways.org](http://wikipathways.org)

[pathvisio.org](http://pathvisio.org)

[bridgedb.org](http://bridgedb.org)



– **Gladstone Institutes**

- Alexander Pico
- Kristina Hanspers
- Nathan Salomonis
- Bruce Conklin

– **Oregon State University**

- Pankaj Jaiswal
- Justin Elser

– **Maastricht University**

- Chris Evelo
- Susan Coort
- Andra Waagmeester
- **Thomas Kelder**



– **NIH**

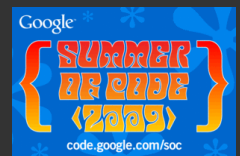
- Mirit Aladjem
- Margot Sunshine
- Augustin Luna

– **Pharmgkb**

- Mark Woon
- Rebecca Tang

– **Summer of code**

- Jianjiong Gao
- Adem Bilican

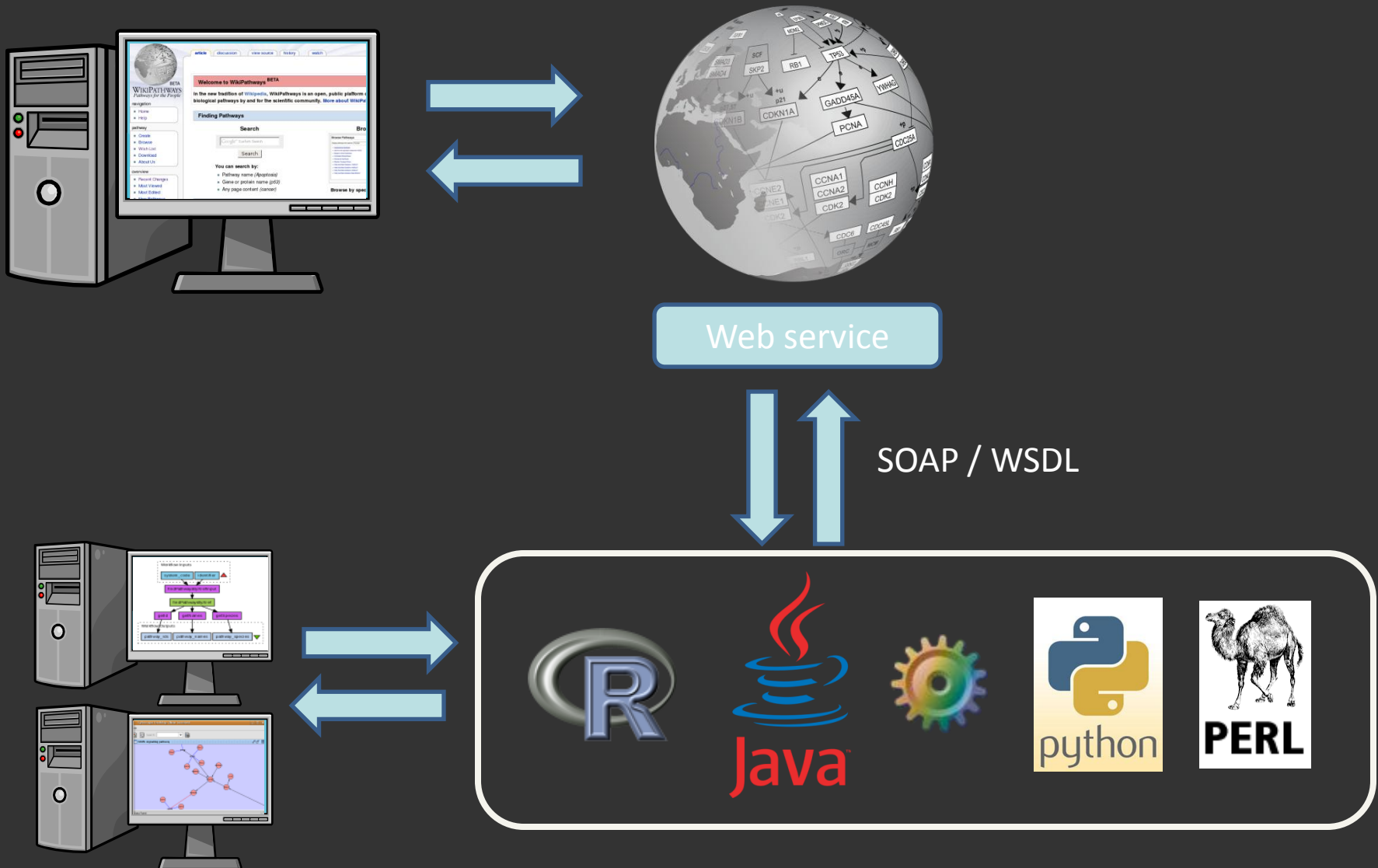


– **NuGO**

- Jildau Bouwman
- Suzan Wopereis
- Ben van Ommen



# WikiPathways web service



# Available services

- Find pathways by keywords or entity id
- Download pathways as XML or image formats
- Access to complete revision history
- Download pathway as identifier list:

<b>Entrez Gene</b>	<b>UniProt</b>	<b>HMDB</b>
123263	A4UU12	HMDB00121
6948	A4UU13	HMDB01846
10588	A9CB79	HMDB01056
23382	Q04609	HMDB01396
4143	Q04609-2	HMDB00972
275	Q04609-3	HMDB01354
1719	Q2VPJ0	HMDB00696
643509	Q541A4	HMDB00043
10840	Q7Z5D2	HMDB01185
...	...	HMDB00939