OBO-Edit Tutorial

GO Editorial Training

January 2011

Getting Started

- OBO-Edit is the tool we use to edit the ontologies. It can also be used to browse the ontologies.

- Download the latest version (or the stable release: 2.0) of OBO-Edit from:
  - https://sourceforge.net/projects/geneontology/

- Load OBO-Edit by selecting the OBO-Edit icon 

Setting Your ID Range

- Choose your individual set of GO ID's by editing and committing the numbers file in the go directory (see CVS tutorial)
  - go/numbers/go_numbers

- You then need to set this range in OBO-Edit.
  - Metadata -> ID Manager
  - Click the cog icon, and edit the 'Default rule' line to be:
    - GO:$sequence(7,00XXXXX,00XXXXX)$.

    [Use your set of assigned numbers instead of XXXXX].
  - Close the ID manager.
  - This will generate IDs with the prefix GO, that are 7 digits long, beginning with 00XXXXX.

Choosing a Layout

- You can configure your OBO-Edit layout how you like. I would recommend:
  - 2 x Ontology Tree Editor
  - 1 x Tree Viewer
  - 1 x Parent Editor
  - 1 x Search Panel
  - 1 x Text Editor
  - 1 x Verification Manager

- Use the top menu panel to add a new Viewer or Editor to your layout.

- Panels in OBO-Edit can be rearranged by dragging and dropping.

A Suggested OBO-Edit Layout

OBO-Edit version 2.0: gene_ontology_write.obo

Edit Layout Editors Viewers Search Tools Metadata Reasoner Summary Config Help

ology Tree Editor | Tree Viewer | Parent Editor | Graph Viewer | Graphviz Viewer

Viewer

Classes
- biological_process
  - signaling
    - signaling process
      - signal transmission
        - signal transmission via phosphorylation event
          - intracellular protein kinase cascade
            - MAPKKK cascade
        - signal transduction
          - intracellular signal transduction
            - intracellular protein kinase cascade
              - MAPKKK cascade
    - signaling pathway
      - intracellular signaling pathway
        - intracellular signal transduction
          - intracellular protein kinase cascade
            - MAPKKK cascade
  - signaling process

ths loaded.

ology Tree Editor

- fat body development
- gall bladder development
- genitalia development
- gland development
- gonad development
  - female gonad development
  - gonad morphogenesis
  - gonadal mesoderm development
  - male gonad development
- heart development
- hemopoietic or lymphoid organ development
- imaginal disc development
- kidney development
- liver development
- lung development
- maintenance of organ identity
- Malpighian tubule development
- meristem development
- mesenchyme development
- multicellular structure septum development
- muscle organ development
- organ maturation
- organ morphogenesis
- organ senescence
- ovum-producing ovary development
- pancreas development

Search Panel

Select terms that have a Name that contains

the value MAPKKK cascade

in Self

name contains "MAPKKK cascade"

Indicate if selected term matches filter | Search

Text Editor | Verification Manager

Text Editor

ID GO:0000165

Namespace biological_process

Name MAPKKK cascade

Definition * | Comment | Cross Products

Definition

A cascade of at least three protein kinase activities culminating in the phosphorylation and activation of a MAP kinase. MAPKKK cascades lie downstream of numerous signaling pathways.

Dbxrefs

GOC:mah

PMID:9561267

+ -

Dbxrefs * | Synonyms * | Subsets

Reactome:1006612
MAP kinase cascade

Reactome:1024924
MAP kinase cascade

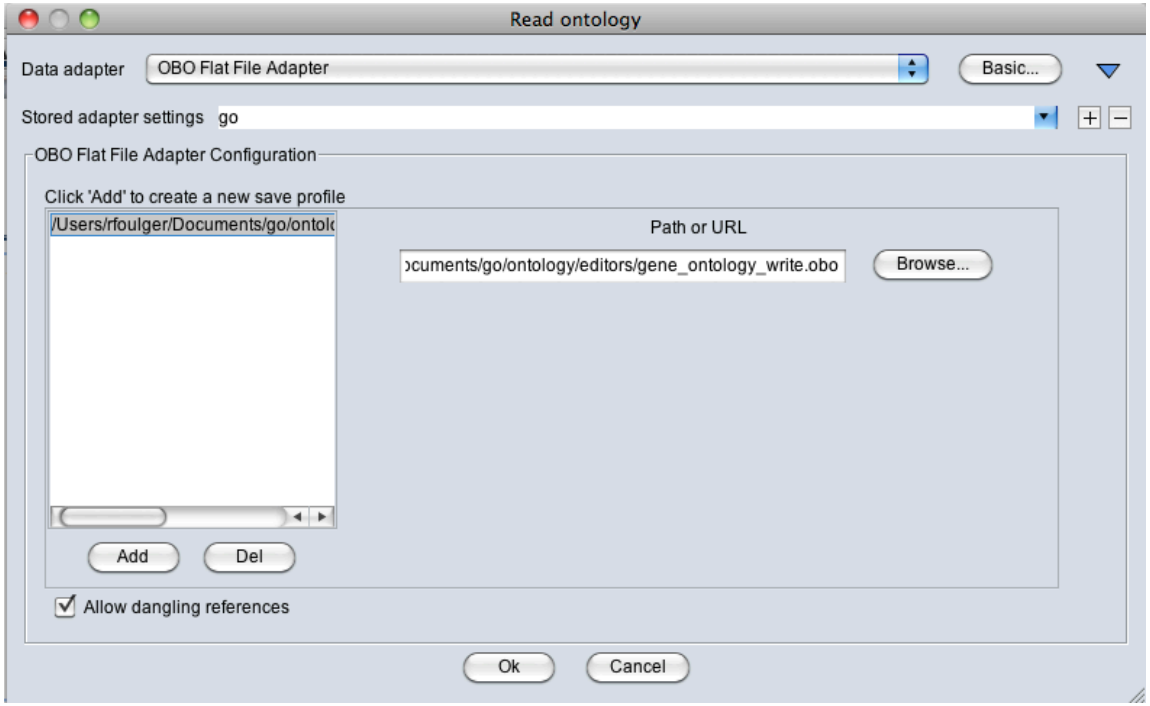
Reactome:1051916
MAP kinase cascade

+ -

Commit Revert

Loading an ontology

- File -> Load Ontologies
- Replace <create new profile> with an identifiable name (E.g. go), and Click 'Add' to add in a new profile.
- Browse to find the link to gene_ontology_write.obo in the go directory:
- Click Ok

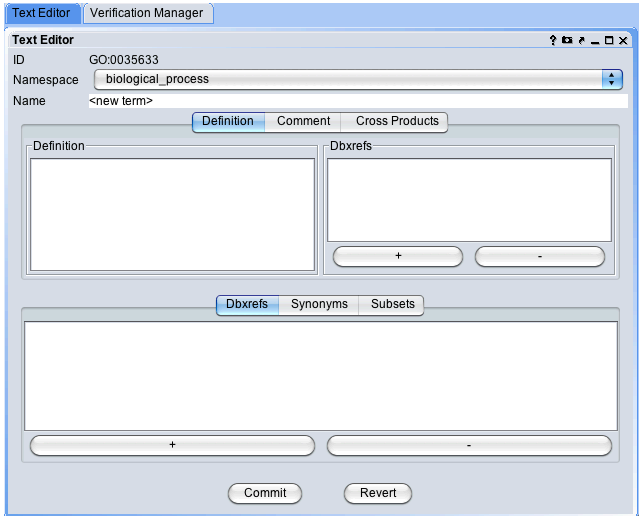


You can store as many profiles as you like in the settings so you can quickly load other ontologies such as cell ontology, GOCHE, anatomy ontologies etc.

Creating a Term

- In an Ontology Tree Editor, click on the term that will be a parent for your new term.
- Hold down the 'Cmd' key, and left-click on the mouse to bring up a menu (on a mac)
- Create new child

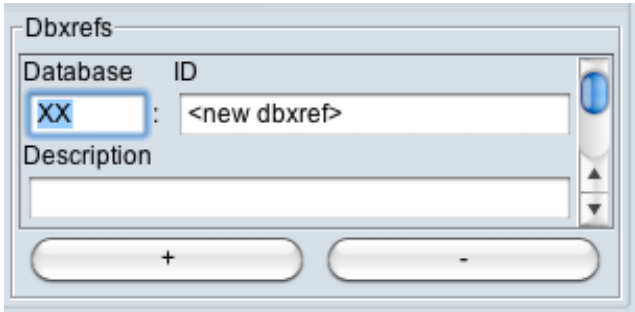
- *OBO-Edit will create a new term using the next free ID in your range*
- *The child term will automatically have an is_a relationship to its parent: this can be changed later*
- *All information about an OBO term is displayed and edited in the OBO-Edit Text Editor panel*



Naming and Defining a Term

- In the Text Editor box, fill in the term name and term text definition. See the GO documentation about naming and defining terms.

- Each definition needs at least one Dbxref. To add a Dbxref, click on the '+' in the Text Editor.
  - In the Database box, fill in a prefix:
    - GOC
    - PMID
    - ISBN
    - http
    - [other anatomy abbreviation]



  - In the ID box, fill in the curator initial, PubMed ID, ISBN ID, web address, other ontology ID.

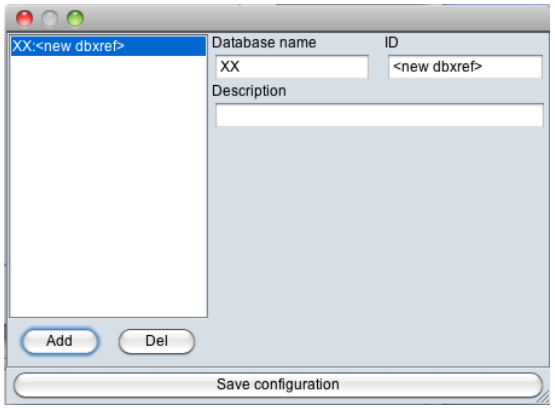
  - Click on '+' to add in another Dbxref

NB: For curator initials, check: go/doc/go.curator_dbxrefs

Dbxref library

You can store commonly used Dbxrefs in a Dbxref library:

- Metadata -> Dbxref Library
- Click on 'Configure dbxref'
- Click on 'Add'
- Fill in the Database name and ID tabs

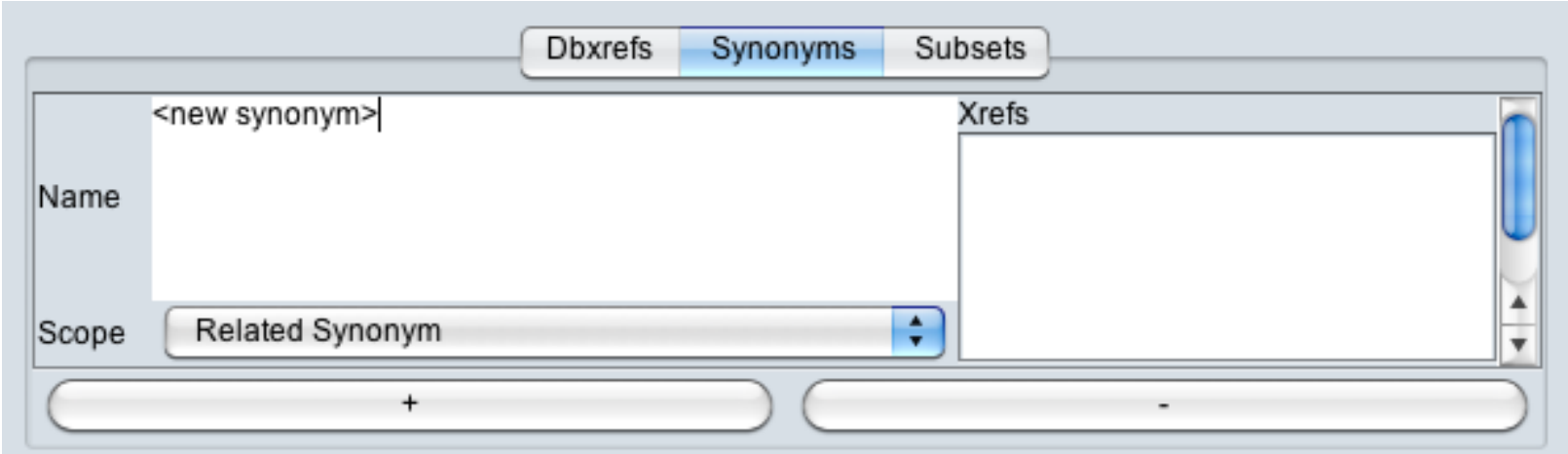


- Save configuration, and your Dbxref will appear in the Dbxref Library
- To add the Dbxref to a term, click on a term in the Ontology Tree Editor, and in the Dbxref panel, click on 'Add as def dbxref'. Check in the Text Editor that the definition Dbxref has appeared.

Adding a synonym to a term

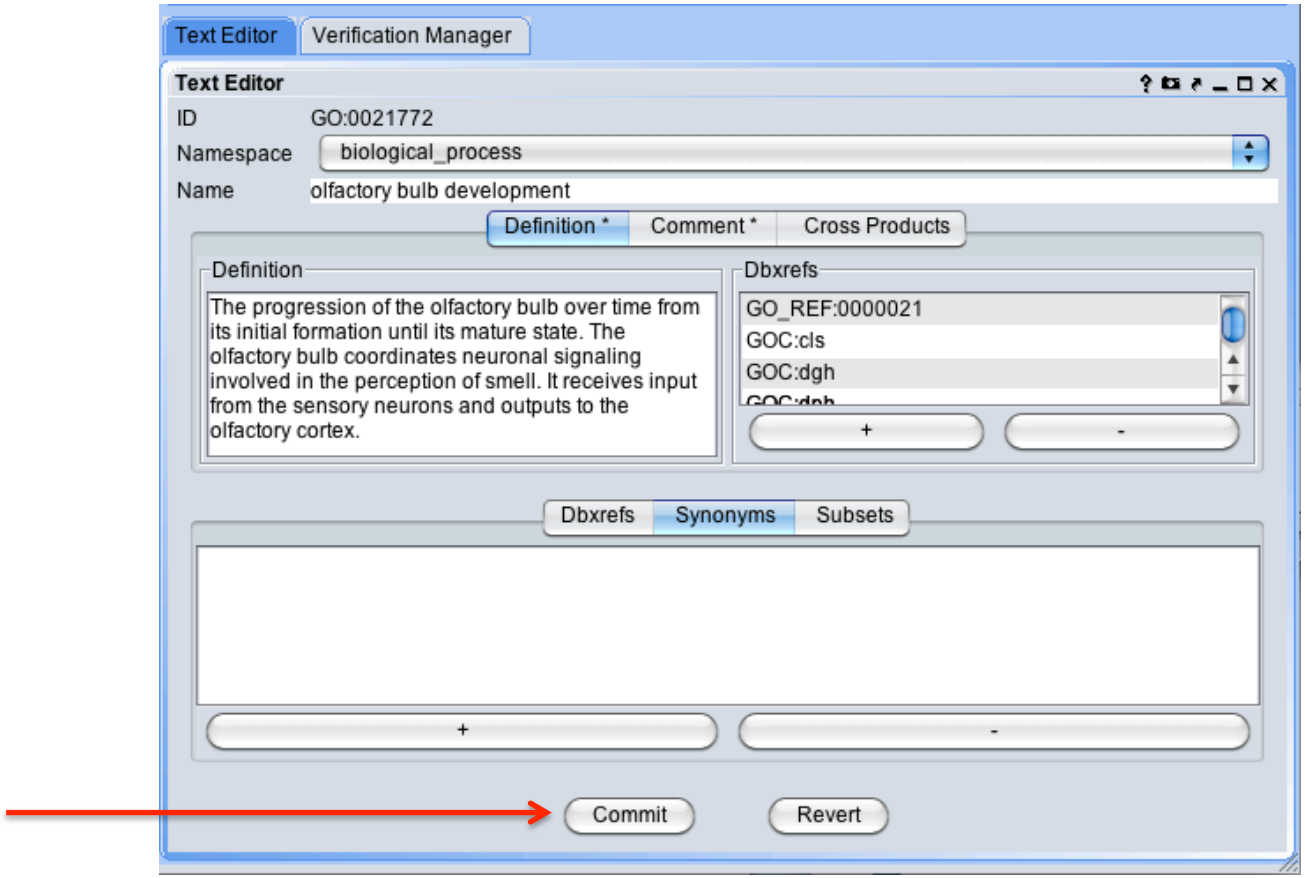
- In the Text Editor panel, select the Synonyms tab, and click the '+' icon.
- Add in an Xref for the synonym (as for the definition Xref).

The scope indicates how a synonym is related to the preferred tern name. An exact synonym means that the synonym string can be used interchangeable with the preferred name in all circumstances.



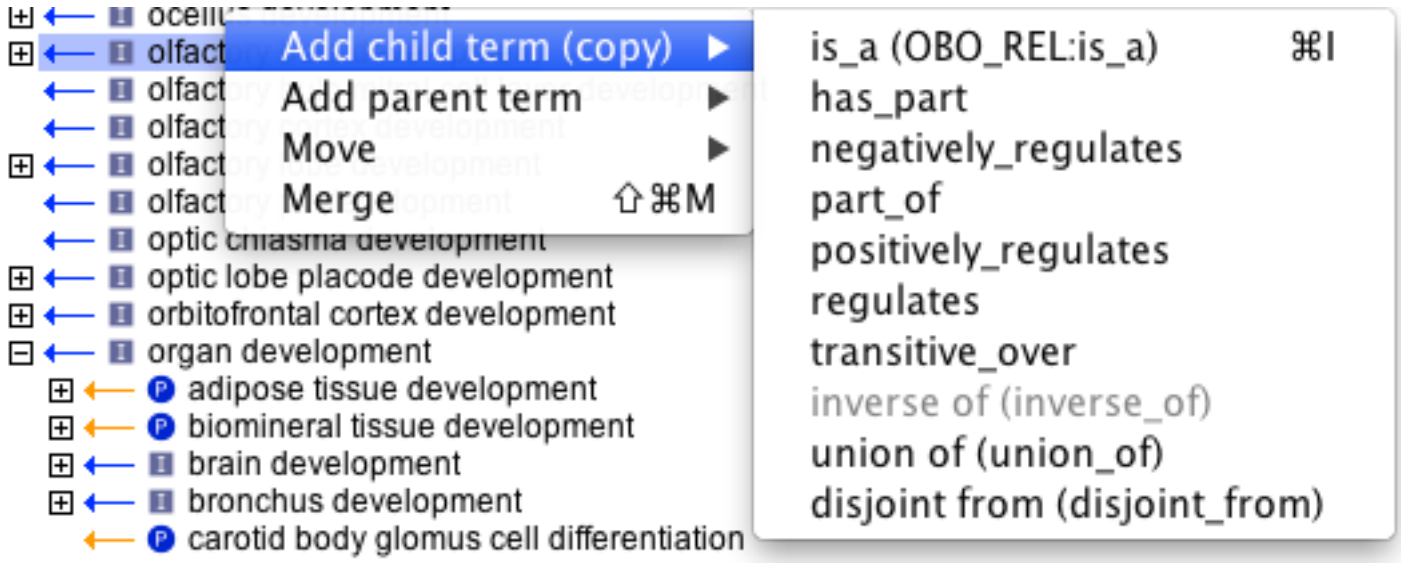
Committing in OBO-Edit

- To save any changes made in the Text Editor panel, click on 'Commit'.



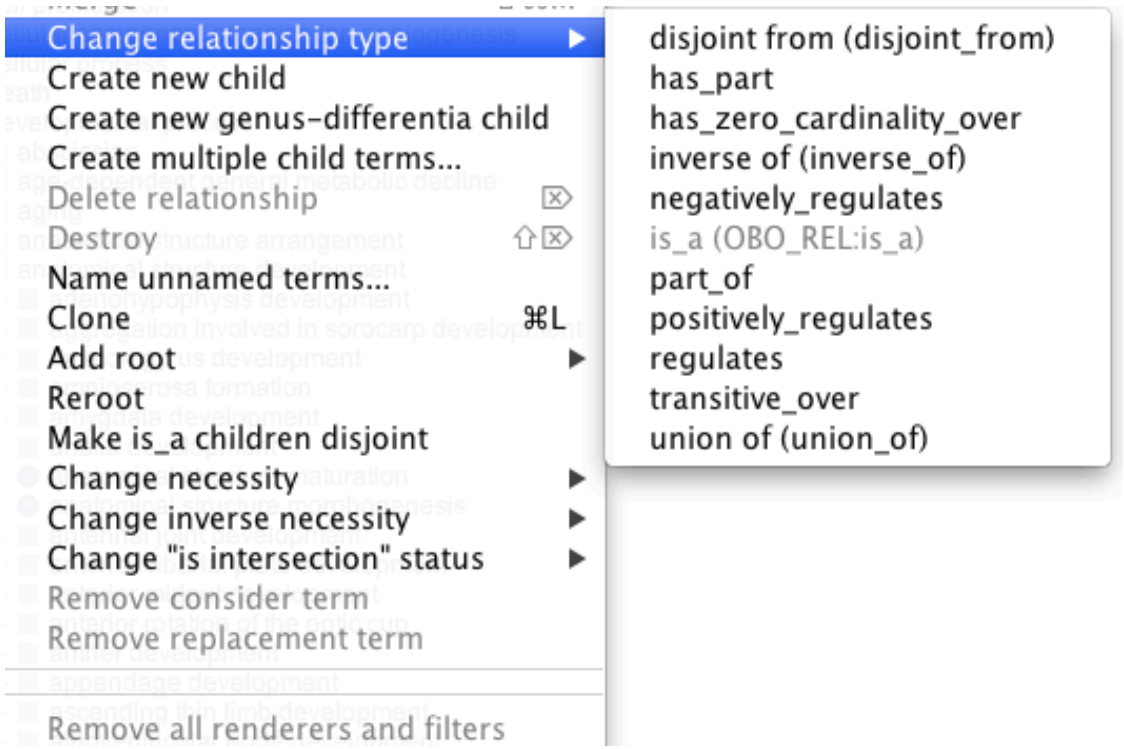
Making Relationships

- To add a new parent to a term, select the child term in an Ontology Tree Editor
- Drag the term onto its new parent (either in the same Ontology Tree Editor, or a second Ontology Tree Editor if the parents are far apart in the ontology).
- Add child term (copy) -> [choose the new relationship type from the drop-down menu].



Changing Relationships

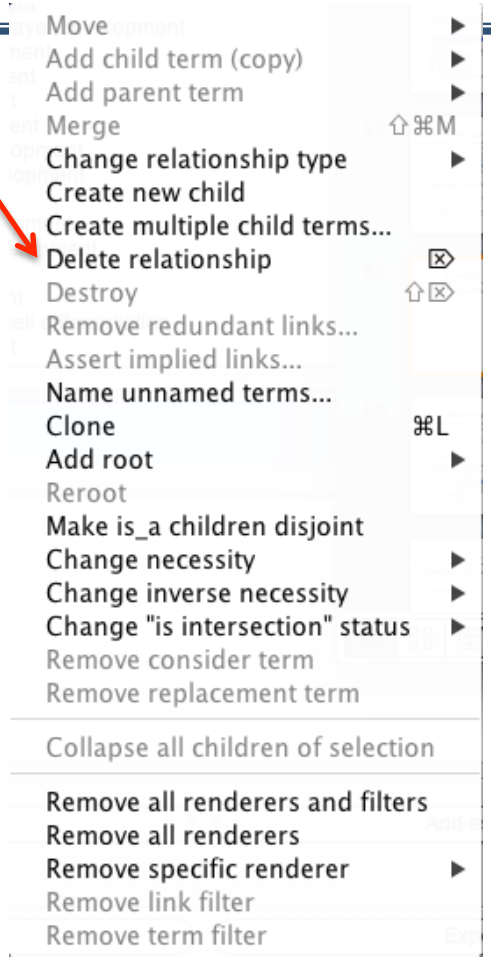
- Click on the child term, and bring up the menu
- Change relationship type -> [select one of the options]



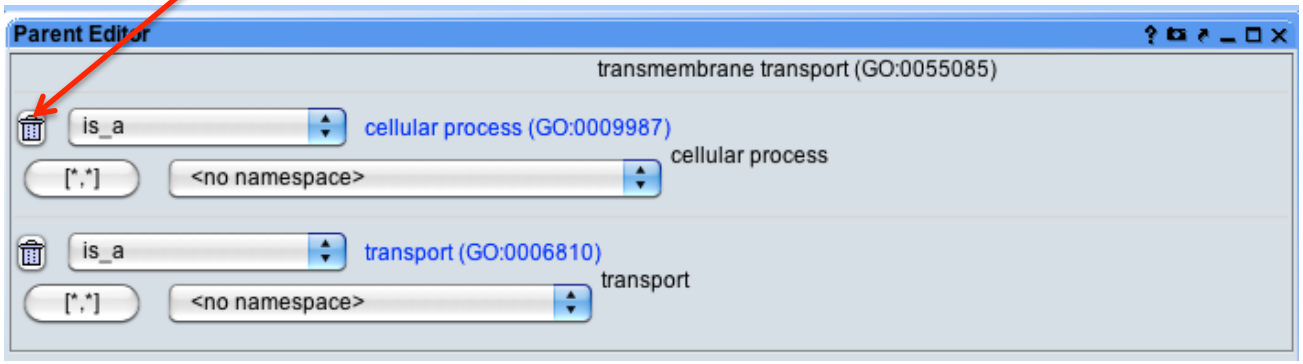
Remember that all terms must have at least one is_a parent.

Removing Relationships

- Cmd left-mouse-click to open menu -> Delete relationship

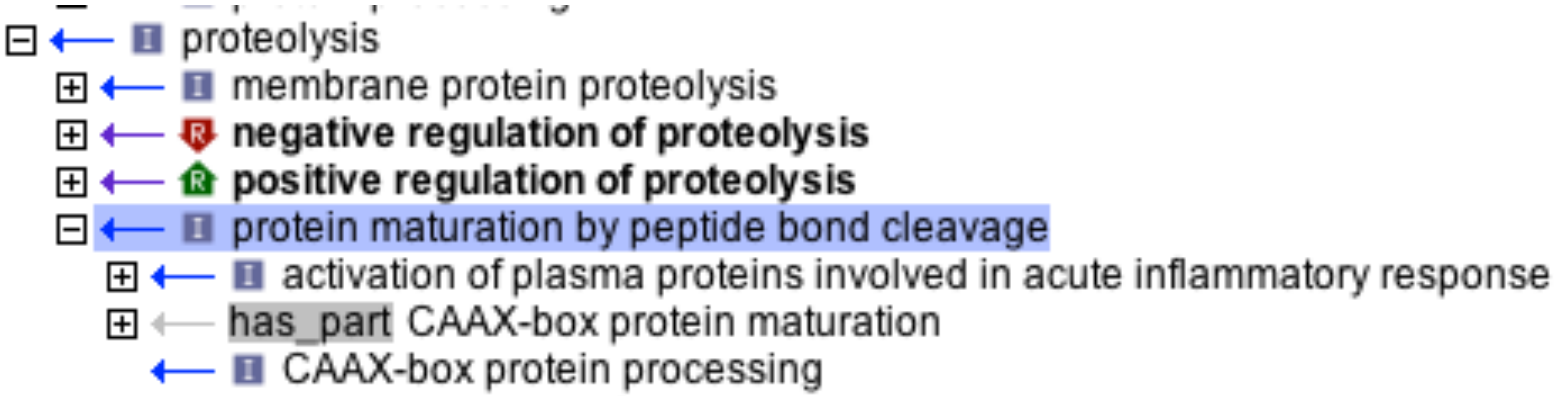


- Parents can also be removed by clicking on the 'waste basket' icon in the 'Parent Editor'



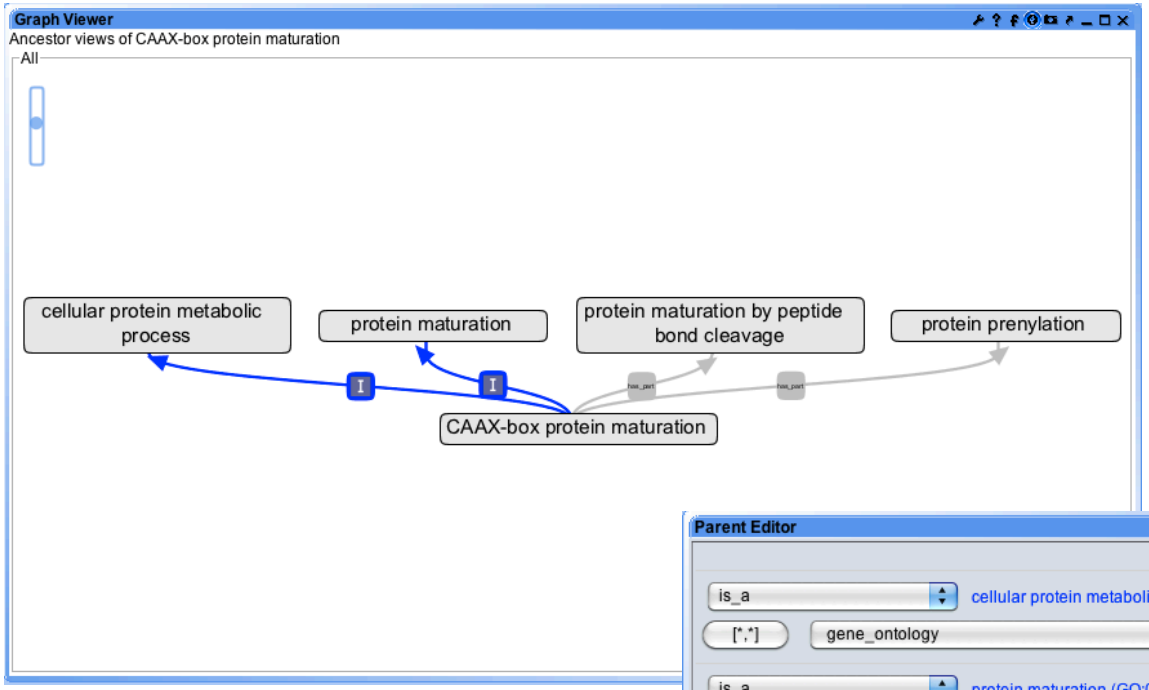
HAS_PART

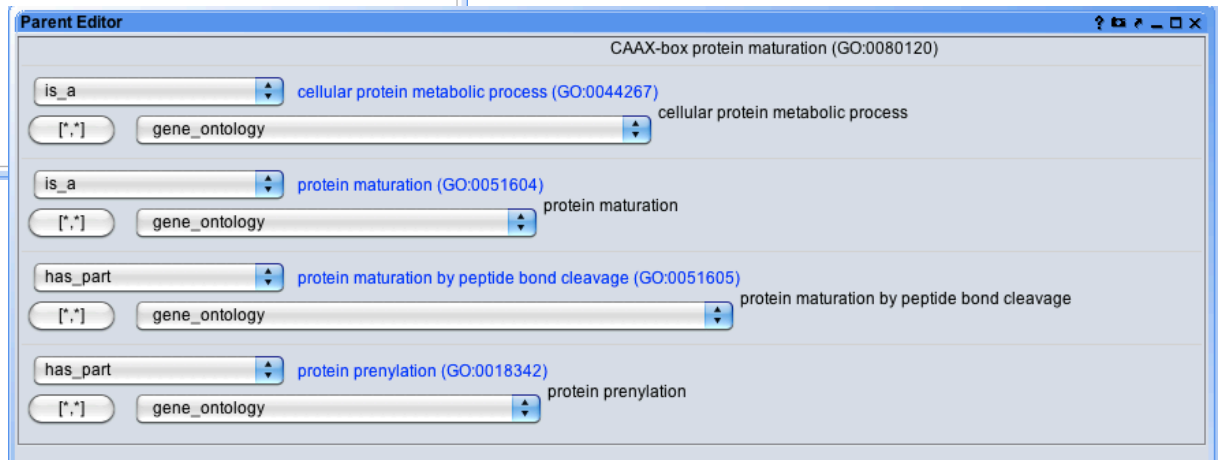
- Remember that HAS_PART relationships are displayed the opposite way to is_a, part_of and regulates relationships:



HAS_PART

- One of the easiest ways to view HAS_PART relationships in OBO-Edit is using the Graph Viewer or the Parent Editor





Ontology Tree Editors

- The Ontology Tree Editors can be in Home or Global mode

- In home mode (house icon), the term chosen in the editor panel will NOT appear in other Editor/Viewer panels.

- In global mode (world icon), the term chosen in the editor panel WILL appear in other Editor/Viewer panels.

- If you have more than one Ontology Tree Editor in your OBO-Edit layout, only one Editor can be on Global mode at once.

- If you are dragging a term to a new parent in a different Ontology Tree Editor, it is useful for the Editor containing the parent to be on Home mode.

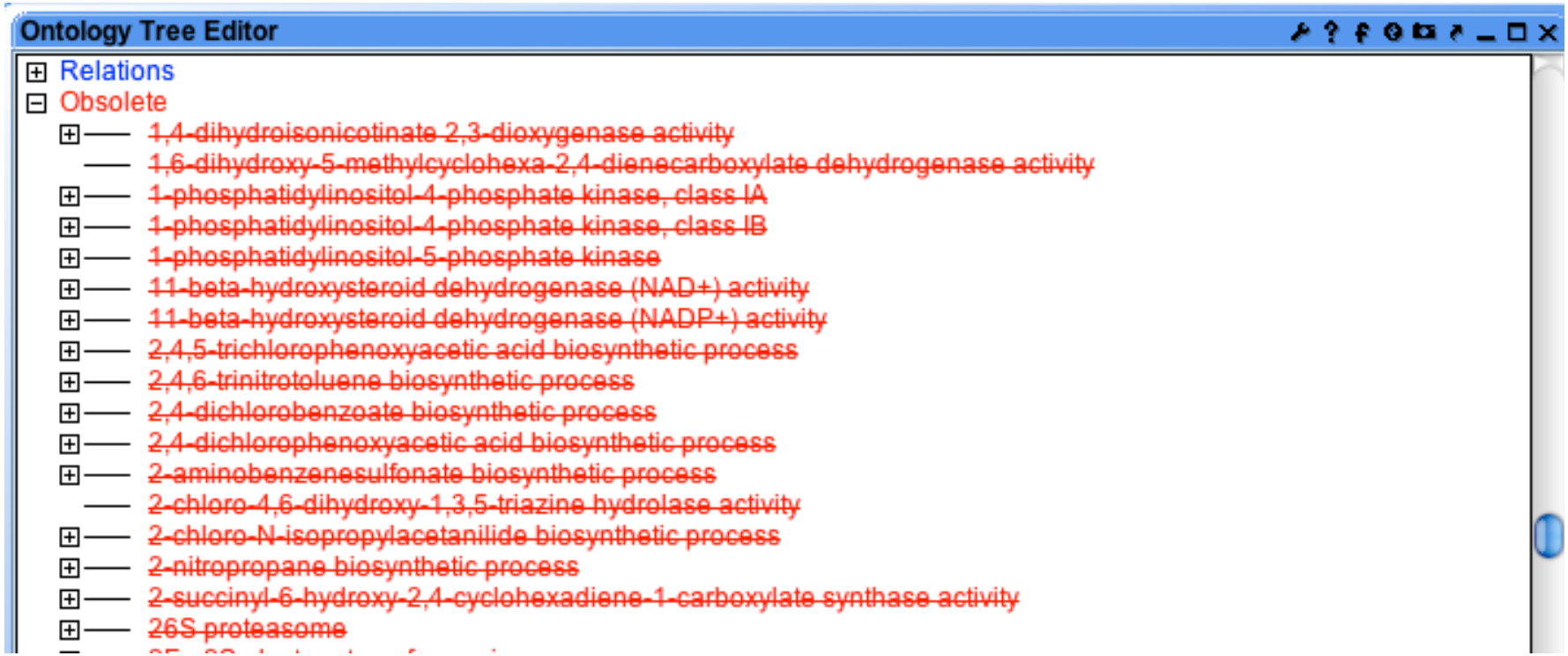
Destroying a Term

- Destroying a term is NOT the same as obsoleting a term. A term should only be destroyed if it has not yet been committed to the live ontology: E.g. if it has been added in OBO-Edit by mistake.

- Destroying a term removes it from the ontology forever.

Obsoleting Terms

- Obsoleting moves a term to the 'Obsolete' parent. These terms are still displayed in red at the bottom of OBO-Edit, and the ID can NOT be reused.

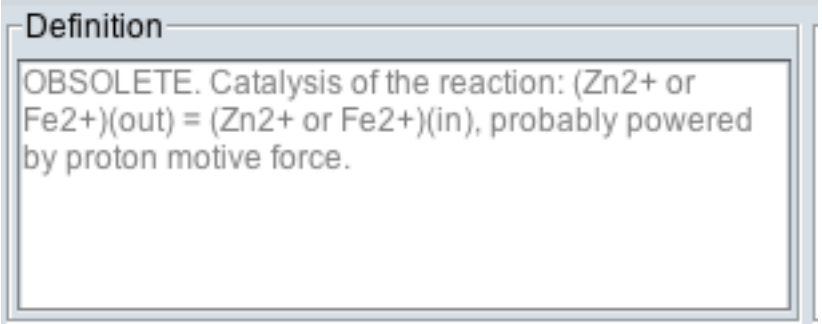


Obsoleting Terms

BEFORE obsoleting a term, go to the Text Editor:

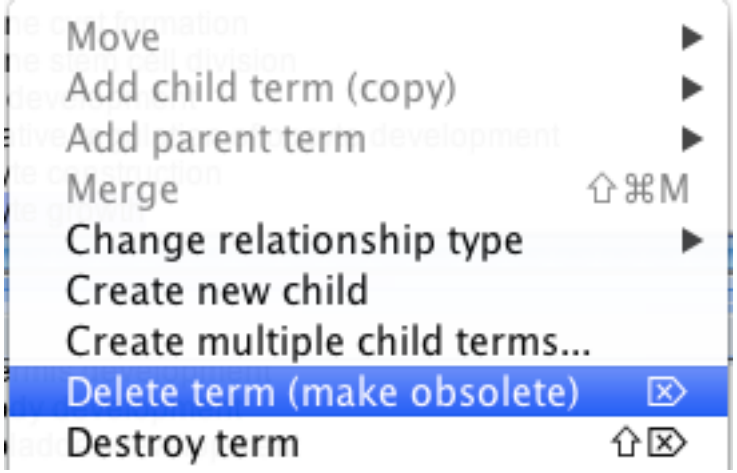
- In the 'Comment' tab, describe the reason for obsoletion. E.g.
  - This term was made obsolete because its definition was inaccurate.
  - This term was made obsolete because 4-nitrotoluene is not synthesized by living organisms, and GO does not cover non-biological processes.
  - This term was made obsolete because it represents a gene product.

- In the 'Definition' tab, type 'OBSOLETE' before the term definition.



Obsoleting Terms

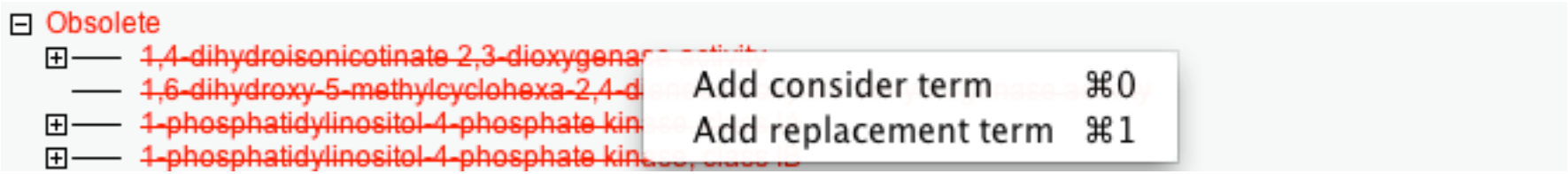
- A term can only be obsoleted if it has no children and only one parent. Therefore, in the Ontology Tree Editor, you need to delete other relationships in the ontology. Once only one parent-child relationship remains for the target term, a 'Delete term (make obsolete) option will appear in the drop-down menu. Click on this.



Replacements/Suggestions for Obsoleted Terms

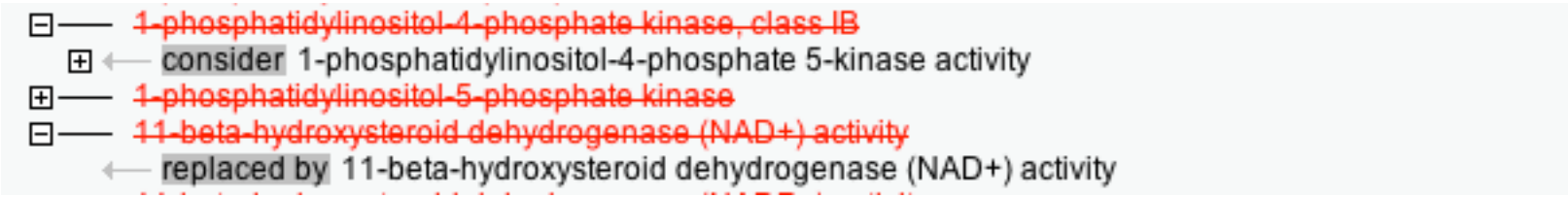
- To point to a replacement term for an obsoleted term, select and drag the replacement term onto the obsoleted term, in an Ontology Editor Panel.

- Choose the 'Add replacement term'



- For alternative terms that could be considered, choose the 'Add consider term'.

These are displayed in OBO-Edit and in some web browsers so annotators can reassign annotations.

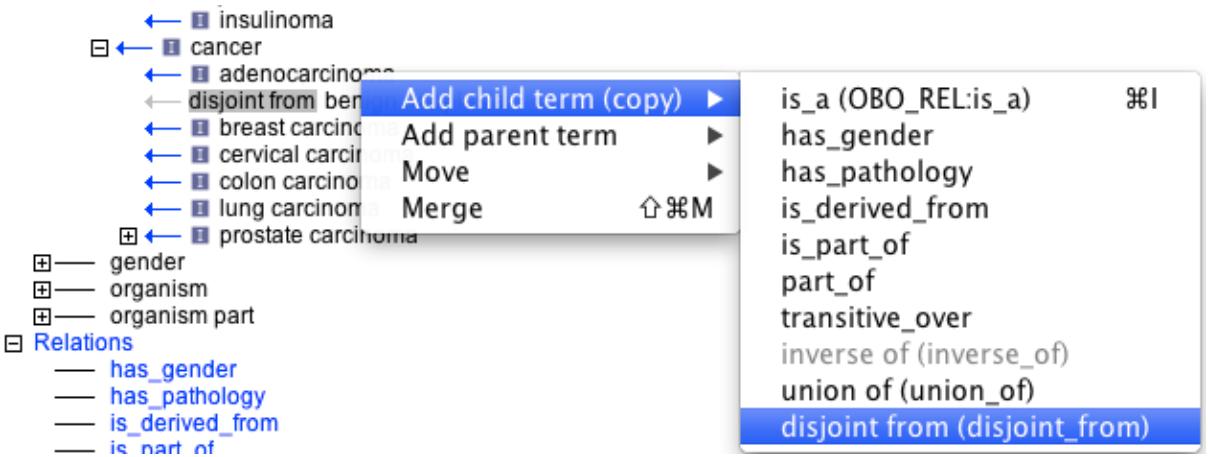


Making terms disjoint

- Having added terms to the ontology, we may wish to exert some restrictions on how these classes can be used.
  - For example, the 'biological process', 'molecular function' and 'cellular component' top level terms are disjoint: this means that an instance can belong to one or the other but not to both.

<u>To assert that classes are disjoint:</u>

- Select the term, and drag it over the term it should be disjoint to
- Choose Add child term (copy) -> disjoint_from:



Undo

- Don’t worry if you make a mistake:
  - Edit -> Undo

Help

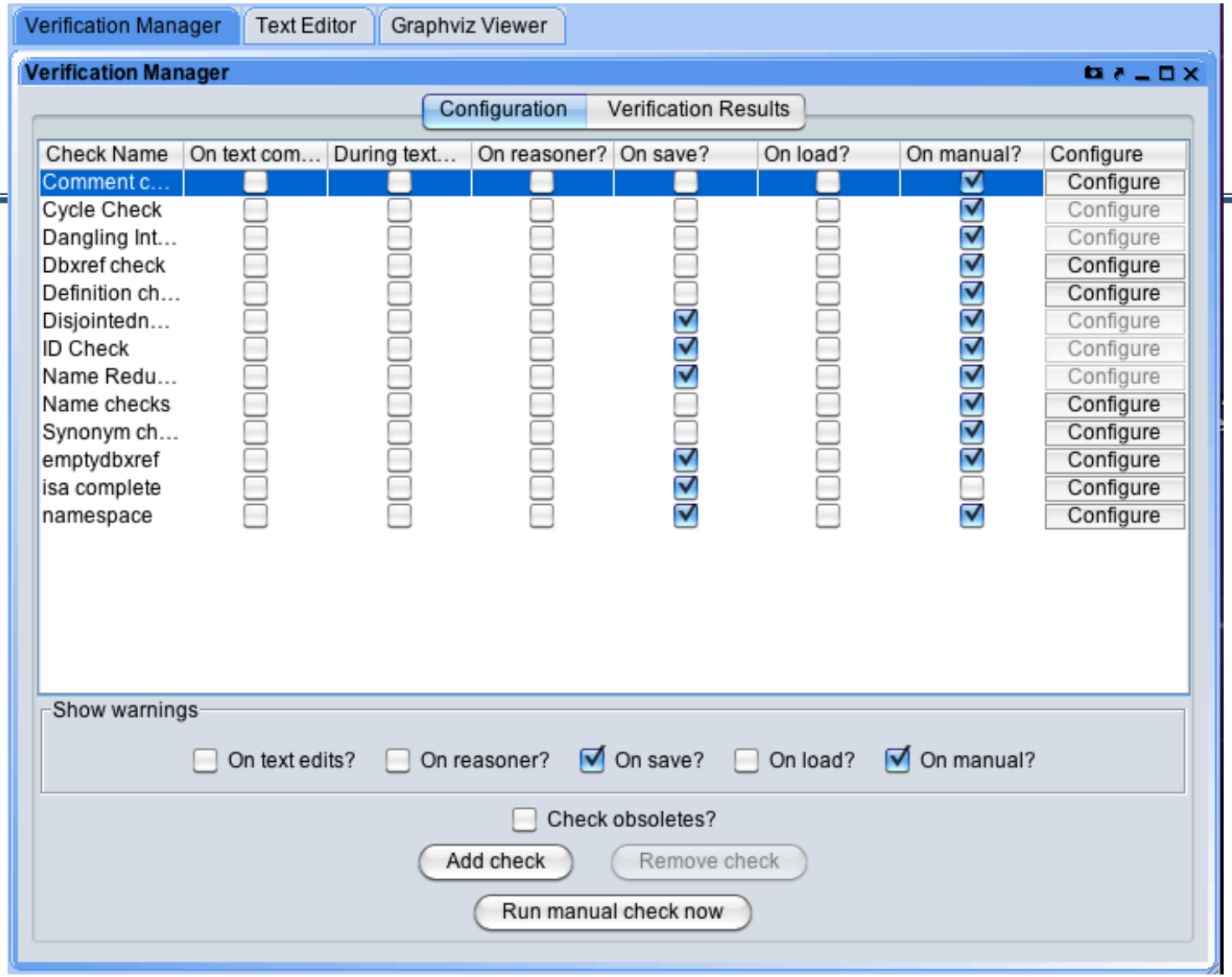
- A Help manual is built into OBO-Edit.
- Help -> User Guide

Verification Plugin

OBO-Edit has a comprehensive set of verification checks to help maintain consistency in the ontology. These checks include a dictionary for definitions, synonyms and term names, a check for disjoint violations, for cycles in the ontology, and a check for name redundancy. The verification tool is also configurable so you can specify your own checks, and specify when and how the checks are run.

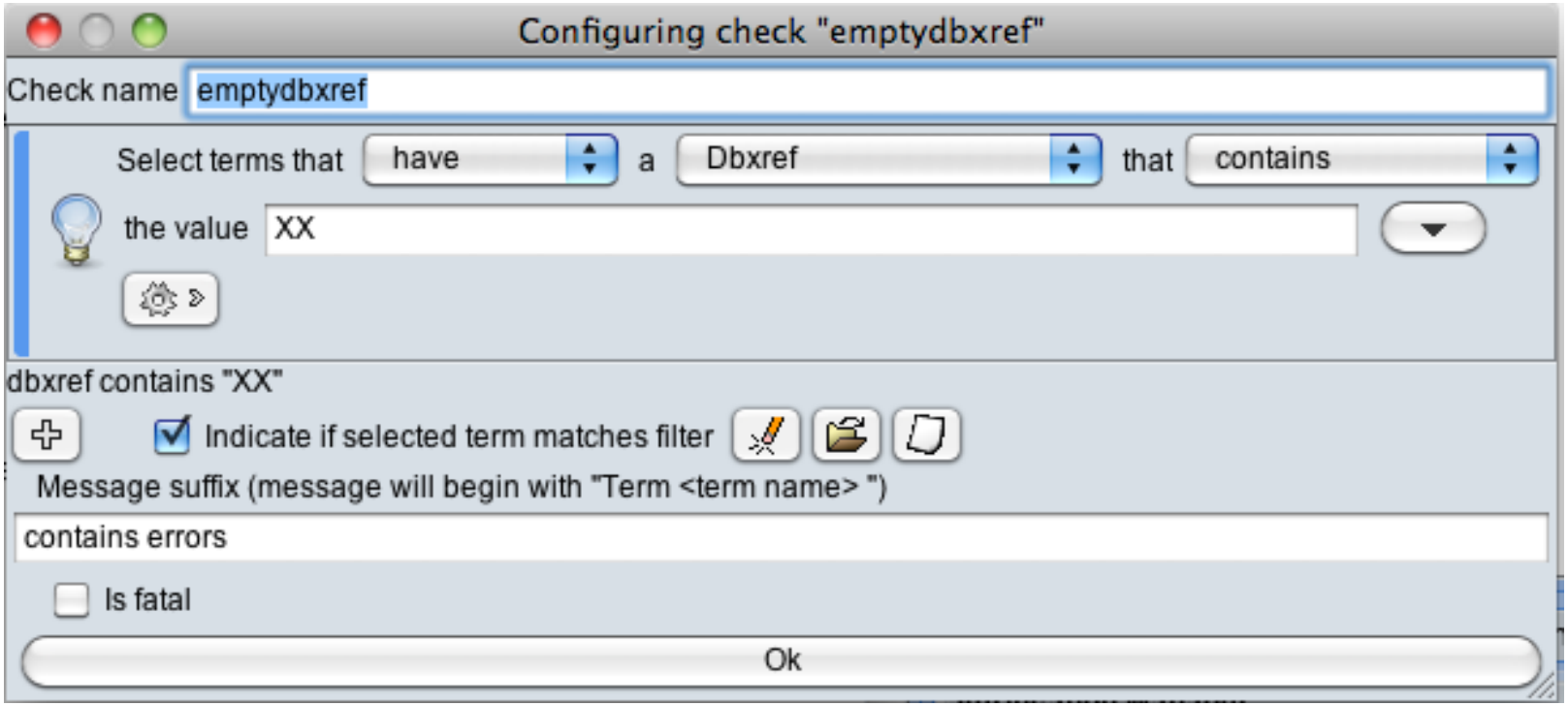
- Tools -> Verification Manager
- Ensure the tab Configuration is checked, and check all the boxes in the 'On Manual' column. Hit 'Run manual check now.
- Results will appear in the 'Verification Results' Tab.
- To test, try adding a spelling error and re-running the manual check.

Chris Mungall also runs a more extensive Verification Manager every night to check for errors. Any errors are mailed round the ontology editors mailing list.

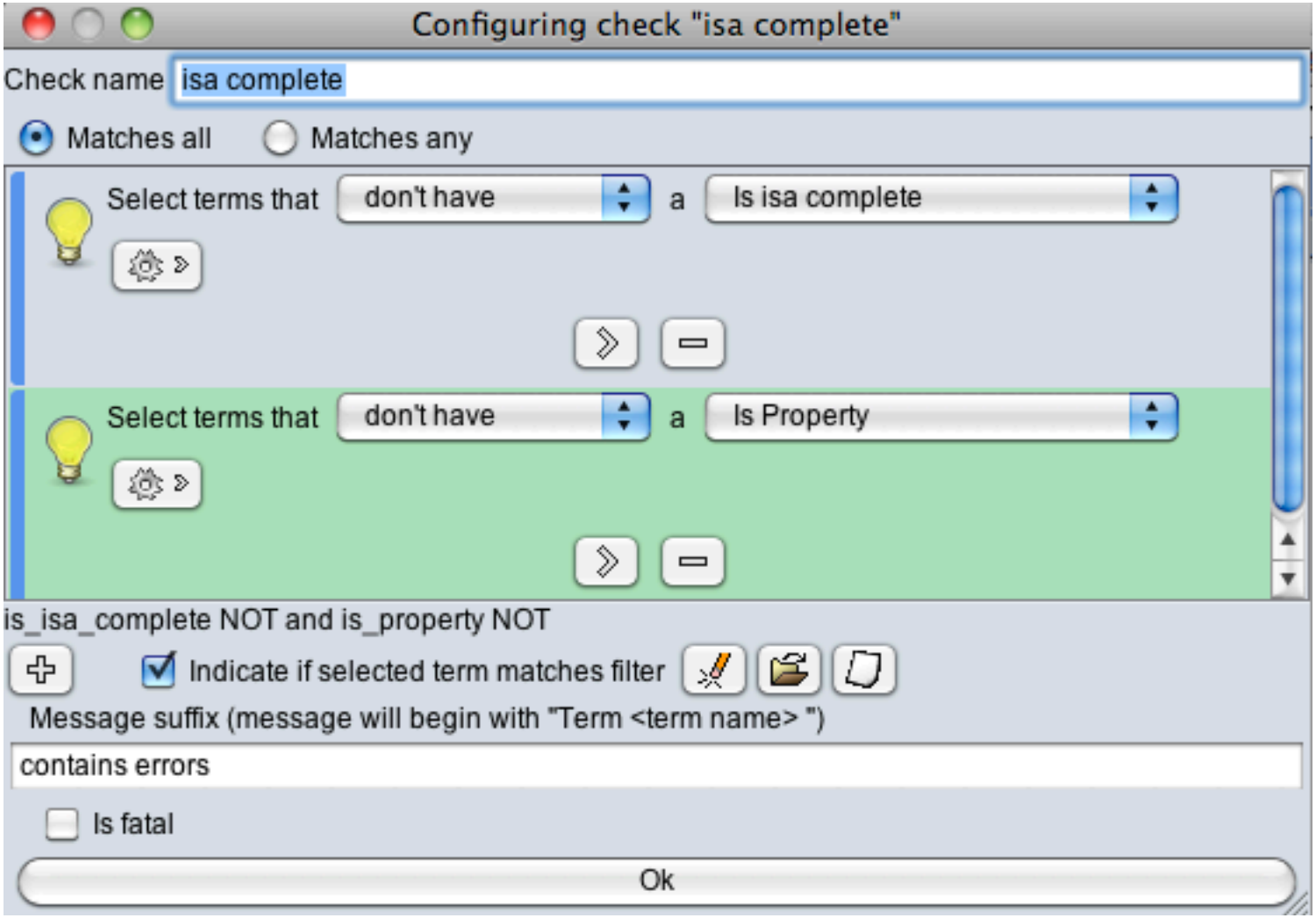


- This is an example of how to set up your Verification manager. The next few slides are additional checks that can be added in.

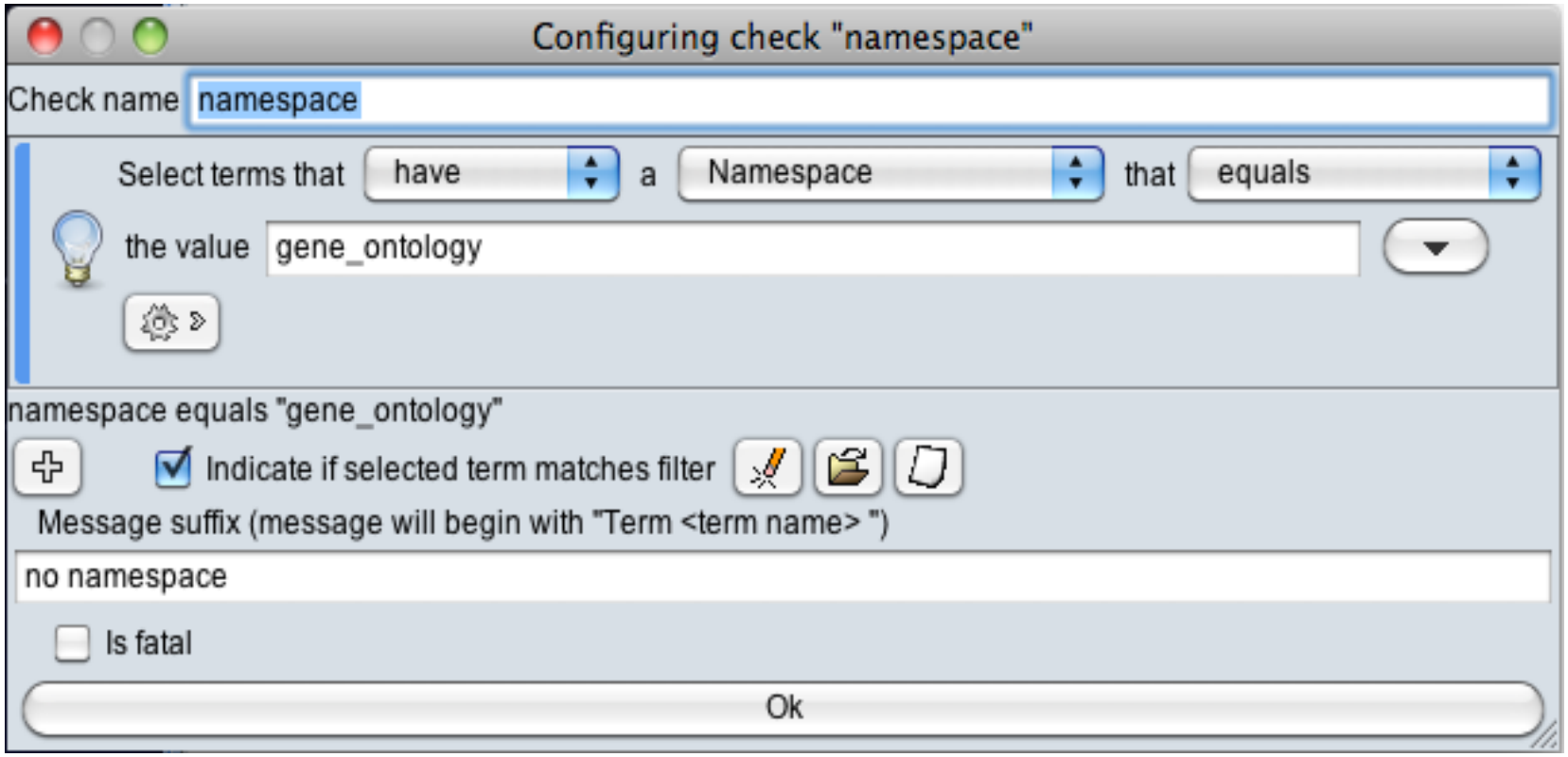
Empty DBXref check



Is_a complete check

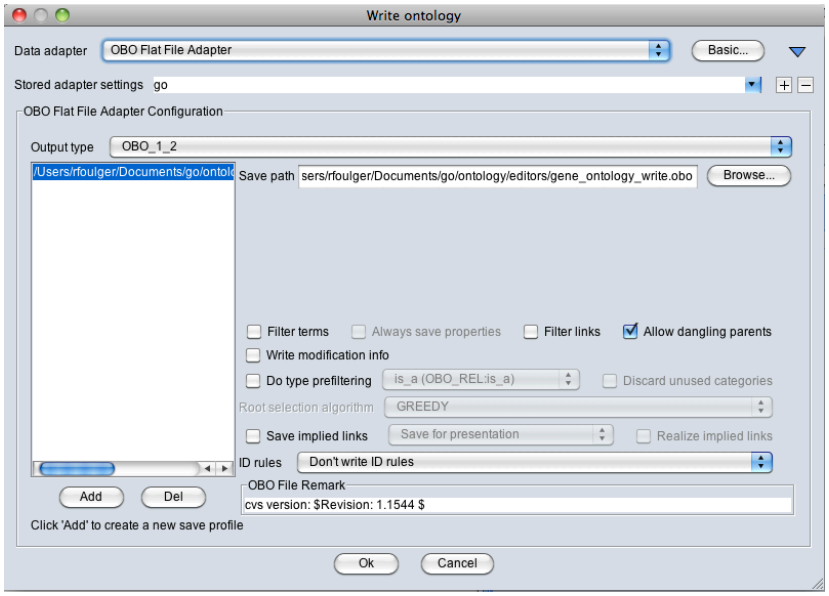


Namespace


Configuring check "namespace"
Check name
namespace
Select terms that
have
a
Namespace
that
equals
the value
gene_ontology
namespace equals "gene_ontology"
Indicate if selected term matches filter
Message suffix (message will begin with "Term <term name> ")
no namespace
Is fatal
Ok

Saving Files in OBO-Edit

- File -> Save As. A Write Ontology dialog will appear
- Click the Advanced button to view the advanced save interface.
- Ensure the output type is set to OBO_1.2, and click Add to create a new save profile.
- Set the path and filename to save to
- Finally, at the top where it says <create new profile>, give a name to your profile. Once you have saved OBO-Edit will remember this profile for future sessions. Hit ok.



The ontology is now saved on your machine, and can now be committed to the go directory using cvs.

Reasoning

Reasoners can be used for to check consistency and automatically classify ontologies.

- Reasoner -> Reasoner manager
- Toggle to 'RuleBasedReasoner'

The Reasoner will run and flag up any unnecessary relationships or inconsistencies

The Reasoner takes a lot of memory to run, so it's recommended to have the Reasoner switched OFF when doing daily edits in OBO-Edit.

You can run the Reasoner as an additional check (once a month). It's also run by ontology managers to flag up any problems.

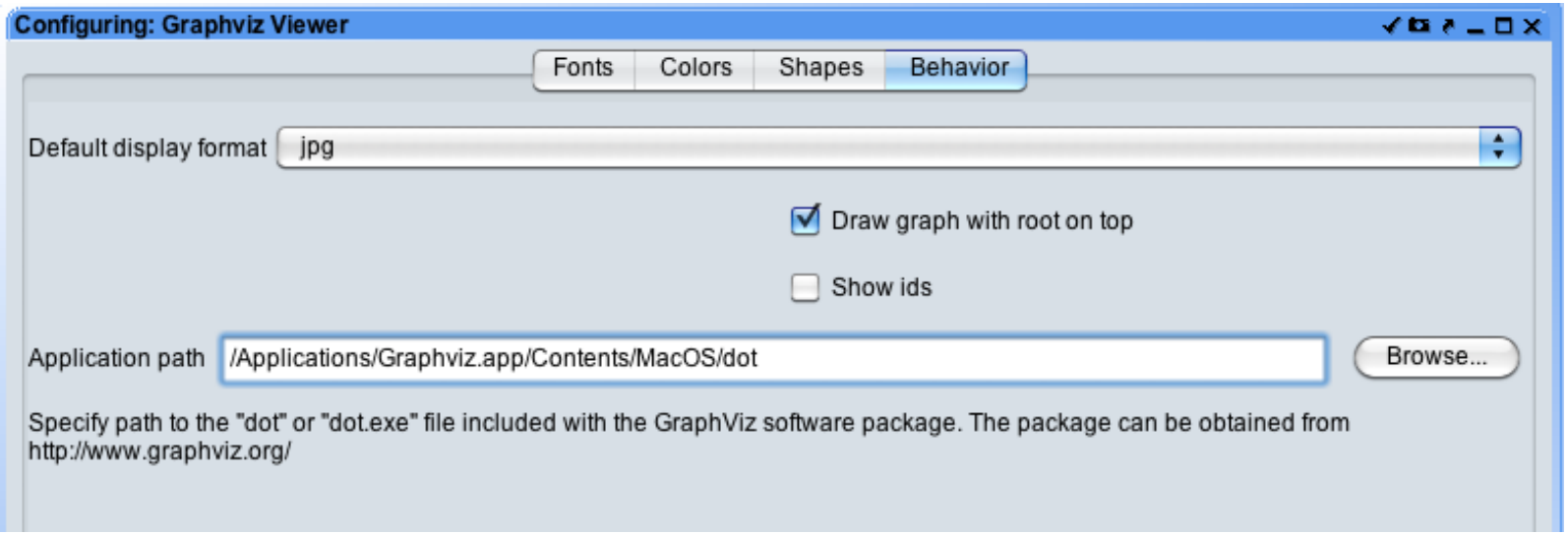
Other Reasoners are available that can automatically place terms in the hierarchy.

Some Handy Extras

Using Graphviz

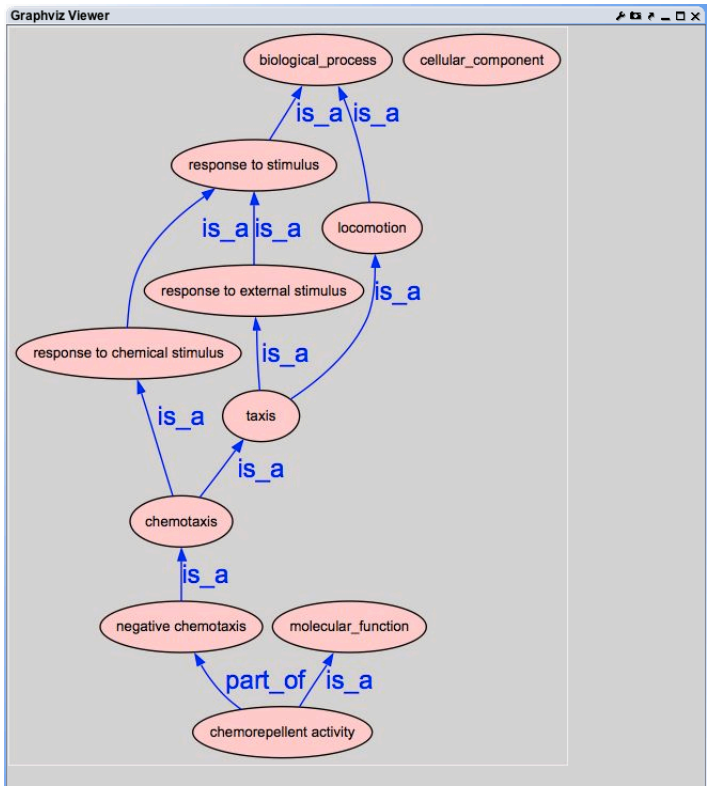
Graphviz is an external application. To use Graphviz in OBO-Edit, you need to do a short set-up:

- To open a Graphviz panel: Viewers -> Graphviz
- In a web browser, download Graphviz from: http://www.pixelglow.com/graphviz/. (this is a mac-specific version)
- You need the 'dot' file: this is the program OBO-Edit uses to create Graphviz displays.
- To set the path, click the spanner icon on the Graphviz Viewer.



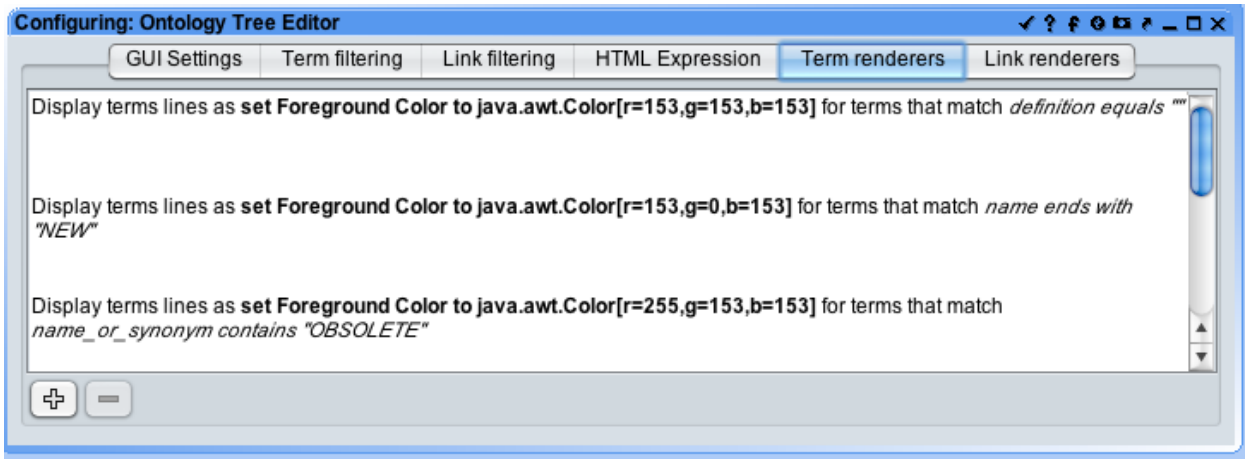
Graphviz

- When correctly configured, Graphviz should look like below. Colours, shapes etc. can all be configured using the Graphviz configuration manager (click on the Graphviz spanner).



Rendering and Filtering

- It can be useful to have different terms showing up in different fonts or colors.
- In the Ontology Tree Editor, click the spanner icon.
- Scroll to 'Term renderers'
- To add a new render, click on the + button.
- Fill in the fields, and choose the Foreground/font face changes.
- Check that the changes appear in the Ontology Tree Editor.



For example, if you are working on a particular field, you can set it so that all terms containing 'neuron' in a name or synonym show up as red.