
OBO-Edit Tutorial

GO Editorial Training

Updated: July 2012

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 release (2.2) of OBO-Edit from:
 - <https://sourceforge.net/projects/geneontology/>
 - You should download the release specific to your computer (mac/pc/unix).
- ❖ 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: you will need a cvs account for this step)
 - 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(7,00XXXXXX,00XXXXXX)\$.
 - NB: use your set of assigned numbers instead of XXXXX. E.g. for ID range GO: 0098001 - GO:0098500, paste:
 - GO:\$sequence(7,0098001,0098500)\$.
 - Close the ID manager.
 - This will generate IDs with the prefix GO, that are 7 digits long, beginning with 00XXXXX. (E.g. GO:0098001)

Choosing a Layout

- ❖ You can configure your OBO-Edit layout how you like.
- ❖ There are two main types of panels you can have in OE:
 - Viewer: Allows you to see the parentage/graph layout etc of a term WITHOUT being able to make changes
 - Editor: Allows you to make changes to your term or its relationships
- ❖ I would recommend the following layout (see next slide for diagram):
 - 2 x Ontology Tree Editor (Use to create new terms, move terms, delete terms)
 - 1 x Tree Viewer (Can be useful to view the ancestors of your terms)
 - 1 x Parent Editor (Useful to view and edit the immediate parents of a term)
 - 1 x Search Panel
 - 1 x Text Editor (Use to edit the definition/synonyms/Xref for a term)
 - 1 x Verification Manager (Use to check there's no errors in your edits)
 - 1 x Graph Viewer (Useful to view a snapshot of the ontology, up to the root)

A Suggested OBO-Edit Layout

OBO-Edit version 2.0: gene_ontology_write.obo

File Edit Layout Editors Viewers Search Tools Metadata Reasoner Summary Config Help

Ontology Tree Editor Tree Viewer Parent Editor Graph Viewer Graphviz Viewer

Tree Viewer

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

12 paths loaded.

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

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

Rearranging Your OBO-Edit Set-Up

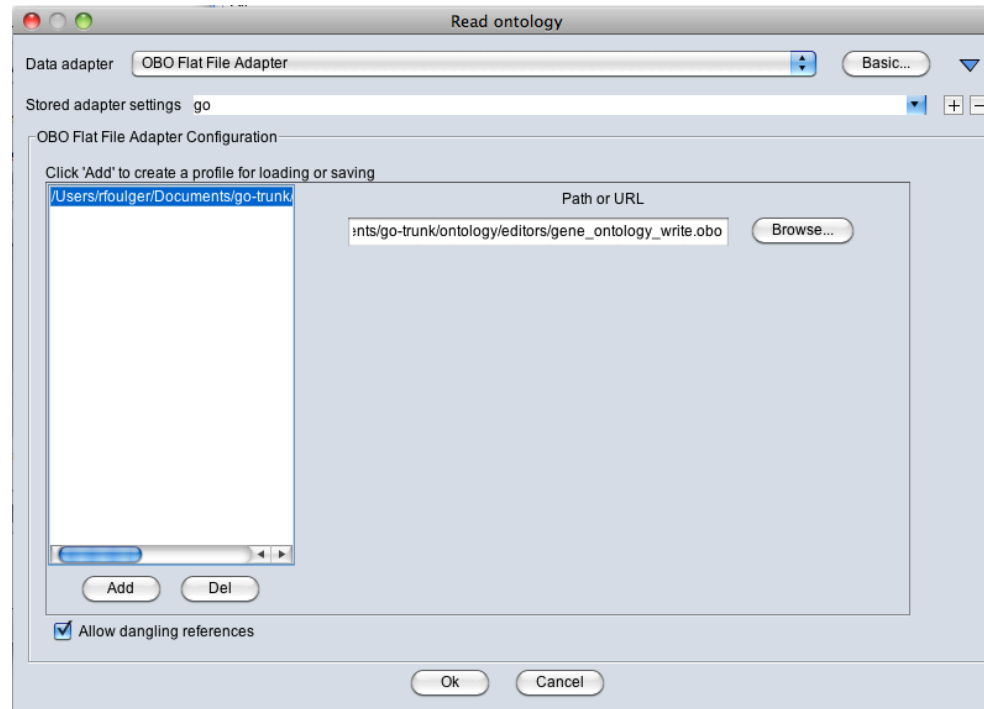
- ❖ Use the top menu to add a new Viewer or Editor panel to your layout.
 - Just click on the panel type you'd like to add, and OE will add it in.
- ❖ Your panels can be arranged as tabs, or as separate windows in OE. They can be expanded or shrunk as required.
- ❖ To move a panel, click on the top bar and drag your panel until the black outline is where you want it.
- ❖ To remove a panel, just click on the 'X' in the top right corner.
- ❖ To maximize a panel, just click on the icon in the top right corner.
 - You can minimize or restore to undo.
- ❖ OE can be a bit click-happy when you're rearranging your panels. If it all goes awry, I'd suggest removing the offending panel and adding it back in afresh.

Loading an Ontology

- ❖ You can load an ontology by:
 - 1. Loading a flat-file
 - 2. Loading from a URL
- ❖ If you are committing your changes back to the go-trunk directory, you will need to load a svn-updated flat-file from `go-trunk/ontology/editors/gene_ontology_write.obo`
- ❖ Loading from a url is a quick way of viewing GO without having to download the very recent copy of the GO file.

Loading an Ontology: Flat File

- ❖ 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-trunk 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.

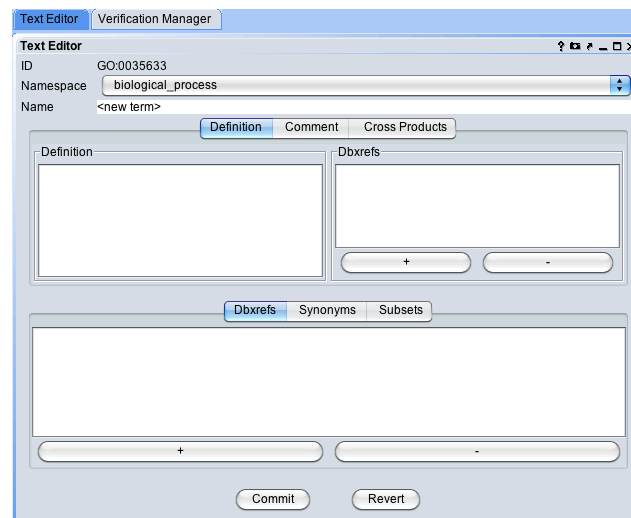
Loading an Ontology: URL

- ❖ File -> Load Ontologies
- ❖ Replace <create new profile> with an identifiable name (E.g. GO_URL), and Click 'Add' to add in a new profile.
- ❖ In the 'Path or URL' box, type:
 - http://www.geneontology.org/ontology/gene_ontology.obo
- ❖ Click 'Ok'

Editing An Ontology

Creating a Term (in an existing ontology)

- ❖ 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)
- ❖ Scroll down to 'Create new child' option
- *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 reference (Dbxref) so we can go back to the source, if needed. To add a Dbxref, click on the '+' in the Text Editor panel.

- In the Database box, fill in a prefix:
 - GOC (used for curator initials)
 - PMID
 - ISBN
 - http
 - CHEBI
 - VZ
 - PR
 - [other anatomy abbreviation]



Database	ID
XX	<new dbxref>

Description

+ -

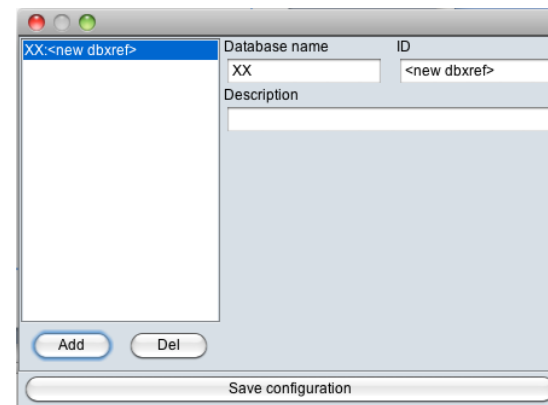
- In the ID box, fill in the curator initial (e.g. bm), PubMed ID, ISBN ID, web address, or other ontology ID.
- Click on '+' to add in another Dbxref. There is no limit on how many definition references a term may have. For most terms, it's good practice to have at least a PMID and curator initials (e.g. GOC:bm).

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

Dbxref library (optional)

If you're going to use a DBXref often, 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

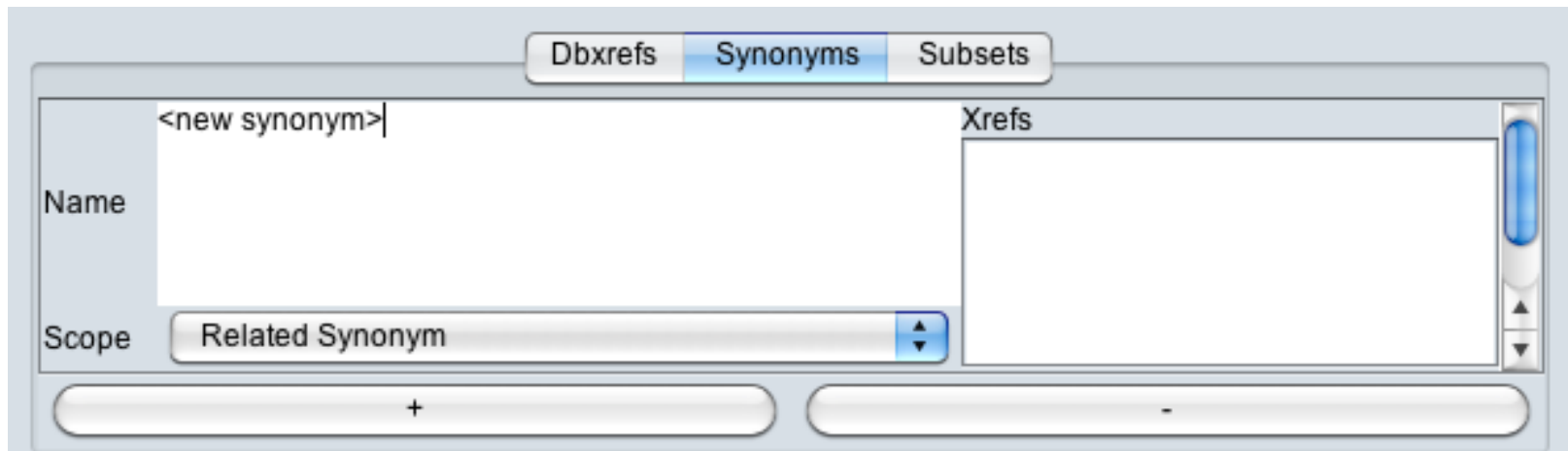


- ❖ Save configuration, and your Dbxref will appear in the Dbxref Library
- ❖ To add the Dbxref to a term, click on a term in the Ontology Tree Editor, and in the Dbxref panel, click on 'Add as def dbxref'. Check in the Text Editor that the definition Dbxref has appeared.

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).

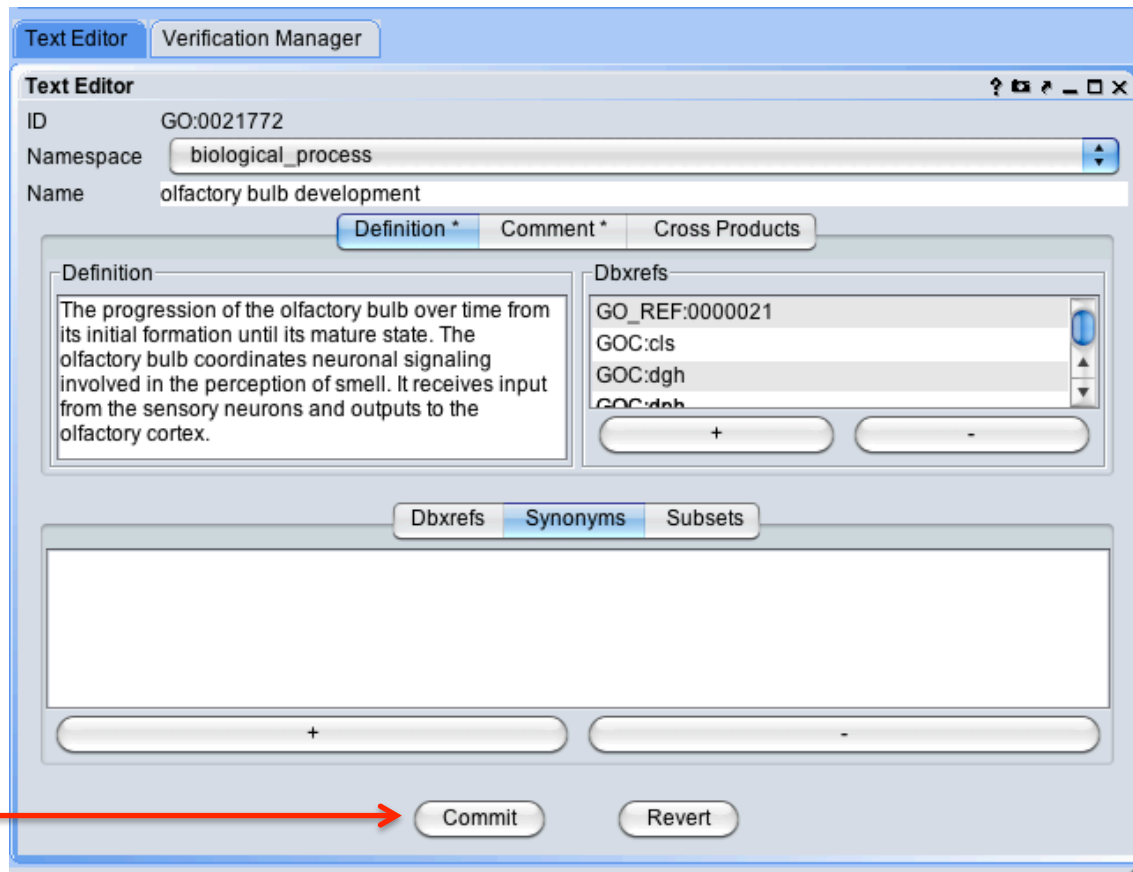
The scope indicates how a synonym is related to the preferred term name. An exact synonym means that the synonym string can be used interchangeable with the preferred name in all circumstances. The default scope is 'Related'. Other options are 'Narrow' and 'Broad'.



The screenshot shows a software interface with three tabs: 'Dbxrefs', 'Synonyms', and 'Subsets'. The 'Synonyms' tab is active. It contains a 'Name' field with the placeholder text '<new synonym>'. Below the name field is a 'Scope' dropdown menu currently set to 'Related Synonym'. To the right of the name field is an 'Xrefs' list area, which is currently empty. At the bottom of the panel, there are two buttons: a '+' button on the left and a '-' button on the right.

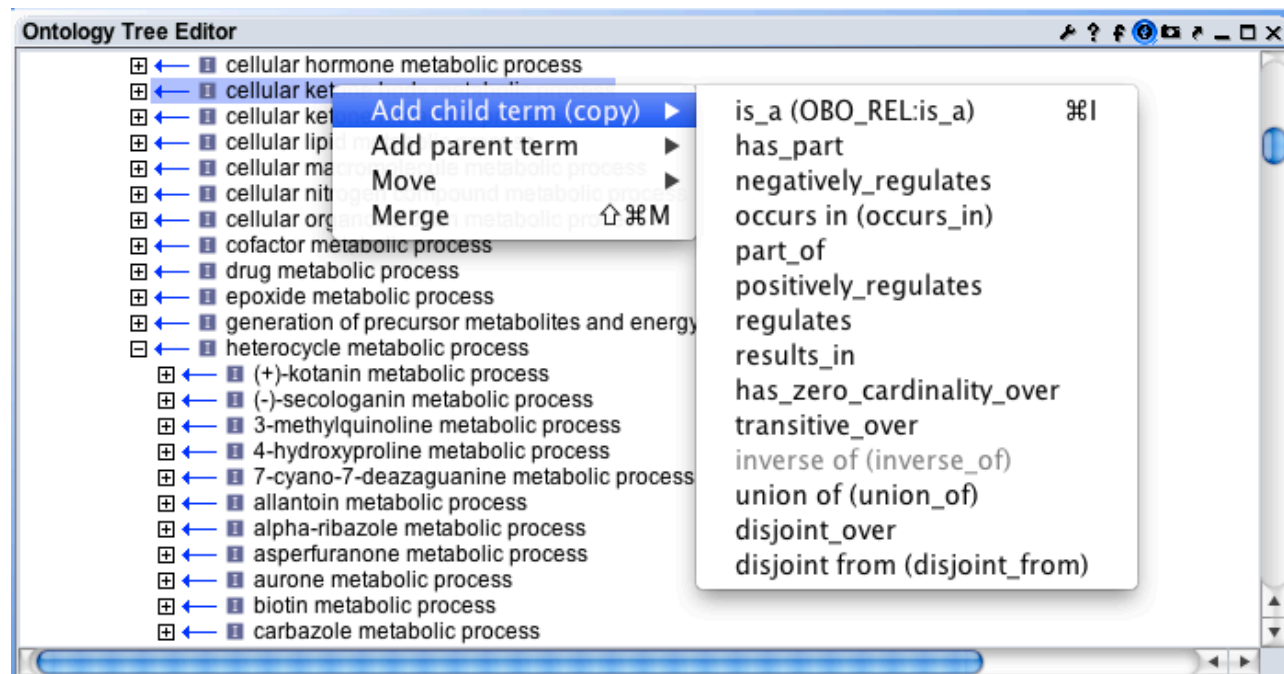
Saving your text changes

- ❖ To save any changes made in the Text Editor panel, click on 'Commit'.
 - If you click on another term without saving, OE will bring up a warning.



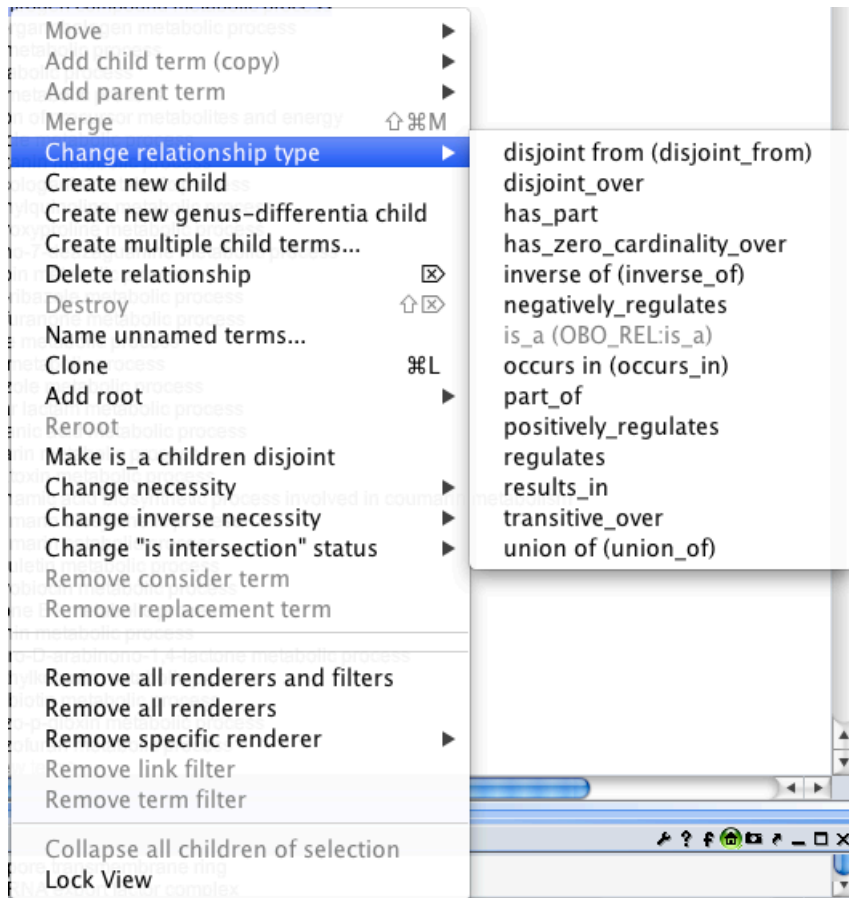
Adding New Relationships

- ❖ To add a new parent to a term, select the child term in one Ontology Tree Editor panel.
- ❖ 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

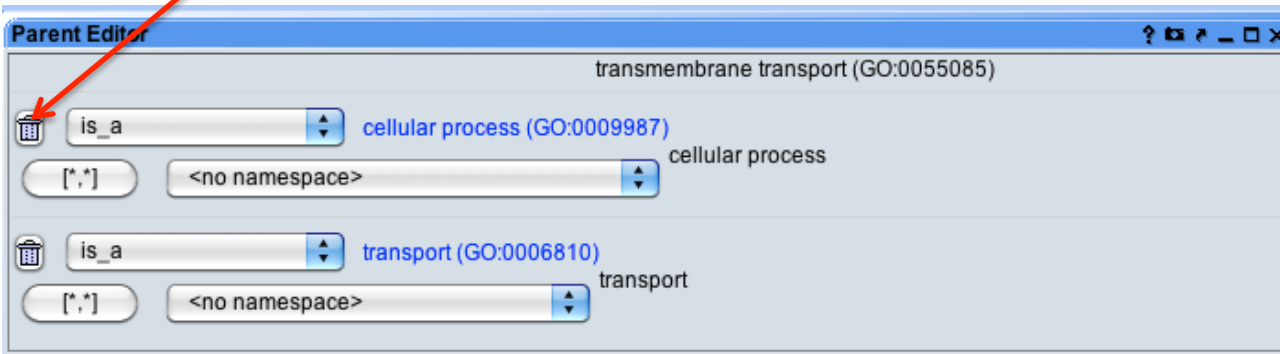
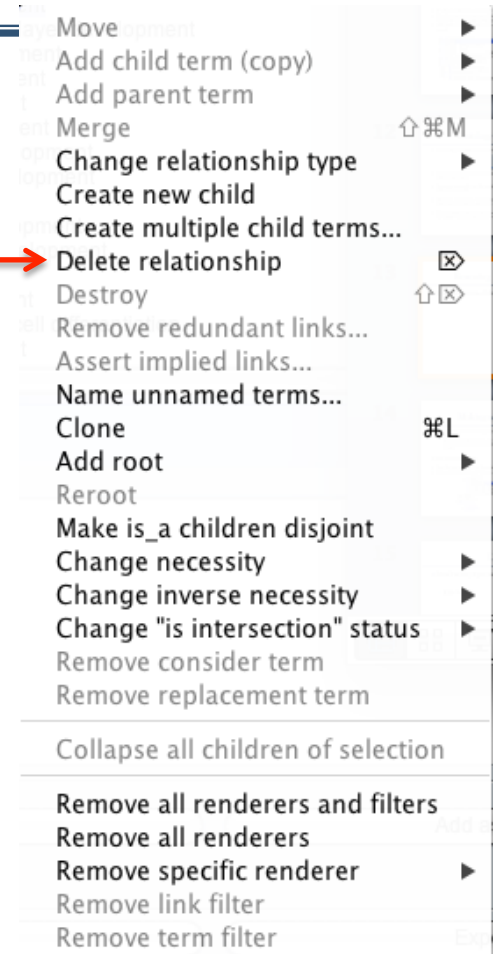
- ❖ Cmd-click on the child term, and bring up the menu
- ❖ Change relationship type -> [select one of the options]



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

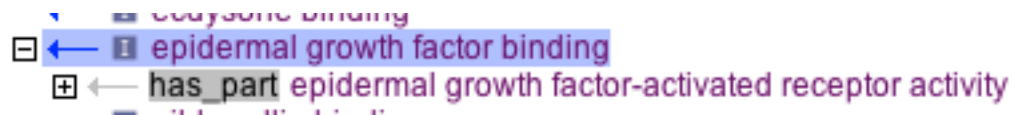
Removing Relationships

- ❖ In the Ontology Editors panel, you can delete a relationship by Cmd left-mouse-click on the child term to open the menu, and selecte 'Delete relationship'.
- ❖ Alternatively, parents can be removed in the 'Parent Editor' by clicking on the 'waste basket' next to the Parent Term.



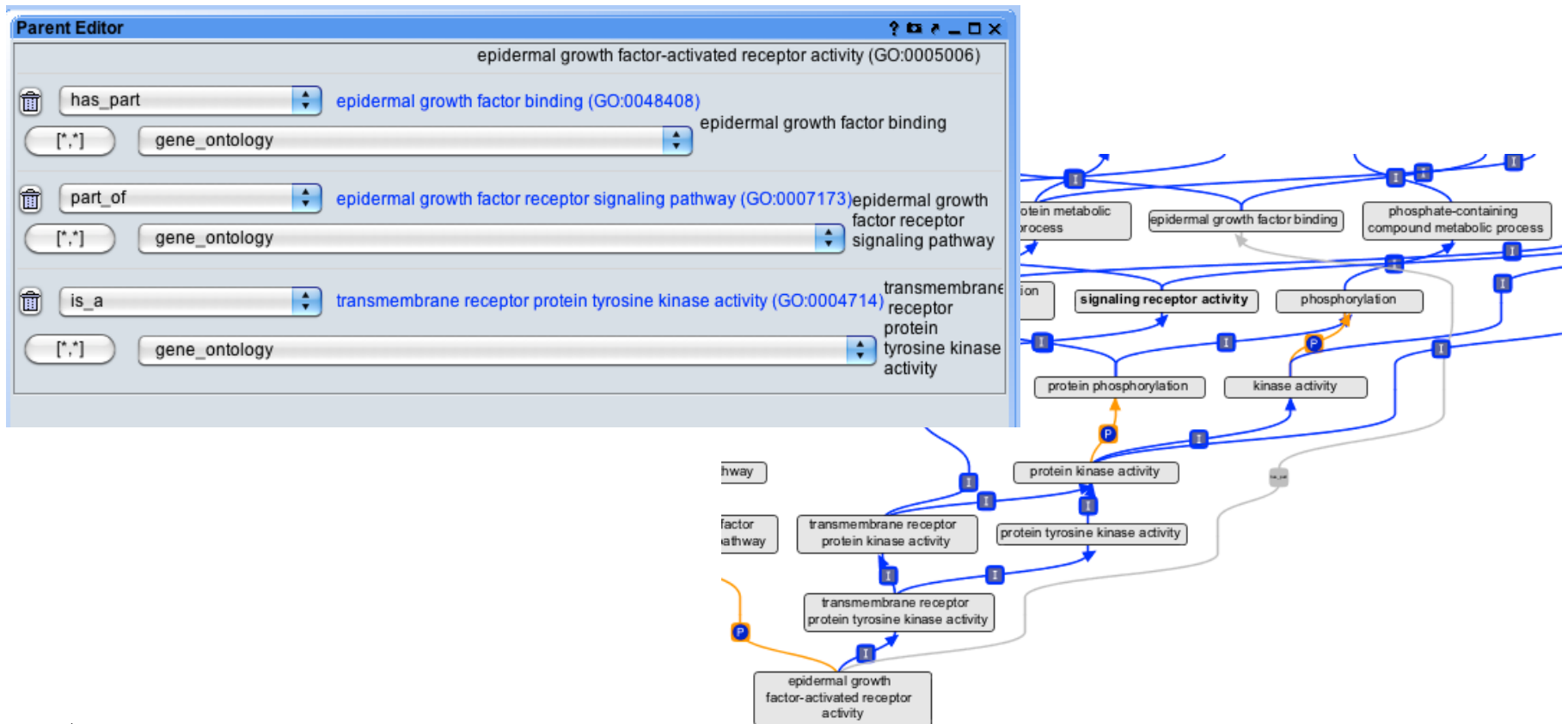
HAS_PART

- ❖ Remember that HAS_PART relationships are displayed the opposite way to is_a, part_of and regulates relationships:
 - ❖ An epidermal growth factor-activated receptor will ALWAYS bind to EGF:



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 two modes: Home or Global.



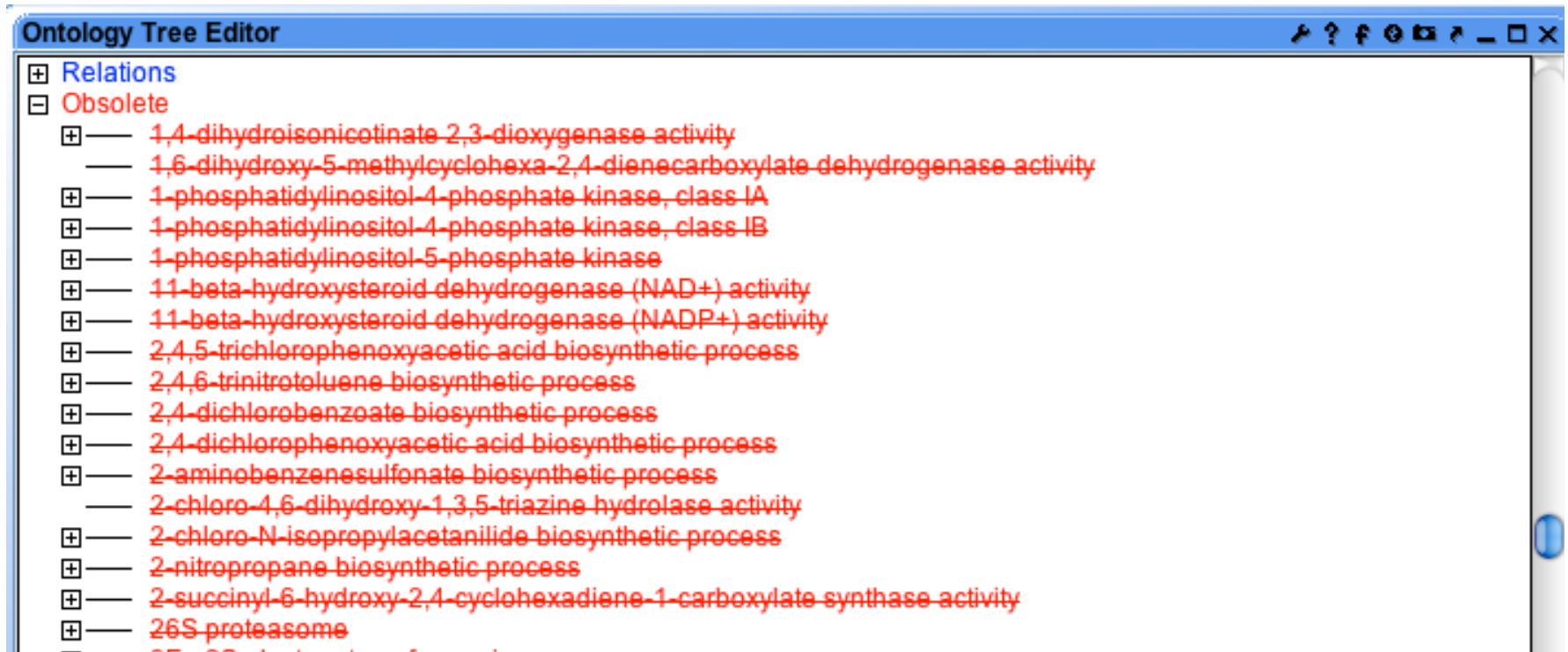
- ❖ In home mode (house icon), the term chosen in the editor panel will NOT appear in other Editor/Viewer panels.
- ❖ In global mode (world icon), the term chosen in the editor panel WILL appear in other Editor/Viewer panels.
- ❖ If you have more than one Ontology Tree Editor in your OBO-Edit layout, the default setting is that only one Editor can be on Global mode at once.
- ❖ These modes are useful if you are dragging a term between two editing windows: 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 or as part of your local edits.
- ❖ Destroying a term removes it from the ontology forever and allows the ID to be reused.

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.

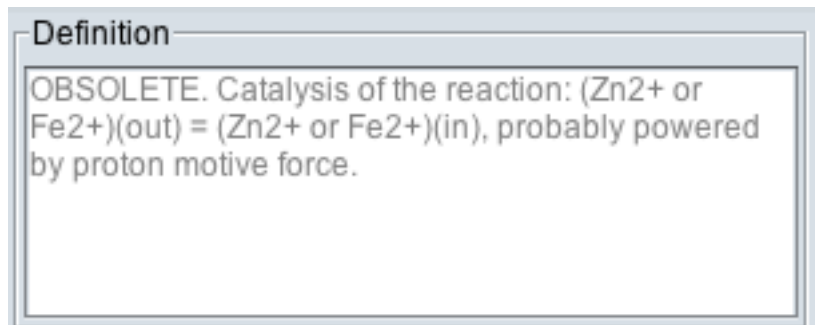


Obsoleting Terms

BEFORE obsoleting a term, go to the Text Editor:

- ❖ In the 'Comment' tab, describe the reason for obsolescence. 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' at the start of the term definition.

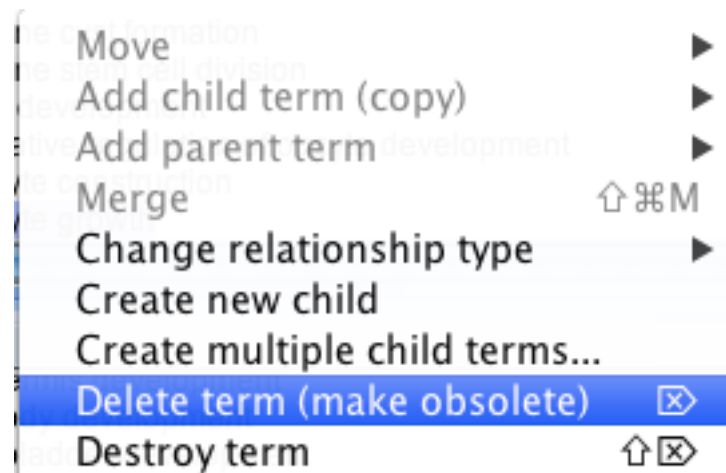


Definition

OBSOLETE. Catalysis of the reaction: $(\text{Zn}^{2+} \text{ or } \text{Fe}^{2+})_{\text{(out)}} = (\text{Zn}^{2+} \text{ or } \text{Fe}^{2+})_{\text{(in)}}$, probably powered by proton motive force.

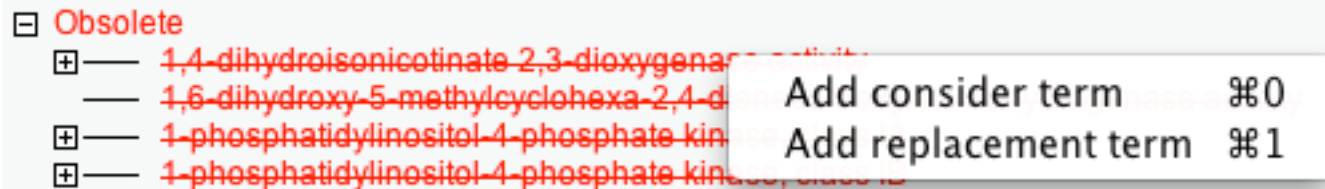
Obsoleting Terms

- ❖ A term can only be obsoleted if it has no children and only one parent. Therefore, in the Ontology Tree Editor or Parent 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’



Obsolete

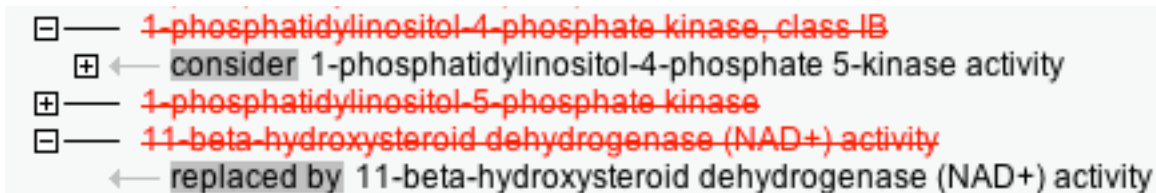
- ~~1,4-dihydroisonicotinate 2,3-dioxygenase activity~~
- ~~1,6-dihydroxy-5-methylcyclohexa-2,4-diene~~
- ~~1-phosphatidylinositol 4-phosphate kinase~~
- ~~1-phosphatidylinositol 4-phosphate kinase, class IB~~

Add consider term ⌘0

Add replacement term ⌘1

- ❖ 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.



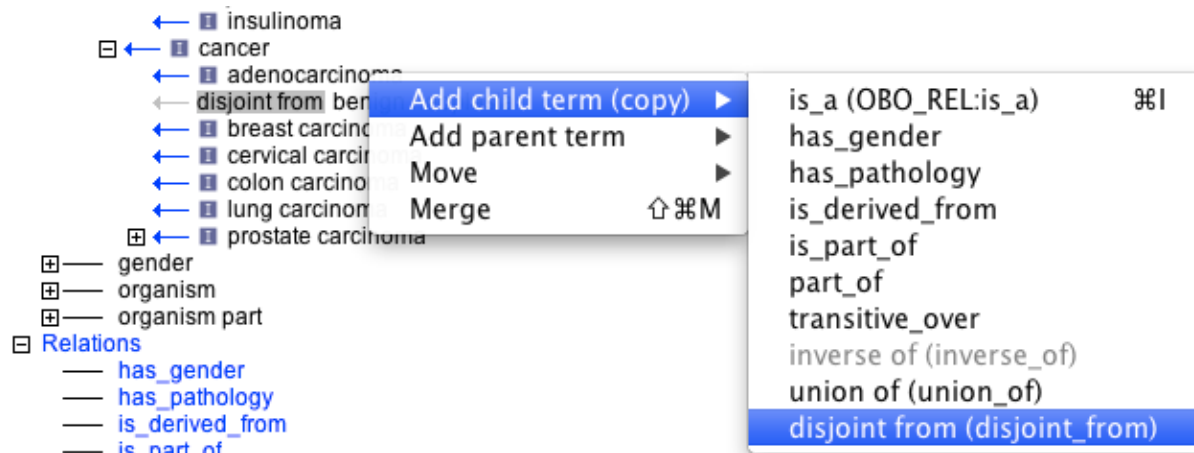
- ~~1-phosphatidylinositol 4-phosphate kinase, class IB~~
- ← consider 1-phosphatidylinositol-4-phosphate 5-kinase activity
- ~~1-phosphatidylinositol 5-phosphate kinase~~
- ~~11-beta-hydroxysteroid dehydrogenase (NAD+) activity~~
- ← replaced by 11-beta-hydroxysteroid dehydrogenase (NAD+) activity

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.

To assert that classes are disjoint:

- ❖ 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. Just:
 - Edit -> Undo

Help

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

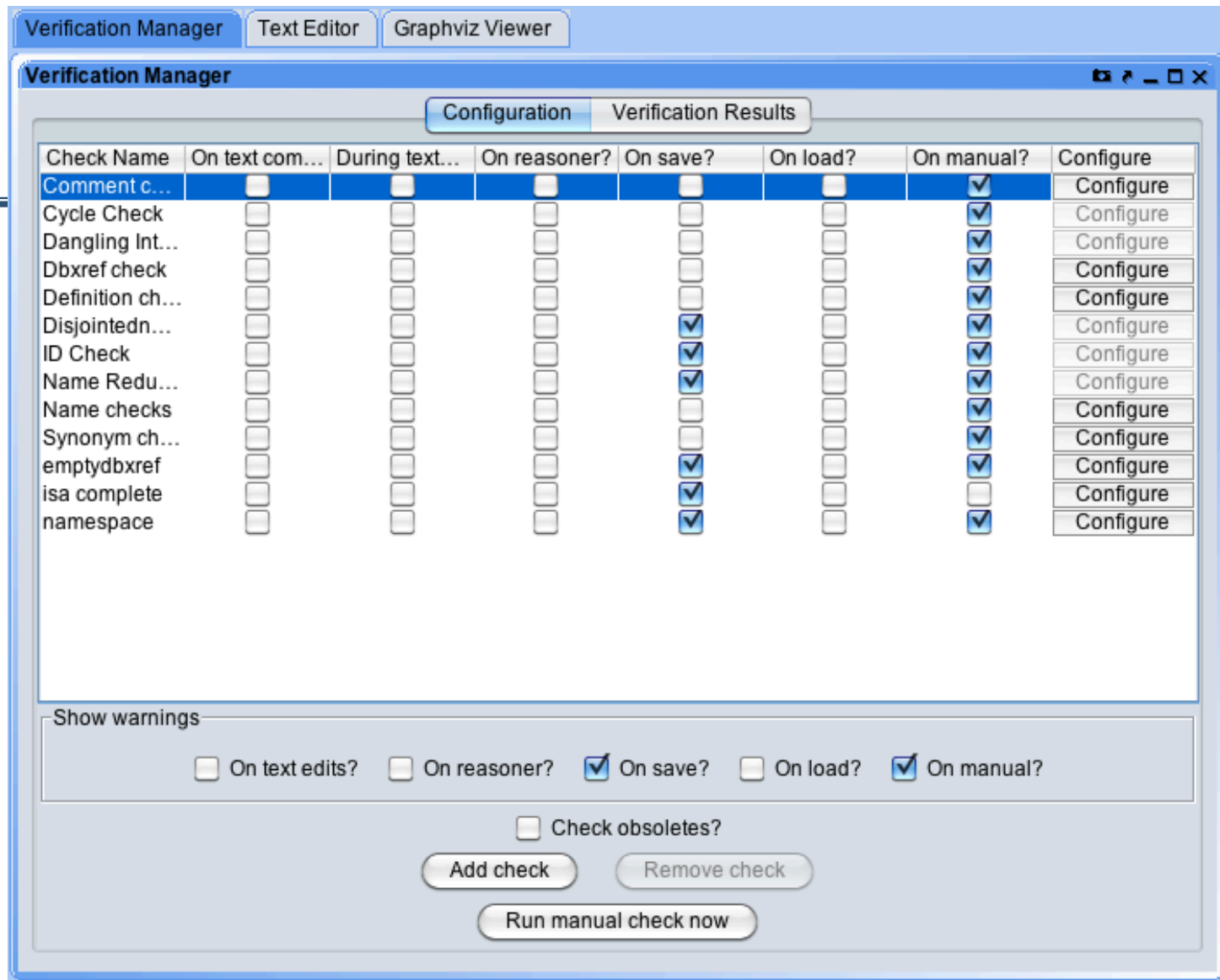
Verification Plugin:

Checking for typos, dodgy parentage, terms of the same name etc

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.

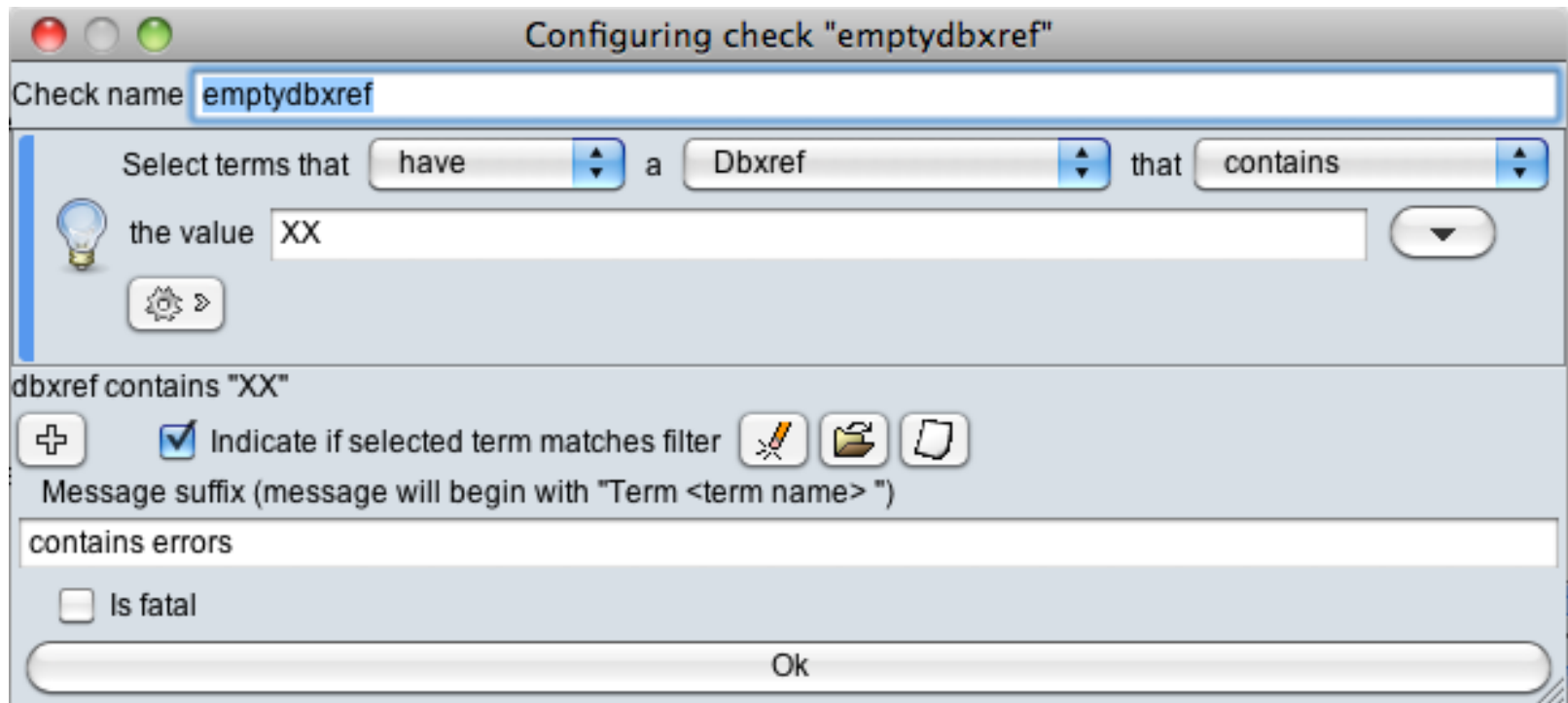
- ❖ Tools -> Verification Manager
- ❖ Ensure the tab Configuration is checked, and check all the boxes in the 'On Manual' column. Hit 'Run manual check now.'
- ❖ Results will appear in the 'Verification Results' Tab.
- ❖ To test, try adding a spelling error and re-running the manual check.

Jenkins also runs a more extensive Verification Manager after each svn-commit to check for errors. Any errors that cause the build to fail are automatically mailed to 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



... useful to double-check you haven't filled in any definition DBXrefs without a prefix or a curator's initials, for example.

Is_a complete check: checks every term has an is_a parent

Configuring check "isa complete"

Check name isa complete

Matches all Matches any

Select terms that a

a

Select terms that a that the value

Select terms that a that the value

Select terms that a that the value

has_isa_parent NOT and is_property NOT and id NOT equals "GO:0008150" and id NOT equals "GO:0005575" and id NOT equals "GO:0003674"

Indicate if selected term matches filter

Message suffix (message will begin with "Term <term name> ")

doesn't have an is_a parent

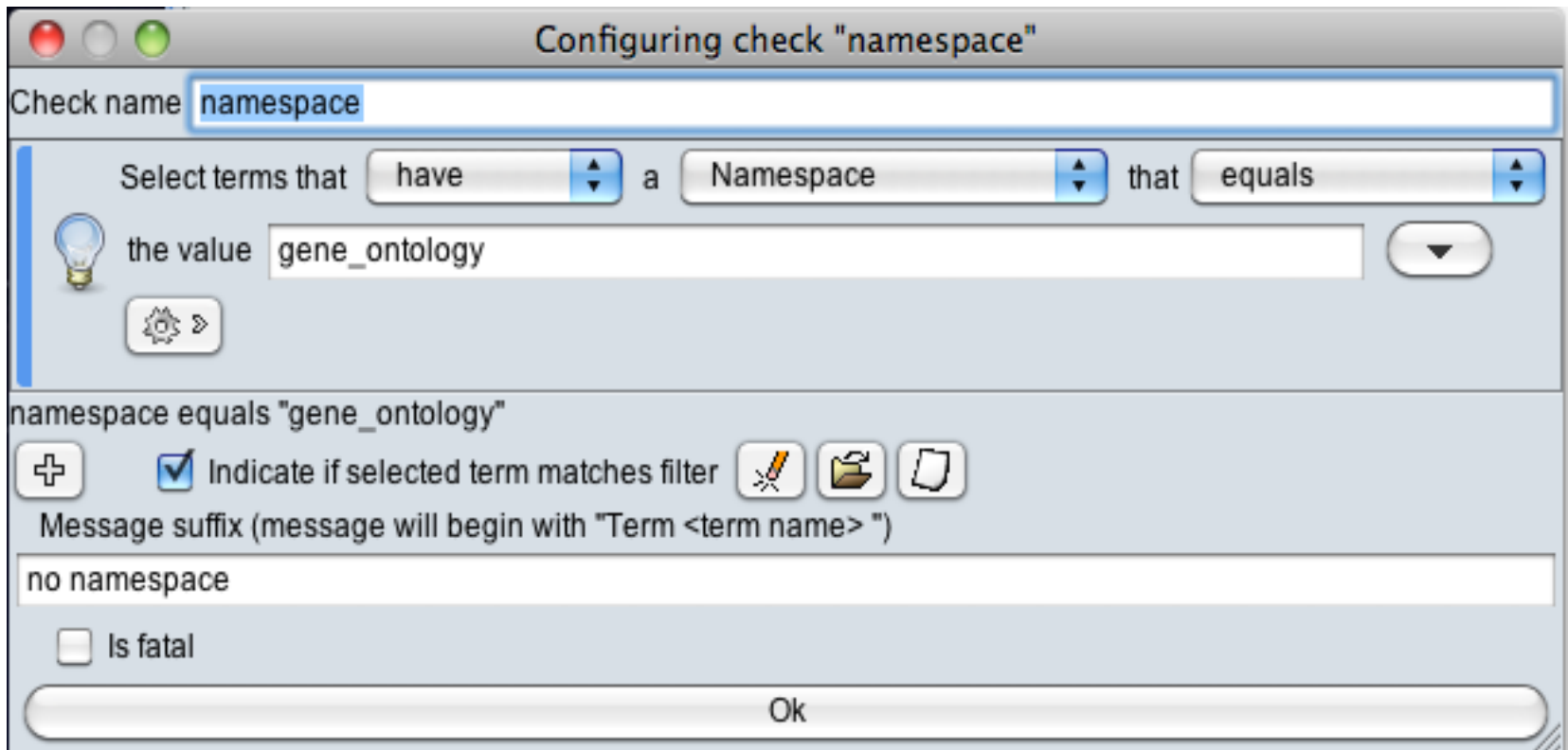
Is fatal

Ok

NB: the check is set up this way, because if you set it up to look for missing is_a links directly, OBO-Edit doesn't recognise the disjoint relationships between the top terms, so produces a lot of errors. This is a way to get round that.

https://sourceforge.net/tracker/?func=detail&aid=3024334&group_id=36855&atid=418257

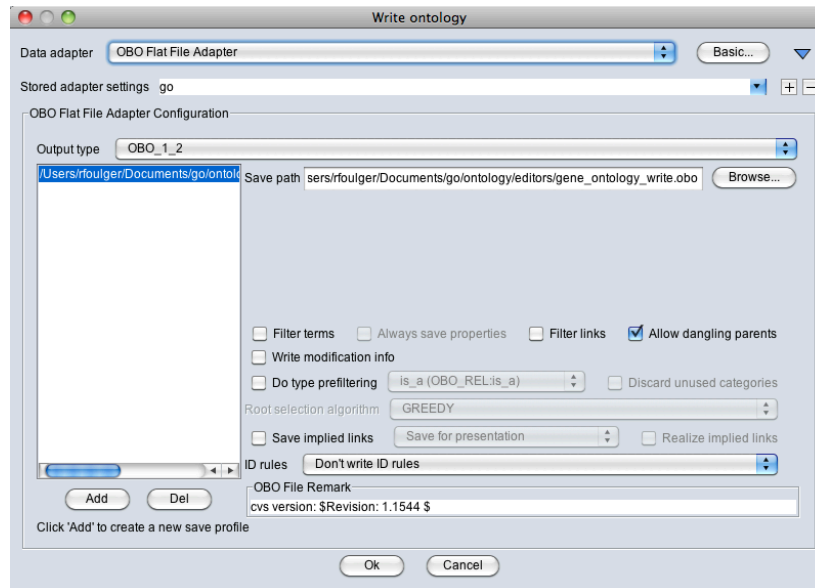
Namespace



Checks that you haven't made a biological_process term as a child of a cellular_component term, for example.

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 once, 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 svn (if you have an account).

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.

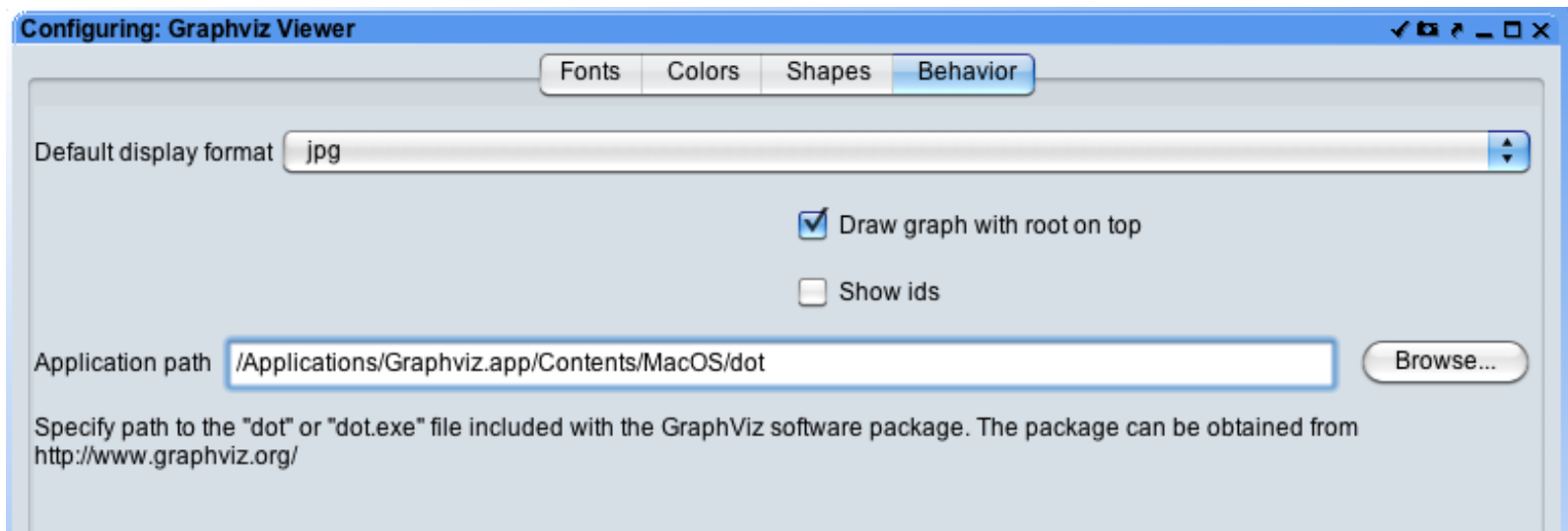
Other Reasoners are available that can automatically place terms in the hierarchy.

Some Handy Extras

Using Graphviz

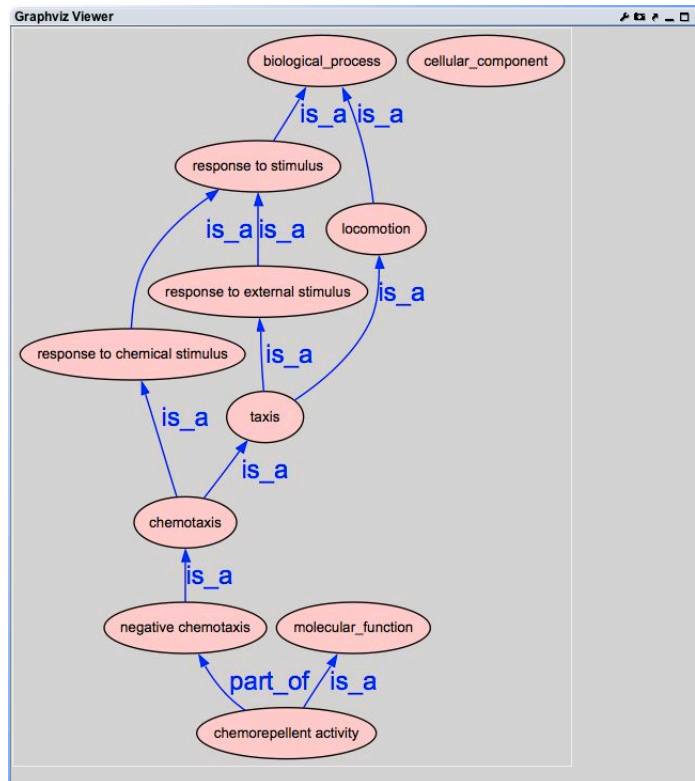
Graphviz is an external application. To use Graphviz in OBO-Edit, you need to do a short set-up:

- ❖ 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.



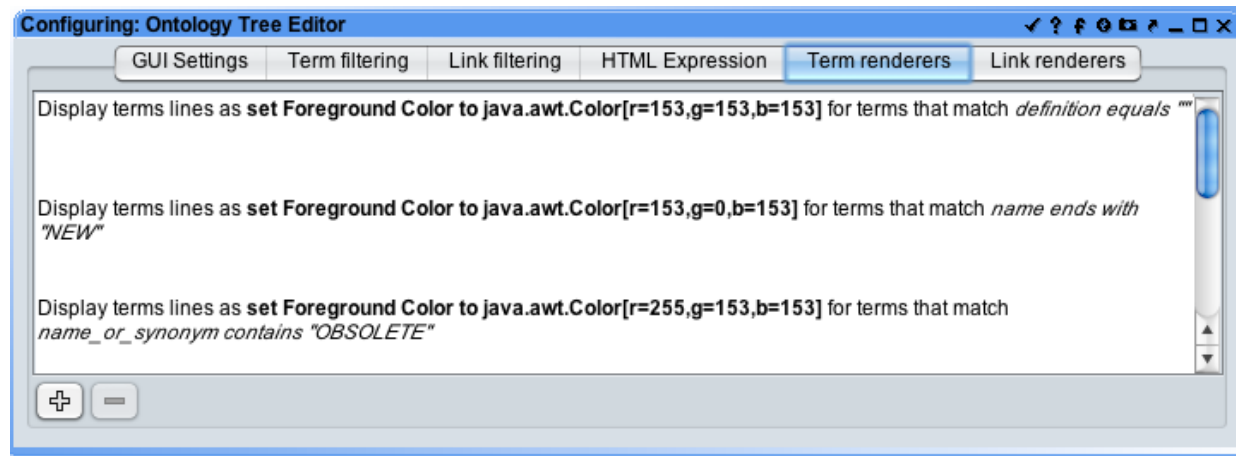
Graphviz

- ❖ 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.