



# **Cell Illustrator™ Player: Reference Manual**

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# 1 Introduction

Cell Illustrator™ (CI) is a software tool that enables biologists to model, elucidate and simulate complex biological processes and systems. It allows researchers to model metabolic pathways, signal transduction cascades, gene regulatory pathways as well as dynamic interactions of various biological entities such as genomic DNA, mRNA and proteins. Cell Illustrator models are used to visualize biopathways, interpret experimental data and test hypotheses. In addition, it provides researchers with model diagrams of publication quality and simulation result charts.

Cell Illustrator Player (CI Player) is a part of the Cell Illustrator™ software package. CI Player enables you to view a Cell Illustrator model and replay a simulation run from a log created with the Cell Illustrator program.

With Cell Illustrator Player, you can:

- view pathway models created by Cell Illustrator
- replay a logged simulation run in a step mode, or quickly move forward and backward to a specific part of a simulation log;
- visualize entity value and process speed/state on the canvas
- display charts with element value changes over time,
- compare results of several simulation runs.

Technically, CI Player is a viewer of Cell Illustrator log files. A CI log (CIL) is an CSML file that consists of two parts: the input model and the time series of values for the logged properties. You cannot edit the model with the Cell Illustrator Player. Neither can you run the simulation in the CI Player; you can only view the CSML model created with Cell Illustrator and replay a simulation run recorded with Cell Illustrator.

CIL is created by the Cell Illustrator during a simulation run if the user requests logging of simulation results. Each simulation run is stored as a separate file. The list of log files is available for viewing in the Simulation History dialog in the Cell Illustrator. Refer to the CI User Guide and CI Reference Manual for instructions on how to create simulation logs with Cell Illustrator.

The documentation for the Cell Illustrator software includes the manuals listed below:

**Cell Illustrator User Guide:** Introduction to Cell Illustrator system

**Cell Illustrator Reference Manual:** Detailed description of Cell Illustrator functions

This manual is a reference for the functional features of Cell Illustrator Player version 5.0 (CI Player 5.0). It can be used to answer questions about specific system commands. For installation instructions and an introduction to modeling biological pathways with Cell Illustrator, please refer to the User Guide.

## 2 Starting CI Player

CI Player can be started in three ways:

- from the Cell Illustrator workspace, by pressing the *Rerun* button in *Simulation History* frame. This opens the selected CSV or CIL files in the CI Player Workspace.
- from the Windows Programs menu, by executing the command Start | Programs | Cell Illustrator | Cell Illustrator Player. This will open an empty CI Player Workspace. To open a log file, use the [File | Open](#) command.

CI Player is a Java Desktop application and can be run directly from the Linux console or Windows command-line.

### 3 Supported Input Model Types

Since the version 3.0, Cell Illustrator Player enables the users to view two types of models:

- (i) Biopathway model dedicated for simulation and modeling of complex biological processes and systems using Petri Net models
- (ii) Gene Relationship Net model dedicated for analysis and exploration of gene relationship networks.

Biopathway models may include simulation results, which can be viewed and replayed in CI Player. A typical gene network cannot be simulated, thus it will not include the simulation log data.

CI Player can load model from various files formats. The *native* CI format is CSML – [www.csml.org](http://www.csml.org). CSML file format can be used to represent biopathway and gene net models. It also can store the simulation results. CSML files with simulation log are called CIL (CI log) files.

Beside CSML files CI player can import other external file formats, such as:

- edge file in CSV format

Those non-native files do not include any simulation log data.

Please refer to the **CI User Guide** to get more information how to create and simulate biopathway models, or to **CI Gene Net User Guide** to learn more about the gene net exploration capabilities.

## 4 Main Window

The Workspace is the main window of Cell Illustrator Player. The **Menu Bar** located at the top provides a set of commands for building and manipulating a model. Frequently used commands can be also executed by pushing a button on one of the **Toolbars** on the sides of Workspace. Menu items and toolbar buttons corresponding to operations that cannot be performed at the moment are disabled (grayed out). In comparison to Cell Illustrator, CI Player does not have menu options for editing a model and the *Simulation* menu and toolbar buttons are replaced with the *Replay* commands.

In the Workspace, multiple model files can be opened simultaneously for viewing and editing. A model file is displayed in a one or more **Drawing Canvas**. During simulation replay, the canvas window is updated with changing entity values and process states.

In Cell Illustrator Player, the user can open several

Frames. The contents of these frames reflect:

- user preferences (applicable to all models),
- properties of the model in the active canvas window, or
- properties of a selected elements in the active canvas window.

Beside the property frames, Cell Illustrators offers chart dialog boxes that display logged simulation results.

## 5 Menu Bar

### 5.1 File | Open

#### Description:

- Opens a model from a file and displays it in the workspace. Cell Illustrator loads data from the native CSML format as well as from other formats.
- The format of the file can be selected in the *File Type* combo box.
- CI tries to recognize the format of the selected file by analyzing its contents. If the “recognized” format is different than the format selected in *File Type*, the warning will be displayed prompting the user: *Do you want to open the file with a different file filter?*
- CTRL+O is the keystroke shortcut for this command.

#### CSML Files – the CI “native” File Format

- The native CI file format is the XML format called CSML – Cell System Markup Language - [www.csml.org](http://www.csml.org)
- The CSML files can be written in various versions: CSML 3.0, which normally should have .csml extension or the older CSML 1.9 files which normally has the .gon extension. This command opens all versions of CSML files.
- It is not possible to open the same file twice. If the user attempts to open a file that is already opened, then the canvas window of that file is activated and displayed in the foreground.
- Since a CI Log (.cil extension) stores the model in the same format as in the original project file, you can open a log file with Cell Illustrator Player.

#### Other File Formats

- File | Open command also opens models from other, non-CSML formats, such as: CSV.

#### CSV – Edge Files

- Imports gene networks from a normal text file with tab separated values. Imports gene networks from a normal text file with tab or comma separated values. The tab separated value files should have the extension \*.tsv or \*.txt, while comma separated values \*.csv
- The text file should contain the connection table – a list of edges.
- Each row in this text file represents an edge. The edge is described by several tab (or comma) separated values as follows:

<parent > <child> <property1> <property2> etc..

- The first two columns must define *name* of the *Parent* and *Child* entity of each edge. The next columns might defined the properties of the edge.
- The text file might include a header row with the description of defined columns. The first and second row must be named *Parent* and *Child*, the next property names can be defined by the user.

- If the file does not include column headers, then the columns will be recognized as follows:

<parent> <child> <edgeScore> <relationType> <bspline>

**Constraints:**

- None

## 5.2 File | Open Recent Files

**Description:**

- Displays a list of recently opened files. Click on an item in the list to open the corresponding file.
- Up to 14 recently opened files are in the list.
- The list does not contain duplicates.
- It is not possible to open the same file twice. If the user attempts to open a file that is already opened, then the canvas window of that file is activated and displayed in the foreground.

## 5.3 File | Close File

**Description:**

- Closes the active model file without exiting the program.
- CTRL+W is the keystroke shortcut for this command.

**Constraints:**

- At least one canvas window must be opened in the workspace.

## 5.4 File | Close All Files

**Description:**

- Closes all model files without exiting the program.
- You are always prompted for a file name if you want to close a canvas created with the File | New command.
- CTRL+Shift+W is the keystroke shortcut for this command.

**Constraints:**

- At least one canvas window must be opened in the workspace.

## 5.5 File | Export

### 5.5.1 Image

#### Description:

- Exports active canvas to JPEG or PNG file
- File name and location is selected by user in dialog window

### 5.5.2 SVG

#### Description:

- The command exports the active canvas to the Scalable Vector Graphics (SVG) file.

#### Constraints:

- At least one canvas window must be opened in the workspace.

### 5.5.3 HTML Report

#### Description:

- Exports the model in the active canvas to a file in HTML format.

## 5.6 File | Export All

### 5.6.1 PNG

#### Description:

- Exports all views from current model or all models to a series of PNG image file
- The user chooses the destination folder in dialog window. If the selected folder exists a warning is displayed that files in this folder can be overwritten.
- Additionally the user may choose what should be exported, selecting one of the two options *Export all views of active model* (default value), or *Export all views of all opened models*

## 5.6.2 JPEG

### Description:

- Exports all views from current model or all models to a series JPEG image file,
- The user can choose destination folder in dialog window. If the selected folder exists a warning is displayed that files in this folder can be overwritten.
- Additionally the user may choose what should be exported, selecting one of the two options *Export all views of active model* (default value), or *Export all views of all opened models*

## 5.7 File | Look & Feel

- Metal
- CDE/Motif
- Windows
- Windows Classic

### Description:

- With these commands, you can set the look and feel of Cell Illustrator to a GUI selected style.
- The selected GUI style is preserved upon restart of the program

## 5.8 File | Print Visible Area

### Description:

- Prints the area that is visible in the canvas window
- With this command, you can print a part of the active canvas. To do this, first scroll and zoom the view in the active canvas and then choose this command.
- The command opens the **File | Print** dialog where you can select printer and specify page setup and appearance.

### Constraints:

- At least one canvas window must be opened in the workspace.

## 5.9 File | Print

### Description:

- With this command, you can print the whole graph in the active canvas.
- The command opens the **File | Print** dialog where you can select printer and specify page setup and appearance.

### Constraints:

- At least one canvas window must be opened in the workspace.

## 5.10 File | Exit

### Description:

- Exits the application.

## 5.11 Edit | Undo

### Description:

- Reverses the most recent edit action for the active model. If this model is displayed in multiple views, the active view will be changed to that view which has been edited.
- Execute this command several times to undo results of subsequent edit commands.
- CTRL+Z is the keystroke shortcut for this command.

### Constraints:

- There is an action to undo.

## 5.12 Edit | Redo

### Description:

- Reverses the action of the last Undo command for the active model. If this model is displayed in multiple views, the active view will be changed to that view which has been edited.
- Effects of subsequent Undo commands are reversed by executing the corresponding sequence of Redo commands
- CTRL+Y is the keystroke shortcut for this command.

### Constraints:

- There is an action to redo.

### 5.13 Edit | Find

**Description:**

- Opens the **Edit | Find** dialog where you can specify the text to search for in the canvas
- CTRL+F is the keystroke shortcut for this command.

**Constraints:**

- At least one canvas window must be opened in the workspace.

### 5.14 Edit | Select All

**Description:**

- Selects all visible objects in the active canvas.
- CTRL+A is the keystroke shortcut for this command.

**Constraints:**

- At least one canvas window must be opened in the workspace.

### 5.15 Edit | Select None

**Description:**

- Deselects all elements in the active canvas
- Shift+CTRL+A is the keystroke shortcut for this command.

**Constraints:**

- At least one canvas window must be opened in the workspace.

### 5.16 Edit | Select Inverse

**Description:**

- Inverts the selection in the active canvas.
- CTRL+I is the keystroke shortcut for this command.

**Constraints:**

- The command is disabled if the active canvas is empty.

## 5.17 Edit | Align To Grid

### Description:

- Aligns selected elements to the grid.
- See also the related commands: [View | Show Grid](#) and [View | Grid Size](#)
- CTRL+Shift+R is the keystroke shortcut for this command.

### Constraints:

- At least one element must be selected in the active canvas.

## 5.18 Edit | Align To

- Top
- Bottom
- Left
- Right
- Vertical
- Horizontal

### Description:

- Aligns all the selected elements in one line to, respectively, the top-, bottom-, left- and rightmost element in the selection.
- *Align Vertical* and *Horizontal* position the selected elements along the vertical or horizontal line respectively, in the middle of the selection area.
- *Align to Top* and *Align to Bottom* command place all selected elements in one horizontal line. *Align to Left* and *Align to Right* command place all selected elements in one vertical line.

### Constraints:

- At least two elements must be selected.

## 5.19 Edit | Move To

- Top
- Bottom
- Left
- Right
- Top (1px)
- Bottom (1px)
- Left (1px)
- Right (1px)

**Description:**

- Moves all selected elements to the top, bottom, left or right.
- The user has the choices to translate the elements by one pixel (1px) or by one grid element, which is the number of pixels defined in grid size
- The key strokes displayed next to the menu items are useful short-cuts to speed up multiple move operations

**Constraints:**

- At least one element must be selected.

## 5.20 Element | Show All

**Description:**

- Shows all elements in the active canvas.
- It will show all hidden elements by changing their *Visible* flag to true.
- This command is useful since hidden element cannot be selected on the canvas
- The other way to make element visible is to edit their *Visible* property in *Element Lists* frame.

**Constraints:**

- At least one canvas window must be opened in the workspace.

## 5.21 Element | Hide

**Description:**

- Hides the selected elements on the active canvas.
- Hidden element cannot be selected cannot be selected on the canvas
- To make the hidden elements visible, either execute the [Element | Show All](#) or change the *Visible* flag in *Element Lists* frame

**Constraints:**

- At least one element must be selected in the active canvas.

## 5.22 Element | Arrange

→ Bring to Front

- ➔ Bring Forward
- ➔ Send Backward
- ➔ Send to Back

**Description:**

- With this set of commands, you can set the depth of overlapping figures in the canvas. Depth defines the way in which overlapping figures are displayed. A figure with a lower depth value is displayed over a figure with a higher depth value.
- The depth value of each figure can be viewed and edited in [Element Settings](#) frame.
- *Bring Forward* decreases the depth value of the selected figures by one.
- *Send Backward* increases the depth value of the selected figures by one.
- *Bring to Front* shows the selected figure at the front. This function sets depth to value which is smaller one degree than the smallest depth value in bounds of this figure on canvas.
- *Send to Back* hides the selected figure behind the other figures. This function sets depth to value which is greater one degree than the greatest depth value in bounds of this figure on canvas.
- 

**Constraints:**

- At least one element must be selected in the active canvas.

## 5.23 Element | References

**Description:**

- Displays the list of external references in a popup menu. Choose an item from the pop up menu to open the URL in a Web Browser window.
- *External References* menu item opens the [Error! Reference source not found.](#) frame where you can view and manage the list of references associated with the selected element.
- References define links from the selected element to external resources specified as URLs. Reference may define a link from the selected element to a database element, such as an entry in a database or a term in a controlled vocabulary.
- URL References can be associated to all elements: entities, processes, connectors.

**Constraints:**

- Exactly one element is selected in the active canvas.

## 5.24 Element | URL Templates

### Description:

- Displays the list of URL templates available for this element.
- Choose a link from the list to open the URL in a Web Browser window.
- The URL templates are associated to all elements: entities, processes, connectors. You can view/edit the list of predefined URL templates in the *Hyperlink Templates* section in the **Preferences** dialog

### Constraints:

- Exactly one element is selected in the active canvas.

## 5.25 Element | Create Chart

### Description:

- Creates a new chart for the entities, processes and connectors that are selected in the canvas window.
- The list of charts can be viewed and controlled in the **Chart Settings** frame

### Constraints:

- At least one element must be selected in the canvas.

## 5.26 Replay | Play

### Description:

- If the model in the active canvas is in the “initialized” or “paused” state, the command starts the simulation.
- The *Log Update Interval*, *Replay Speed*, *Sampling Interval*, *Simulation Time* and all other simulation settings are properties of the model (CIL file). You can see these parameters in the **Simulation Settings** frame.
- Process firing and changes of entity values are shown in the canvas during the simulation. The *Canvas Update Interval* defines how often the canvas is updated.
- The status of a simulation run is displayed on the progress bar at the top of the active canvas.
- If there are any charts defined for the model, one or more **Chart Window** are opened when the command is executed. The charts are periodically updated as the simulation runs. The update time is defined by the *Chart Update Interval*.
- The simulation stops when: (1) the user has executed the **Replay | Stop And Initialize** command, or (2) the user has executed the **Replay | Pause** command, or (3) the simulation time has reached the value specified (in pt units) by the *Simulation time* setting in the Simulation Settings frame.

**Constraints:**

- At least one canvas is opened in the workspace
- The model in the active canvas includes a simulation log
- The model in the active canvas is not in the “simulation end” state

**5.27 Replay | Step Forward****Description:**

- The command replays one step from the simulation log for the model in the active canvas.
- The replay status is displayed at the top of the CI canvas.

**Constraints:**

- At least one canvas is opened in the workspace
- The model in the active canvas includes a simulation log

**5.28 Replay | Step Backward****Description:**

- The command replays one step backward from the simulation log for the model in the active canvas.
- The replay status is displayed at the top of the CI canvas.

**Constraints:**

- At least one canvas is opened in the workspace
- The model in the active canvas includes a simulation log

**5.29 Replay | Pause****Description:**

- Pauses a running simulation.
- The simulation can be resumed with the **Replay | Play** and other play commands: *Step Play*, *Fast Play*, *Max Speed Play*.

**Constraints:**

- The model in the active canvas includes a simulation log

### 5.30 Replay | Stop And Initialize

#### Description:

- If there is a running simulation, it is stopped and initialized
- Variables associated with entities are reset to their initial values.

#### Constraints:

- The command is enabled if a simulation replay for the model in the active canvas has been paused or completed.

### 5.31 View | Mode

- None
- View
- Edit
- Simulation
- All
- Custom

#### Description:

- This command sets the global *mode* of displaying labels. Changing the *View Mode* causes that specific information is not displayed on the canvas and that selected labels are always hidden.
- To see the details of global label view settings, open the **View Settings** frame.
- The *Custom* view mode can be defined by the user in the **View Settings** frame.
- This command is a short-cut that allows for changing the view setting for several label types at once.
- Depending on the selected *View Mode*, selected labels of entities, processes, connectors or fact edges are always hidden, e.g after *View | Mode | None* command all labels will be hidden. In the other view modes only the less important labels are hidden, e.g. after *View / Mode | View* all simulation-related labels will be hidden. After *View | Mode | All*, all labels are shown.
- The *View Mode* setting is global. It applies to all canvases in the workspace.

#### Constraints:

- None

### 5.32 View | Zoom In

#### Description:

- The command brings a virtual camera closer to the model in the active canvas
- If necessary, the command will enlarge the canvas by increasing its width and/or height.
- **View | Actual Size**, reverts the canvas to its original scale and size.

**Constraints:**

- At least one canvas window must be opened in the workspace.

**5.33 View | Zoom Out****Description:**

- The command brings a virtual camera farther from the model in the active canvas window.
- **View | Actual Size** reverts the canvas to its original scale

**Constraints:**

- At least one canvas window must be opened in the workspace.

**5.34 View | Actual Size****Description:**

- The command moves the virtual camera so that the canvas is displayed with its actual size.
- If necessary, the command will shrink the canvas by decreasing its width and/or height.

**Constraints:**

- At least one canvas window must be opened in the workspace.

**5.35 View | Fit In Canvas****Description:**

- If one or more elements are selected, the command scrolls and zooms the graph in the window to display the selected elements in the canvas.
- Otherwise, the virtual camera is moved to fit the display of all elements in the active window.
- If necessary, the command will enlarge the canvas by increasing its width and/or height.
- **View | Actual Size** reverts the canvas to its original scale and size

**Constraints:**

- At least one canvas window must be opened in the workspace.

### 5.36 View | Show All Charts

**Description:**

- Opens all **Chart Window** defined for the active canvas

**Constraints:**

- At least one canvas window must be opened in the workspace.

### 5.37 View | Hide All Charts

**Description:**

- Closes all **Chart Window** defined for the active canvas

**Constraints:**

- At least one canvas window must be opened in the workspace.

### 5.38 View | Show Grid

**Description:**

- Toggles the grid display on and off for the active canvas window.
- If grid is on, entities are aligned to the grid automatically, when they are inserted or moved.
- If the grid is off, the entities are moved and inserted freely without grid alignment
- Changing the grid size (**View | Grid Size**) may disturb the alignment. In such a situation, the elements can be aligned using this command **Edit | Align To Grid**

**Constraints:**

- At least one canvas window must be opened in the workspace.

### 5.39 View | Antialiasing

**Description:**

- Toggles antialiasing on and off for the active canvas windows.
- With the antialiasing in the *on* state, model diagrams look better but it takes more time to draw them.

**Constraints:**

- At least one canvas window must be opened in the workspace.

**5.40 View | Grid Size****Description:**

- Sets the grid size for the active canvas windows

**Constraints:**

- At least one canvas window must be opened in the workspace.

**5.41 View | Background Color****Description:**

- Sets the background color for the active canvas window

**Constraints:**

- At least one canvas window must be opened in the workspace.

**5.42 Analyze | Select | Downstream****Description:**

- Extends the current selection in the canvas by children of the selected entities

**Constraints:**

- At least one element must be selected in the active canvas.

**5.43 Analyze | Select | Upstream****Description:**

- Extends the current selection in the canvas by parents of the currently selected entities

**Constraints:**

- At least one element must be selected in the active canvas.

#### 5.44 Analyze | Select | Both

**Description:**

- Extends the current selection in the canvas by selecting children and parents the currently selected genes

**Constraints:**

- At least one entity must be selected in the active canvas.

#### 5.45 Analyze | Keyword Search

**Description:**

- Opens the **Keyword Search** dialog where you can specify the text to search for in the canvas
- CTRL+F is the keystroke shortcut for this command.

**Constraints:**

- At least one canvas window must be opened in the workspace.

#### 5.46 Analyze | Path Search

**Description:**

- Opens the **Path Search** dialog, where you can search for closest neighbors of the selected entity or perform start-to-end path search

**Constraints:**

- At least one canvas window must be opened in the workspace.

#### 5.47 Analyze | Entity List Search

**Description:**

- Opens the **Entity List Search** dialog where you can search for a given list of entities.

**Constraints:**

- At least one canvas window must be opened in the workspace.

## 5.48 Window | Tile Horizontal

### Description:

- Tiles the canvas windows horizontally.

### Constraints:

- At least two models must be opened in the workspace.

## 5.49 Window | Tile Vertical

### Description:

- Tiles the canvas windows vertically.

### Constraints:

- At least two models must be opened in the workspace.

## 5.50 Window | Maximize Canvas

### Description:

- Maximizes the canvas windows of the active model.
- It removes the split created by the Window | Tile commands.

### Constraints:

- At least two models must be opened in the workspace.

## 5.51 Window | Reset Perspective

### Description:

- Resets the layout of the currently selected perspective by reverting to the initial (default) location, size, layout and visibility of all frames.

### Constraints:

- None

## 5.52 Window | Show Frame

### Description:

- Display and activate the selected frame.
- This command drops down the list of all frames available in Cell Illustrator.

**Constraints:**

- None

**5.53 Window | Hide All Frames****Description:**

- Hide all frames and display the canvas window in maximal size.

**Constraints:**

- None

**5.54 Window | Restore All Frames****Description:**

- Restore the frames which were hidden, e.g. by Window | Hide All Frames command or other user actions.

**Constraints:**

- None

**5.55 Window | Preferences****Description:**

- Opens the **Preferences** dialog box, in which the user can view/edit the global settings.

**Constraints:**

- None

**5.56 Help | Cell Illustrator Help****Description:**

- Opens the HTML help system for Cell Illustrator.

**Constraints:**

- Internet connection is required

## 5.57 Help | User Guide

### Description:

- Downloads and opens the Cell Illustrator User Guide.

### Constraints:

- The User Guide is a PDF document. Adobe Acrobat Reader or another software capable of reading PDF documents needs to be installed and configured on your machine.
- Cell Illustrator uses your default internet browser to open document so you have to be connected to the internet to download the User Guide.

### Constraints:

- Internet connection is required

## 5.58 Help | CSML Online

### Description:

- Opens the [www.csml.org](http://www.csml.org) web site in the default browser.
- CSML (Cell System Modeling Language) is the XML file format and OWL ontology that is used in Cell Illustrator to store and exchange models.

### Constraints:

- The Internet connection must be available.

## 5.59 Help | Cell Illustrator Web page

### Description:

- Opens the CI web site in the default browser.

### Constraints:

- The Internet connection must be available.

## 5.60 Help | About Cell Illustrator

### Description:

- Displays the dialog [About Cell Illustrator](#) with the version and license information

## 6 Toolbars

### 6.1 Draw Toolbar

This toolbar is located at the top of the main window and contains a set of buttons for the most frequent edit operations.

Icon	Button Name	Description
	Zoom In	Push this button to zoom in.
	Zoom Out	Push this button to zoom in.
	Reset Zoom	See <a href="#">View   Actual Size</a>
	Fit in Canvas	See <a href="#">View   Fit In Canvas</a>
	Toggle the Antialiasing Status	See <a href="#">View   Antialiasing</a>
	Toggle the Grid Visible Status	See <a href="#">View   Show Grid</a>
	Set View Mode	With this button, you can set global view mode. See <a href="#">View   Mode</a>

### 6.2 File Toolbar

This toolbar is located at the left side of the main window, above the Undo/Redo and Simulation toolbars. It consists of a set of buttons for file management operations.

Icon	Toggle Button	Name	Full Description
	No	Open Canvas File	See <a href="#">File   Open</a>
	No	Close File	See <a href="#">File   Close File</a>
	No	Close All Files	See <a href="#">File   Close All Files</a>

### 6.3 Edit Toolbar

This toolbar is located at the left side of the main window, below the File Toolbar and above the Simulation Toolbar. It contains buttons for Undo/Redo and Align commands.

Icon	Name	Description
	Undo	See <a href="#">Edit   Undo</a>
	Redo	See <a href="#">Edit   Redo</a>
	Align Top	See <a href="#">Edit   Align To</a>
	Align Bottom	
	Align Left	
	Align Right	
	Align Vertical	
	Align Horizontal	
	Space Evenly Vertical	
	Space Evenly Horizontal	

### 6.4 Replay Toolbar

This toolbar is located on the left side of the main window below the File Toolbar and Undo/Redo Toolbar. It contains buttons for starting and stopping simulation.

Icon	Name	Description
	Replay Simulation	See <a href="#">Replay   Play</a>
	Step Forward	See <a href="#">Replay   Step</a>
	Fast Play Simulation	See <a href="#">Replay   Step Backward</a>
	Pause Simulation	See <a href="#">Replay   Pause</a>
	Stop Simulation and Initialize	See <a href="#">Replay   Stop And Initialize</a>

## 7 Drawing Canvas

The canvas window is the place where you view the model. During simulation, the canvas window is updated with entity value changes. In some simulation modes, processes that fire are marked with color and animated tokens move between entities.

You can customize the background color and other properties of your canvas windows by editing the Canvas section of the application global settings in the [Preferences](#) dialog.

### 7.1 Multiple Views

In Cell Illustrator one model can be displayed on multiple canvases, which are located side by side in a tabbed pane. Different views can be used to show the model in a different way or to view different parts of the model. To make elements visible, execute [Element | Show All](#) command or change the *Visible* flag in *Element Lists* frame

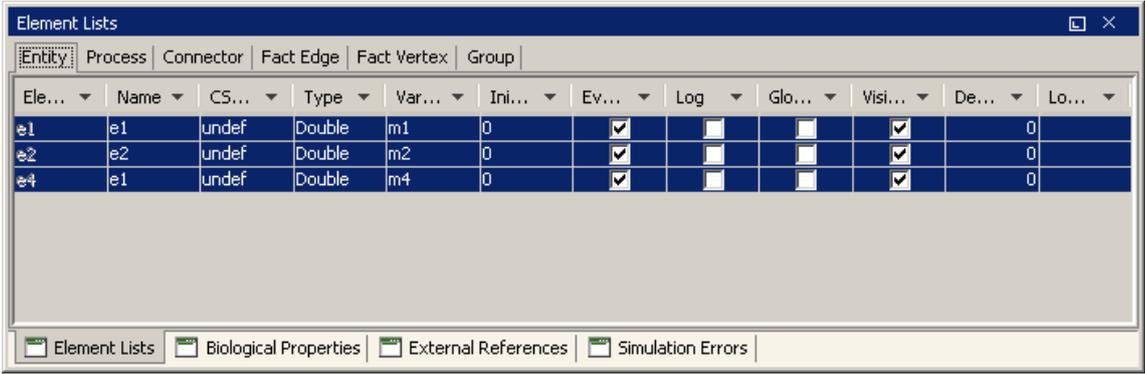
### 7.2 Canvas Popup Menus

In addition to commands available in the Menu Bar and the toolbars, you can right click (CTRL click on a Macintosh) on selected element(s) in the canvas to access a popup menu customized to your selection.

## 8 Frames

### 8.1 Element Lists

For the model in the active canvas, this frame displays the elements together with their major properties in a table



Ele...	Name	CS...	Type	Var...	Ini...	Ev...	Log	Glo...	Visi...	De...	Lo...
e1	e1	undef	Double	m1	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0
e2	e2	undef	Double	m2	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0
e4	e1	undef	Double	m4	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	0

The *Element Lists* frame consists of the tabbed tables *Entity*, *Process*, *Connector*, *Fact Edge*, *Fact Vertex* and *Group*.

The following operations can be done for each of the table:

- Select an element on the canvas by clicking on a row
- Sort rows according to the specified column by clicking on the column header,
- Filter rows by specified column by clicking on combo box on header of the column,
- Customize the visible column by right click on column header and choosing one of the menu items:
  - o Hide column
  - o Show All Hidden Columns
  - o Select Visible Columns
  - o Restore Default Columns

#### 8.1.1 Entity Table

Each row in the table corresponds to an entity in the active canvas. The following properties are listed in the table:

- o Element Id – unique identifier (not editable)
- o Name – entity name

- CSO Class – Cell System Ontology Class
- Type – the value type of entity, *Integer* represent a discrete entity, *Double* – a continuous entity, *String* and *Boolean* – a generic entity, *Unknown* is a universal value.
- Variable – name of variable associated with the entity
- Initial Value – initial value or script for simulation
- Eval Once – tells whether the Initial Value script is evaluated only once at the simulation start up, or many times at each simulation step
- Max Value – maximum value of the entity during simulation
- Min Value – minimum value of the entity during simulation
- Log – if the box is checked the entity is included in a simulation log. The logged values can be viewed and analyzed in Simulation History Frame or exported to a CSV file.
- Global – by default for normal entities this flag is false. If the Flag is true, the entity is global. Global entities are used to represent cell biological compartments, containers for normal entities, such as cell components. The global entities cannot be connected to any process using connectors.
- Visible – toggles element visibility on the canvas.
- Show Name – toggles visibility of name label on the canvas.
- Show Variable – toggles visibility of variable label on the canvas.
- Show Value – toggles visibility of value label on the canvas.
- Show Biological Property – toggles visibility of biological property label on the canvas.
- Depth – changes how deep will be the entity painted.
- Location – biological location of the entity.
- GO, PubMed - display database IDs defined in external references (read-only)
- TRANSFAC, TRANSPATH – display Transpath database ID defined in external references (read-only)

### 8.1.2 Process Table

Each row in the table corresponds to a process in the active canvas. The following process properties are listed in the table:

- Element Id – unique identifier (not editable)
- Name – process name.
- CSO Class – Cell System Ontology Class, e.g.: biological process
- Type – discrete, continuous or generic.
- Calc Style – The meaning of the Calc Style depends on the process type. The *Speed* property is for a continuous process, for a discrete process – the *Add* property and for generic process – the *Update*.
- Firing Style – determines the firing style of the process. For “*And*” style, the process fires if all input connectors fulfill the firing condition. The “*Or*” firing style can be used if the process has two or more input connectors of type *Inhibitor* or *Association*. For the “*Or*” firing style at least one *Inhibitor* or *Association* connector must fulfill the firing

condition in order to the process to be enabled. Additionally \, all input *Process* connectors must be enabled.

- Kinetic Style –
- Kinetic Script – a value of script that defines how to calculate the value change in each simulation step.
- Delay Script – defines delay parameter.
- Activity – if the Activity is set to *false* a process does not fire. The Activity can be defined by mathematical formula.
- Priority – priority of the process used during simulation. Process with higher priority fires before a process with lower priority.
- Log – if the box is checked the process state is included in simulation log. You can see simulation log in Simulation History frame or export it to a CVS file.
- Activity Log –
- Visible – toggles visibility of the element.
- Show Name – toggles visibility of name label on the canvas.
- Show Speed – toggles visibility of speed label on the canvas
- Show Delay – toggles visibility of delay label on the canvas.
- Show Firing Style – toggles visibility of firing style label on the canvas.
- Show Biological Property – toggles visibility of biological property label on the canvas.
- Depth – changes how deep will be the entity painted.
- Location – biological location of the process.
- Biological Process – defines which process in real cell is represented by this element.
- GO, PubMed - display database IDs defined in external references (read-only)
- TRANSFAC, TRANSPATH – display Transpath database ID defined in external references (read-only)

### 8.1.3 Connector Table

Each row in the table corresponds to a connector in the active canvas. The following connector properties are listed in the table:

- Element Id – unique identifier (not editable)
- Name – connector name.
- CSO Class – Cell System Ontology Class.
- Type – process, inhibitory or association.
- From – the input element (entity or process) of the connector.
- To - the output element (entity or process) of the connector.
- Kinetic Script – a value of script that defines how to calculate the value change in each simulation step.
- Firing Style – the firing style of the connector.
- Firing Script – the script or value that defines the firing condition.
- Log - if the box is checked the connector state is included in simulation log. You can see simulation log in Simulation History frame or export it to a CVS file.
- Visible – toggles element visibility.

- Show Name – toggles visibility of name label on the canvas.
- Show Firing Operation – toggles visibility of firing operation label on the canvas.
- Show Firing Style – toggles visibility of firing style label on the canvas.
- Depth – changes how deep will be the entity painted.
- Line Style – changes style of connector line. You can choose between:
  - Straight,
  - Curve Bezier,
  - Curve Spline.

#### 8.1.4 Fact Edge

Each row in the table corresponds to a Fact Edge in the active canvas. The following properties are listed in the table:

- Element Id – unique identifier (not editable)
- Name –fact edge name.
- Parent – parent entity (source of the edge)
- Child – child entity (target of the edge)
- Type – directed or undirected relation.
- Comments – doesn't need explanation ☺
- Visible – toggles visibility of selected element
- Show Name – toggles visibility of name label on the canvas.
- Show Biological Property – toggles visibility of biological property
- Depth – changes how deep will be the entity painted.
- GO, PubMed - display database IDs defined in external references (read-only)
- TRANSFAC, TRANSPATH – display Transpath database ID defined in external references (read-only)

#### 8.1.5 Fact Vertex

Each row in the table corresponds to a Fact Vertex in the active canvas. The following properties are listed in the table:

- Element Id – not editable identifier.
- Text – if vertex is a text field you can change text here.
- Visible – toggles visibility of selected element.
- Depth – changes how deep will be the entity painted.

#### 8.1.6 Group

Each row in the table corresponds to a connector in the active canvas. The following connector properties are listed in the table:

- Element Id – not editable identifier.
- Name – connector name.
- Visible – toggles visibility of selected element.
- Entity/Process/Connector/Fact Edge/Fact Vertex/Group Count – the number of elements of given type that are in the group
- Depth – changes how deep will be the entity painted

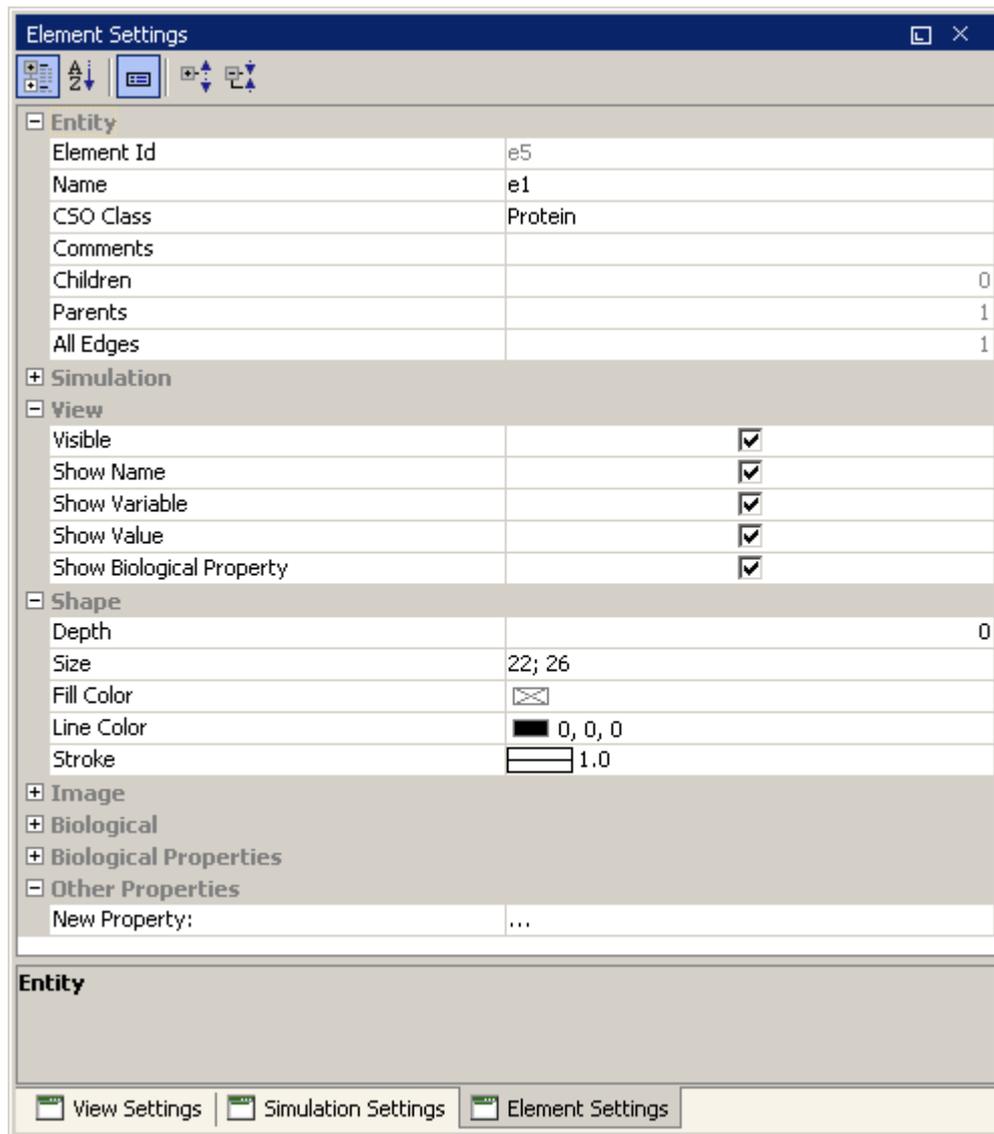
## 8.2 Element Settings

The *Element Settings* frame allows viewing and setting of properties of a selected element:

- If exactly one element is selected, the frame displays its properties. If more than one element is selected, the frame displays the *Multiple Selection* frame. Otherwise the frame shows global properties of the model in the active canvas.

<b>Selection</b>	<b>Frame</b>	<b>Description</b>
Single Selection: Exactly one element is selected	Element Settings frame. Depending on the type of selected element it displays the property sheet for: Entity, Process, Connector, Fact Vertex, Fact Edge, Group.	The Single Selection frames give the user the ability to view and edit the property values for the selected element
Multiple Selection: more than one element is selected	Multiple Selection frame: displays common view and biological properties for the selected elements	The Multiple Selection frames give the user the ability to view and edit the property values for several selected elements at once
Empty Selection	Model and Canvas Property Sheet	

- Change of selection or switching between canvas frames results in an update of the frame.
- Changing a setting in the frame has an immediate effect in the model.
- For models with multiple views, the view properties of the element in the active canvas are displayed or edited, e.g. the change of color will be shown in the active view only, while other views will remain unchanged.



Most of the properties are self-explanatory and are already described in Element List frame. Therefore only the non-trivial properties will be described in this chapter including:

- Simulation Settings
- Biological Properties
- Custom Biological Properties
- Model and Canvas Properties
- Multiple Selection Frame

## 8.2.1 Simulation Section

The Element Settings frame allows the setting of mathematical formulas as element properties to define dependencies between elements during the simulation. The mathematical formulas can be set for specific entity, process or connector properties with the help of the [Error! Reference source not found.](#)

### 8.2.1.1 Entity

Property Name	Description
Type	The <i>Double</i> type is associated with continuous entities, <i>Integer</i> with discrete entities, the other value types: <i>Boolean</i> and <i>String</i> with generic entities.
Variable	Name of variable associated with the entity
Initial Value	The value of the entity at the simulation startup. The property can be a fixed value or a script. If it is a script, it can be evaluated only at simulation startup (normal case), or at each simulation step (special case) - see <i>Evaluate Script Once</i> . The right, drop-down button allows for the definition of the mathematical formula within the <a href="#">Error! Reference source not found.</a>
Eval Once	This property is ignored if the <i>Initial Value</i> is a fixed value. Otherwise, if the <i>Initial Value</i> is a script, there are 2 possibilities: <ul style="list-style-type: none"> <li>• If the property is <i>on</i>, the <i>Value</i> property is initialized with value set by the script at the beginning of simulation.</li> <li>• If the property is <i>off</i>, the <i>Value</i> property is set by evaluating the script at each simulation step</li> </ul>
Max Value	The maximum value that can be assigned to the variable associated with the entity. It can be 1, <i>infinite</i> or any other value entered by the user. This entry is enabled only for scalar value types: <i>Integer</i> , <i>Long</i> or <i>Double</i> .
Min Value	
Log	Tells, whether to log the entity values during simulation
Global	Tells, whether this entity is global. Global entities cannot be connected with connectors.

### 8.2.1.2 Process

Property Name	Description
---------------	-------------

<p style="text-align: center;">Calc Style</p>	<p>Determines how the variables in the connected entities are modified when the process fires. The following operations (calculation styles) can be specified:</p> <ul style="list-style-type: none"> <li>• <i>Speed</i> – the process defines the speed of production or consumption of the entities. Speed determines the continuous process type.</li> <li>• <i>Add</i> – the process calculates the concrete values that should be added (subtracted) to the entities. Add determines the Discrete process type.</li> <li>• <i>Update</i> – the process calculates a concrete value that will replace the entity value. Update determines the Generic process type.</li> </ul> <p>Note: The <i>Update</i> and <i>Add</i> calculation styles are time independent. Thus it is recommended that they be used in conjunction with a <i>Delay</i> value. This will assure that the process fires at a constant time interval and makes the simulation results independent of the sampling interval.</p>
<p style="text-align: center;">Firing Style</p>	<p>Determines how the enabled/disabled state of the process is calculated. The following styles can be selected from the drop-down list:</p> <ul style="list-style-type: none"> <li>• <i>And</i> – All connected input connectors must fulfill their conditions to enable the process.</li> <li>• <i>Or</i> – At least one <i>Inhibitor</i> or <i>Association</i> input connector must fulfill its condition to enable the process. Additionally, all <i>Process</i> input connectors must fulfill their conditions.</li> </ul>

Kinetic Style	<p>The following values can be selected from the drop down list:</p> <ul style="list-style-type: none"> <li>• <i>Custom</i></li> <li>• <i>Connector Custom</i></li> <li>• <i>Connector Rate</i></li> <li>• <i>Mass</i></li> <li>• <i>Stochastic Mass</i></li> <li>• <i>Michaelis Mentens</i></li> <li>• <i>MM</i></li> <li>• <i>Stochastic Log Normal Mass</i></li> </ul> <p>Each kinetic style requires different parameters. These parameters can be specified below Kinetic Script property:</p> <ul style="list-style-type: none"> <li>- <i>coefficient1, coefficient2,</i></li> <li>- <i>variance,</i></li> <li>- <i>rate,</i></li> <li>- <i>connector stoichiometry,</i></li> <li>- <i>speed/add/update</i></li> <li>- <i>connector speed/add/update.</i></li> </ul> <p>Only the parameter fields that are meaningful for the selected kinetic style are displayed.</p>
Kinetic Script	<p>This is not editable property which is generated automatically using kinetic style property and parameters which are displayed below (as a sub tree) this property.</p>
Delay Script	<p>For discrete and generic processes, if the delay time <math>T &gt; 0</math>, then the process fires just after the delay time <math>T</math> if it is still active. Otherwise, it can lose its chance to fire. If the delay time <math>T = 0</math>, the process fires immediately when it is possible. For continuous processes, there is no delay; The process fires immediately when the enabling conditions become true and its Activity property is set to <i>true</i>.</p>
Activity	<p>If the property is set to <i>false</i>, the process does not fire. The button allows for the definition of the mathematical formula within the <a href="#">Error! Reference source not found.</a></p>
Priority	<p>Sets the priority of the process during simulation. If two processes P1 and P2 with equal priority fire at the time <math>t</math>, the order of firing P1 and P2 is random. But if the priority of P1 is larger than P2, then P1 always fires before P2.</p>
Log	
Activity Log	

### 8.2.1.3 Connector

Property Name	Description
Kinetic Script	
Firing Style	<p>Specifies the way, and how to calculate the firing activity of the connector. The Firing Style can take one of the following values:</p> <ul style="list-style-type: none"> <li>- Threshold</li> <li>- Rule</li> <li>- No Check</li> </ul>
Firing Script	<p>Depending on the <i>Firing Style</i>, this script can define either the <i>Firing Threshold</i> or the <i>Firing Rule</i>.</p> <p><b><i>Firing Threshold</i></b>  The Threshold should be used for input connectors to discrete or continuous entities. The Threshold is a real value or a script that returns real value. The Threshold is used to control the connected discrete or continuous process; If the current value of source entity is larger than the threshold specified by the connector, the connector is enabled. If all input connectors of a process are enabled and the Activity property of the process is <i>true</i>, the process is enabled.</p> <p><b><i>Firing Rule</i></b>  The Firing Rule is used to control the enabled/disabled state of a linked generic process; If the Firing Rule is set to <i>true</i>, the connector is enabled. As with discrete and continuous processes, a generic process is enabled if all of its input connectors are enabled and the Activity property of the process is set to <i>true</i>. The Firing Rule option can be a Boolean value or a script that returns a Boolean value.</p>
Log	Tells, whether to log the process values during simulation

#### 8.2.1.4 Calculation Style

This section gives more details on the calculation style concept. The table below describes the impact of a firing process on the connected entities for different process types and calculation styles.

Calc Style	Process behavior

Speed	<p>When the process fires, the value of each input/output entity is decreased/increased by change value (delta). The formula for the change value (delta) depends on the kinetic style – see the table below.</p> <p>For the kinetic style <i>Custom</i> the absolute value of delta is the same for all input/output entities. For all other kinetic styles, the value of delta depends on connector specific parameters (e.g. <i>Connector Stoichiometry</i> or <i>Connector Custom</i>). Thus, the delta value may be different for different input/output entities.</p>
Add	<p>When the process fires, the value of each input/output entity is decreased/increased by change value (delta). The formula for the change value (delta) depends on the kinetic style – see the table below.</p> <p>For the kinetic style <i>Custom</i> the absolute value of delta is the same for all input/output entities. For all other kinetic styles, the value of delta depends on connector specific parameters (e.g. <i>Connector Stoichiometry</i> or <i>Connector Add</i>). Thus, the delta value may be different for different input/output entities.</p>
Update	<p>When the process fires, the value of each input/output entity is set to the update value. The script for the update value is specified in the <i>connector update</i> field. The update value may be different for different input/output entities.</p>
Check	

### 8.2.1.5 Kinetic Styles

This chapter gives more details on the kinetic style concept. The table below specifies the mathematical formula that is used to calculate the entity value change (delta) for all the various kinetic styles. Also, the parameters used for each kinetic style are listed in the table.

Kinetic style	Process type	Formula for the change value delta
<b>Custom</b> parameter: speed / add	continuous (speed calc style)	$\text{delta} = \text{speed} * \text{sampling interval}$
	discrete (add calc style)	$\text{delta} = \text{add}$

<b>connector custom</b>  parameters: speed / add / update for each connector	continuous (speed calc style)	$\text{delta} = \text{connector\_speed} * \text{sampling\_interval}$
	discrete (add calc style)	$\text{delta} = \text{connector\_add}$
<b>Mass</b>  parameters: coefficient <sub>1</sub> , coefficient <sub>2</sub> , stoichiometry for each connector	continuous (speed calc style)	$\text{delta} = \text{m\_product} * \text{coefficient}_1 * \text{coefficient}_2^{[\text{number\_of\_input\_entities}] * \text{stoichiometry}} * \text{sampling\_interval}$  where m_product is the product of all input entity values. For the input entity variables (m <sub>1</sub> , m <sub>2</sub> , ..., m <sub>n</sub> ) $\text{m\_product} = m_1 * m_2 * \dots * m_n$
	discrete (add calc style)	$\text{delta} = \text{m\_product} * \text{coefficient}_1 * \text{coefficient}_2^{[\text{number\_of\_input\_entities}] * \text{stoichiometry}}$  where m_product is the product of all input entity values. For the input entity variables (m <sub>1</sub> , m <sub>2</sub> , ..., m <sub>n</sub> ) $\text{m\_product} = m_1 * m_2 * \dots * m_n$
<b>stochastic mass</b>  parameters: coefficient <sub>1</sub> , coefficient <sub>2</sub> , standard deviation and stoichiometry for each connector	continuous (speed calc style)	delta is randomly generated using the Gaussian distribution with the calculated delta_mean and specified standard deviation.  delta_mean is calculated using the formula for the mass kinetic style: $\text{delta\_mean} = \text{delta\_mass} (\text{coefficient}_1, \text{coefficient}_2, \text{stoichiometry})$

	discrete (add calc style)	<p>delta is randomly generated using the Gaussian distribution with the calculated <code>delta_mean</code> and specified standard deviation</p> <p><code>delta_mean</code> is calculated using the formula for the mass kinetic style:</p> $\text{delta\_mean} = \text{delta\_mass} \cdot (\text{coefficient}_1 \cdot \text{coefficient}_2 \cdot \text{stoichiometry})$
<b>connector rate</b>  parameters: rate and stoichiometry for each connector	continuous (speed calc style)	$\text{delta} = \text{rate} \cdot \text{stoichiometry} \cdot \text{sampling\_interval}$
	discrete (add calc style)	$\text{delta} = \text{rate} \cdot \text{stoichiometry}$

## 8.2.2 Biological Properties

The biological properties are divided in predefined (or well-known) biological properties and user-defined or custom ones. Both, *custom and well known properties*, can be also displayed in *Biological Properties* frame.

The well-known properties depend on element type and CSO Class, e.g. a process will have different properties than an entity. An entity with *CSO Class Protein* will have many properties, while a *non-biological entity* (CSO Class) will have no biological properties. Therefore the number of rows displayed in the *Biological Properties* section changes with the change of element type or CSO Class.

Several Biological Properties can be set with values from a predefined CSO dictionary. In such a case the CSO Hierarchy tree control will be displayed.

### 8.2.3 Custom Biological Properties

The *Custom Biological Properties* allow the user to add his own properties. To add a new property:

- Double click the “...” in the *New Property* row
- Enter the name of the new property, e.g. A

This will display the new property A as a new row in the *Custom Biological Properties*. Now you can:

- Double click the “...” in the A row to set a new value for that property

### 8.2.4 Multiple Selection Sheet

This pane displays common properties of multiple objects selected in the active canvas. In this pane you may change a given property for all the selected objects at once in the following way:

- Select the elements to be modified on the canvas. You might select all elements.
- Go to the Element Setting frame and find the desired property in the property tree.
- Double click the cell and set the new value

Please note that the properties tree is normally in collapsed state and all properties are hidden. This is done to speed up the software, since the calculation of properties for multiple elements might be time consuming.

A concrete value is displayed in the property cell only if all selected cells have the same value of the property. Otherwise the cell is empty.

The *Multiple Selection* pane consists of 3 sections (categories) with such properties as:

- Shape section: Figure Type, Depth, Size, Fill Color, Line Color, Stroke
- **Biological Properties** and **Custom Biological Properties** sections as described above

## 8.2.5 Model and Canvas Property Sheet

This pane displays a number of properties describing the model in the active canvas and the canvas window itself. These properties cannot be edited

### 8.2.5.1 File Section

Property Name	Description
Name	Full path to the file
Modified	Date of the last file modification
Loaded	Date when the file was opened from filesystem

### 8.2.5.2 Model Section

Property Name	Description
Edited	Date when the model was last time edited
Total Count	Count of all elements in the model
Entity Count	Count of all entities in the model
Process Count	Count of all processes in the model
Connector Count	Count of all connectors in the model
Fact Vertex Count	Count of all fact vertexes in the model
Fact Edge Count	Count of all fact edges in the model
Group Count	Count of all groups in the model

### 8.2.5.3 Canvas Section

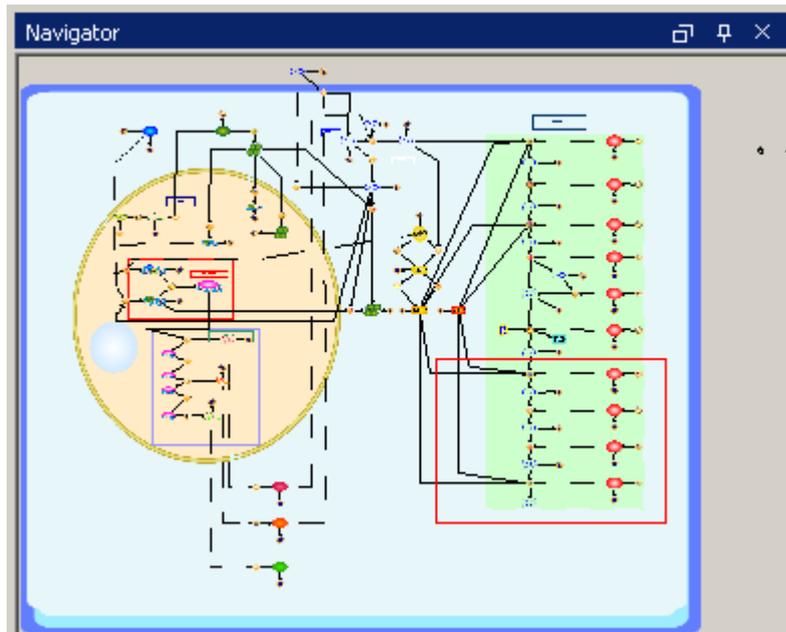
Property Name	Description
View Size	The size of the visible area
Actual Size	The actual size of the active model
Antialias Status	Toggles antialiasing on and off for the active canvas window
Grid Status	Toggles the grid display on and off for the active canvas

### 8.2.5.4 Biological Section

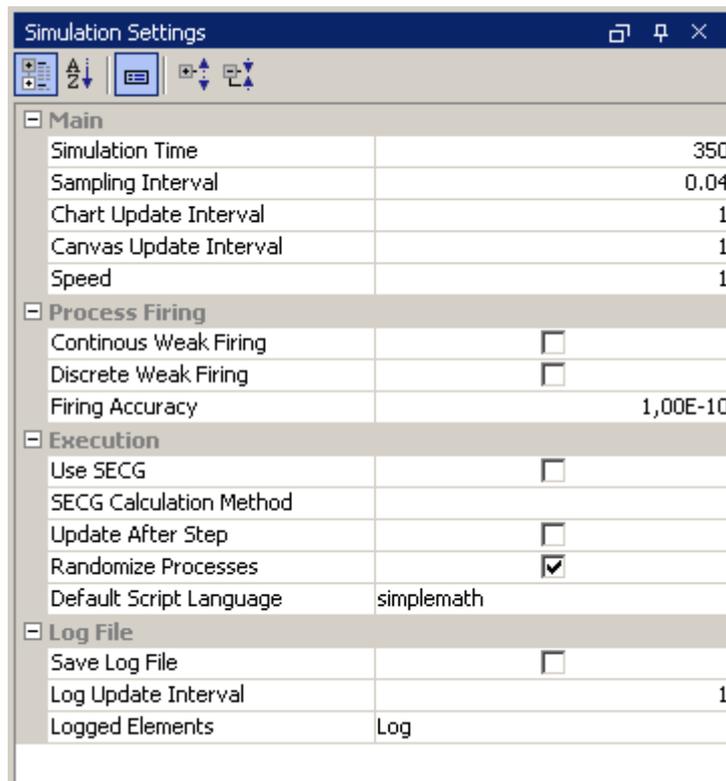
Property Name	Description
Organism	Defines the CSO property for the model
Cell Type	Defines the CSO property for the model
Tissue	Defines the CSO property for the model

### 8.3 Navigator

For a large model, the Navigator frame provides a convenient way to locate and display in the canvas window a desired part of the model. The Navigator displays a small view of the entire model, with a red rectangle marking the portion of the model currently shown in the active canvas. You can drag this rectangle around in order to navigate the model in the canvas window.



## 8.4 Simulation Settings



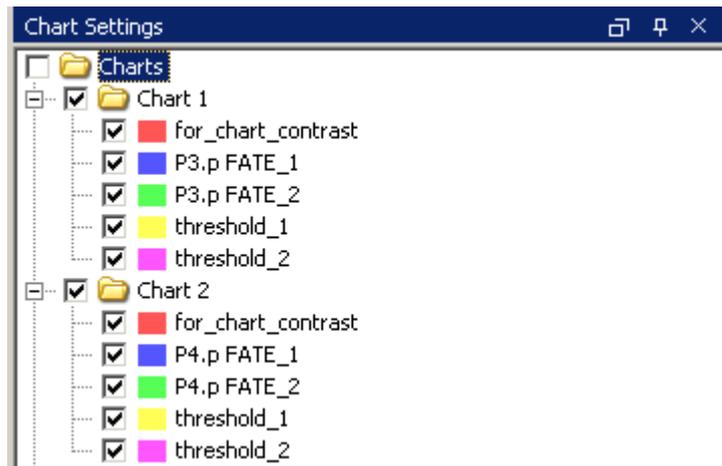
The *Simulation Settings* frame displays simulation parameters for the model in the active canvas:

- *Sampling Interval* is the basic simulation input parameter that controls the simulation accuracy and performance. The smaller the *Sampling Interval*, the higher the accuracy.
- *Simulation Time* tells how long the simulation should last. The ratio  $Simulation\ Time/Sampling\ Interval$  defines the number of steps to be executed in the simulation.
- *Chart Update Interval* defines how often the **Chart Window** should be updated. This parameter has no impact on simulation results.
- *Canvas Update Interval* defines how often the canvas should be updated. This parameter is ignored if the simulation is executed in the fastest mode.
- All the times are specified in Petri net time units (pt).

## 8.5 Chart Settings

The Chart Settings frame allows the visualizing of the simulation results with concentration or amount versus time graphs. You can:

- create a new chart,
- edit/customize an existing chart, and
- remove an existing chart.



The *Chart Tree* displays all defined charts and their properties on two levels. The main level of the tree is the list of charts labeled by the chart names. The leaves of the tree are model elements that are included in the parent chart. A chart can display time series of the following simulation values:

- entity value
- process speed
- connector speed

One and the same element can be included in one or more charts.

The checkboxes allow for changing visibility of all charts, a single chart or a single data series. To hide all charts uncheck the tree root node – *Charts*.

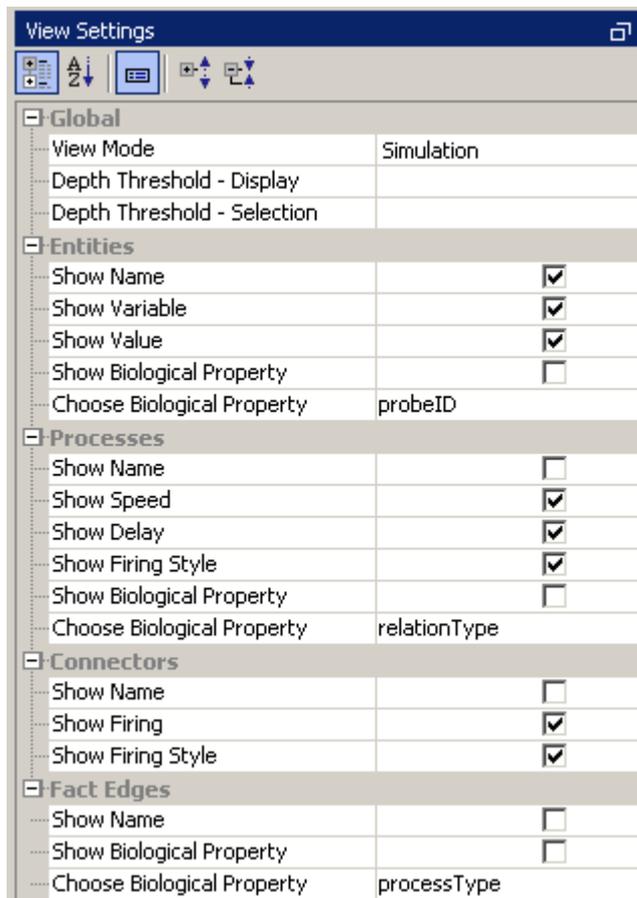
You can add/define/remove charts or change its properties using context sensitive popup menu, which depends on selection item and includes the following commands:

- Create New Chart – creates new chart from entities and processes selected on active canvas. If nothing is selected chart will be empty
- Remove All charts – removes all charts defined in active document.
- Add Selection from Canvas – adds selected elements to the selected chart, if selection will be empty nothing happen.If more than one chart is selected, the entities are added only to the first one.
- Remove Selected – removes selected elements
- Rename – changes name of the chart
- Set Item Color – sets color of line on the chart. After add or create chart all items have random selected color. The User can also change color by double clicking Chart Item
- Show on Canvas – selects related entities or process on the canvas

- Centerize All Charts
- Centerize on Canvas – brings chart to the center of canvas

The entity, process and connectors names cannot be edited in the *Charts Tree*. The *Charts Tree* supports multiple selections including all possible combinations of chart and entity nodes - several charts and entities can be selected at once.

## 8.6 View Settings



This frame allows you to set global visualization settings for the Cell Illustrator. The view settings are stored as user preferences and apply also the next time you start the application. A change in the settings results in an immediate update of all canvas windows.

- **View Mode**  
This option allows you to change the visibility of several label types by one click. In the list of available choices, the user can select:
  - *All* – all label types visible
  - *Edit, Simulation, View* – display label types which are important for the selected scope
  - *None* – all label types are hidden
  - *Custom* – user defined label visibility
  
- **Depth Threshold - Display**  
This option allows you to set depth threshold of active canvas. Every item on canvas has *Depth* parameter. Global *Depth Threshold Display* setting sets depth that elements can be displayed to. E.g. if entity has depth of 60, and global *Depth Threshold -Display* is set to 50, entity can't be displayed. To be visible, item must have *Depth* smaller than actual *Depth Threshold* value
  
- **Depth Threshold - Selection**  
This option allows you to set depth threshold of active canvas. Every item on canvas has *Depth* parameter. Global *Depth Threshold* setting sets depth that elements can be selected to. E.g. if entity has depth of 60, and global *Depth Threshold* is set to 50, entity can't be selected (but is still visible on canvas). To be active, item must have *Depth* smaller than actual *Depth Threshold* value.
  
- **Show Label Type**  
This flag tells whether the selected label type can be displayed. If the flag is *off*, then the selected label type is always hidden.
  
- **Choose Biological Property**  
In this entry the user can select the biological property that should be displayed on the canvas.
  
- **Save As Custom**  
This command saves the current label visibility settings to *Custom* view mode.

## 8.7 Biological Properties

For the model in the active canvas, this frame displays elements together with their biological properties in a tabular view.

Biological Properties					
Entity	Process	Connector	Fact Edge	Fact Vertex	Group
Id	Name	Cell Component	Biological Event	Synonym	
p345	p2	plasma membrane (integral to plasma membrane)	dimerization		
p78	p70	extracellular	unknown degradation		
p363	p29	extracellular	translation		
p335	p160	cytosol	unknown degradation		
p353	p353	extracellular	translocation		
p270	p22	plasma membrane (integral to plasma membrane)	binding		
p99	p48	cytosol	translation		
p253	p53	cytosol	unknown degradation		

The *Biological Properties* frame consists of the tabbed tables *Entity*, *Process*, *Connector*, *Fact Edge*, *Fact Vertex* and *Group*.

The following operations can be done for each of the table:

- Select an element on the canvas by clicking on a row
- Sort rows according to the specified column by clicking on the column header,
- Filter rows by specified column by clicking on combo box on header of the column,
- Edit a given property by double clicking a cell
- Customize the visible column by right click on column header and choosing one of the menu items:
  - o Hide column
  - o Show All Hidden Columns
  - o Select Visible Columns
  - o Restore Default Columns

## 8.8 Path Search Results

This frame displays the list of paths that have been discovered during the [Path Search](#).

Path Search Result									
	0		1		2		3		4
1	e1	→	p1						
2	e1	→	p1	→	e64				
2	e1	→	p1	←	e67				
3	e1	→	p1	→	e64	→	p2		
3	e1	→	p1	←	e67	←	p4		
4	e1	→	p1	→	e64	→	p2	→	e65

Each path is displayed in one row and described by the following properties:

- column 1: path length – the number of connectors in the path
- column 2: the first entity in the path – the entity specified in the Search

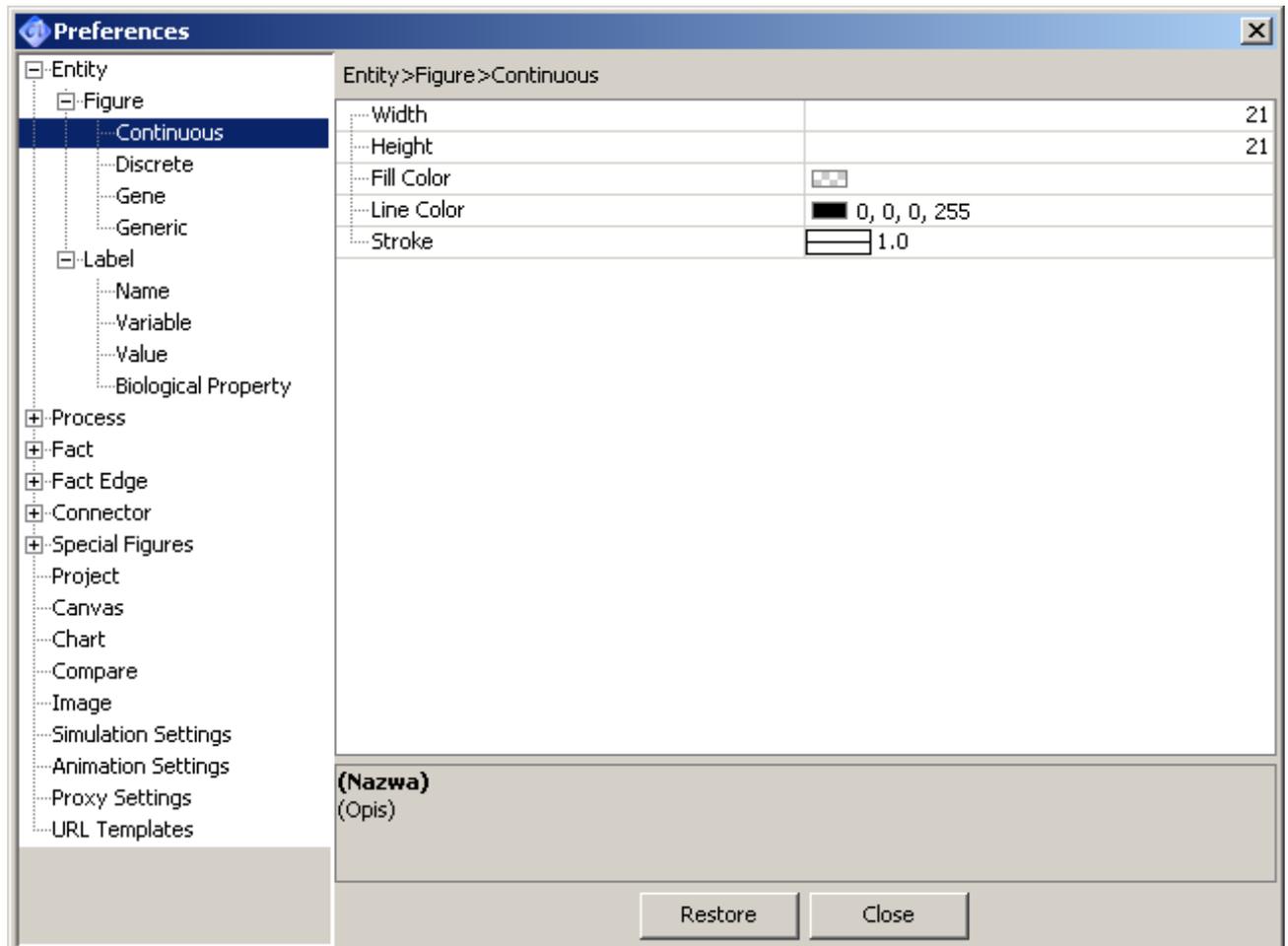
From field

- column 3: connector direction – the direction of the connector between the first entity (column 2) and the connected process (column 4)
- column 4: the first process in the path
- column 5: connector direction – the direction of the connector between the first process (column 4) and the second entity (column 6)
- column 6: the second entity in the path
- etc.

Click a row in the table to select the corresponding path on the canvas. CTRL+click (Apple+click on Mac) and SHIFT+click allow for the addition or removal of multiple items to the selection.

## 9 Dialog Boxes

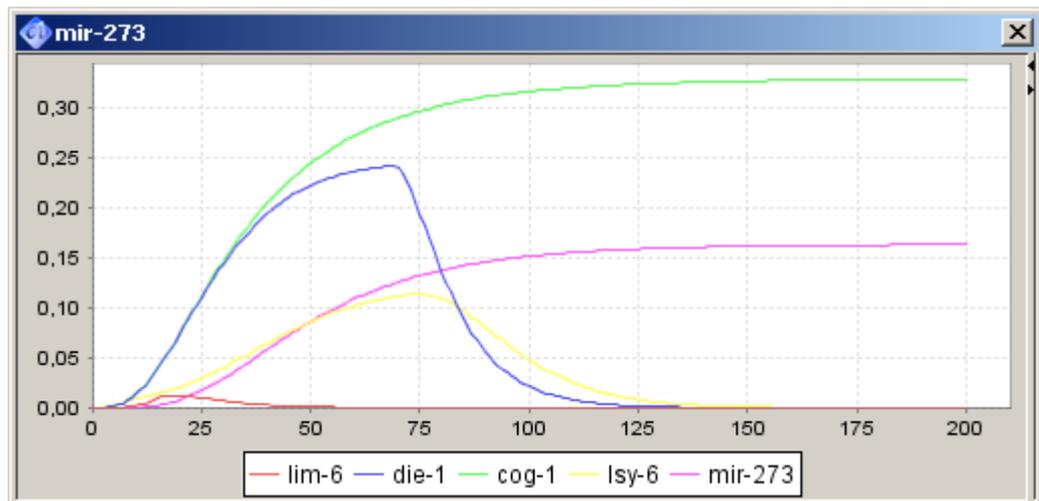
### 9.1 Preferences



With the Preferences dialog, you can set the global properties of Cell Illustrator. The settings are stored as user preferences and apply also the next time you start the application. A change in the Preferences dialog is effective immediately and applies to new elements, canvas windows and simulations runs that are executed after the change unless the setting is one for the whole application, such as the grid size. In such a case, the setting applies to all (already existing and new) canvas windows. The *Restore Defaults* button restores the default (factory) settings for the selected branch of the option tree.

## 9.2 Chart Window

A *Chart Window* presents how element values change over time in the course of simulation and the time dependence of one or more element variables in a chart.



After simulation is started the *Chart Windows* appear. Each *Chart Window* contains the list of the plots defined in the [Chart Settings](#) frame. The *Chart Window* enables you to:

- Display plots with time series of entities, processes, connector values,
- Choose which of the plots are displayed or hidden,
- Customize chart and plot properties (set colors, fonts etc.),
- Zoom in, zoom out and auto range axes,
- Save *Chart Window* as PNG files,
- Print chart,
- Rasterize (freeze) a specified chart for later analysis or comparison,
- Copy the time series to system clipboard in a tab-separated text format. You can paste the chart data to another application, e.g., Microsoft Word or Excel

The *Chart Window* consists of the *Chart Panel* with the time series plots, the *Element List Panel*, and the popup menu.

### 9.2.1 Chart Panel

The *chart panel* presents how element values change over time in the course of simulation and the time dependence of one or more entity variables in a chart.

Chart Panel update interval depends on the mode of simulation:

- in the *Step* mode: for each step the *Chart Window* is updated,
- in the *Play* mode: update by each *Chart Update Interval*, default is one update per 1 Petri net time,
- in the *Fast Play* or *Max Speed* mode chart updates are done rarely: each time the time series increases by 10% or 50% respectively in comparison to the last updated time and at the end of simulation.

You can see the value of the data point once you move the mouse cursor over it. You can zoom into a chart area by dragging the mouse over this area from upper left to the bottom right corner. To reset the original size drag the mouse in the opposite direction from the bottom right to the upper left corner.

### 9.2.2 Element List Panel

The element panel contains the list of elements displayed in the chart. It consists of 3 columns: *Name*, *Show*, *Color*. In this panel you can:

- Show or hide the plot associated with a given element by clicking on the *Show* cell of a given element.
- Customize colors of data series in the chart by clicking on the *Color* cell of a given element.

### 9.2.3 Popup menu

Right-click on the chart control opens a popup menu where you can customize the chart display:

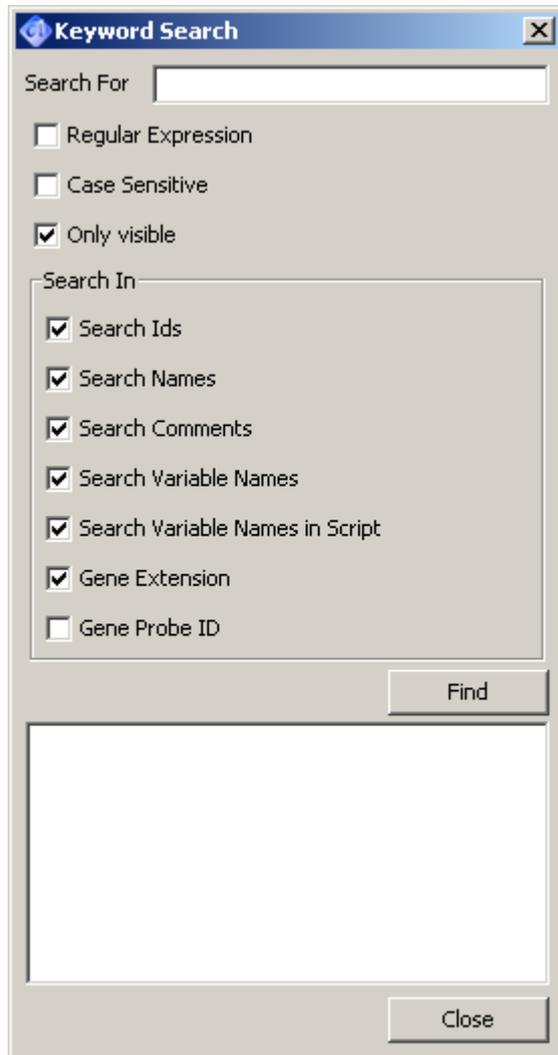
- *Properties* - set chart visualization properties.
- *Save As* – save the chart in PNG file.
- *Print* – print image on printer
- *Zoom In/Zoom Out* – specify the range for x and y axis. Only the data points that fit that range will be displayed
- *Auto Range* – Automatically adjusts the range of X and Y axis
- *Rasterize* - creates a window that is a snapshot of the chart. The snapshot is not updated during simulation. If you close it, the rasterized chart is destroyed. In contrast, if the original chart is closed, it just becomes hidden and reappears at the simulation start.
- *Copy To Clipboard* - Copy the time series to system clipboard in a tab-separated text format. You can paste the chart data to another application, e.g., Microsoft Word or Excel

## 9.3 Keyword Search

Using this dialog, you can locate elements (entities, processes and connectors) containing the specified text in one of their properties. The keyword search is performed by execution of the following steps:

- Enter a search string into the *Search For* edit box,
- Select search options using the checkboxes

- Select the properties to be searched for, in the *Search In* panel.
- Press the *Find* button.
- Left click an item in the *Search Result* list to select the elements



The *Keyword Search* is a modeless dialog. After finding an element, the user can switch back to the canvas window and edit the element without closing the *Keyword Search* window.

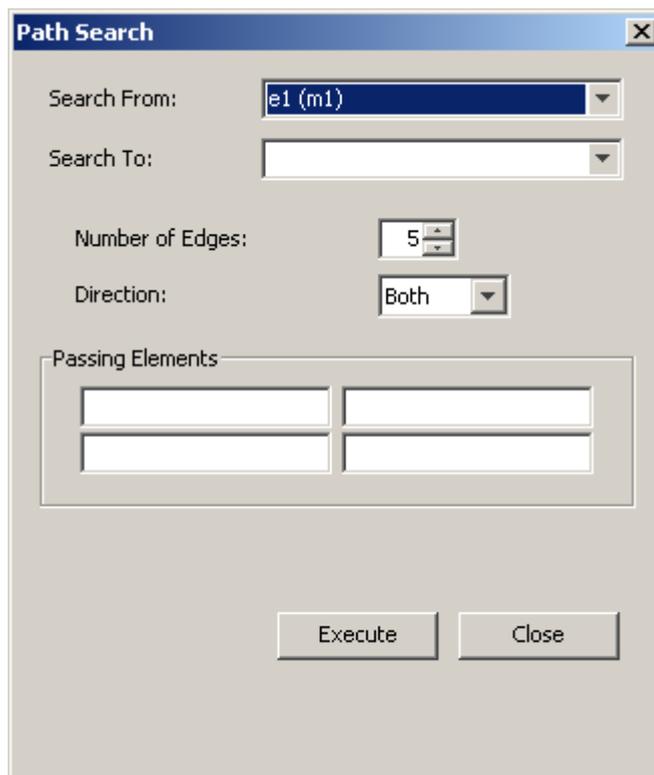
- Regular expressions can be used to find groups of similar elements.
- The following object types can be found: entity, connector, process.
- You can search in the following element properties: element name, element comment, entity variable name, variable names in scripts, gene extension, gene id
- Elements found in the search process are displayed in the *Search Results* list box at the bottom of the dialog. Also, the number of found objects is displayed above the list box.
- Clicking an item in the *Search Results* list box selects the corresponding element in the workspace. CTRL+click (Apple+click on Mac) and SHIFT+click allow for selecting/deselecting multiple items.

- To select an object, the canvas that has been searched must be active. If the active canvas is changed after the search, the *Search Results* list is cleared.
- The *Close* button dismisses the dialog window.

## 9.4 Path Search

Using this dialog, you can find sub-networks around the specified entity or entity-to-entity paths. The path search is done in the following steps:

- Select an entity in the *Search From* combo box.
- Select a target entity in the *Search To* combo box. This step is optional. Leave the *Search To* field empty, if you want to find a sub-network around the specified entity.
- Specify the *Number of Edges* to be searched for.
- Specify the search *Direction*.
- Specify the auxiliary options *Passing Vertices*
- Press the *Execute* button. This will display the [Error! Reference source not found.](#) frame



The *Path Search* dialog consists of the following controls

### 9.4.1 Search From Combo Box

In this combo box you can select the starting entity for each search. This combo box contains list with all entities in the active canvas.

Each entity is represented as a pair *Entity Name* and *Entity Variable Name* in the entity list. The additional *variable name* is useful to handle ambiguous situations. In some cases, two entities may have the same *Entity Name*, but they will possess different *Variable Names*.

### 9.4.2 Search To Combo Box

In this combo box you can select the target entity for each search. This combo box contains the list with all the entities in the active canvas.

If this field is empty, the target entity can be any entity in the canvas and the search results will include all paths beginning in the Search From.

If this field is not empty the search results will include only those paths that start in the *Search From* entity and end in the *Search To* entity.

Use this field, if you want to find a path between two entities (entity-to-entity paths) only. Otherwise, if you want to find a subnetwork around the starting entity leave this field empty.

### 9.4.3 Number of Edges

In this field you specify the number of edges to be searched for. To search for the nearest neighbors only, specify 1. To search for the nearest neighbors plus their nearest neighbors specify 2. The larger the number of connectors the more search results will be found.

### 9.4.4 Direction Combo Box

In this combo box you specify the search direction. You may choose one of the following 3 possibilities:

- Forward - to search for output (target) entities/processes only.
- Reverse - to search for input (source) entities/processes only.
- Both to search for any connected entities/processes.

### 9.4.5 Passing Element

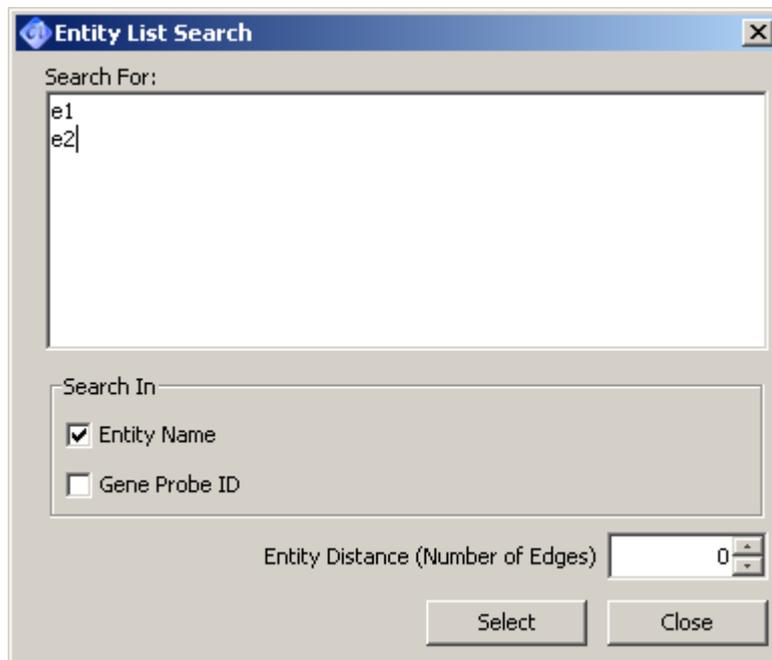
A *Passing Element* is an entity or process that must be included in *the Search Results* paths. You may define up to 4 *Passing Elements*, by specifying their names in the edit boxes.

### 9.4.6 Execute Button

This starts the search with the specified options. The discovered paths are displayed in the *Path Search Results* frame.

## 9.5 Entity List Search

Using this dialog, you can locate a subnet by specifying a list of entity names.



The search is done in the following steps:

- Open the *Entity List Search* dialog box.

**Note:** The *Search For* edit box is initialized by the names of the currently selected entities. This is useful if you want to search for a subnet that consists of the selected entities and their connections within a given distance of edges.

- Enter (paste) the list of names into the *Search For* edit box

**Note:** After copying nodes of one canvas, you may paste the list of their names into any text editor, including the *Search For* edit box.

- Select where to search by choosing the options in the *Search In* box

- Specify the *Entity Distance* in edges. For the default value 0 no edges will be selected. If the specified edge distance is larger than 0 then all paths (entity-edge-entity-edge-entity-...) connecting found entities within the given number of edges will be selected. The larger the *Entity Distance* value the more elements will be selected)
- Press the *Select* button. The Entity/probe names might be separated by any standard separator, such as space, tab, coma, semicolon, new line. The entity name list to be searched for can be copied from an external database or spreadsheet or from another canvas.
- The found sub-network is highlighted on the canvas with the selection color (green is the default). After inspecting the search results on the canvas, you may change the search criteria (e.g. the *Entity Distance*) and resume the search by clicking the *Select* button.

The *Close* button dismisses the dialog window.

## 9.6 About Cell Illustrator

About Cell Illustrator is a modal dialog that contains tabs: *Version*, *License Information*, *Licensed Modules*, *License*, and *Third Party Components*.

- *Version* contains the version number and the copyright information.
- *License* contains the End User License Agreement text.
- *License Information* sheet displays the user's license details, including license type, expiration date, etc.
- *Third Party Components* sheet displays information about software components used in Cell Illustrator.