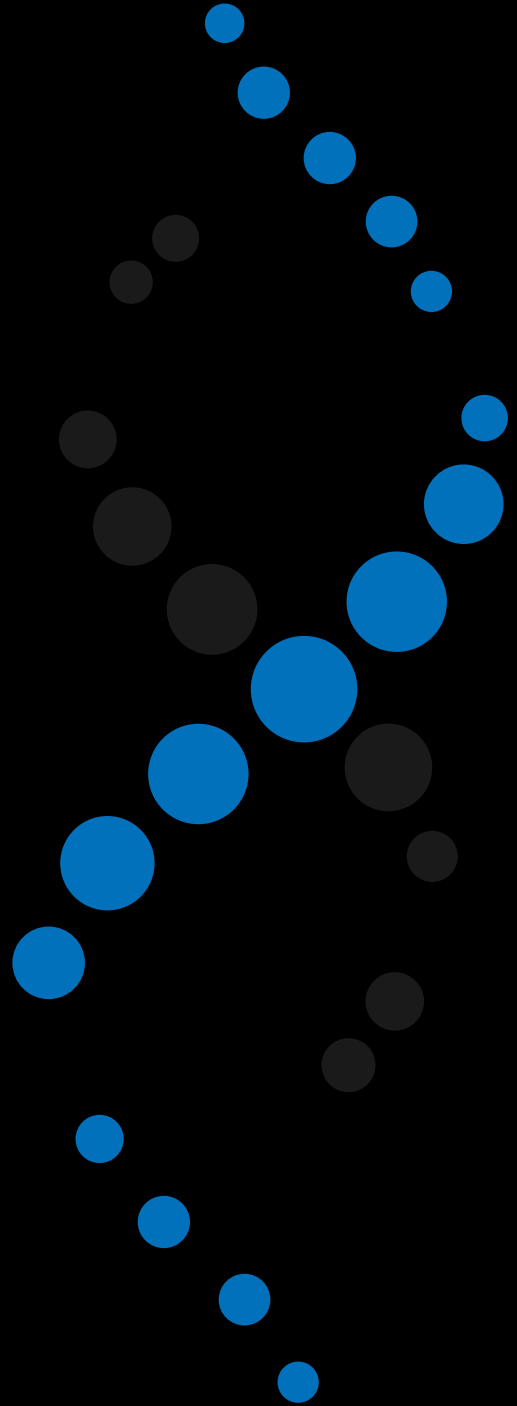


# QChromosome

4D Studio

## Reference Manual



Built with

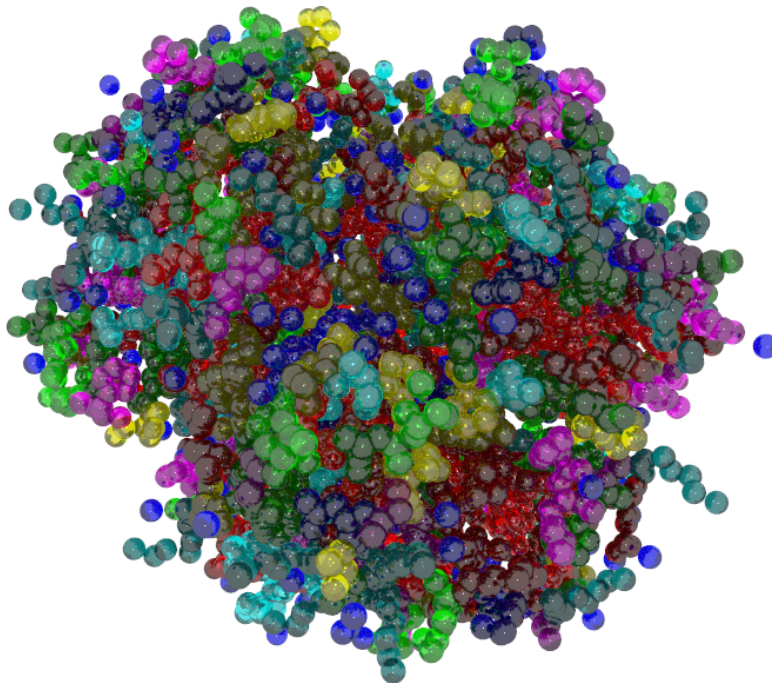
Qt

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## Chapter 1

# QChromosome 4D Studio



Thank you for using **QChromosome 4D Studio**. The application is designed for impressive visualization of 3D shapes of proteins and nucleic acids, especially its changes in time. It uses a powerful **POV-Ray** rendering engine to generate a high quality images and animations.

# Chapter 2

# Reference

In this section you will find information on all functionalities of **QChromosome 4D Studio**, its user interface and plenty of other topics.

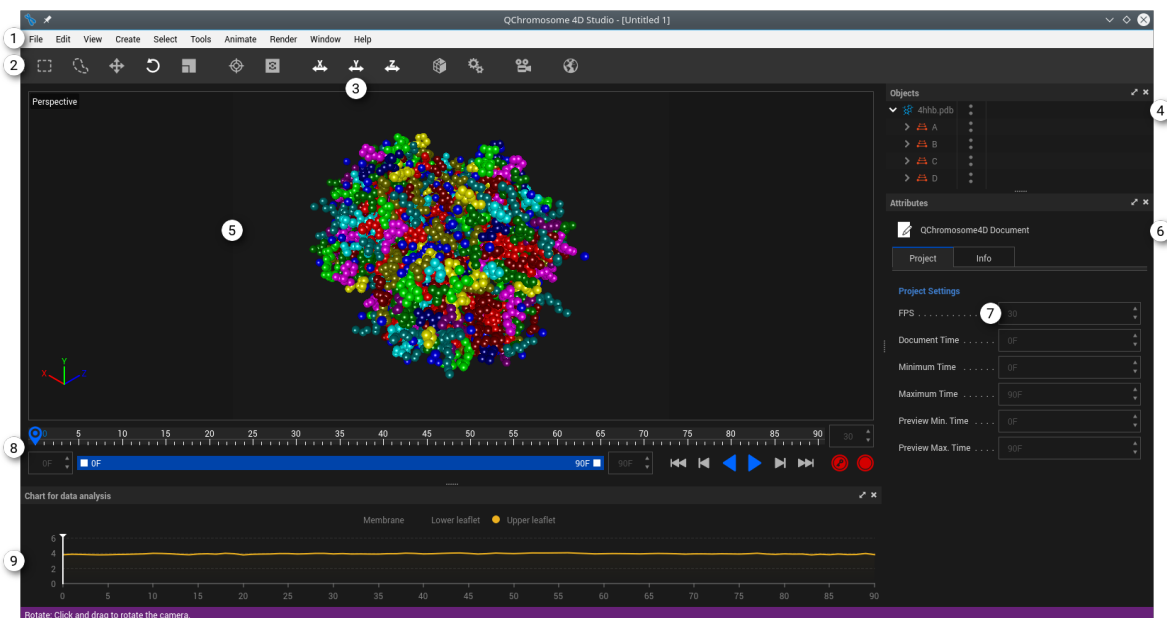
## 2.1 Overview

### Start

To start **QChromosome 4D Studio** double click the program icon or run it from terminal. Any number of `.qcs` scene files provided as command line parameters will be opened in separate sessions.

### The user interface

This section gives an overview of user interface as it appears after launching **QChromosome 4D Studio**.



### 1 Main menu

The main menu contains almost all functionalities of **QChromosome 4D Studio**.

- 2 Main toolbar

The most useful tools are displayed on main toolbar, so you can easily access them without searching through menus.
- 3 Command group
- 4 Object Manager

[Object Manager](#) contains all objects present on scene, grouped hierarchically. If you want to edit an object, you can select it in the manager. Its name will be highlighted and all its settings will be displayed in [Attribute Manager](#).
- 5 Editor's viewport
- 6 Attribute manager

[Attribute Manager](#) displays all settings of selected objects and allows user to edit them.
- 7 Data entry control
- 8 Animation toolbar

Imported file can contain a trajectory represented by a number of consecutive models. [Animation toolbar](#) allows user to easily navigate through them and manage recorded keyframes.
- 9 Data chart

Several applications can process a trajectory to output some numerical data describing its molecular dynamics. In **QChromosome 4D Studio** you can display them as a chart synchronized with viewport.

Main elements of user interface are various managers. Unlike other system windows, they can be docked into the main window or set floating. On each of them you can operate independently, but all changes are immediately applied to other managers accordingly. For example, moving the [camera](#) automatically updates its coordinates in [Attribute Manager](#). All features are grouped in tabs to save display space.

## A quick tutorial

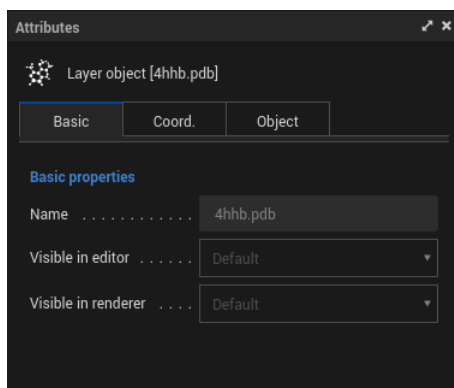
Launching an application automatically starts a new project. To import *.pdb* and *.xvg* files select **File | Import...** If the import is successful, a new layer item appears in [Object Manager](#). If imported file contains a trajectory, you can read more frames by selecting [Animate | Play forwards](#). Frames are parsed on the fly and

hence animation does not overuse operating memory.

To render current frame with **POV-Ray**, select **Render | Render to Picture Viewer**. To render an animation consisting of all cached frames, go to **Render | Render settings...** and in tab **Output** set **Frame range** to **All frames**. Then select **Render | Render to Picture Viewer** just as before.

To close an application use a native window control or select **File | Quit**.

## 2.2 Attribute Manager

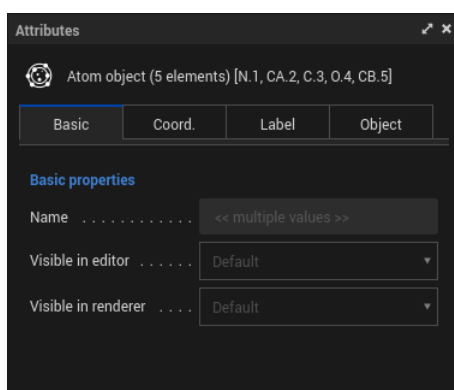


**Attribute Manager** gives an easy access to all attributes of objects and materials. Changes are applied in real time.

**Attribute Manager** displays common parameters of all selected objects. Values can be edited using standard system controls. If value has a unit, it is appended automatically.

On the top of **Attribute Manager** there are tabs corresponding to parameter groups defined for selected objects. To display and modify parameters from a group, click on its tab. Scroll bars will appear automatically when there is not enough display space.

**QChromosome 4D Studio** allows user to select multiple objects. If they have different types, only common attributes will be displayed in **Attribute Manager**.



In the above example five atoms are selected. If the same attribute (e.g. **Name**) has different values for any two of them, it is displayed with a special text **<<multiple values>>**. Any change is applied to all selected objects.

## 2.3 Configuration

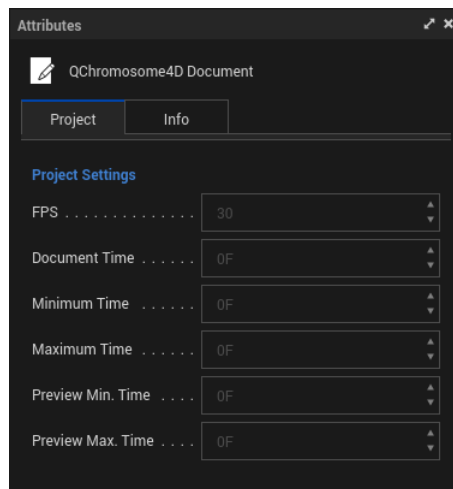
**QChromosome 4D Studio** has plenty of options that can be customized. This chapter gives an overview of them.

### 2.3.1 Project Settings

Standard values for current scene can be defined in **Project Settings**. These parameters are global and can not be changed for individual objects.

**Project Settings** can be opened in [Attribute Manager](#) by choosing [Edit | Project Settings](#).

#### Project Settings: Project



#### FPS

Frequency at which consecutive simulation frames are displayed on screen. It is taken into account by both editor and renderer.

#### Document time

Currently displayed simulation frame. It is also the position of time slider.

#### Minimum time

Defines the beginning of simulation tracks. Its value must represent an already cached frame. Effectively it only imposes some constraints on other controls.

#### Maximum time

Defines the end of simulation tracks. Its value must represent an already cached frame. If set to the last cached frame, it will automatically advance when additional frames are cached. Effectively it only imposes some constraints on other controls.

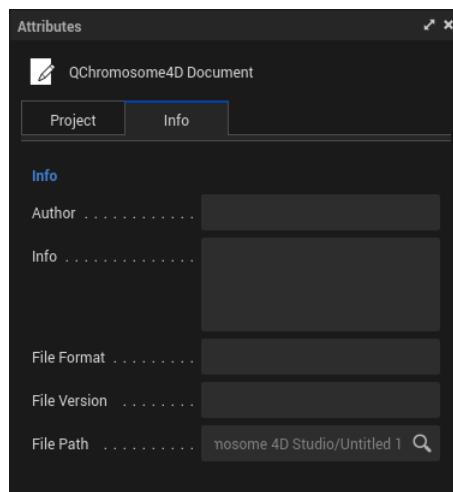
## Preview Minimum Time

Defines the beginning of preview range displayed on [Animation toolbar](#).

## Preview Maximum Time

Defines the end of preview range displayed on [Animation toolbar](#). If set to the last cached frame, it will automatically advance when additional frames are cached.

## ProjectSettings: Info



### Author

Author of the project.

### Info

Important metadata distributed with the project. The text field has no limit on amount of data it can contain.

### File format

Format of the project file. It cannot be modified.

### File version

Version of the protocol. It is required for backwards compatibility and cannot be modified.



File path

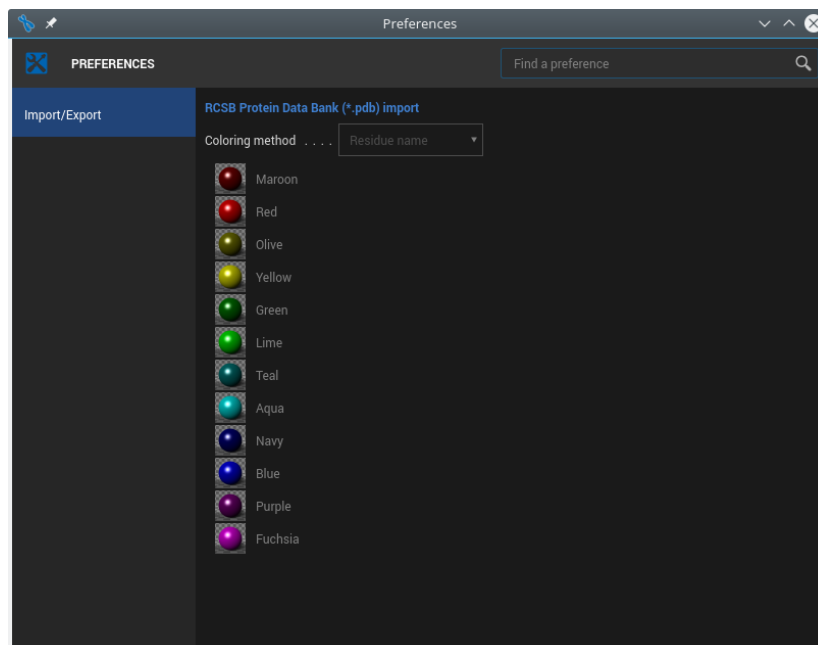
Location of the project file. Click the icon on the right to display system dialog and change the save path.

## 2.3.2 Preferences

**Preferences** allow user to change some default parameters and customize the application.

**Preferences** can be opened by choosing **Edit | Preferences**.

### Import/Export



## Coloring method

There are two available methods of applying materials to a newly imported *.pdb* layer:

- coloring by residue name
- coloring by chain identifier

When the first option is chosen, each residue gets its own material from the list, in order of appearing in the underlying *.pdb* file. If another layer already contains atoms with the same residue name, they are assigned the same material. If the number of different residues is greater than number of materials on the list, they will be cyclically repeated.

When the second option is chosen, each chain gets its own material from the list, in order of appearing in the underlying *.pdb* file. If the number of chains is greater than number of materials on the list, they will be cyclically repeated.

If coloring method is changed, all material tags are removed and assigned anew. This allows user to switch dynamically between different coloring schemes.

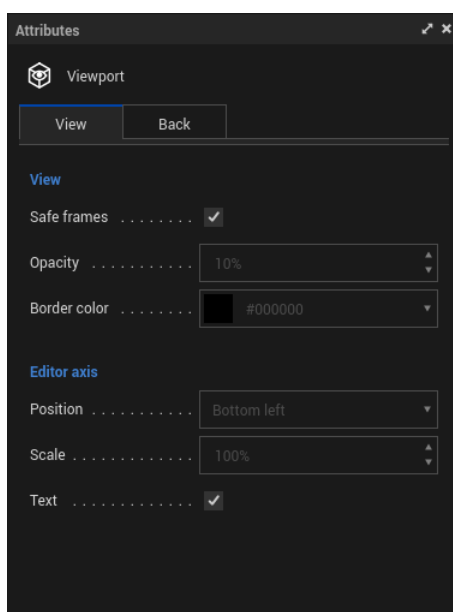
After successfully importing a new layer, material tags are visible in [Object Manager](#) and in [Content Browser](#) and thus can be simply modified.

### 2.3.3 Viewport

Standard values for current view can be defined in **Viewport**.

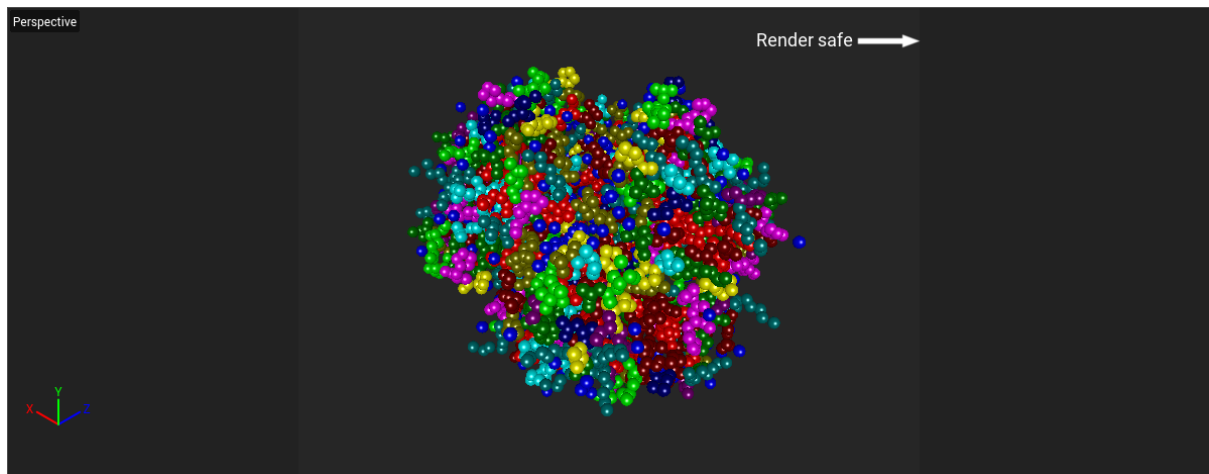
**Viewport** can be opened in [Attribute Manager](#) by choosing [View](#) | [Options](#) | [Configure...](#)

#### Viewport: View



## Safe frames

Safe frames are areas that will be rendered and viewed on external devices.



Opacity

Border color

Screen segments that lie outside Render safe area can be assigned a color and opacity.

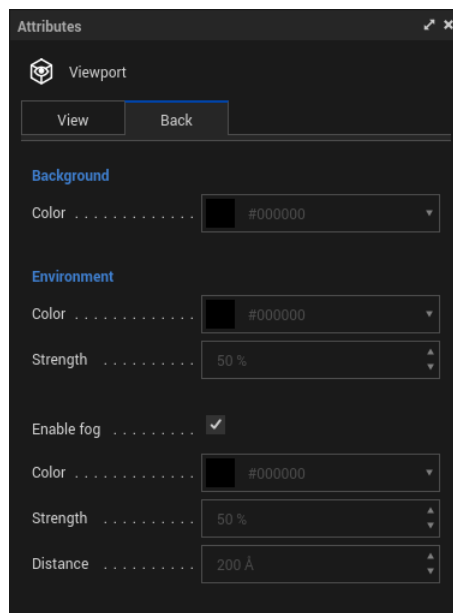
Editor axis Position

Editor axis Scale

Editor axis Text

By default a small axis system is displayed in the bottom left of view. It is useful for indicating the position of current camera. **Position** defines where the system is displayed, **Scale** defines its size and **Text** determines whether labels are displayed.

## Viewport: Back



### Background Color

View can be assigned a background color.

### Environment Color

Defines the color of environment light. The light illuminates scene uniformly from all directions.

### Environment Strength

Strength of environment light.

### Enable fog

Switches the fog effect.

### Color Strength

Defines color and intensity of the fog.

## Distance

Environment fog fills the whole scene. **Distance** determines its density by specifying the distance at which a light beam will lose 50% of its initial intensity.

## 2.4 Menu File



New

Ctrl+N

Creates new empty project.



Open...

Ctrl+O

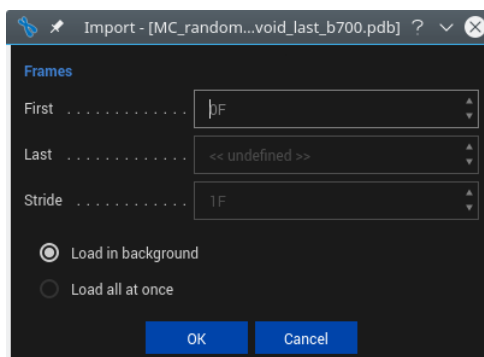
Opens project saved as *.qcs* file.



Import...

Ctrl+Shift+O

Imports new external file into current project. Only two file formats are supported: *.pdb* for importing molecular data and *.xvg* for importing charts. Aforementioned files can be compressed with **gzip**, but since archives do not support random access, animation may be significantly slower.



Parameters **First** and **Last** represent indices of first and last frame to be imported, respectively. If **Last** is set to the special value **<<undefined>>**, then new frames will be read until end of file is reached. Parameter **Stride** specifies the distance between consecutive simulation frames in the underlying file.

Radio buttons below allow user to specify the caching policy. The first option (which is the default) means that application will scan the underlying file for a next frame just before displaying it. It results in an immediate import, but later the animation may be jerky (especially for large stride). The second option forces application to cache offsets to all frames at the same time. When selecting this option one may have to wait some time to let the application scan the whole file (especially when its size is significantly large), but then the animation will be smooth.

Application accepts the latest version of standard *.pdb* file format. See [Protein Data Bank Contents Guide](#) for details. Each frame must be enclosed between corresponding **MODEL** and **ENDMDL** records. Coordinates of each atom are presented by **ATOM/HETATM** record. The **CONNECT** records specify connectivity between atoms for which coordinates are supplied. All other record types are ignored.

Application accepts also standard *.xvg* file format generated by various **GROMACS** analysis utilities. It can be directly used in many graphing software packages including **Grace**, **gnuplot** and **MS Excel**. Each data series must be introduced with **Grace** command `@s<number> legend "<name>"`. Series enumeration starts from 0. All other lines starting with special characters **#@&** are ignored. Lines that do not start with a special character are assumed to present data for consecutive simulation frames. Parser ignores therefore the first column, which usually should provide a timestamp.



Save

Ctrl+S

Saves active project as *.qcs* file.



Save as...

Ctrl+Shift+S

Asks for new file name and saves active project as *.qcs* file.



Quit

Alt+F4

Quits the application. If there are some unsaved changes in any active project, a dialog will ask if you want to save them. **Cancel** returns to the program.

## 2.5 Menu Edit



Project Settings...

Ctrl+D

Displays [Project Settings](#) in [Attribute Manager](#).

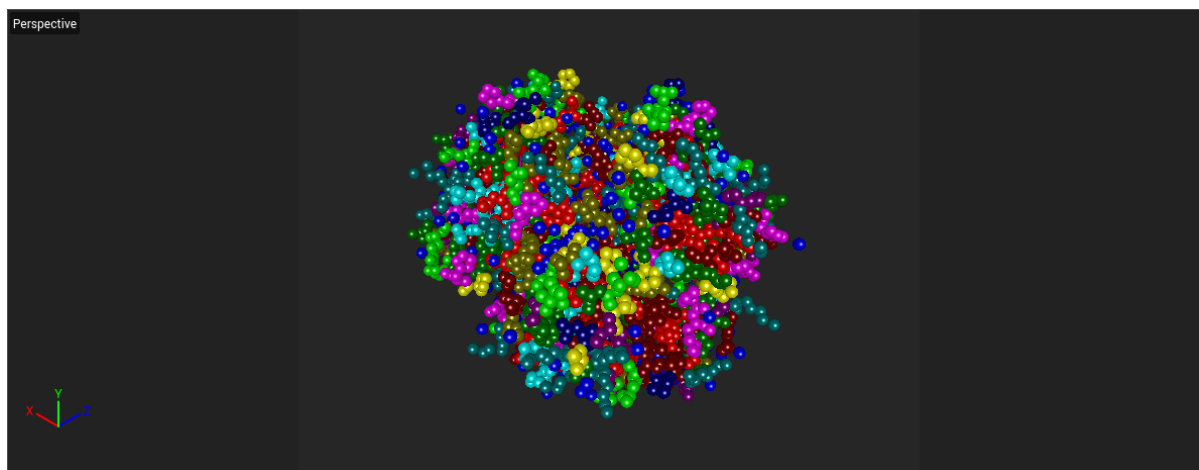


Preferences...

Ctrl+E

Displays [Preferences](#).

## 2.6 Menu View



The only application's viewport has its own display settings. This menu gives an overview of them.

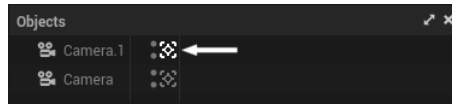
On the main toolbar there are three icons. If you click and hold the viewport, you can move or rotate the camera – dependent on the selected tool. Viewport is rotated along camera's orthographic axis.

## 2.6.1 Cameras



### User cameras

To associate a [camera](#) with view so that it looks through it, select one from this submenu.



### Default camera

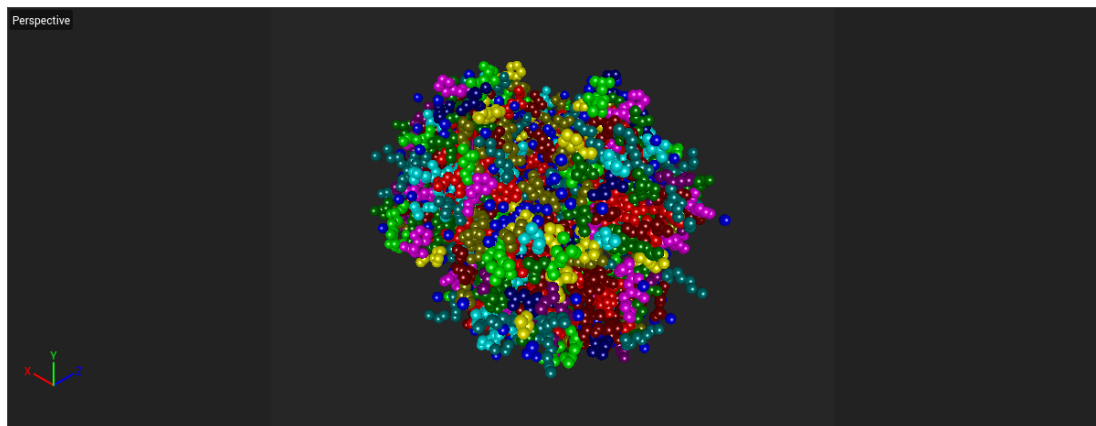
This action associates editor camera with view.

Below you can choose a projection mode for camera. Currently there are only two projections available.



### Perspective

Default projection imitating real camera.

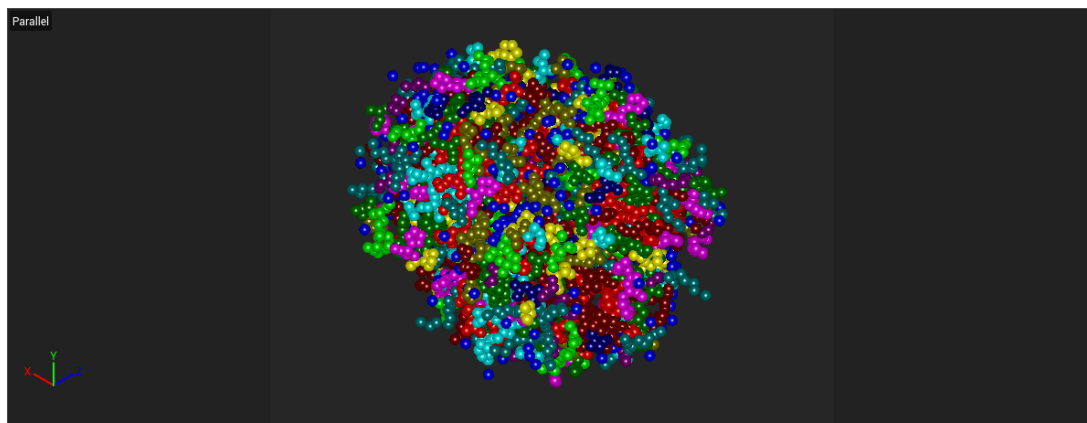






## Parallel

Orthogonal projection popular for technical purposes.

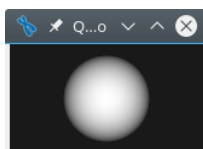


### 2.6.2 Options



#### Default light...

Opens **Default Light** manager. Using this manager you can quickly light the scene from any angle by simply dragging the shaded sphere.



#### Configure...

Shift+V

Displays [Viewport](#) in [Attribute Manager](#).

## 2.7 Menu Create

This menu enables user to create all types of objects. Currently only user cameras are supported. Other indispensable objects like layers, chains, residues and atoms are created automatically when simulation file is loaded.

Object properties can be viewed and edited in [Attribute Manager](#).

### 2.7.1 Camera Object

#### General

Cameras are important part of every visualization software, as they specify how a 3D scene is displayed on a 2D viewport. Each view has its own default camera, which can not be accessed through [Object Manager](#). All

properties of user cameras can be modified in [Attribute Manager](#).

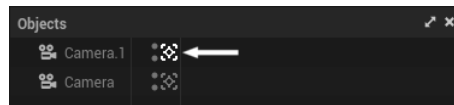
You can create any number of cameras, from which you can view and render the scene. When a new camera is created, it appears as the first item in [Object Manager](#) and inherits all its parameters from current camera. It is displayed in the viewport as a green outline.

Just like any other object, camera has its own coordinate system. It looks at the direction defined by **Z** axis.

## Linking with viewport

To associate a camera with view so that it looks through it, you can do one of the following:

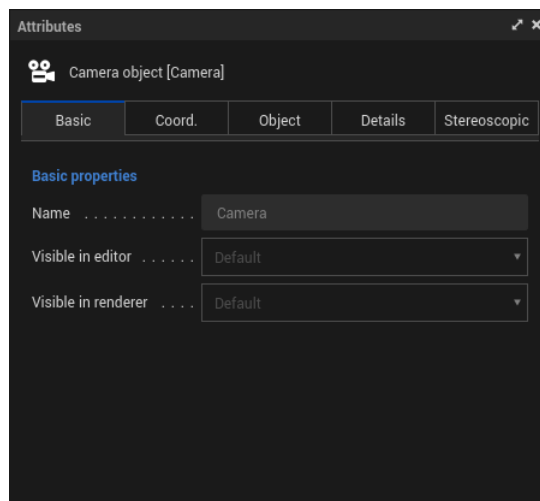
- Click the icon on the right of the chosen camera in [Object Manager](#). To revert back to the default camera just click the icon again.



- Select camera from [View | Cameras | User cameras](#). To revert back to the default camera select [View | Cameras | User cameras | Default camera](#).

While rendering the scene with an external renderer, it will always use the currently linked camera as viewport.

## Camera Object: Basic



### Name

You can define a (not necessary unique) name for every object displayed in [Object Manager](#).

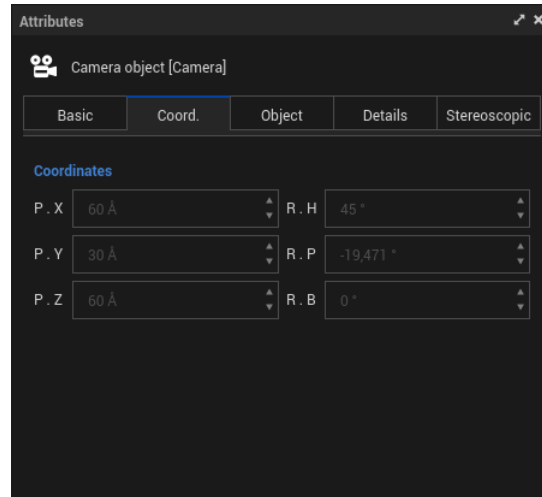
### Visible in editor

Specifies if the object is visible in viewport. It does not affect rendered image.

Visible in renderer

Specifies if the object is visible in rendered image. It does not affect viewport.

## Camera Object: Coordinates



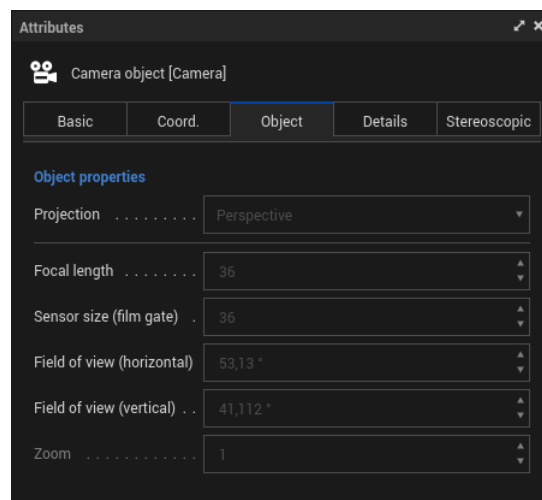
P

Position relative to global coordinate system.

R

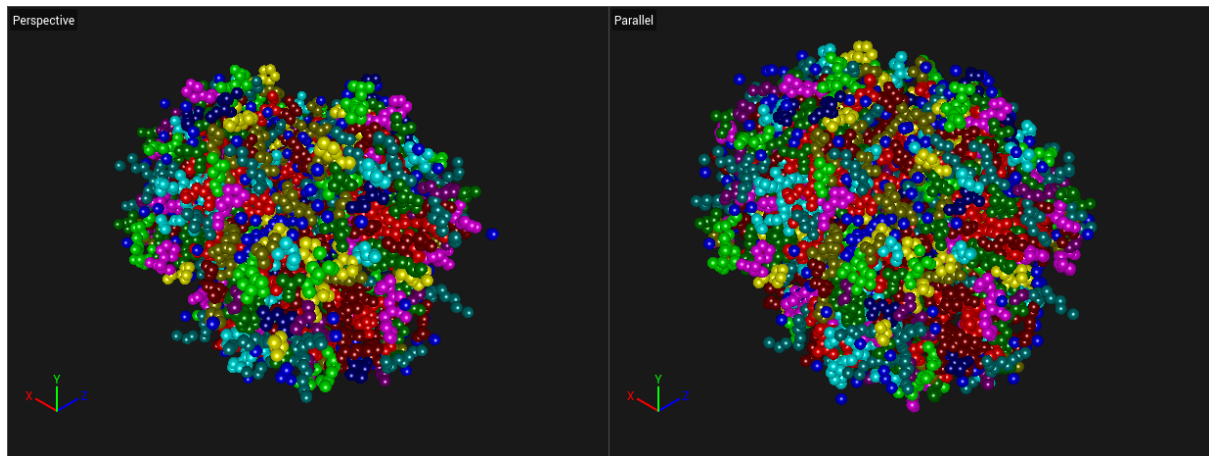
Euler angles relative to global coordinate system.

## Camera Object: Object properties



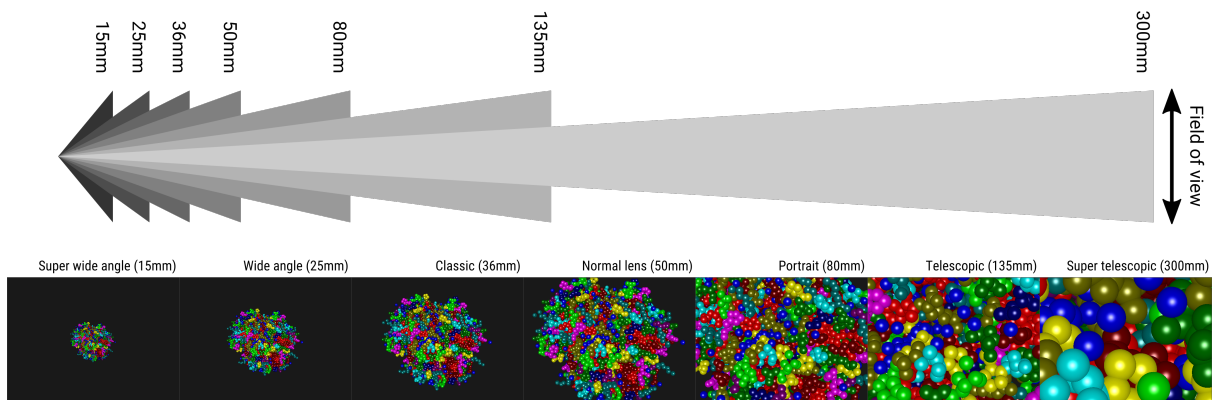
## Projection

You can choose any type of projection from the given list. By default it is a central projection from camera's position.



## Focal length

In photography longer focal length leads to higher magnification and narrower angle of view. Conversely, shorter focal length leads to lower magnification and wider angle of view.

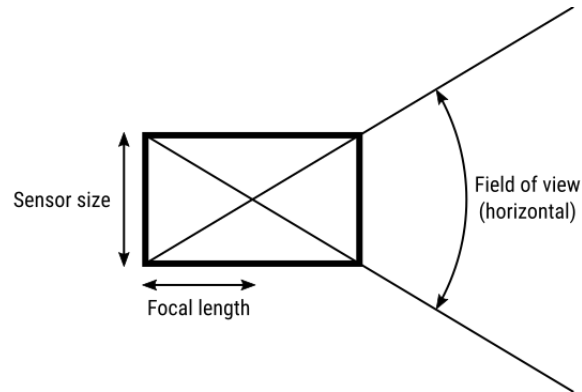


## Sensor size

In a real camera it specifies the size of film on which the light falls, in most cases equal to 36mm. Since it is a technical parameter, it should be constant.

Field of view (horizontal)  
Field of view (vertical)

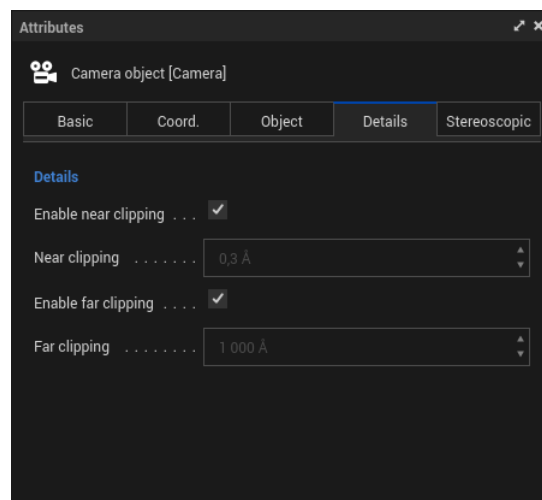
Field of view corresponds to horizontal and vertical angle captured by the camera. It is bounded to focal length and sensor size by the following scheme:



Zoom

Scaling factor available only for parallel projection.

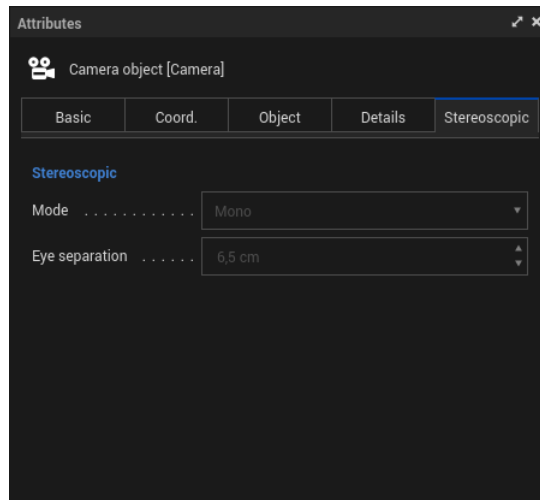
## Camera Object: Details



Enable near clipping  
Near clipping  
Enable far clipping  
Far clipping

Position of near and far clipping planes, in front of which (near clipping) or behind which (far clipping) objects are not displayed. Clipping can not be disabled due to limitations of OpenGL.

## Camera Object: Stereoscopic



### Mode

- *Mono*  
Normal camera without stereoscopy.
- *Symmetrical*  
Use this mode to render Omni-Directional Stereo (ODS) designed for VR viewing with a head-mounted display. For more detailed description see <https://developers.google.com/vr/jump/rendering-ods-content.pdf>.
- *Left / Right*  
Use this mode to render only one corresponding part of ODS image.

### Eye separation

Distance between left and right camera. Default value reflects the average distance between human's eyes.

## 2.8 Menu Select



Rectangle selection

0

Select all object visible within a rectangle drawn by mouse pointer.



Lasso selection

8

Select all object visible within a path drawn by mouse pointer.



Select all

Ctrl+A

Select all object on the active scene.

## 2.9 Menu Tools



Move

Moves the active camera along the plane orthogonal to its direction vector.



Rotate

Rotates the active camera around the current pivot point.



Scale

Moves the active camera along its direction vector, effectively scaling the view.



X-Axis / Heading

X

When checked, active camera can move along **X** axis. Otherwise this coordinate is fixed. This option can be useful in combination with **Move**, **Rotate** and **Scale** tools.



Y-Axis / Pitch

Y

When checked, camera can move along **Y** axis. Otherwise this coordinate is fixed. This option can be useful in combination with **Move**, **Rotate** and **Scale** tools.



Z-Axis / Bank

Z

When checked, camera can move along **Z** axis. Otherwise this coordinate is fixed. This option can be useful in combination with **Move**, **Rotate** and **Scale** tools.

## 2.10 Menu Animate

This menu contains mostly functions from [Animation toolbar](#). Nevertheless there are some advanced options exclusive for this menu.

### 2.10.1 Creating keyframes

**QChromosome 4D Studio** offers two ways of creating keyframes:

1. Record active objects

## 2. Autokeying

Both methods are described below. Only parameters of the active camera are recorded, since positions of particles are specified in underlying simulation file and cannot be modified by the user.



### Record active objects

F9

This icon is located on [Animation toolbar](#). It records position and rotation of active camera and saves it as a new keyframe. To create animation, one should move the time slider to the desired position, adjust the parameters of the active camera and click **Record active objects** button. This can be repeated as many times as needed.



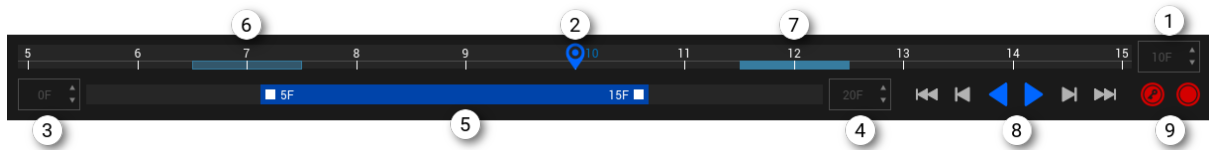
### Autokeying

Ctrl+F9

This icon is located on [Animation toolbar](#). When active, it automatically records position and rotation of active camera without the need to press any button. To create animation, one should move the time slider to the desired position, adjust the parameters of the active camera, then move the time slider to the next position etc. All keyframes are recorded automatically.

## 2.10.2 Animation toolbar

The **Animation toolbar** contains all the navigation buttons. It consists of following elements:



1

### Document time

This control enables user to manually set the current frame number. See [Project settings](#) for details.

2

### Current frame marker

You can drag the marker or simply click on upper half of the timeline to change the current frame number.

3

### Minimum time

This control enables user to manually set the document minimum time. See [Project settings](#) for details.



## 4 Maximum time

This control enables user to manually set the document maximum time. See [Project settings](#) for details.

## 5 Preview range

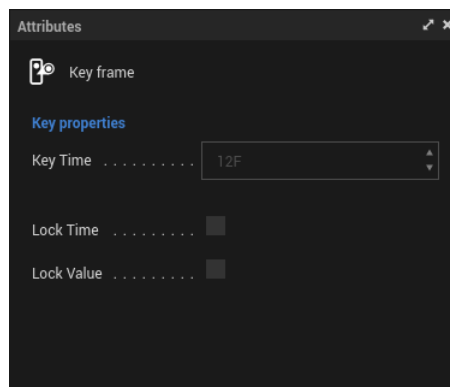
This slider enables user to quickly navigate a long timeline. You can change the preview range by simply dragging the left or right endpoint of the slider. Clicking on the empty space moves the corresponding endpoint to specified location. You can also drag the whole slider without changing its size. See [Project settings](#) for details.

## 6 Keyframe

Each keyframe of an active camera has its corresponding marker on the lower half of the timeline.

## 7 Selected keyframe

Click on a keyframe marker to select it. Selected keyframes can be moved or deleted. Selection can be cleared by clicking an empty space in the lower half of the timeline.



After selecting a keyframe one can edit its properties in [Attribute Manager](#). **Key time** represents the frame number for which the key values were captured. Options **Lock time** and **Lock value** make corresponding parameters read-only and protect them from being overwritten by any user action.

## 8 Navigation panel

These buttons enable user to play an animation. They are described in detail in [Menu Animate](#).

## 9 Recording panel

These buttons enable user to record keyframes or switch to autokeying mode. They are described in detail in [Creating keyframes](#).

### 2.10.3 Menu Animate



Record active objects

F9

See [Creating keyframes](#) for details.



Autokeying

Ctrl+F9

See [Creating keyframes](#) for details.



Play mode

#### **Preview range**

When enabled, restricts the animation from full simulation range to the preview range.

- **Simple**  
Animation stops when either endpoint is reached.
- **Cycle**  
When an endpoint is reached, animation jumps to the other one without changing direction.
- **Ping-Pong**  
When an endpoint is reached, animation changes its direction.



Play forwards / Stop

F7

Plays animation forwards. It can be stopped by selecting this action again.



Play backwards / Stop

Plays animation backwards. It can be stopped by selecting this action again.



Go to start

F6

Jumps to the first frame.



Go to end

F8

Jumps to the last frame.



Go to next frame

G

Jumps to the next frame.



Go to previous frame

F

Jumps to the previous frame.

## 2.11 Menu Render

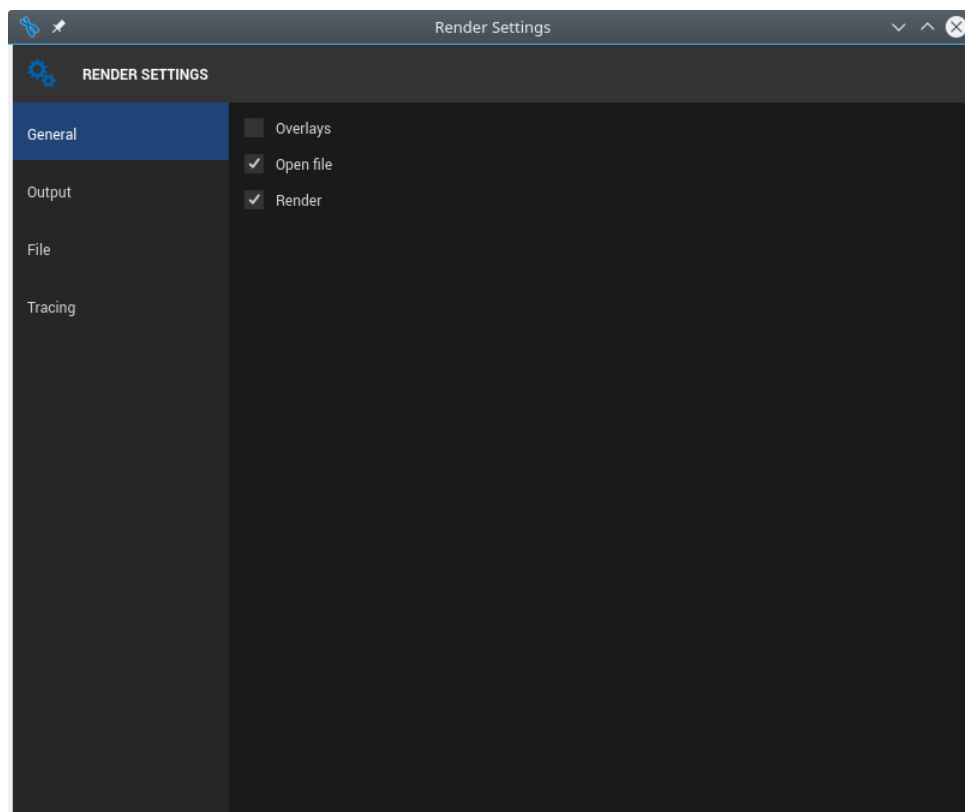
**Menu Render** contains all option you need to render a picture or an animation. Once you defined your presets, they are saved in [Render Settings](#), so you do not have to set them each time.

### 2.11.1 Render Settings

Options in **Render Settings** are used to define image or movie output format.

**Render Settings** can be opened by choosing [Render](#) | **Render Settings...**

#### Render Settings: General



#### Overlays

Adds to every rendered animation frame a timestamp with format specified by *HH:mm:ss.SSS d/d (d F)* pattern string. For a single image it has no effect.

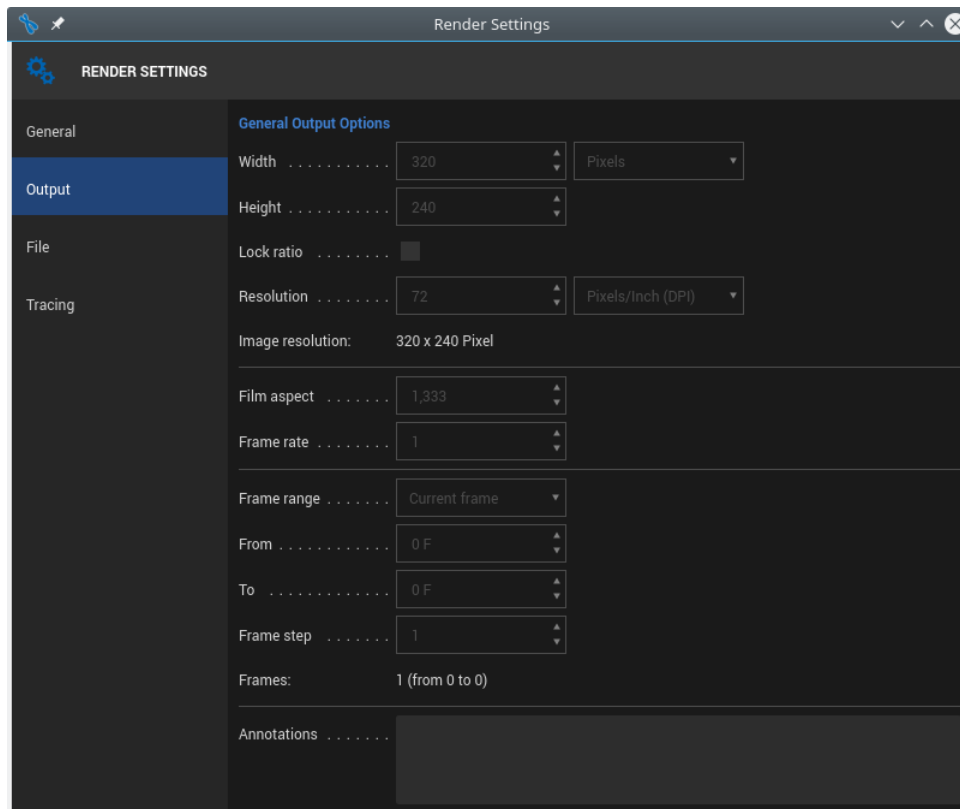
#### Open file

If enabled, file will be opened by a system-default application when the rendering process is finished.

## Render

If disabled, nothing is rendered. This option is useful when you want to generate only the project files, e.g. to be processed by an outside hardware or render farm.

## Render Settings: Output



### Width Height

Define the width and height of an output image. You can select desired unit from the menu on the right. If it is different from **Pixel** (which is the default), image resolution will be calculated taking **Resolution** into account.

### Lock ratio

When enabled, changing width or height modifies the other dimension accordingly to preserve **Film aspect**.

### Resolution

Defines the conversion between device units (pixels) and absolute units (inches or centimeters). It is taken into account only when dimensions of output image are given in absolute units.

## Film aspect

Defines the ratio between width and height of the output image. If **Film aspect** is changed manually, then **Height** will be modified accordingly.

## Frame rate

Sets the frame rate for the movie. It is relative to **FPS** set in [Project Settings](#). The parameter specifies how many physical frames will be rendered to interpolate consecutive logical frames of underlying simulation. It does not affect the speed of animation but rather its smoothness.

actionFrame range

- *Manual*  
If you want to render a custom frame sequence, specify its first and last element in the boxes below. **Frame range** will then automatically change to *Manual*.
- *Current frame*  
Render only a current frame as a single image.
- *All frames*  
Render all frames as an animation.
- *Preview range*  
Render only the [preview range](#) as an animation.

From

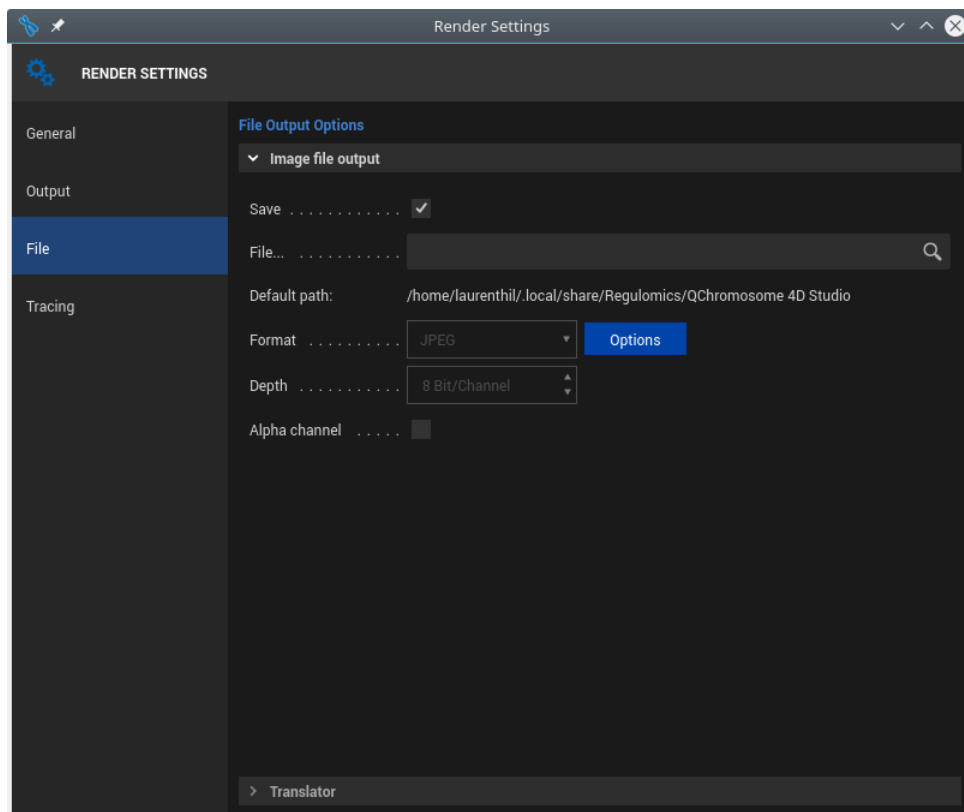
To

You can enter the frame range manually. **Frame range** will then automatically change to *Manual*.

## Frame step

Specifies the stride between consecutive rendered frames. This option is useful especially for test renders, since it gives a rough impression of how the entire animation will look like.

## Render Settings: File



### Save

When enabled, the rendered image or animation is automatically saved on the hard drive.

### File...

You can enter a path to the desired file location or select it with system dialog by clicking on the search icon. If the path is relative, the file is saved in the system-specific application's directory (**Default path**). File extension is deduced automatically and will be stripped if present.

### Format

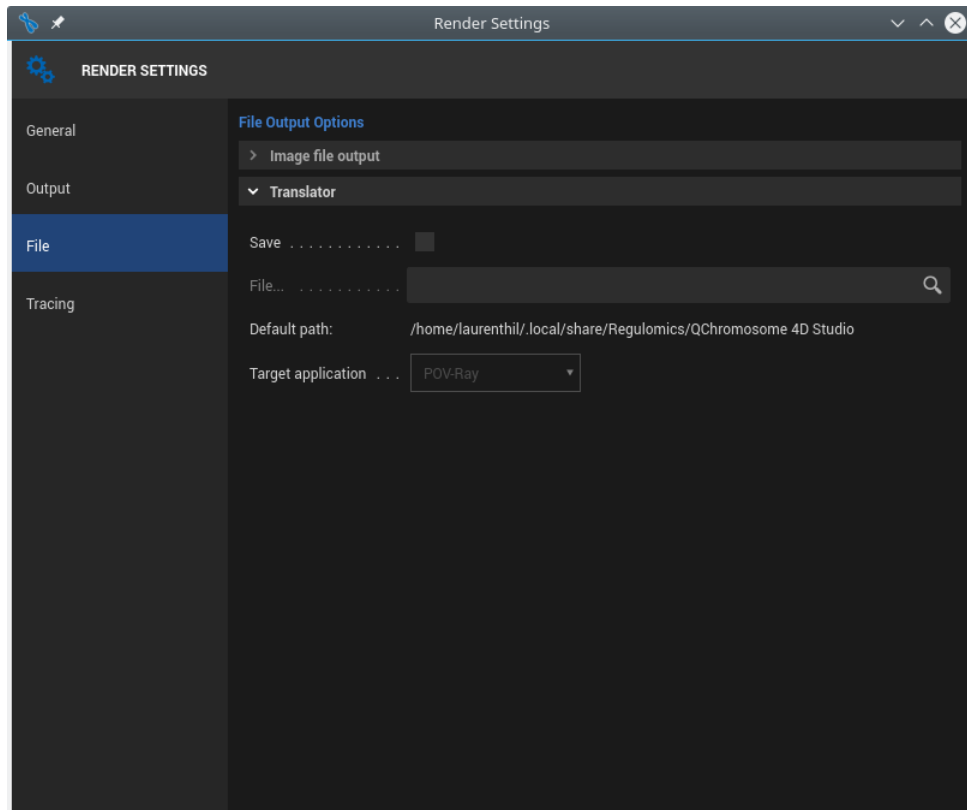
You can select an output format from the list of those supported by **POV-Ray**. Then depending on your choice you can specify some additional settings (e.g. JPEG compression) by clicking on the **Options** button on the right, if visible. See [POV-Ray Documentation](#) for details.

### Depth

Defines the bit depth per color channel. See [POV-Ray Documentation](#) for details.

## Alpha channel

If enabled a premultiplied alpha channel will be rendered. See [POV-Ray Documentation](#) for details.



## Save

When enabled, the project file for selected target application is automatically saved on the hard drive.

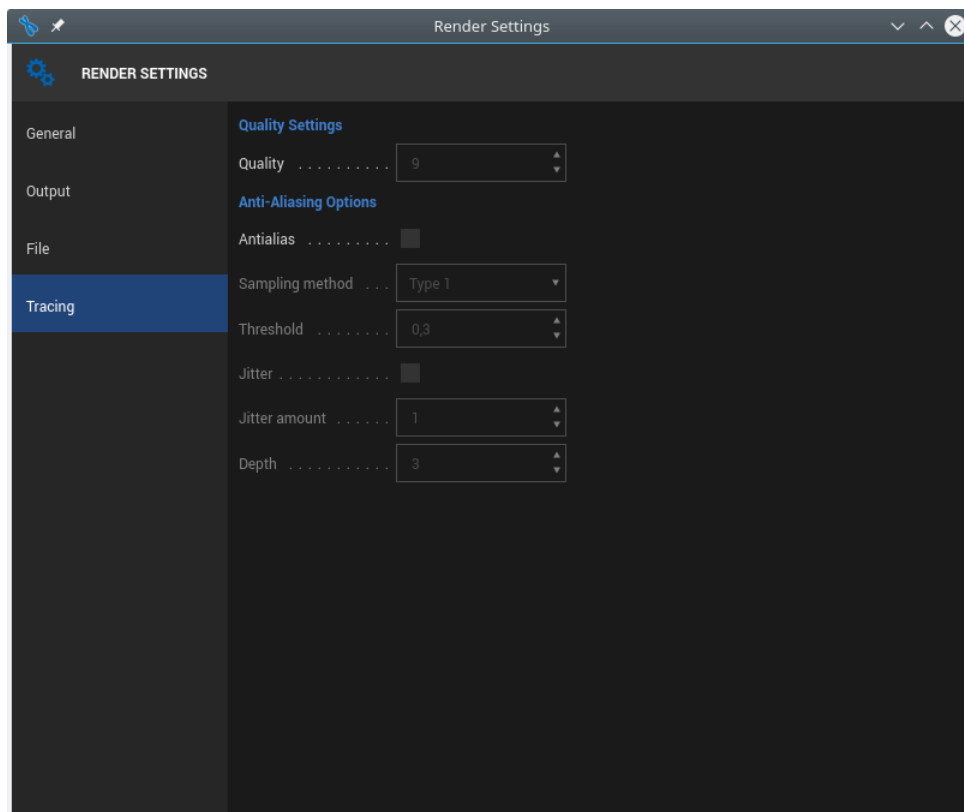
## File...

You can enter a path to the desired file location or select it with system dialog by clicking on the search icon. If the path is relative, the file is saved in the system-specific application's directory (**Default path**). File extension is deduced automatically and will be stripped if present.

## Target application

You can select an application for which the project file will be generated. Currently only **POV-Ray** is supported.

## Render Settings: Tracing



### Quality Settings

Allows to specify the image rendering quality. See [POV-Ray Documentation](#) for details.

### Anti-Aliasing Options

In general, anti-aliasing makes the ray-traced image look smoother. See [POV-Ray Documentation](#) for details.

## 2.11.2 Menu Render



Render to Picture Viewer

Shift+R

Starts rendering process. A progress bar in status bar shows its progress and elapsed time.

If you want to cancel rendering, press **Esc**.

If you want to save the picture or animation, enter a valid path in [Render Settings](#) before launching the process.





Render settings...

Ctrl+B

Opens the [Render Settings](#) dialog window.

## 2.12 Menu Window



Recently closed docks

This menu contains the dialogs you have closed recently. You can reopen a dialog by selecting its name from the list.



Dockable dialogs

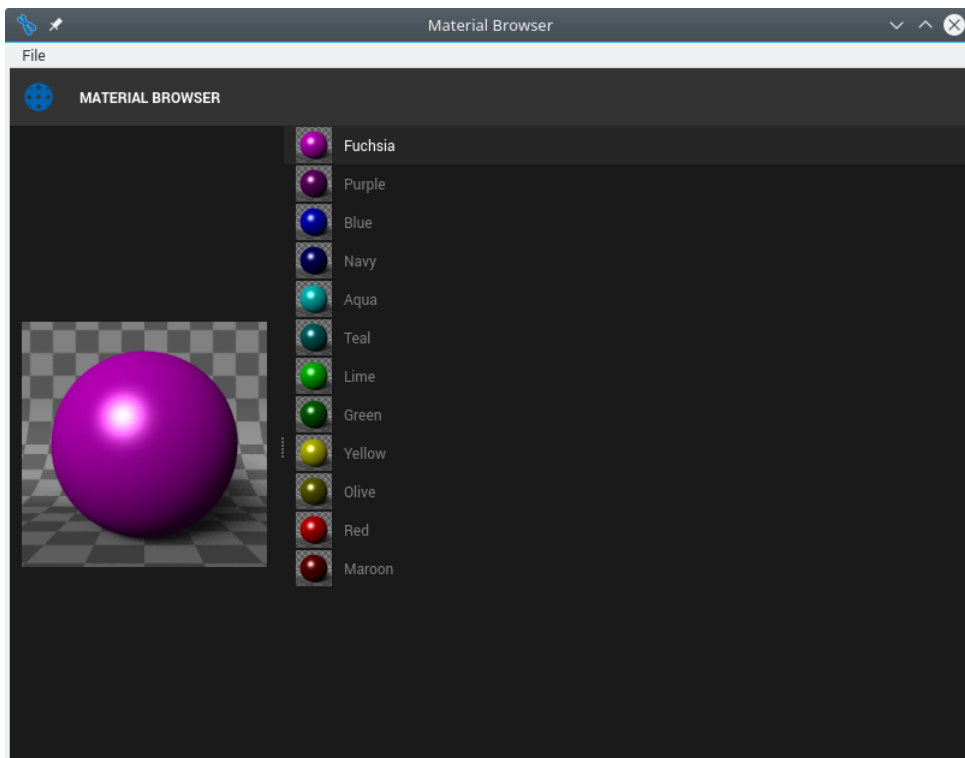
This menu contains the list of all dockable dialogs. Select a dockable dialog from the list to change its visibility. If the dialog is opened, it will be closed. If it is closed, then it will be opened.



Content Browser...

Shift+F8

Opens the [Content Browser](#). It is used to manage project's materials.





Opened projects

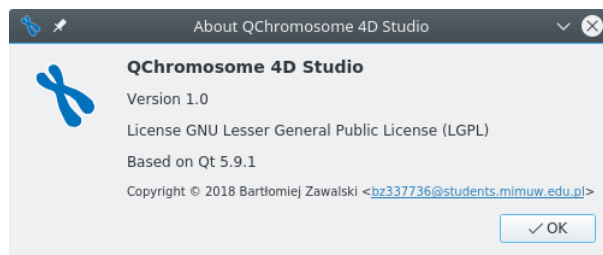
**QChromosome 4D Studio** allows opening any number of projects. They are listed at the end of **Window** menu. To switch between projects just select one of them from the list. Only one project can be edited at a time. Projects appear on the list in the order they were opened.

## 2.13 Menu Help



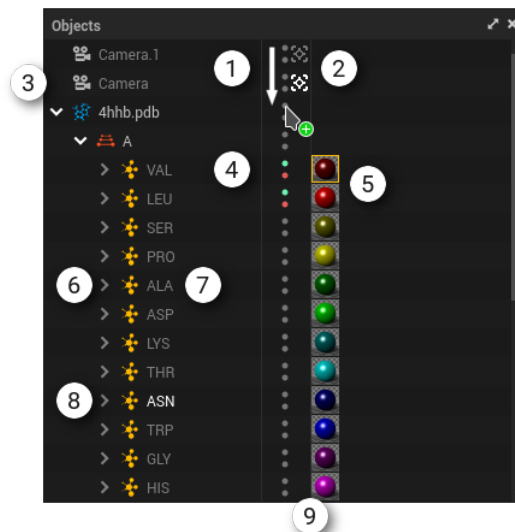
About...

Opens a dialog containing some technical information about **QChromosome 4D Studio**.



## 2.14 Object Manager

The **Object Manager** displays all the objects present on scene including their tags. It consists of following elements:



1

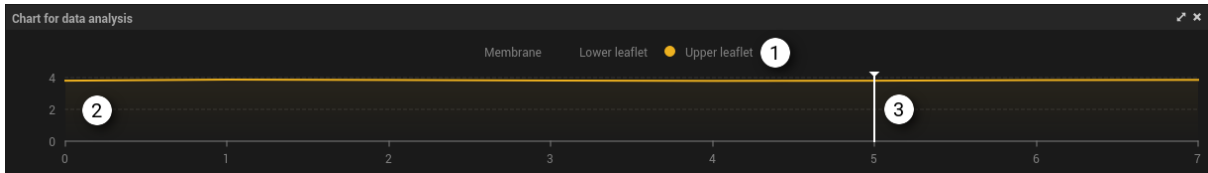
Inherit state

This manager enables user to copy object's editor / renderer visibility to objects above or below.

- 2 Switch current camera  
This control indicates the current camera and enables user to switch it.
- 3 Object present on the scene  
Main purpose of **Object Manager** is to control objects' internal structure and properties such as name, visibility and assigned material tags.
- 4 Visible in editor / renderer  
These controls enable user to change object's editor / renderer visibility.
- 5 Tags  
Right part of **Object Manager** is dedicated for tags management.
- 6 Open / close handles  
To open or close branch, click on the handle on the left of the item.
- 7 Item name  
You can double-click on any item's name to change it. You can also rename an item in [Attribute Manager](#).
- 8 Selected item  
You can select items by clicking them, drag-selecting a region or using arrow keys if any other item is already selected. Hold **Ctrl** key to alter an existing selection. All selected items are highlighted and their ascendants and descendants in the hierarchy are displayed slightly lighter. This allows for example to quickly locate an item selected on the scene. [Attribute Manager](#) always displays common settings of all selected objects.
- 9 Movable splitting line

## 2.15 Chart for data analysis

**Chart for data analysis** displays numerical parameters of molecular dynamics . It consists of following elements:



## 1 Legend

Every data series defined in the underlying file has a corresponding legend entry. You can change its default color by left-clicking the marker and selecting a new one. You can also show / hide an undergraph or even the entire graph by right-clicking the marker and enabling / disabling desired parts.

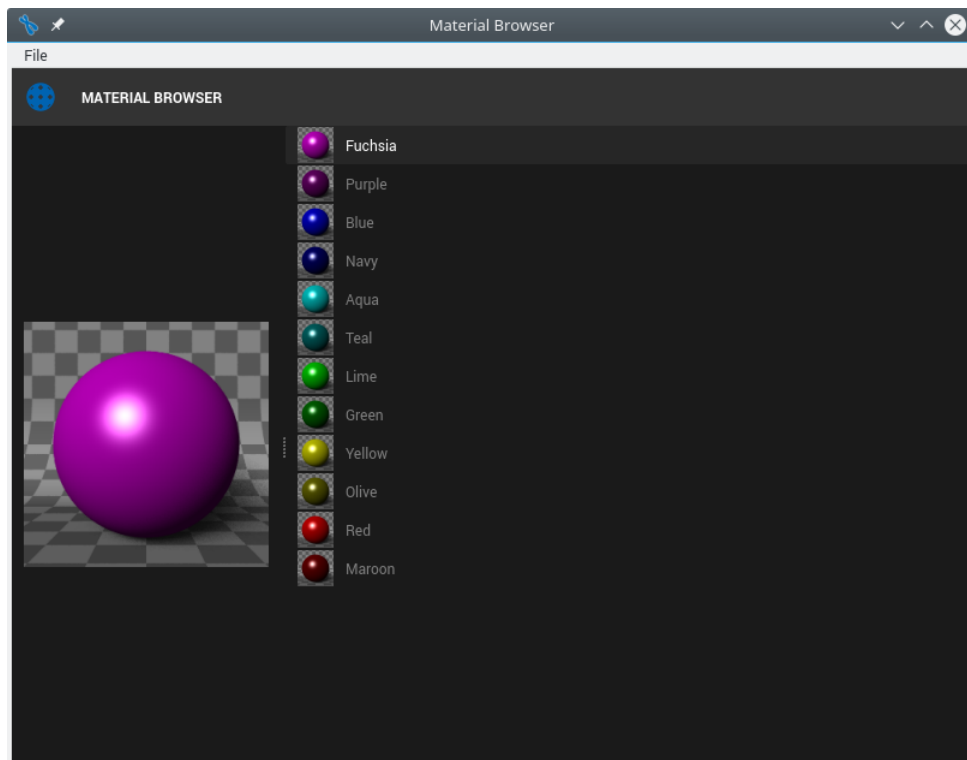
## 2 Chart view

Widget where all charts are displayed.

## 3 Current frame marker

You can drag the marker or simply click on a chart view to change the current frame number.

## 2.16 Content Browser



Using **Content Browser** you can create any type of material to achieve a desired visual effect.

To apply a material, drag it from **Content Browser** and drop on the desired object in [Object Manager](#) or viewport. A new texture tag is automatically created. An object can have multiple texture tags, but only the last one is active.

To edit material, select it from the list. Its settings will be displayed in [Attribute Manager](#).

### 2.16.1 Menu File



New material

Ctrl+N

Creates new material with default attributes. It is placed on the top of material list.



Close manager

Shift+W

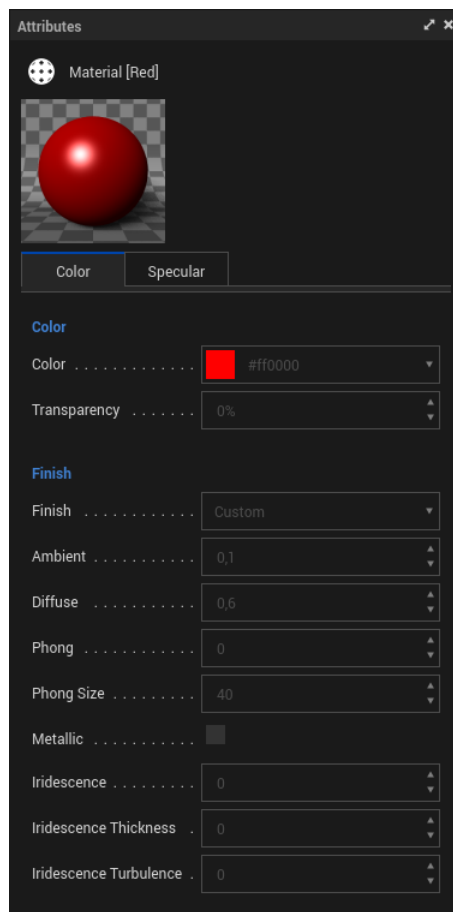
Quits the manager.

### 2.16.2 Material properties

You can edit material properties in [Attribute Manager](#). To open it, select a material from [Content Browser](#) or a texture tag from [Object Manager](#).

All parameters have their counterparts in **POV-Ray** material system.

## Material properties: Color



Color  
Transparency

Define the basic color and transparency of the object. See [POV-Ray Documentation](#) for details.

Finish

Defining a photorealistic material from scratch is very difficult. You can however choose a preset from the list of most common surfaces. See [POV-Ray Documentation](#) for details.

Ambient

Allows to specify the amount of ambient light. See [POV-Ray Documentation](#) for details.

Diffuse

Allows to specify the amount of light reflected via diffuse reflection. See [POV-Ray Documentation](#) for details.

Phong  
Phong size

Allows to specify the amount of Phong highlight on the object. See [POV-Ray Documentation](#) for details.

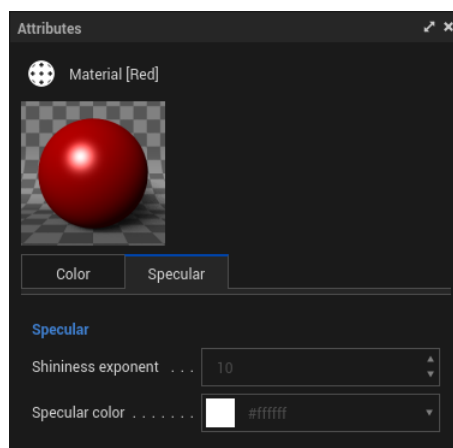
Metallic

This keyword indicates that the color of the highlights will be calculated by an empirical function that models the reflectivity of metallic surfaces. See [POV-Ray Documentation](#) for details.

Iridescence  
Iridescence thickness  
Iridescence turbulence

Simulates the effect of light on surfaces with a microscopic transparent film overlay. See [POV-Ray Documentation](#) for details.

## Material properties: Specular



Shininess exponent  
Specular color

Allows to specify the amount of specular highlight on the object. Currently it is not used by **POV-Ray**.