3D image viewer

Molcer

ver. 1.7

White Rabbit Corporation

WhiteRabbit

Index

1. Introduction

What is Molcer? What can it do for you?

What is 3D image viewer Molcer?

Molcer is software to view 3D objects.

Features

Import

Half or quarter size reading for huge data.

View

Show surface view of 3D objects (Surface Rendering).
Show penetrated view of 3D objects (Volume Rendering).
Show, hide and change rendering type and color by each unit (Main Control).
Show scale bar.
Easily control clipping plane to show section.
Rotate / Move / Scale 3D objects.
Show multiple 3D objects alongside, synchronize them.

Export

Voxel data export as a sectional image sequences (Voxel export)
Polygon data export with a STL / OBJ / glTF / glb format file (Polygon export)

2. Basic Operation

How to open a Molcer file

There are four different ways to open the file;

Double-click the Molcer File (file extension;".mol").
Drag and Drop the Molcer File to the icon of Molcer application.
Start the Molcer application. Go to the "File" menu and choose "Open", then select Molcer File.
Start the Molcer application. Drag and Drop the Molcer File to the screen.

Open Sequential Images

Select "File (F)" > "Open Sequential Images (F)" in menu bar, and dialog below appears.
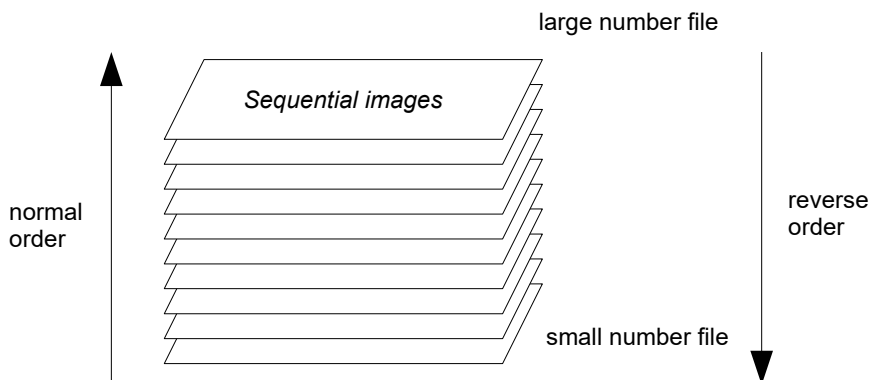
Press "Select Data", and open folder contains sequential images, then choose one of them. Press "OK" to draw 3-Dimensioned objects.

Available file format:
jpg, png, bmp, tif(8bit,16bit), DICOM. DICOM without extension is also available. Data bit must correspond when opening two data.
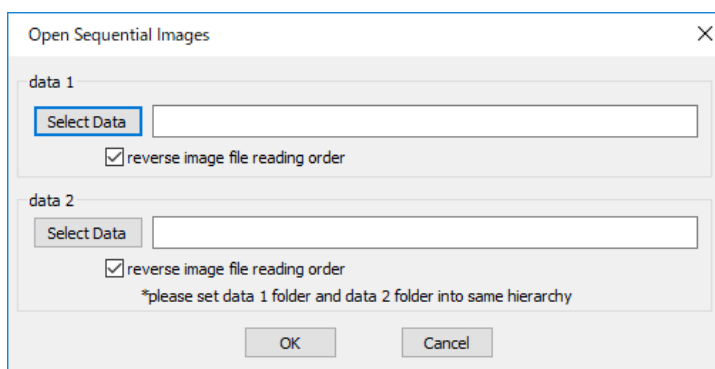

If "reverse image file reading order" is checked, sequential images are read by reversed order.

If sequential image in folder without size setting file selected, Data Preference dialog opens. See "5.9 Data Preference" about Data Preference.

Reverse order read object is drawn as mirror image.

Horizontal Mirror Image ⟷

Front / Back Mirror Image ⇕

reverse order read

Vertical Mirror Image ⇕

Rotate ↑

Rotate ⟵
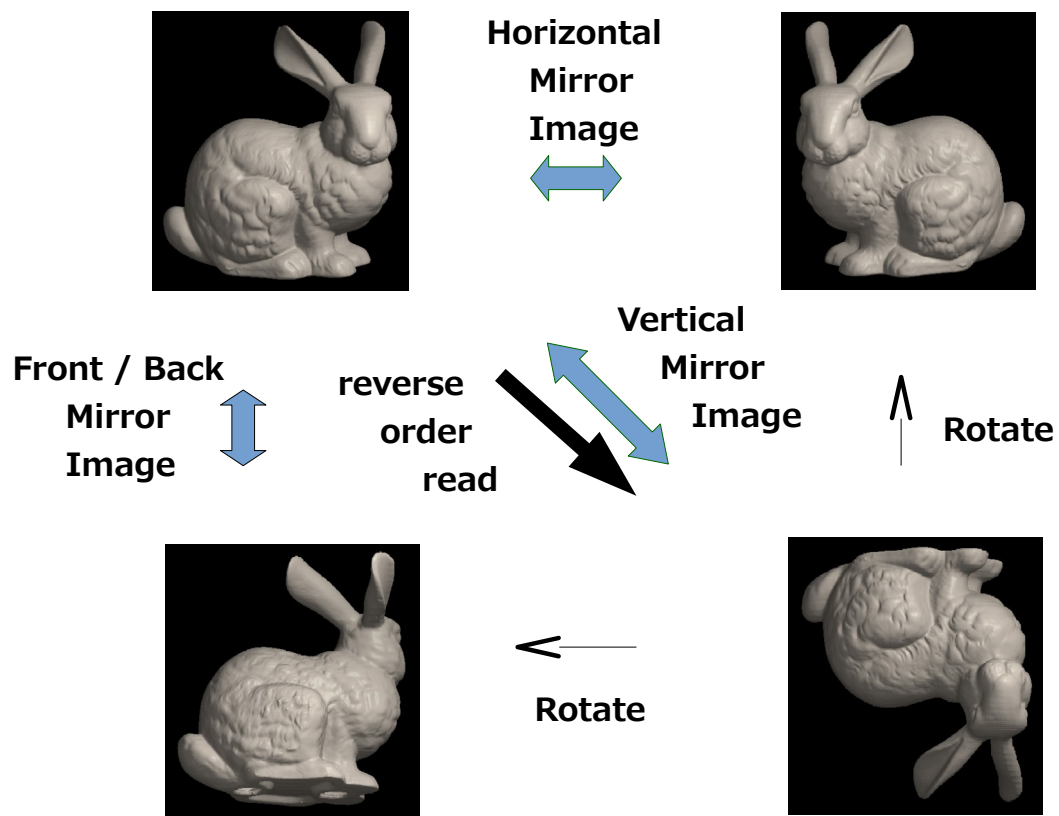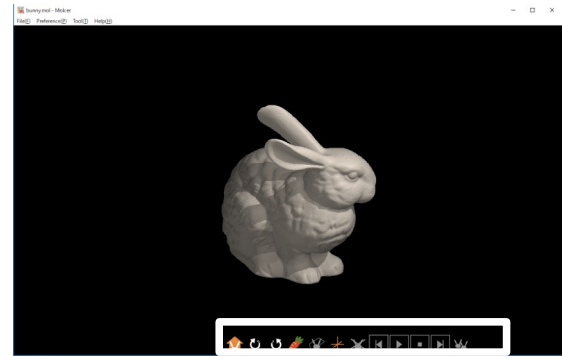
Overwrite molcer file

Select "File (F)" > "Overwrite molcer file (W)" in menu bar, and you can overwrite molcer file only.

Control by buttons on the screen

After opening a file, the screen right will be displayed. All control buttons line up at the bottom, inside the white rectangle.

This is an enlarged image of the white rectangle interior. Each button's explanation is described below (function keys are also usable).

(1) Home button — Initialize 3D object's position to home. (F2 key)

(2) Rotation buttons — Rotate 3D object clockwise (F3 key). / counterclockwise (F4 key).

(3) Whole/cut-off view switch button   (F5 key)

Whole view	Whole object is shown. Change to the cut-off view.
cut-off view	Cut-off object is shown. Return to the whole view.

(4) Switch the control target during cut-off view button   (F6 key)

target is object	You can control cut-off object. Section is fixed. Target will change to clipping plane.
target is clipping plane	You can control clipping plane and change section. Object is fixed. Target will return to object.

(5) Show/Hide Rotation Center button   (F7 key)

Rotation Center is not changeable	Rotation Center appears.
Rotation Center is changeable	You can change Rotation Center by click. Rotation Center hides.

(6) Delete button — Deletes the control target object when it is available.

(7) Animation control buttons — These buttons are available on time series object. Animation playback, stop, pause and frame-by-frame.

(8) Friend button — When the button is available, the current object can switch to another one. (F8 key)

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Control by mouse

whole view / cut-off view (target is object)

Mouse can control whole or cut-off 3D objects: Movement, rotation, and scaling.

Rotate an object;
Press the left mouse button and drag the mouse. To continue the rotation, simply release the left mouse button.

Rotate an object clockwise / counterclockwise;
To rotate clockwise, press and hold the left mouse button, and rotate mouse wheel forward.
To rotate counterclockwise, rotate mouse wheel backward.

Move an object up, down, left or right;
Press the right mouse button and drag the mouse. The object follows the drag movement.
To continue the movement, simply release the right mouse button.

Scale an object;
To enlarge an object, rotate mouse wheel backward.
To shrink the object, rotate mouse wheel forward.

target is clipping plane

While a 3D object is cut off and target is clipping plane, mouse can also control clipping plane.

Rotate clipping plane;
Press the left mouse button and drag the mouse.
To continue the rotation, simply release the left mouse button.
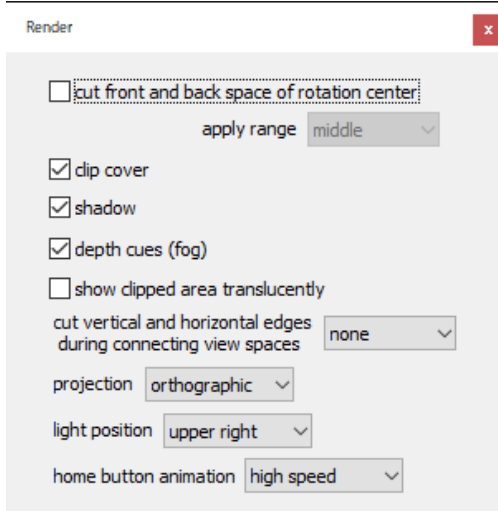
Move clipping plane vertically;
As rotate the mouse wheel, a clipping plane moves vertically.

Full screen display

[F11] key can toggle full screen / normal display.
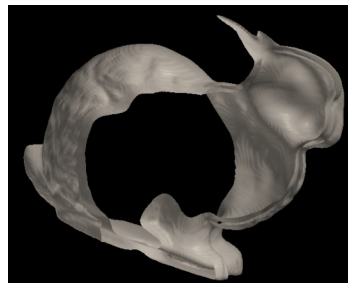
3. "Preference" Menu

3.1. Render

To show Render Preference Dialog, select "Preference (P)" > "Render (R)" in menu bar.
You can change Molcer's render preferences by check boxes and combo boxes.

cut front and back space of rotation center

Show object cutting front and back space of rotation center.

Set degree by [apply] combo box.

clip cover

Cover section of cut-off object. Voxel data would be drawn if the object has it.

By "Unit Preference" in "Main Control", you can invalidate this preference by a unit.


without cover   with cover

shadow

For more reality, you can attach some shadow to the 3D object.
Only available when "clip cover" is checked.

If you check "shadow", most objects have shadows. But some don't.
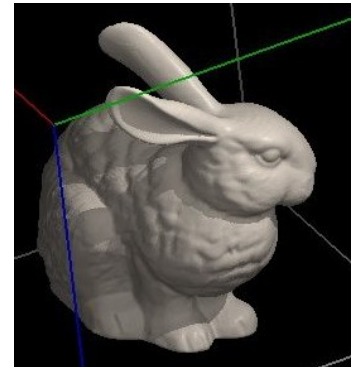Checking "shadow" may obviously reduce drawing speed.

depth cues (fog)

If you check "depth cues"(sometimes called "fog"), you can see the objects as if in the fog (farther points fade into the background) .
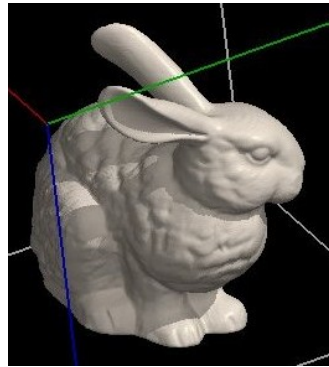
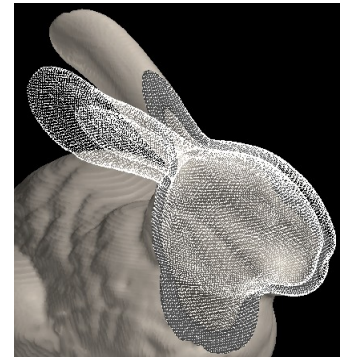without depth cues   with depth cues

show clipped area translucently

Clipped area is drawn in translucent rendering type.

By "Unit Preference" in "Main Control", you can invalidate this preference or change drawing method by a unit.

without clipped area   with translucent clipped area

cut vertical and horizontal edges during connecting view spaces

Objects are shown with all edges cut when "Preference" > "Connect view spaces" menu is checked. Select validity or degree by combo box.

projection

perspective;
The distance increases, the object is drawn smaller.

orthographic;
Object is drawn by constant size regardless of distance, , so you can easily see the object's height, width and depth.

light position

[upper right] [upper left] [lower right] [lower left] are available.

home button animation

Objects play animation when "Home button" is pushed. Select validity or speed by combo box.

3.2. Show Frame

A frame appears in the screen and helps to observe the 3D object, if "Preference (P)" > "Show Frame (F)" menu is checked.

3.3. Fix clipping plane during rotation

If "Preference (P)" > "Fix clipping plane during rotation (O)" menu is checked, object rotates alone while clipping plane is fixed.
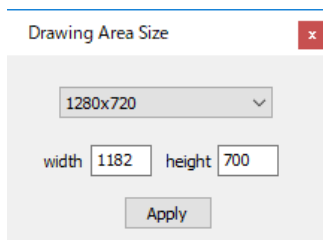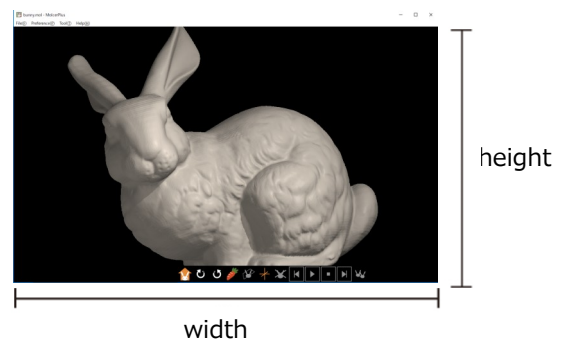Without check, object and clipping plane rotate simultaneously.

3.4. Connect view spaces

If "Preference (P)" > "Connect view spaces (C)" menu is checked, all objects' motion in other view spaces follow manipulation to the selecting object.

3.5. Drawing Area Size

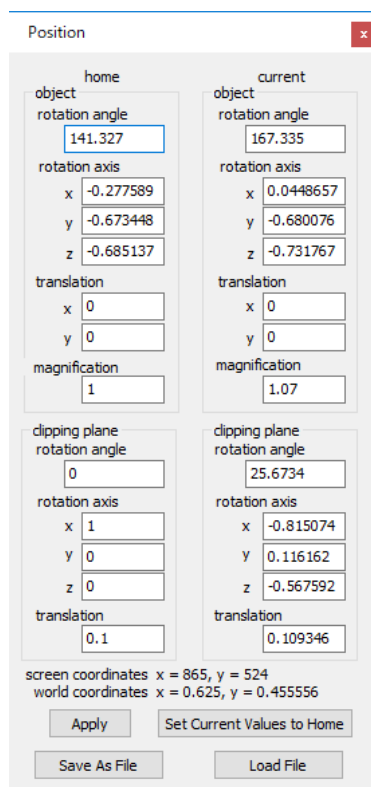Drawing area is between menu bar and control buttons.

To show Drawing Area Size Preference Dialog, select "Preference (P)" > "Drawing Area Size (A)" in menu bar.
Press "Apply" to set width and height by pixel.
"Width" and "height" are updated when real drawing area size changes.

3.6. Position

To show Position Preference Dialog, select "Preference (P)" > "Position (P)" in menu bar.
You can designate positions and angles of object and clipping plane.

Press "Apply" button to apply input home and current values. Current values are updated immediately as object or clipping plane moves. Home values are used when "Home button" is clicked.

Press "Set Current Values to Home" button to overwrite home values by current values.

"Screen coordinates" indicates mouse pointer's position based on coordinate system which has origin point at bottom left corner of drawing area.

Press "Save As File" button to save parameters to file. "Load File" to restore.

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"World coordinates" is expressed by coordinate system that smaller axis ranges from -1 to 1, the other is normalized by smaller axis.
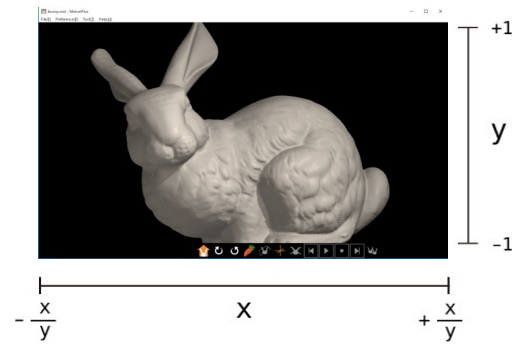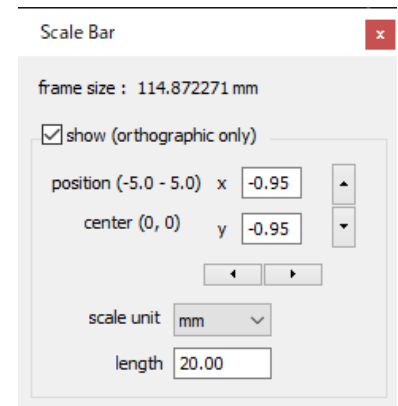

3.7. Scale Bar

To show Scale Bar Dialog, select "Preference (P)" > "Scale Bar (I)" in menu bar.
"Frame size" indicates the length of one edge of the frame shown by "Preference" > "Show Frame" menu.
If you use "scale down in data reading" in "Preference" > "Application" menu, scale down ratio is shown.
Check "show" to show scale bar in the screen.

Move scale bar by inputting position or pressing arrow buttons.
Usable scale units are: nm, um, mm, cm and m.

Scale bar only appears when "projection" is "orthographic" in "Render Preference".

3.8. Application

To show Application Preference Dialog, select "Preference (P)" > "Application (Z)" in menu bar.

If your machine has not enough memory, occasionally memory errors occur.
Check the boxes of "scale down in data reading" to reduce load data size.
Press "OK" button and reopen the file.

4. "Tool" Menu

4.1. Rotation

To show Rotation Dialog, select "Tool (T)" > "Rotation (R)" in menu bar.

You can rotate objects by buttons on the dialog instead of mouse control.
Rotate by any degrees input in "angle" by one click.
If "90" box is checked, rotate by 90 degrees.

5. Main Control

5.1. What is Unit?

3D Object is consist of one or more parts.
The parts are called "Unit".

"Unit" has "Types" below.
"Voxel" :   Voxel data drawn by volume rendering.
"Voxel Surface" :   Voxel data drawn by surface rendering.
"Surface" :   Polygon Surface generated from voxel data.
"STL" :   Polygon Surface generated from STL format file.
"Label" :   Labeled Surface.
"Primitive" :   Primitive Polygon.
and so on.

5.2. Operating Units

"Main Control" shows list of all Units. You can change display / hide, name, rendering type and color of the selected Unit. If you use "scale down in data reading" in "Application Preference", scale down ratio is shown.
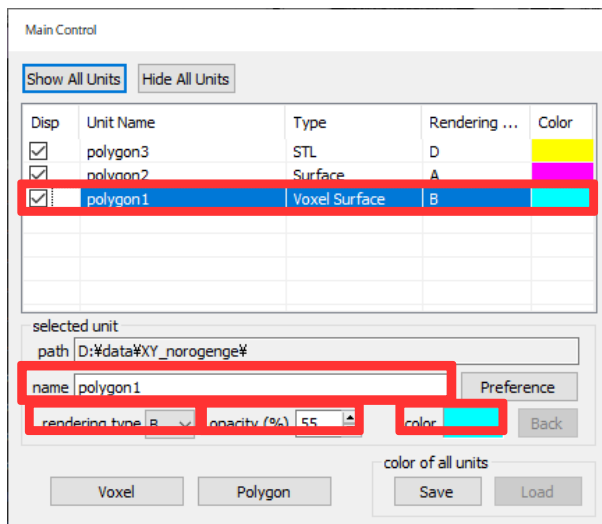
You can control display of Units by the check boxes on the left. "Show All Units" and "Hide All Units" buttons can control all check boxes at once.

Other items will be edited under the list to the selected Unit.

[name] [rendering type] [opacity] [color] applies immediately. "Back" button rewinds [color] to the last one.
[opacity] is available when [rendering type] is B, C or D.

Buttons in "color of all units" box can control all Units' [color] at once. "Save" button to save, "Load" button to load.
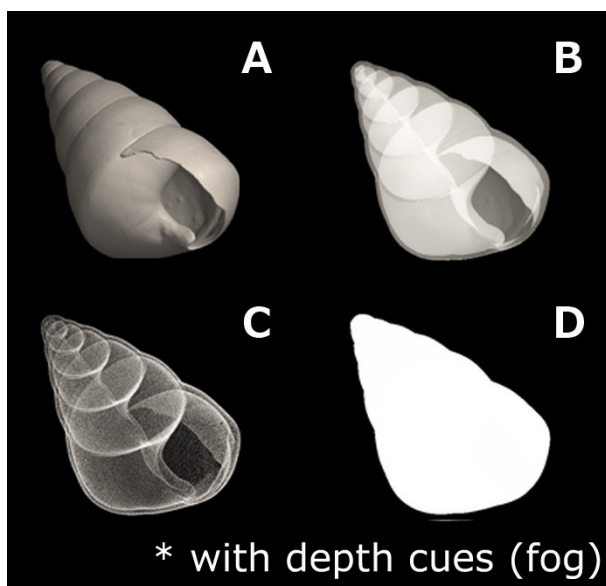
"Voxel Surface" "Surface" and "STL" Units' surface are drawn by assembly of triangles. [Rendering Types] are below.
 A. Triangles are opaque.
 B. Triangles are translucent.
 C. Only triangles' vertexes are drawn translucently. Triangles turning side are emphasized.
 D. Only triangles' edges are drawn translucently. Each triangle will be recognized.
 E. A and D.

* with depth cues (fog)

Enlarged view of "C"


Enlarged view of "D"

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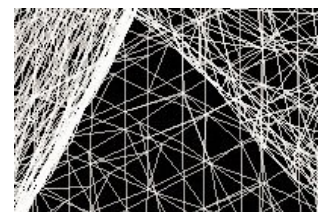
[Rendering Type] of "Voxel" Unit have three types below.

A. Colors are added from back to front (=alpha blending).
B. Use the largest value in added layers (=maximum intensity projection, MIP).
C. Color Transmission Map

5.2.1. Unit Preference (Surface, STL)

Press "Unit Preference" button in "Main Control" while selecting "Surface" or "STL" Unit, and dialog below appears. This section combines explanation for same functions of "5.4. Unit Preference (Voxel Surface)".
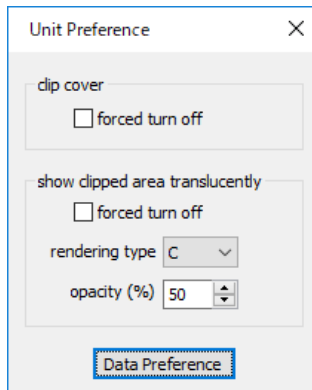

"Forced turn off" in "clip cover" box invalidates designation in "Render Preference" for the selected Unit.

"Forced turn off" in "show clipped area translucently" box invalidates designation in "Render Preference" for the selected Unit.
"Rendering type" and "opacity" specify drawing method of clipped area.

5.2.2. Unit Preference (Voxel Surface)

Press "Unit Preference" button while selecting "Voxel Surface" Unit, and dialog below appears. See also "5.3. Unit Preference (Surface, STL)" for some undescribed functions.
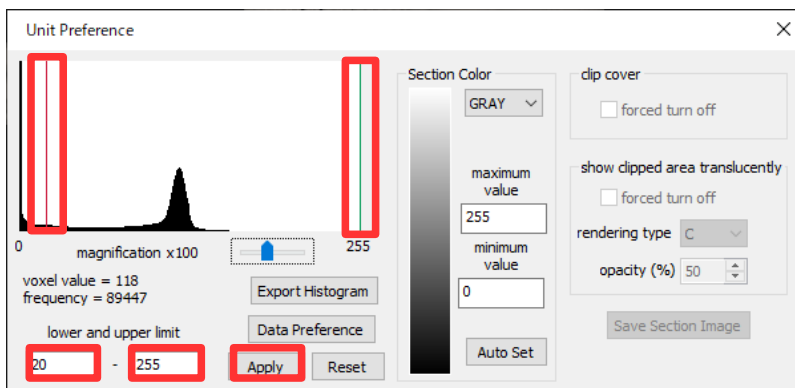
Press "Apply" button after inputting "upper limits" or "lower limits" to change isosurface value range.
You can also change "lower limits" or "upper limits" by dragging bars on histogram graph shown on the left.
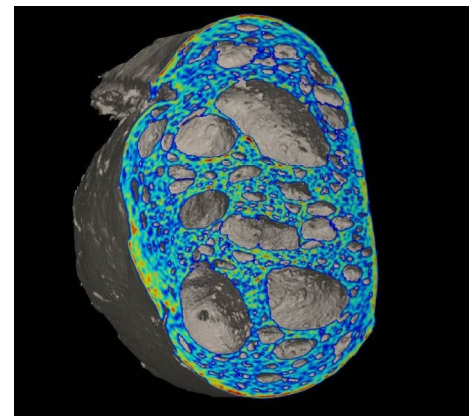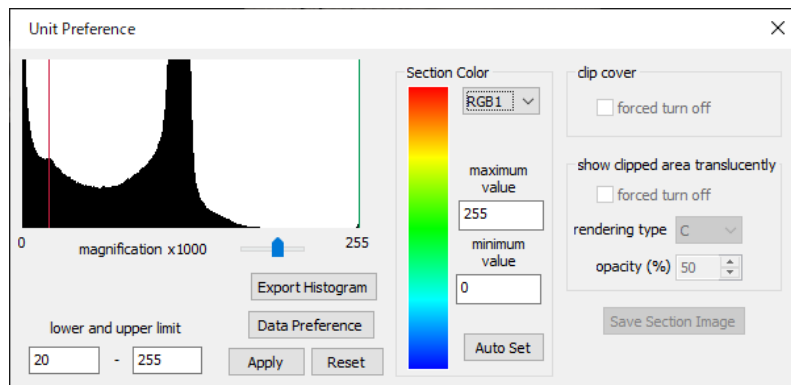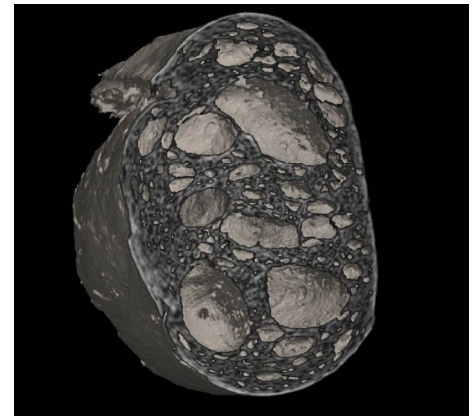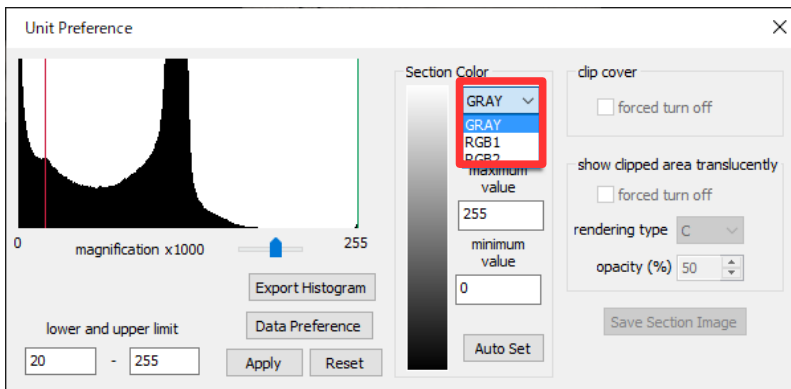"Upper limits" is green bar and "lower limits" is red bar.
Press "Reset" button to abandon all changes.

Histogram graph of voxel value is shown on the left.
Graph height is normalized by maximum frequency value.
Usable magnifications range from one to one million.

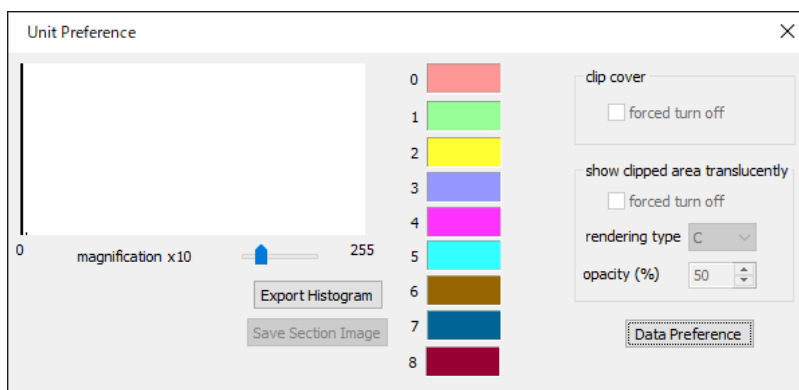Press "Export Histogram" button to export histogram values to a text file.

You can set pseudo color on section by [Section Color]. Select one of three color scales. Section will be colored.

Press "Auto Set" to adjust "maximum" and "minimum" value to "upper limits" and "lower limits" respectively.

See "5.9. Data Preference" about "Data Preference".

5.2.3. Unit Preference (Label)

Press "Unit Preference" button in "Main Control" while selecting "Label" Unit, and dialog below appears. You can change each label color.
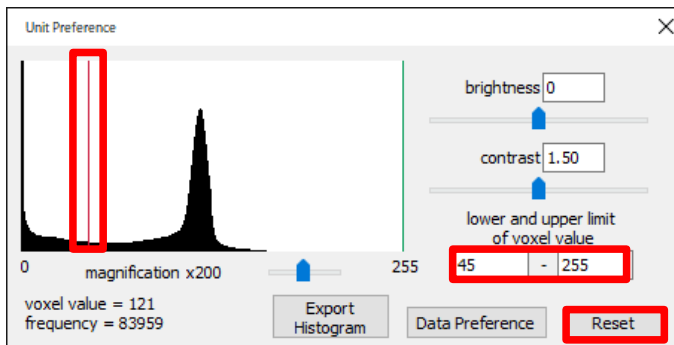

Press "Export Histogram" button to export histogram values to a text file.

See "5.9. Data Preference" about "Data Preference".

5.2.4. Unit Preference (Voxel)

Press "Unit Preference" button in "Main Control" while selecting "Voxel" Unit, and dialog below appears.

Histogram graph of voxel value is shown on the left.
See also "5.4. Unit Preference (Voxel Surface)" about histogram.
You can change "brightness", "contrast", "lower and upper limits of voxel value" freely.
You can also change "lower and upper limits of voxel value" by dragging bars on the histogram graph.
Press "Reset" button to abandon all changes.

5.2.5. Unit Preference (Voxel Color Transmission Map)

Press "Unit Preference" button in "Main Control" while selecting "Voxel" Unit whose "rendering type" is C, and dialog right appears.

This dialog provides transmission map settings. See also "5.4. Unit Preference (Voxel Surface)" for some undescribed functions.

"limits of voxel value"
Set by three horizontal slide bars below, upper, middle and lower. Slide bars move in the range that do not violate the order, lower <= middle <= upper. You can also designate each voxel value by inputting.
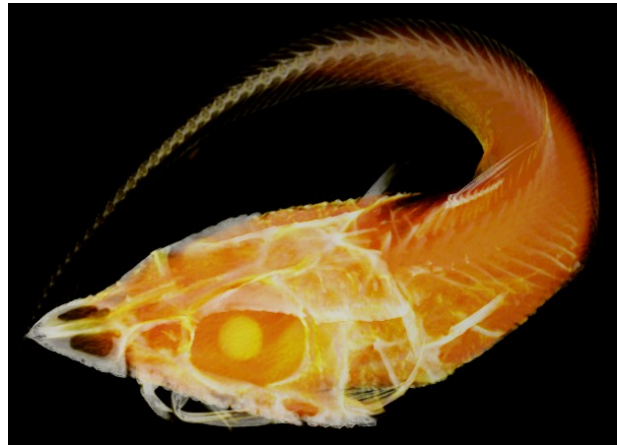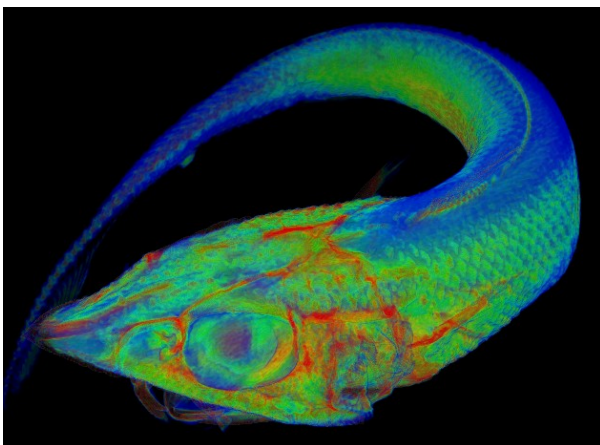
"opacity maximum"
Set by vertical slide bar right. You can also designate value by inputting.
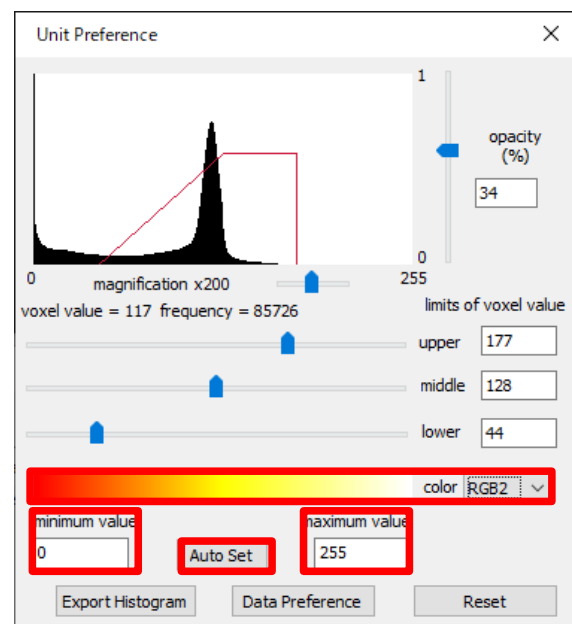
"color"
Select one of three color scales by combo box. Designate "maximum" and "minimum" value by inputting.
Press "Auto Set" button to adjust "maximum" and "minimum" value to the unit respectively.
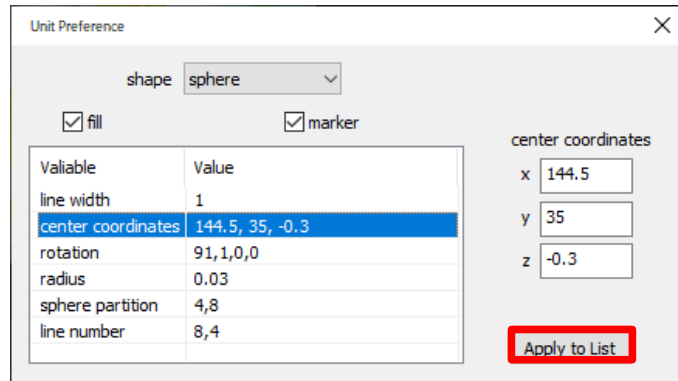
5.2.6. Unit Preference (other)

Press "Unit Preference" button in "Main Control" while selecting Unit other than "Voxel Surface" "Voxel" "Surface" "STL" "Label", and dialog like right appears corresponding to "Type".

Changes by combo box or check box apply immediately.
You can edit values in right area by selecting list. Pressing "Apply to List" button updates values.
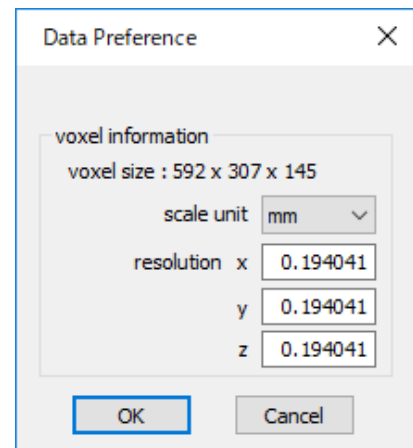
5.3. Data Preference

Press "Data Preference" button on "Unit Preference" dialog of "Voxel Surface" or "Voxel" Unit, and dialog right appears.

If you use "scale down in data reading" in "Application Preference", scale down ratio is shown.

"Voxel size" in "voxel information" box indicates number of voxels for x-, y- and z-axes.
You can manipulate resolutions for each x-, y- and z-axis.
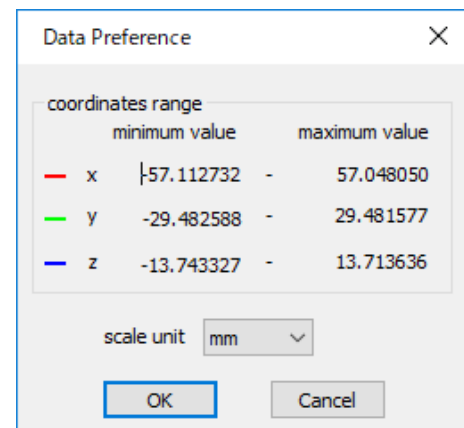Usable scale units are: nm, um, mm, cm and m.

Press "Data Preference" button on "Unit Preference" dialog of "Surface" or "STL" Unit, and dialog right appears.

"Coordinates range" indicates minimum and maximum values of polygon surface data for x-, y- and z-axes.
Usable scale units are: nm, um, mm, cm and m.

5.4. Voxel Export

Press "Voxel" button in "export file" box of Main Control, and dialog below appears.
You can export sectional image sequences with specified corresponding voxel values.
Press "OK" button and select save folder.

5.5. Polygon Export

Press "Polygon" button in "export file" box of Main Control, and dialog below appears.
You can export polygon data with specified file format (STL, OBJ, glTF and glb are available) and magnification.
Press "OK" button and select save folder and save file.

Additional Information

System Requirements

Windows 7 / 8 / 10
1GB of system memory (4GB recommended)
Graphic card that supports OpenGL 3.3 or higher

Contact us

We are waiting for your comments, wishes, bug findings etc...
Please email;
support@white-rabbit.jp
If you inform us of bugs, please add the detailed situation of the error that had occurred.

You can see the latest version of our programs on our website;
https://white-rabbit.jp/en/

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The 3D Rabbit model used in this manual is :
Stanford Bunny
https://graphics.stanford.edu/data/3Dscanrep/
(c)Stanford Computer Graphics Laboratory

The 3D Deep-Sea Fish model used in this manual is :
3D-CT Deep-Sea Creatures (Japanese)
https://www.aori.u-tokyo.ac.jp/project/3D/index.html

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