MARI

USER GUIDE

VERSION 2.5v3

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1 PREFACE

Mari is a creative texture-painting tool that can handle extremely complex or texture heavy projects. It was developed at Weta Digital and has been used on films such as The Adventures of Tintin: The Secret of the Unicorn, District 9, The Day the Earth Stood Still, The Lovely Bones, and Avatar.

The name Mari comes from the Swahili 'Maridadi', meaning 'beautiful' and carrying connotations of 'usefulness'.

About this Guide

This guide provides you with the full details of running and using Mari. You should read the *Getting Started Guide* first for installation and basic usage instructions.

The first part of the guide walks you through the various Mari functions. The tutorials provide comprehensive walk-throughs of all Mari's functions, complete with geometries and associated textures. As you follow the steps in these tutorials, you'll gain a good feel for Mari's user interface and workflow. This, in turn, provides a good working knowledge for creating more complex production projects.

For more detailed information on Mari and its functions, see the accompanying Mari *Reference Guide*.

Contact Customer Support

Should questions arise that this manual fails to address, you can contact Customer Support directly via e-mail at support@thefoundry.co.uk or via telephone to our London office on +44 (0)20 7479 4350 or to our Los Angeles office on (310) 399-4555 during office hours.

2 Customizing the View

In the *Getting Started Guide*, you learned how to control the view in Mari (spinning, panning, rotating, switching to preset views, and so on). You have a choice of how many of these controls work, and how Mari displays the model on screen.

Display Options

You can set:

- how the model rotation works — the model movement speed, friction, and whether it uses momentum (see Appendix A: Shortcuts for model rotation shortcuts).
- the background displayed behind the model — either a color, a gradient, or an image.
- the color for the paintable area (when it displays).
- the quality settings for the display (how much detail to show).
- whether to show the wireframe model, and how to display it.
- in the UV view, whether to show gridlines or labels.

You can also adjust the focus of your canvas by hovering your cursor over the point on the model that you want to focus on and pressing **F**. The canvas centers on that part of the model at the current view size and angle. If the cursor is hovering over the canvas where no part of the model is present, pressing **F** instead brings the entire model to focus.

Lighting

Mari comes with three default modes for **lighting** the model, and optional shadow control:

- **Flat** — a flat, uniform, directionless light.
- **Basic** — basic diffuse lighting without specular.
- **Full** — full lighting with diffuse and specular lighting.
- **Shadows** - toggles whether shadows are displayed or not.

In **Basic** and **Full** modes, you can set custom lights. This lets you control the intensity of the lights from four directions (right, left, front, and top, relative to the model).

Mari only stores custom light settings as part of the project (they cannot be independently saved to a file).

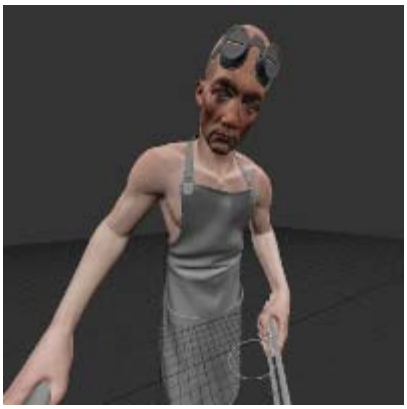
Toggling **Shadows** does not enable or disable shadow processing. It simply controls whether the shadows are displayed on the canvas. To enable shadow processing, enable **Depth Projections** in the **Preferences**. For more information on shadows, please refer to Object Shadows in the Multiple Objects chapter.

Perspective Camera Settings

For the perspective you can set the near and far clipping planes. Anything closer than the near clipping plane or farther than the far plane is not displayed.

You can also set the field of view. This controls the amount of distortion applied to generate the perspective.

Field of view set to 20



Field of view set to 120

TIP: You can also have black bars appear in the Canvas to indicate the aspect ratio of the perspective camera. Select **View** > **Display Properties** and set **Camera Mask Opacity** to anything other than 0.

Configuring Navigation

The navigation has preferences that allow you to change, among other aspects:

- momentum
- flick speed
- friction
- rolling
- orbiting

See Appendix A: Shortcuts for model rotation shortcuts.

Steps for Customizing the View in Mari

To set the view in Mari, follow these steps:

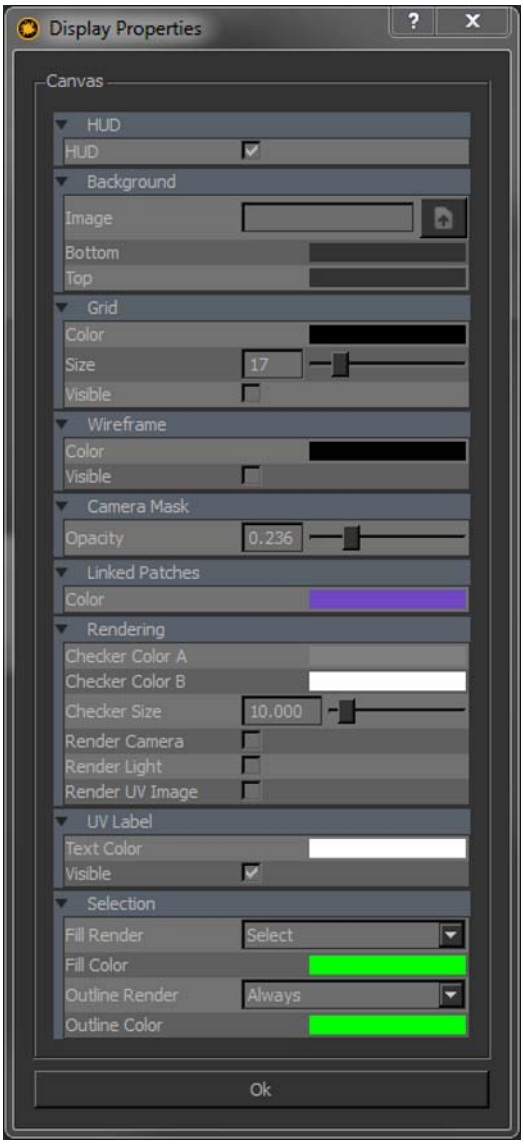
1. Set the Main View Options
2. Configure the Lighting
3. Set the Perspective Camera Details
4. Configure Navigation

Set the Main View Options

You can set the view options separately for the UV and 3D views.

1. Switch to the view you want to set the view options for.
2. Either:
   - right-click on the canvas and select **Display Properties** from the drop-down menu, or
   - from the **View** menu, select **Display Properties**.

   *The **Display Properties** dialog displays.*



3. To turn the onscreen display of the project information (Current Tool, Tool Help, Current Channel, and so on) off, uncheck the **HUD** box.

4. Under the **Background** section, set the window background.

To set the background to...	do this...
an image	enter the path to the image in the **Image** field. *Use the button next to the field to open a dialog to find your image.*
a single color	set the **Bottom** and **Top** fields to the same color. *Click on the fields to set the color.*
a gradient between two colors	set the **Bottom** field to the color for the bottom of the window, and the **Top** field to the color for the top of the window. *Click on the fields to set the color.*

5. If you want to display a reference grid in a 3D view, set the details under the **Grid** section.

   *The **Visible** switch turns the onscreen grid on and off, while the other fields let you set the **Color** and **Size** of the grid displayed.*

6. To show the wireframes on the model, turn the **Visible** option on under **Wireframe**.

   *You can set the wireframe color in the **Color** field.*

TIP: You can turn the wireframe display on/off using the button on the **Canvas** toolbar, or using the keyboard shortcut **Shift**+**W**.

TIP: If the **WireframeColor** has a high alpha value, it may be hard to see onscreen. If you have the wireframe turned on but cannot see it on your model, check that the **WireframeColor** isn't too transparent.

7. If you want to adjust the **Camera Mask Opacity**, use the entry box or the slider to select a value between 0 and 1.
8. To select the color that you want shown when selecting **Linked Patches**, click on the color swatch to select from the color picker. You can also select the **Linked Patch** color from within the **Patches** palette.
9. Under the **Rendering** section, you can control which additional parts of the scene display onscreen:
   - **Checker Color A** — changes color A of the transparency checkerboard to the selected swatch color.

- **Checker Color B —** changes color B of the transparency checkerboard to the selected swatch color.
- **Checker Size** — changes the individual transparency checkerboard squares to the selected size using either the entry box or the slider. The default value is set to 10.
- **Render Camera** — shows the camera view onscreen.
- **Render Light** — shows the lights as globes on the main canvas.
- **Render UV Image** — if this is off, the UV view shows the patches as they appear as part of the model. If this is on, the UV view shows the patches as they appear when exported (that is, as square images, with overpaint areas around the corners of the patches).

TIP: You can also turn **Render UV Image** on/off using the button on the **Canvas** toolbar.

10. If you're setting properties for the UV view, under the **UV Label** section, set the details for the text labels shown over the individual patches:
    - **Text Color** — click the swatch to set the color for the text on the labels.
    - **Visible** — uncheck this to stop showing the text labels in the UV view.
11. If you're setting properties for 3D views, under the **Selection** section, set the details for highlighting shown on selected areas:
    - **Fill Render** — when to show the highlighting in the middle of the selected areas. One of:
      - **Always** — Mari shows the highlighting the whole time the area is selected.
      - **Select** — Mari only shows the highlighting while you are actually selecting the area.
      - **Never** — Mari does not show the selection highlighting.
    - **Fill Color** — click the swatch to set the highlight color for the middle of the selected areas.
    - **Outline Render** — when to show the highlighting around the outline of the selected area. You can set this to **Always**, **Select**, or **Never**, as for **Fill Render** (above).
    - **Outline Color** — click the swatch to set the highlight color for the middle of the selected areas.

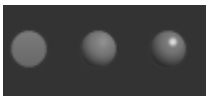
12. Click **OK** to save your settings.

EXPERIMENT: Try changing...

- the project background to a different color, then a gradient, then an image
- whether wireframes display, and their color, and
- the color of your outline highlights.

Configure the Lighting

1. To switch between flat, basic, and full lighting, click the toolbar buttons:

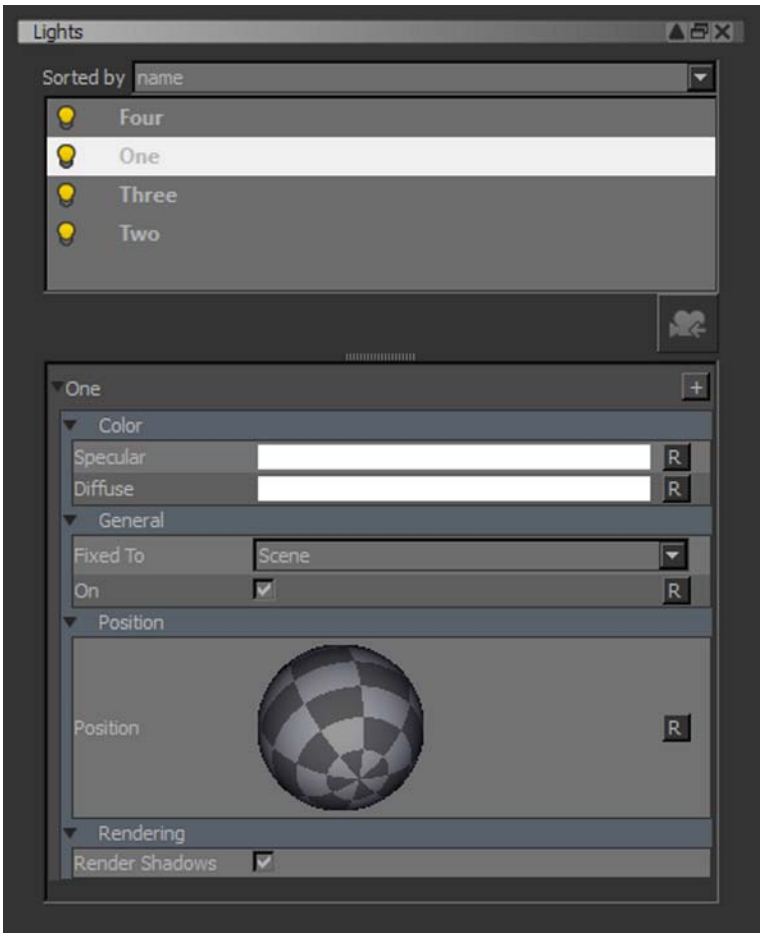
    (left to right: flat, basic, full).

2. To toggle the **Shadows** icon in the toolbar:

   - (shadows off)
   - (shadows on)

NOTE: If the **Depth Projections** option is turned off in the **Preferences**, the **Shadows** icon cannot be toggled and is turned off in the **Lighting** toolbar.

3. To set individual lighting directions, make sure you're in full lighting mode. If it's not already visible, open the **Lights** palette by clicking **View** > **Palettes** > **Lights**:



The top half displays the lights available, and the bottom shows the details of the selected light. The lights currently in use have a "lit bulb" icon.

TIP: Mari has four customizable lights. You cannot add or delete lights. If you don't want a particular light, turn it off.

4. To turn individual lights on and off, click on the light bulb icon next to the light.
5. To change a light, first select it. In the bottom half of the palette, set the light's:
   - **Color** — you can set separate values for the **Specular** (shiny highlights) of the light and **Diffuse** (the color the light shines on surfaces).

- **Fixed to** location — whether the camera is fixed relative to the **Scene** or the **Camera**.

This...	means...	Example
Scene	The light always shines on the same part of the model, no matter how you move the view.	If you only have one light on, pointing at the left side of the model, the right side is always in darkness, no matter how you move the view.
Camera	The light always shines from the same direction relative to the camera view. This means that it illuminates different parts of the model depending on how the model appears in the camera.	If you only have one light on, pointing from the left of the camera, it illuminates whatever part of the model(s) is visible on the left side of the current view.

6. To move a light around, either:

Select...	then...
The **Pan Object** tool	click on the light and drag it around the canvas.
The sphere control in the **Lights** palette	click and pull the sphere around to move the light.
The **Move to Camera Position** icon	the light is repositioned to your current camera position.

You may need to zoom out from your object in order to see the lights.

NOTE: The **Move to Camera Position** icon can be used in both perspective and orthographic view; however, be aware that this feature does not account for zooming of the camera in the ortho view.

7. To toggle cast shadows from the selected light, click on the checkbox to toggle shadows on or off. This does not impact the light itself, but the model casts shadows depending on the light's position.
8. More options for shadows and depth projection settings are located in the **Preferences** under **GPU | Depth Projection**. The settings in the **Preferences** allows you to trade off the quality of the rendered shadows

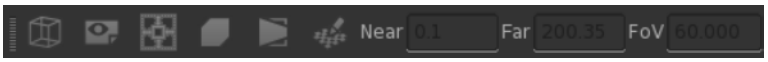
and the amount of GPU memory and processing required. Increasing the resources available for shadow rendering decreases the resources available for other operations, which may decrease Mari's performance.

TIP: Mari saves custom lights with the project. If you need the same lights in another project, you'll need to set them up separately.

EXPERIMENT: Switch between the different lighting modes. Then try customizing a preset light. Play with its color settings and orientation. Try using the position sphere to control the light position. Notice the effects on your display?

Set the Perspective Camera Details

1. Click on the **Perspective** tab to switch to the perspective camera.
2. If it's not already visible, open the **Canvas** toolbar.



*To open the toolbar, right-click in the toolbars area at the top of the screen and select **Canvas** from the dropdown menu.*

3. Enter values for the **Near** and **Far** clipping planes.

   Mari only displays parts of the scene that fall between these two planes. Anything closer than the Near plane, or further than the Far plane, is not shown.
4. Set the value for the field of vision in the **FoV** field. This controls how much Mari distorts the view when applying perspective. At 0, the perspective camera gives exactly the same view as the ortho camera. As the value increases, the distortion increases.

TIP: You can also change view mode by:

- clicking the **Ortho** , **Perspective** , and **UV** buttons, or
- pressing **F10**, **F11**, and **F12** respectively.

Configure Navigation

To configure navigation settings: go to **Edit** > **Preferences**, and select the **Navigation** tab.

1. To set the controls, select one of the options below, from the **Control Type** dropdown menu:

- Houdini
- Lightwave
- Mari
- Maya
- Nuke

These controls allow you to set what type of control options, shortcuts and preferences you want to use.

2. To manually change how the model movement and navigation works, set the following:
   - **Momentum Enabled** — if this is enabled, the model has momentum, so when you let go of the mouse button, the model slowly coasts to a stop. If this is off, the model only moves when you are holding the mouse button down.
   - **Minimum Flick Speed** — the minimum speed at which you can move your model around. The lower this is set, the more sensitive the movement controls are.
   - **Friction** — affects the momentum of your model as you move it around the canvas. Decreasing this value allows movement to retain its momentum for longer. Increasing the value arrests momentum faster.
   - **Lock To World Up** - if this is enabled, the navigation is locked with the y axis in place so that the "world up" view cannot be modified.
   - **Center Mode -** a dropdown menu that allows you to select the orbit view center: **Look At**, **Objects**, **Origin**, or **Selection**.
   - **Circular Motion Enabled** - if this is enabled, you can roll by making a circular motion around the center of the viewport. If disabled, rolling is achieved by simply making a horizontal motion across the viewport.

3 Using Shortcuts

To optimize your workflow, you can set up shortcuts for common actions or settings in Mari.

Shortcuts for Actions

As you'll realize by now, there are usually two or three ways of performing any Mari function. These include:

- **keyboard shortcuts** — pressing one or more keys.
- **mouse shortcuts** *(also called "gestures")* — holding a key and moving the mouse in a particular way.

As well as the default shortcuts that come with Mari, you can customize your own keyboard shortcuts *for any Mari function*. Plus, for each project, you can create custom shortcuts for the items and sets within that project or assign multiple shortcuts for the same action.

TIP: You can also change shortcuts through custom configuration files. See the Extending Mari chapter for details on how to do this.

Canceling Actions

Some actions can also be canceled once they have been started. To cancel an action, press **Escape** or click the **x** button on the status bar. Canceling actions is not immediate and depends on the complexity of the action. Canceling is limited to:

- applying filters
- ambient occlusion
- autosave
- projecting
  - from the paint buffer
  - through projectors
- turntable rendering
- paint projection.

Shortcuts for Settings

Mari includes a configurable on-screen "pie" control menu that allows you to select common brush tips or color settings. You can add up to seven

brush tips or colors to the "pie" control, as well as being able to quickly switch between the paint and eraser tools.

Steps for Using Shortcuts and Gestures

To use and customize Mari keyboard shortcuts and mouse gestures, follow these steps:

1. View the Default Shortcuts and Gestures
2. Try the Mouse Gestures
3. Customize General Keyboard Shortcuts
4. Set Keyboard Shortcuts for Project Items
5. Use the Pie Selection Control#
6. Unassign Shortcuts

View the Default Shortcuts and Gestures

The list of shortcuts and mouse gestures is in Appendix A: Shortcuts.

The appendix is formatted so you can print out the pages and use them as a reference card. All the default shortcuts in the **Manage Keyboard Shortcuts** dialog box are listed in the appendix.

For the keyboard shortcuts, a plus sign (+) means to hold down two keys at the same time. For example, "**Ctrl**/**Cmd**+**C**" means: press **Ctrl** (for Windows or Linux) or **Cmd** (for Mac), and keep holding it down while you then press **C**.

For the mouse gestures, press and hold down the backslash key (\), while drawing the shape illustrated, in the direction indicated — from the ball start point (●) to the arrow.

TIP: The shortcuts for the **Color Picker** and **Select** tools work differently from the other tools. By default, the keyboard shortcuts for these tools only switch to the tool while you hold down the key, and then switch back to the original tool when you release the key. This is to make it easier to quickly pick a color or select a patch while painting with another tool.

If you would prefer, you can set Mari so that quickly tapping the shortcut key for these tools switches "permanently" to the tool, while holding down the shortcut key switches it temporarily (until you let go of the key). To set this, navigate to the Mari **Preferences** dialog box (from the **Edit** menu, select **Preferences**), and on the **Misc** tab, turn off **Tool On Key Held**.

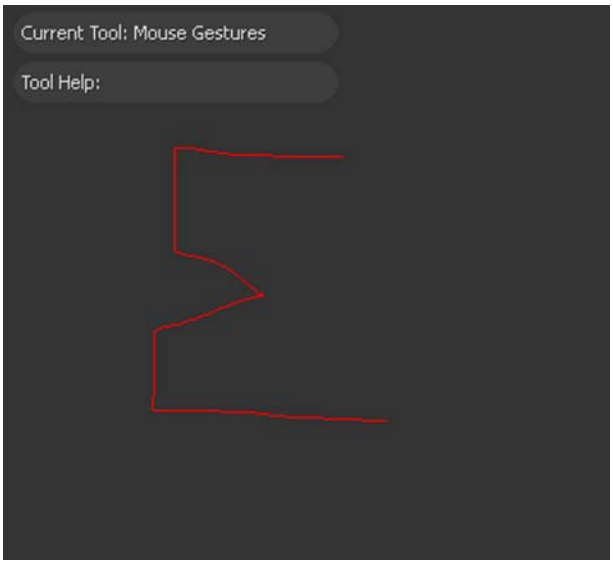
EXPERIMENT: Before looking at the mouse gestures, try several of the keyboard shortcuts. You can look up which controls have assigned shortcuts by searching in the **Manage Keyboard Shortcuts** dialog or referring to Appendix A.

Try the Mouse Gestures

To use a mouse gesture:

Press and hold the backslash key (\), then click and hold the left mouse button, and move the mouse in the direction indicated.

A red line traces your mouse movement on the canvas.



When you release the mouse button, the tracing disappears and Mari performs the function you selected (in the illustration, tracing an "**E**" to select the **Erase** tool).

EXPERIMENT: Try several of the mouse gestures. (You may have to paint something before you can try some of them!) The mouse gesture shortcuts are not shown in the **Manage Keyboard Shortcuts** dialog, but can be located in Appendix A.

Customize General Keyboard Shortcuts

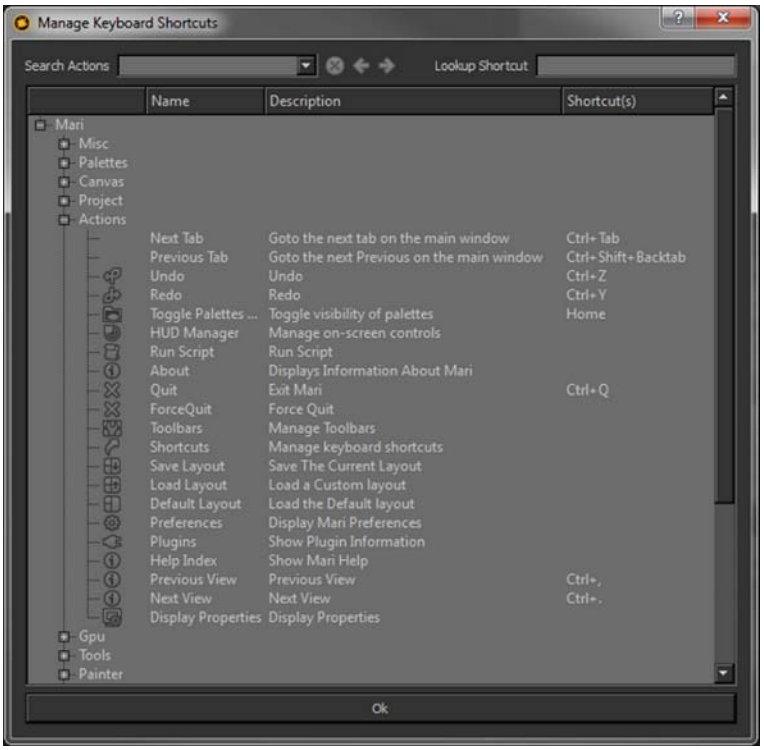
To add and change the general keyboard shortcuts:

1. From the **Edit** menu, select **Shortcuts**.

   *The **Manage Keyboard Shortcuts** dialog box displays many categories of Mari functions.*

2. Click [+] to expand a category.

   Entries display in columns for the **Name**, **Description**, and **Shortcut** key for each function in that category.



TIP: Drag the edges of column headings to make them wider (so you can see the full contents of the Description column, for example). Similarly, drag the edges of the entire dialog box to re-size it as necessary.

3. To add or change a shortcut key, double-click in the **Shortcut** column, and type over the new key. Before you click **OK**, click somewhere to take the focus outside the **Shortcut** column you're editing.

   If the new key you entered is already used, a "warning" icon displays. In this case, the newly entered key doesn't work. This includes parts of any other shortcut that conflicts with a previously set shortcut.

   *For example, a new shortcut **Ctrl/Cmd+R+**left-click can't be set if a shortcut already exists with the definition **Ctrl/Cmd+R.***

4. If there are no conflicts, press **OK** (otherwise select a different key).

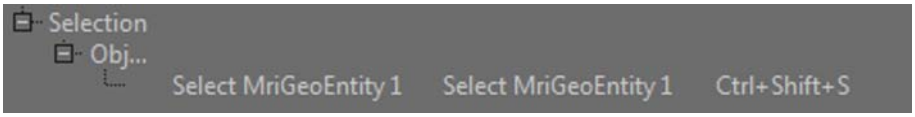
EXPERIMENT: Expand and browse through the different categories of Mari functions and their shortcut keys. Try adding shortcuts for functions that don't yet have a key assigned — and then try the shortcut key you've added.

Set Keyboard Shortcuts for Project Items

To set shortcuts for a project item:

1. In the palette showing the item, right-click on the item and select **Assign Shortcut**.

   *The **Assign Keyboard Shortcut** dialog box displays, with the item selected in the list.*



   This works exactly as described in Customize General Keyboard Shortcuts*.*

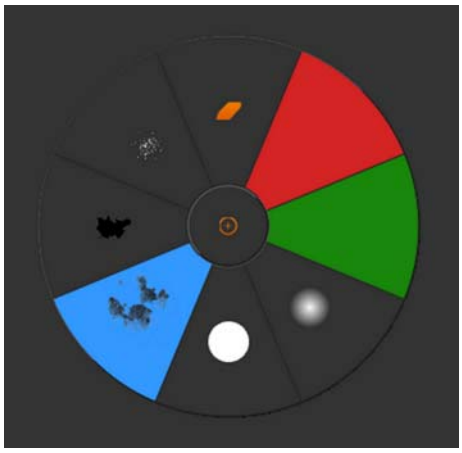
   Once you have set a shortcut for a project item, it displays on palettes to the right of the item.

2. To remove the shortcut from the item, right-click on it again and select **Assign Shortcut** from the dropdown menu.

   *The **Assign Keyboard Shortcut** dialog box opens again, with focus on your item. Double-click on the shortcut key for the item and delete the key.*

Use the Pie Selection Control

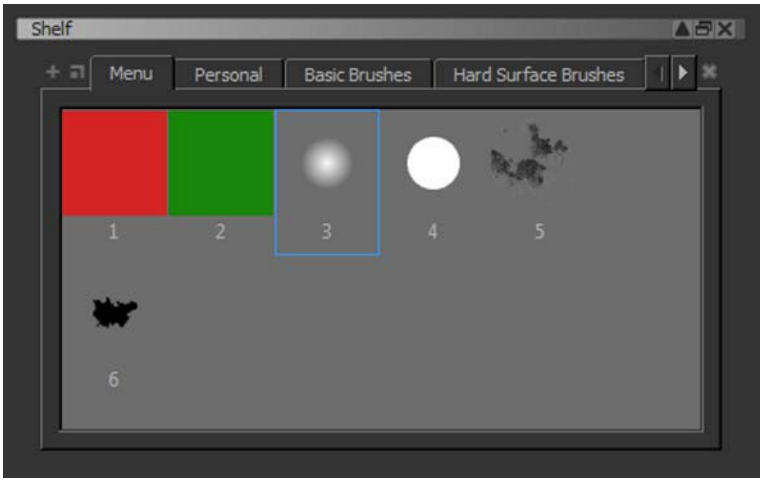
1. With the mouse over the canvas, press and hold **F9**.
   The pie selection menu displays:



2. To select a setting or tool from the menu, move the mouse over your selection and let go of **F9**.
   You don't need to click – Mari picks up what your mouse is hovering over.

To configure the pie selection control:

1. Add your items (colors and brushes) to the **Menu** shelf.
2. Rename them as 1 through 7.



*Mari ignores any other items on the **Menu** shelf, and only displays the items named 1-7.*

TIP: For details on how to add items to the **Menu** shelf, see Storing Resources Using Shelves.

Unassign Shortcuts

You can unassign previously configured shortcuts at any time by following these steps:

1. Go to **Edit** > **Shortcuts**.
2. Double-click on the shortcut you want to unassign and press **Backspace** to unassign a single command; or
3. Press **Delete** to unassign all commands for that shortcut.

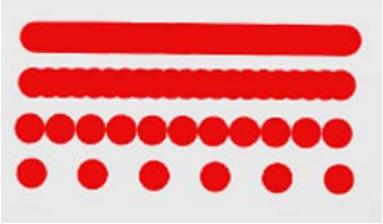
4 Configuring Brushes

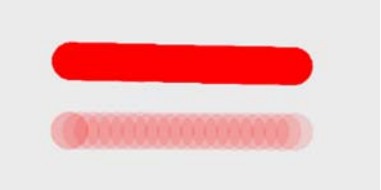
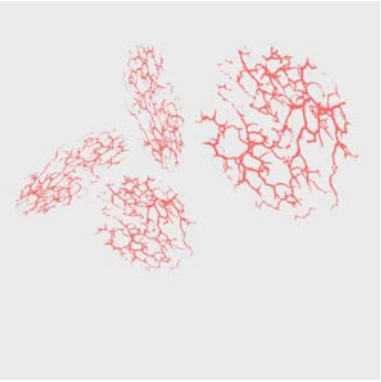
The Mari **Brush Editor** palette lets you select and customize a wide array of preset brushes, with a wide variety of brush properties you can edit. You can then drag modified brushes to a shelf for your ongoing personal use, or for a particular project only. You can also export and import brushes to share with other Mari users, and you can use keyboard-and-mouse shortcuts to modify your brush tips "on the fly".

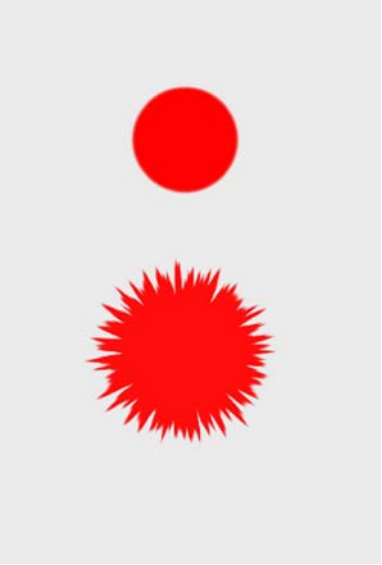
Brush properties generally apply to a **splat** (also sometimes called a "stamp") — one application of the brush tip onto the canvas. A **stroke** is one continuous application of splats.

For some properties you can specify **jitter** — a random variation, to approximate how an actual (as opposed to digital) paintbrush might work.

Below are brief explanations and examples of some of the properties Mari lets you modify:

Property	Explanation	Example
spacing	the distance between splats in a stroke, as a proportion of splat size	a stroke from the same brush with spacing set to .02, .25, .50, and 1.0: 
opacity	how dark a stroke can be (maximum alpha)	a stroke from the same brush with opacity set to 1.00 and 0.50 with no jitter, and 1.00 with maximum jitter:

Property	Explanation	Example
flow	how quickly paint flows out of the brush, mimicked digitally by how dark a splat can be (maximum opacity)	a completely hard brush tip, full opacity, with spacing of 0.15 and flow at 1.00 and 0.30: 
radius	how big the brush tip is; you can also specify an **inner radius** and link **pressure** to vary between the two, and apply **jitter** to randomly vary between the two	a stroke with and without radius jitter, where the jitter is equal to the whole radius of the brush:
distortions to the shape of the brush tip	• **rotation** — spinning it. • **shear** — pulling opposite corners vertically or horizontally. • **scale** — sizing vertically or horizontally. • **squish** — like vertically scaling down, but affects the radius rather than brush tip.	a splat squished, rotated, sheared, and scaled: 

Property	Explanation	Example
noise	how "spikey" the brush is, as measured in: • **octaves** — 1 to 8 applications of noise. • **frequency** — 0 to 100, how many spikes per octave. • **scale** — 0.00 to 1.00, how big the spikes are, as a proportion of the radius (1.00 = twice as big as the radius). • **segments** — 4 (a square) to 360 (a circle) lines making up the brush outline (to which noise is applied). **Tip:** Noise is very hard to explain in words! (Developers understand it in mathematical equations.) Your best bet is to experiment with the settings, to get the right spikiness for your purposes!	the same brush with the default and maximum noise: 

Property	Explanation	Example
profile	opacity from the center to the edge of a brush, determines whether it is hard (more opaque throughout) or soft (fuzzier at the edges)	hard and soft brush tip profiles:
pressure	whether pressure when painting on your graphics tablet increases the radius, flow or opacity (as calibrated for your tablet)	

Steps for Configuring Brushes

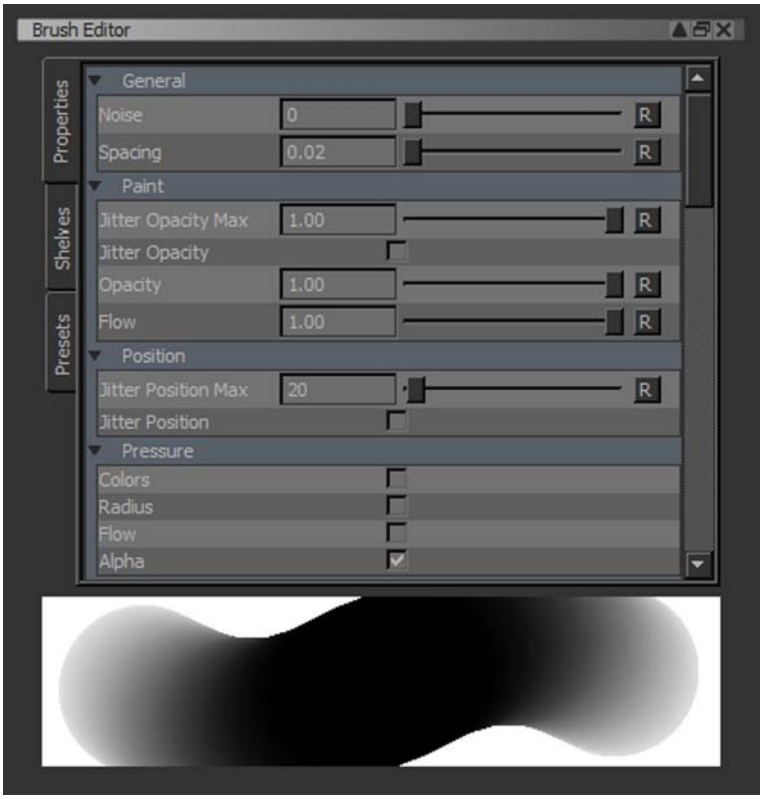
To configure your brushes in Mari, follow these steps:

1. Open the Brush Editor
2. Review the Preset Brushes That Come with Mari
3. Review Properties You Can Change
4. Customize a Brush
5. Export and Import Brushes
6. Change Brush Properties "on the Fly"

Open the Brush Editor

1. Start Mari, and either create a new project or open an existing one.
2. Open the **Brush Editor** palette:
   - from the **View** menu, select **Palettes** > **Brush Editor**, or
   - right-click in the toolbar area and select **Brush Editor** from the drop-down menu.

   *The **Brush Editor** palette displays.*



The **Brush Editor** has three tabs:

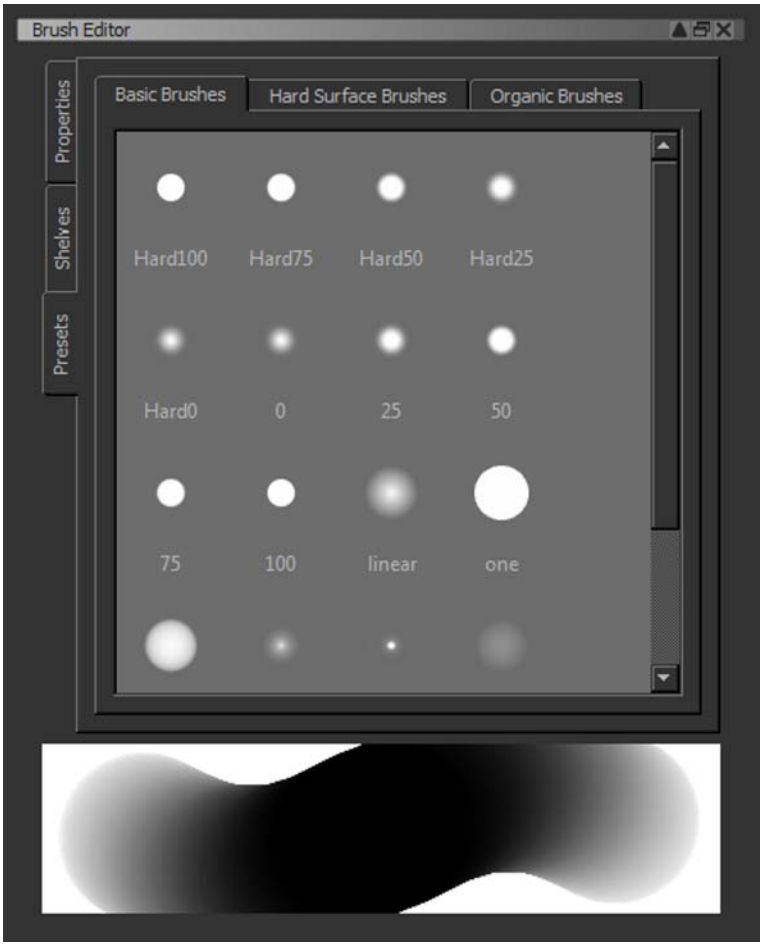
- **Properties** — configurable properties of the selected brush.
- **Shelves** — the same shelves that display in your Shelf palette.
- **Presets** — an array of predefined brushes that come with Mari.

The **Brush Editor** also includes a "scratch pad" at the bottom. The scratch pad shows a squiggle painted with the selected brush. You can also paint directly in the scratch pad (the default squiggle disappears while you enter a stroke).

Review the Preset Brushes That Come with Mari

Mari comes with a set of preset brushes.

1. Click the **Presets** tab.
   The preset brushes display and are collected into tabs.



2. Click through each tab and familiarize yourself with the different brushes that are available. Try selecting some brushes and painting in the scratch pad with them.

Review Properties You Can Change

For each brush, Mari specifies several properties that you can view and change.

1. To view the properties of the selected brush, click the **Properties** tab.

The following properties display. (Below is an extract from the Mari Reference Guide *explaining each property.)*

Property	Explanation
GENERAL	
Noise	How much noise to add to each splat, to soften the appearance and reduce banding. Lower values give a harder brush, higher values a softer brush. (You can also add noise to the brush tip itself — under the **Noise** section below.) **Range:** 0.00 to 100.00, **Reset:** 0
Spacing	The space between splats, as a proportion of the width of a splat. 1.00 = side-by-side (so if the tip is a circle, it would look like a string of beads.) .02 = .02 x the width of a splat. **Range:** 0.02 to 5.00, **Reset:** 0.02
PAINT	
Jitter Opacity Max	How much to randomly vary the opacity (if **Jitter Opacity** is enabled). **Range:** 0.00 to 1.00, **Reset:** 0.00
Jitter Opacity	Whether to randomly vary the opacity (to the degree specified in **Jitter Opacity Max**).
Opacity	How dark a stroke can be (maximum alpha). **Range:** 0.01 to 1.00, **Reset:** 1.00
Flow	Mimics how quickly paint is applied, by setting the maximum opacity in a splat. **Range:** 0.01 to 1.00, **Reset:** 1.00
POSITION	
Jitter Position Max	How many pixels at most to randomly vary displacement from the line of the brush stroke (if **Jitter Position** is enabled). **Range:** 0 to 1000, **Reset:** 20
Jitter Position	Whether to randomly vary displacement from the line of the brush stroke (to the degree specified in **Jitter Position Max**).
PRESSURE Whether pressure on the graphics tablet affects properties of a splat (as calibrated for your tablet)	
Colors	Whether more pressure increases the color strength.
Radius	Whether more pressure increases the radius.
Flow	Whether more pressure increases the flow.
Opacity	Whether more pressure increases the opacity.

Property	Explanation
RADIUS	
Squish	How much to flatten the radius. If the brush tip is a circle, 1.0 is a circle, .5 is an oval half as tall as it is wide. **Range:** 0.05 to 1.00, **Reset:** 1.00
Jitter Radius	Whether to randomly vary the radius (to the degree specified for the **Radius** and **Inner Radius**).
Inner Radius	How few pixels the radius of a splat can be (if **Jitter Radius** and/or **Radius Pressure** are enabled). **Range:** 1 to 1200, **Reset:** 1
Radius	How many pixels at most the radius of splat can be (if **Jitter Radius** and/or **Radius Pressure** are enabled). **Range:** 1 to 1200, **Reset:** 100
ROTATION	
Align to Stroke	Whether the brush tip rotates along with the direction you're painting. (With calligraphy, for example, the tip does *not* align.)
Jitter Rotation Max	How many degrees at most to randomly vary the rotation (if **Jitter Rotation** is enabled). **Range:** 1 to 360, **Reset:** 360
Jitter Rotation	Whether to randomly vary the rotation.
Rotation	The degree to which the brush rotates to match the direction you're painting (if **Align to Stroke** is enabled). **Range:** 0.00 to 360.00, **Reset:** 0.00
GENERAL	
Type	Whether to use a **Bitmap** image for the brush tip, or **Render** based on the qualities specified in these properties
preview	An image of the brush tip, based on the selected properties.
BITMAP	
Use Painting	Click to use the painting in the paint buffer as a brush tip. Mari prompts you to save it either as an **.exr** or a **.tif** file (which file format is used depends on the support in your graphics card). Note that **.exr** files are 16-bit — most other bitmaps are 8-bit.
Path	Type the path or click the button to select an existing bitmap to use as the brush tip. Note that to use an image as the brush tip, you need to set **Type** to **Bitmap**.

Property	Explanation
GEOMETRY	
Vertical Shear	How much to distort the brush tip diagonally, top to bottom (as if pulling opposite corners up and down). **Range:** -1.00 to 1.00, **Reset:** 0.00
Horizontal Shear	How much to distort the brush tip diagonally, right to left (as if pulling opposite corners right and left). **Range:** -1.00 to 1.00, **Reset:** 0.00
Vertical Scale	How much to distort the brush tip vertically. **Range:** 0.00 to 2.00, **Reset:** to .50
Horizontal Scale	How much to distort the brush tip horizontally. **Range:** 0.00 to 2.00, **Reset:** to .50
NOISE Noise is very hard to explain in words! (Developers understand it in mathematical equations.) Your best bet is to experiment with the settings, to get the right spikiness for your purposes!	
Octaves	number of applications of noise. **Range:** 1 to 8, **Reset:** 4
Frequency	how many spikes per octave. **Range:** 0.00 to 100.00, reset to 1.00
Scale	how big the spikes are, as a proportion of the radius (1.00 = twice as big as the radius). **Range:** 0.00 to 1.00, **Reset:** 0.00
Segments	lines making up the brush outline, to which noise is applied (4=square, 360=circle). **Range:** 4 to 360, **Reset:** 360
PROFILE	
Profile	For rendered brushes (see **Type** above), alpha profile of the brush tip from center to edge — determines how "hard" or "soft" it is.
Bit Depth	**Byte** (8-bit), **Half** (16-bit), or **Float** (32-bit) It is generally a good idea to use a brush with the same bit depth as the texture you're painting, to avoid stepping. Note that if you use an 8-bit bitmap, it still paints in 8-bit even if you set the bit depth to **Half**.

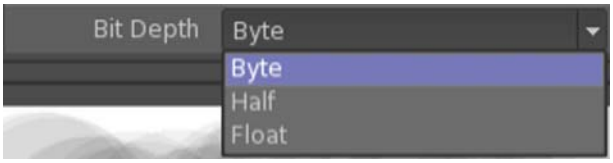
2. Study the descriptions (above) of the different brush properties.
3. Note the following types of controls used to specify brush properties:
   - **Entry boxes** — to type an entry (usually a number).

- **Sliders** — to slide between the minimum and maximum allowable entries.
- **Reset button** — to return to the default setting.

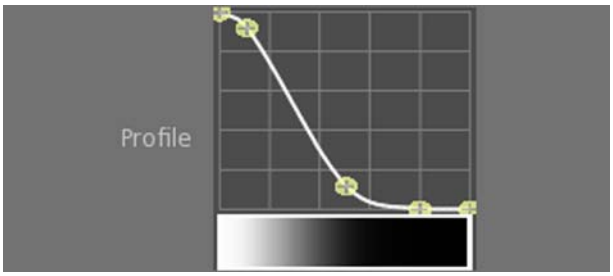
(Often entry boxes, sliders and reset buttons are combined.)

- **Checkboxes** — to select or deselect a property.

- **Dropdown menus** — to select from available options.

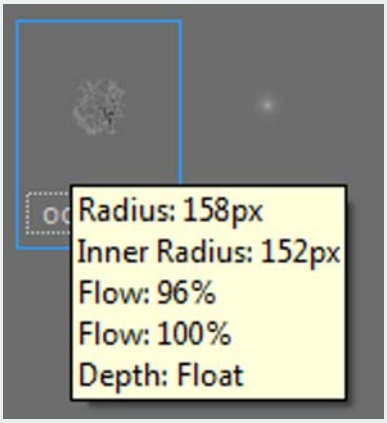


- **Spline Editors** — to move values along a curve; you can drag any of the points on the curve in any direction, and see the effects in the preview bar below the curve. Click to add a new point, and right-click to invert, select presets, and export and import settings. To remove a point, click on it while holding **Ctrl/Cmd**.



4. Try changing some brush properties, and note the change in the squiggle in the scratch pad (it updates dynamically). You can also try painting in the scratch pad, or painting on the canvas (and then undo-ing) to see the effect of your changes.

TIP: When you hover the mouse over a brush, tooltips display key properties:



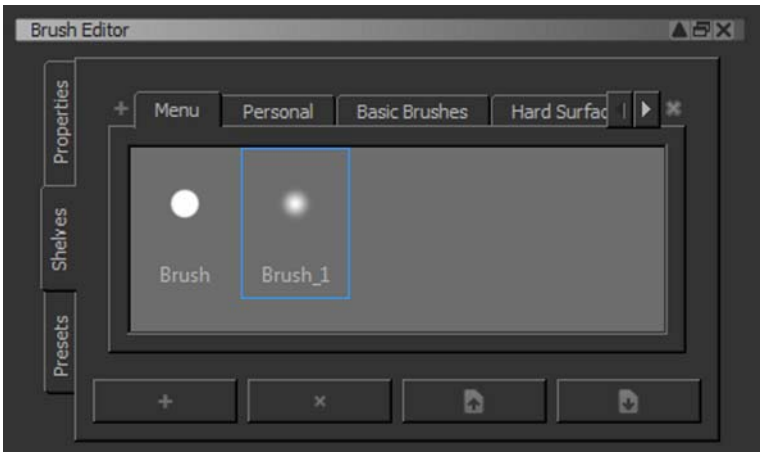
EXPERIMENT: Select one of the preset brushes, and play around with the **Radius**, **Opacity**, **Profile**, and **Jitter** settings. Notice how each affects your brush strokes on the canvas or in the **Brush Editor** scratch pad.

Customize a Brush

Having looked at the available preset brushes, and different properties you can change, let's (finally) try customizing a brush. This involves three steps: selecting a preset, changing its properties, and saving it to a shelf.

1. First select a preset to modify: click the **Presets** tab, then click a tab for a category of preset brushes, and click to select a brush.
2. Review Properties You Can Change: click the **Properties** tab, and change the brush properties.
3. Finally, save it to a shelf: click the **Shelf** tab; click to select the **Personal** shelf, **Project** shelf, or any other custom shelf you may have created, and click the button.

   The modified brush displays in the selected shelf. By default it is named "Brush" (and then "Brush_1", "Brush_2" etc., incremented for every tool you add).



4. To rename the brush, double-click its name, type over a new name, and press **Enter**.

NOTE: Any brush tip that you select is shown as an outline for the brush cursor design with any tool that allows you to apply paint to the model; for example, **Paint**, **Paint Through**, and **Clone Stamp**, among others. This cursor outline scales according to the radius of the brush tip, but does not reflect other options, such as jitter or opacity.

TIP: To a delete a custom brush, select the brush and click .

EXPERIMENT: Try creating three custom brushes you might actually use and test them out on a model. If it doesn't turn out as you expected, try customizing it and re-saving it to your **Personal** shelf.

Export and Import Brushes

You can also export and import your brushes. This is useful, for example if you want to share brushes with other users.

1. To export a custom brush, right-click it and select **Save Item**.

   *The **Save Item** dialog box prompts you to save the brush, as an **.msi** file.*

TIP: The first time you save or open items in Mari, it defaults to your home directory. Thereafter, Mari remembers the last folder you navigated to in that dialog box.

2. Type a filename, and click **Save**.

Mari exports the brush.

3. To import a brush, right-click in the **Personal**, **Project** or custom shelf and select **Load Item**.

   *The **Import Item** dialog box prompts you to select an **.msi** file.*

4. Navigate to and select the **.msi** file for the brush you want to import, and click **Open**.

   Mari imports the brush.

TIP: You can also import and export entire shelves (see Storing Resources Using Shelves).

EXPERIMENT: Try creating a custom brush, exporting it, then deleting it from the shelf, and finally (re)importing it.

Import a Custom Photoshop Brush

Custom-made Photoshop brushes can be imported into Mari and stored in a custom shelf. These brushes are "stamp" brushes that do not take into consideration any variable size or spacing. The shape (or shapes) of the brush are imported into a custom shelf where you can set the preferences for the brush manually.

To import custom brushes:

1. Navigate to *Menubar*| **Tools** > **Import Brushes**.

   *This opens an **Import Brushes** dialog.*

2. Select the Photoshop brush (**.abr** format) from the file location it was saved to, and click **Open**.

   A new shelf is created and populated with the brush or brush parts. If there are multiple "stamp" images, you may need to set the preferences for the brush.

NOTE: Brushes imported from Photoshop must be custom-made. If you try to import Photoshop's default brushes, or any invalid brush, an error message displays and the brush fails to be imported.

Change Brush Properties "on the Fly"

Mari also includes default keyboard-and-mouse shortcuts to change the relative **Radius**, **Rotation**, **Opacity**, and **Squash** of the brush you're using.

1. To change the **RADIUS** of your brush, press and hold **R**, and move the mouse right or left to increase or decrease the outer radius, and up or down to increase or decrease the inner radius.
2. To change the **ROTATION** of your brush, press and hold **W**, and move the mouse right or left to rotate clockwise or counterclockwise.
3. To change the **OPACITY** of your brush, press and hold **O**, and move the mouse right or left to increase or decrease the opacity.

   *The alpha slider in the **Colors Palette** moves along with your mouse.*
4. To change the **SQUASH** of your brush, press **Q** and move the mouse right or left to squish the brush tip more or less.

TIP: To save any changes you make on the fly, see the procedure to Customize a Brush.

EXPERIMENT: Play around with the **R**, **O**, **W**, and **Q** keyboard/mouse shortcuts for changing your brush tip on the fly.

5 Clone Stamping

The clone tools let you copy paint from one image or part of a channel to the surface of your model. This is a standard feature in painting packages such as Adobe® Photoshop®, GIMP, and so on.

You start clone stamping by setting a source point. This is the point from around which Mari takes the cloned texture. As you paint, Mari duplicates the area around the origin point you've set.

Mari's **Clone Stamp** tool lets you clone from:

- the model's surface (baked paint) in the active channel, or in a different channel
- the current (unbaked) paint in the paint buffer
- an external image (selected from the **Image Manager**, optionally zoomed in or out).

When cloning from the baked paint on a channel, you can select to clone directly from the surface. In this mode, the tool clones the paint from the channel surface straight up into the paint buffer directly above that point. This is basically a way of copying the model's surface into the paint buffer so you can edit it and then re-bake the paint.

TIP: When you clone from a source on the model (any mode other than using an external image), the source point you set is based on the **view** of the model, not the model itself. Moving the view moves the source point. For instance, you cannot set the source point on the front of the model, move the view to the rear, and paint the cloned texture from the front to the rear of the model. (The source point has moved to the same spot in the view, but on the rear of the model.) Note, however, that you can use a split screen to select a source in one view and clone it to another.

In these modes, think of the source point as being a position within the window. As you zoom, pan, and rotate the model, the source point remains in the same position in the window, but not the same position on the model.

Choosing a Source Point

When cloning from a particular channel, the **Clone Stamp** tool takes a "snapshot" of that channel as it appears on screen and uses that as the source. As a result, the resolution of the cloned texture can depend on the

current display resolution within Mari. Higher display resolutions give better cloning results, but can dramatically slow Mari's performance.

When cloning from a source point on the model's surface, bear in mind that the shape of the model determines what gets cloned. For example, if your source point is on a part that sticks out from the model, the space between that part and the rest of the model does not provide a source texture when painting.

The original model, with clone point set in the paint on the arm.

See how the cloned texture comes directly from the surface as seen in the view.

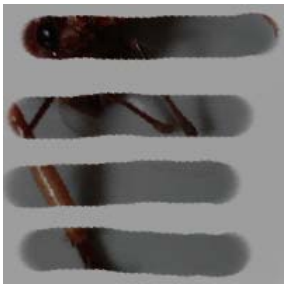
Setting a Start Point

You can set the start point for each stroke. This can be either:

- **Relative to the source point** — Your first brush stroke starts from the source point, but for later strokes the cloned texture starts from a position relative to the source point. For example, if your second brush stroke starts from 2 cm below the first, the texture cloned there is the texture 2 cm below the source point in the original image. This is the default setting.
- **From the source point** — All brush strokes take their cloned texture starting from the source point. As you finish each stroke, you can see the source area preview snap back to the original source point.

This example shows the difference between the two modes:

Source texture for cloning.



Texture cloned relative to source point.

Texture cloned not relative to source point.

Image Options

When you are painting using an external image, you can choose to have Mari display a preview of the image, floating over the canvas. This makes it easier to see exactly which parts of the source image Mari is cloning when you paint. This is very similar to using the **Paint Through** tool (see Painting Through an Image or Gradient).

Mari can either scale the external image as you zoom in or out on the model while painting, or keep it at the same size. You control this with the **Scale Lock** setting: if on, Mari locks the image size relative to the model, at the current zoom level. As you zoom in or out, the image that you're cloning from zooms in or out too, so the cloned texture always stays at the same scale, relative to the surface you're painting on.

If **Scale Lock** is off, the image scale does not change when you zoom in or out.

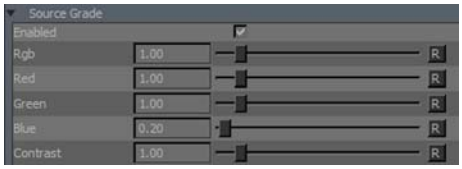
TIP: Mari copies textures you clone from an external image at the resolution of the source. Mari then paints these into the paint buffer at the buffer's resolution. For example, a 4k image provides 4k source texture for cloning, which Mari can then paint into the paint buffer at a maximum of 16k (the maximum size of the paint buffer). See Controlling the Way Mari Applies Paint to Your Model for details on paint buffer resolution.

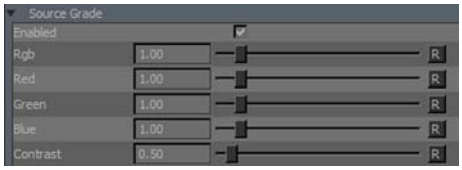
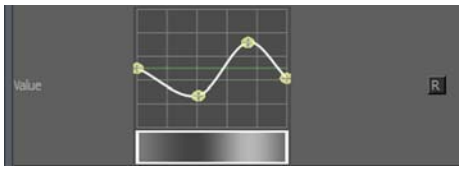
Color Grading the Image

You can apply a color grade to your source image as you paint. You can apply the color grade to any clone operation, whether from an external image or from a channel's surface. You can:

- Change the color values in the source image, either all at once, or by RGB channel.
- Alter the **Contrast** or **Saturation**.
- Use the value curve to apply a specific change to the colors. Mari grades the colors by converting the input value (on the x axis) to the matching value on the y axis.

For example:

Setting	Result
Default settings	
Blue component turned down: 	

Setting	Result
Colors at default settings, but contrast turned down: 	
Color and contrast at defaults, but the following value curve applied: 	

Steps for Clone Stamping

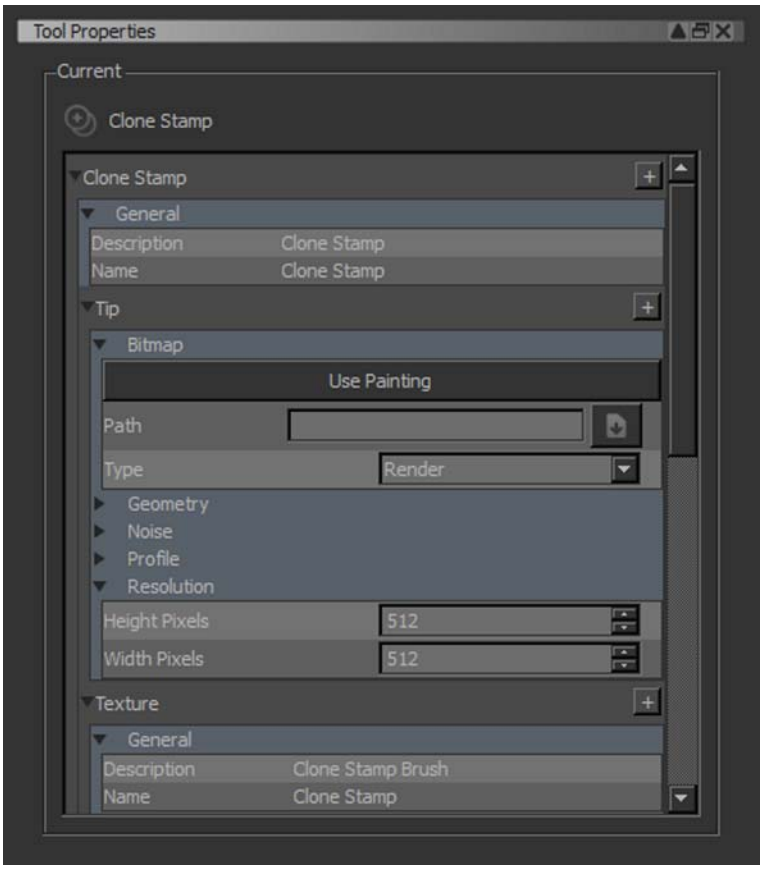
To paint using the clone tools, follow these steps:

1. Set the Clone Stamp Options
2. Clone stamp
3. Apply a Color Grade as You Clone

Set the Clone Stamp Options

1. Start Mari and open your project.
2. Click to select the **Clone Stamp** tool.
3. Open the **Tool Properties** palette.

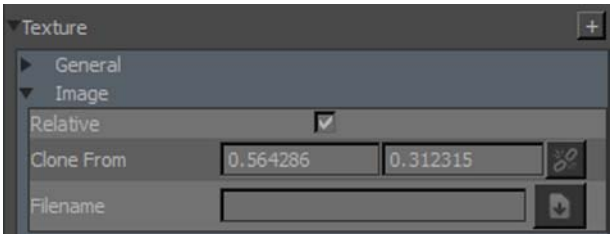
   The current properties of the selected tool display. Scroll down to view them all.



4. To customize the brush you're using for your selected tool, set the options under the **Tip** and **Geometry** sections.

   These are the same options available for brushes in general — see Configuring Brushes.

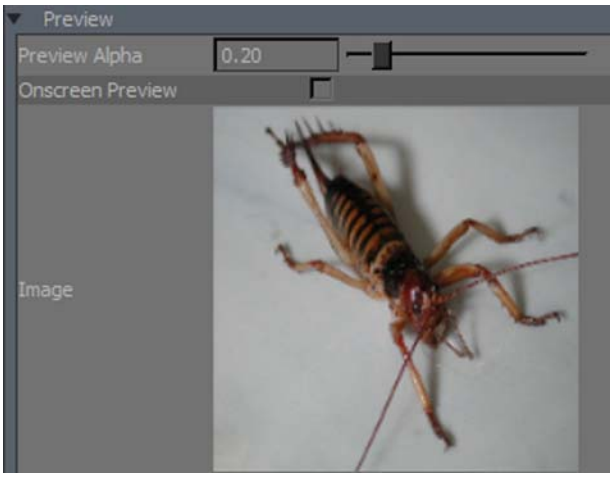
5. To set the brush strokes to start relative to the source point, click the **Relative** checkbox under **Texture** > **Image**.



   If this is not selected, the clone brush strokes always start from the source point (see Setting a Start Point *for examples).*

6. To turn the onscreen preview on when cloning from an external image, under **Texture** > **Preview**, click to turn **Onscreen Preview** on. Set the

Preview Alpha to your preferred value (higher makes the preview clearer, but makes it harder to see the current paint in the channel).



As you click in the external window to change the source point, the preview moves around on the main canvas.

7. To set whether Mari zooms images relative to your view, turn **Scale Lock** on or off, under **Texture** > **Transform**.

   If this is on, Mari locks the image size relative to the model, at the current zoom level. If you zoom in or out, Mari also zooms in or out the image that you're painting through. If this option is off, the image scale won't change when you zoom in or out.

8. To set whether Mari resizes source images to fit the paint buffer, change **Reset Size** setting, under **Texture** > **Transform**:

- **ToOriginalSize** — Displays and clones the source image in its original size, in screen pixels. For example, a 1024x1024 image takes up 1024x1024 pixels on screen. This is the default.
- **RelativeToPaintBuffer** — Displays and clones the source image resized so that one pixel in the image matches one pixel in the paint buffer. For example, a 1024x1024 image in a 2k (2048x2048) paint buffer appears onscreen as half the size of the paint buffer.

9. To set whether Mari preserves transformations when you switch source images, change the **Auto Reset** setting, under **Texture** > **Transform**:
   - **DoNotReset** — Preserves any transformations (such as moving, resizing, or rotating) you have made to the source image that you're cloning, if you switch to using another source image. This is the default.
   - **Reset** — Resets the image to the default size, location, and rotation, each time you switch to another source image. For example, if you're using a 2k paint buffer and a 4k image, the image always appears to be twice the size as the paint buffer onscreen.

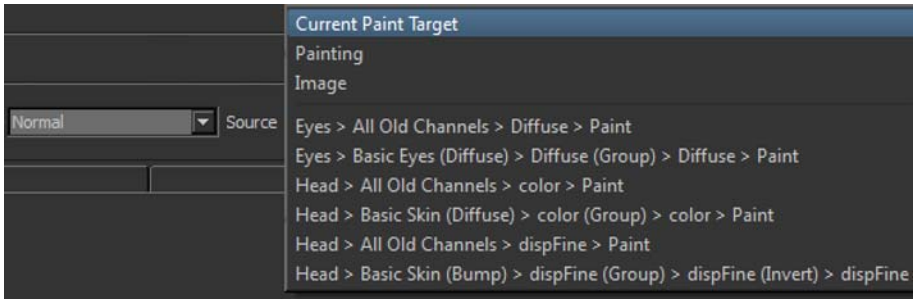
TIP: Use **DoNotReset** if you want to clone several images of the same size. This is specifically useful if you want to switch between using multiple 4k textures, as it saves you having to resize the source image preview from the huge default every time you switch.

Now that you've set up how the clone tool works, you can get on and start painting.

Clone stamp

To clone from an existing current layer:

1. If you haven't already, select the **Clone Stamp** tool.
2. In the **Tool Properties** toolbar at the top of the screen, select the clone source from the **Source** dropdown.

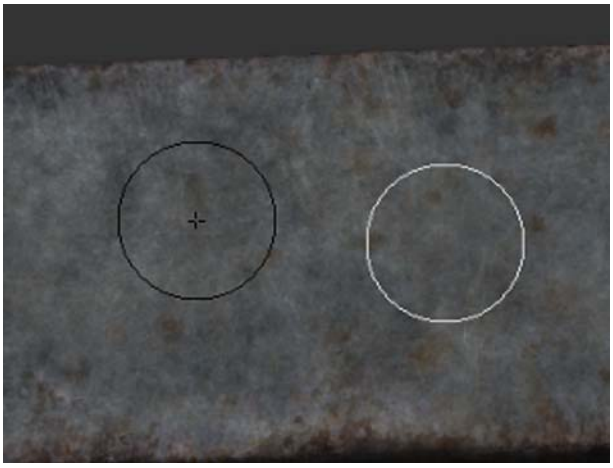


The list includes all channels in your project, plus Painting (clone from the unbaked paint) and Image (clone from an external image). The default value for Source is ***Current Paint Target****.*

TIP: If you can't see the **Tool Properties** toolbar, open it by right-clicking in the toolbar space at the top of the window and selecting **Tool Properties** from the bottom of the dropdown list.

3. Select **Current Paint Target**, select the layer you want as a source, then hold down **Ctrl**/**Cmd** and click on the model's surface to set the source point.

   Mari highlights the source point with a cross.



4. Paint normally. As you paint, Mari copies the texture from around your source point in the source channel:
   - The white circle is your brush.
   - The black circle is the source area — as you move your brush, this circle shows you the texture you'll be cloning from.

   You can select any preset brush to use with the clone stamp tool, or edit the brush as normal (see Configuring Brushes).

To clone from the paint buffer:

1. To set the clone source in the unbaked paint (that is, the contents of the paint buffer), from the **Tool Properties** toolbar at the top of the screen, select **Painting** from the **Source** dropdown.
2. **Ctrl**/**Cmd**-click to set the source point. Paint normally:
   - As above, the white circle is your brush.

- The black circle is the current source area.

TIP: Bear in mind that if a particular area doesn't have any unbaked paint on it (that is, there is no data in the paint buffer for that area), no clone data is available from the area. It's as if you're trying to paint from an area that doesn't have anything on it.

If you're trying to clone and getting nothing, check that there actually is unbaked paint on the area you're cloning from!

To clone from surface directly into the buffer:

To clone from the surface straight up into the paint buffer directly over the clone point, select the layer to clone from as normal. When you set the source point, hold down **Ctrl**+ (**Windows** key), or **Cmd**+**Ctrl** for Mac, and click on the model. Paint normally. As you paint, Mari copies the area you paint from the layer surface into the paint buffer.

If you are cloning from the current channel and layer, you won't see any visible effects, as Mari is just copying the paint right on top of itself, but you can then switch tools and edit the paint and then re-bake. This lets you make fine adjustments to the paint already baked into a layer, or to clone sections of paint from one layer to another (for example, to clone from a displacement channel into the diffuse channel to get the basic details of the surface contours to paint).

To clone from an image:

1. To clone from an external image, drag the image from the **Image Manager** (or from a shelf) onto the main canvas.

   *The image opens up in a separate window. You can zoom the image in and out by holding down **Ctrl/Cmd+Alt**, clicking and dragging. This sets the clone source to **Image** automatically.*
2. Click in the separate image window to set the source point. The white circle in this window shows where the current clone source is, as you move the mouse.

3. Paint in the main Mari window as normal.

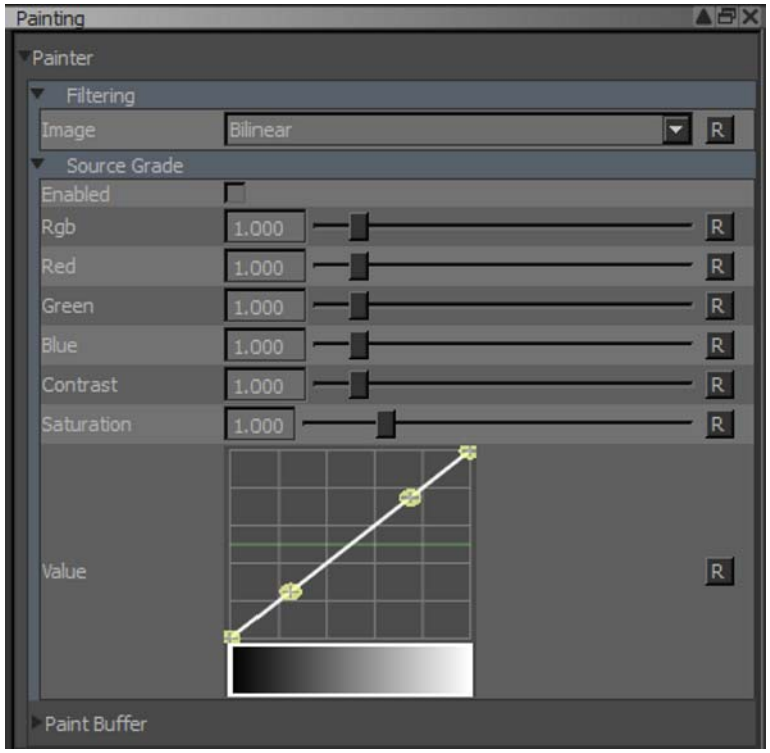
TIP: If you paint off the edge of the image, no clone data is available. You can choose to tile the source image. If this is on, when you paint off the edge, Mari repeats the image (so you always have source data).

Use the **;** (semicolon) key to toggle source image tiling on and off.

EXPERIMENT: Experiment with the various options and modes of clone stamp. Try using a custom brush, with an unusual texture, lower alpha, and so on to find which settings work best for you.

Apply a Color Grade as You Clone

1. Open the **Painting** palette and scroll down to the **Source Grade** section.

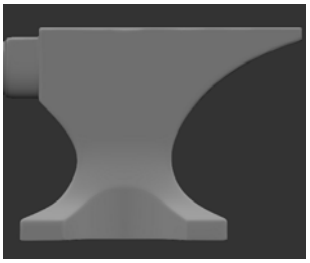


   This section lets you control the color grade for your source image.
2. Click to check the **Enabled** box.
3. You can use the controls to:
   - Change the color values in the source image, either all at once (using the **Rgb** slider) or one by one.
   - Alter the **Contrast** or the **Saturation**.
   - Use the value curve to apply a specific change to the colors. Mari grades the colors by converting the input value (on the x axis) to the matching value on the y axis.
4. Select the clone tool.
5. Paint some sample strokes, experimenting with the settings in the **Source Grade** section.

EXPERIMENT: Use the sliders to change the color balance in the red, green, and blue components. Try altering the contrast. Use the value curve control to change the color values in the source image. Paint a number of sample strokes to see how the color grading works.

6 Painting Through an Image or Gradient

Paint Through is closely related to clone stamping. The **Paint Through** tool lets you drag an image from the **Image Manager** and hover it over your model. As you paint, Mari applies the area of the image underneath your brush to the model. It's like clone stamping, except that you're always cloning directly from the preview onto the model below it.



Unpainted model.

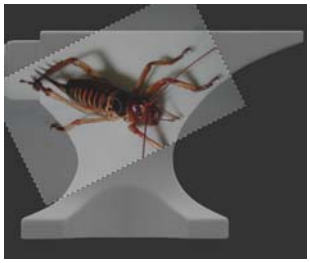
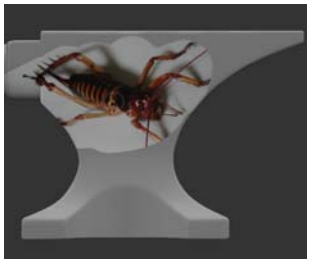


Image overlaid, painting through.



The result.

As you paint, you can move the source image around, rotate it, and resize it.

TIP: If you paint off the edge of the image, no clone data is available. You can choose to tile the source image. If this is on, when you paint off the edge, Mari repeats the image (so you always have source data).

Use the **;** (semicolon) key to toggle source image tiling on and off.

Paint Through has two modes:

- **Paint through** — you hover the image preview over the model and stamp it down onto the surface.
- **Image clone** — you hover the image next to the model, set a source point, and clone from that point.

The **Image clone** mode is like the normal **Clone Stamp** tool, but you have more control over the source image (you can resize, stretch, and rotate it).

To lock the model and paint buffer to the source image so that Mari automatically pans or scales the model relative to the image, check the **Lock Object** checkbox in the **Paint Through** toolbar.

You can also lock the source image proportions using the **Image Scale** button, so that any changes to scale are applied proportionately to both

axes. If **Image Scale** is off, you can alter the image by different amounts on the vertical and horizontal axes.

As you paint through, you can switch images. By default, when you switch to another source image, Mari applies any transformations you've made to the last source image onto the new one. For example, if you have resized the source image onscreen, moved it around, or rotated it, the next source image appears the same. You can control this behavior through the **Auto Reset** option.

TIP: You can change the algorithm Mari uses to clone from a resized texture. Set this on the **Painting** palette, under **Painter** > **Filter**. Your options are:

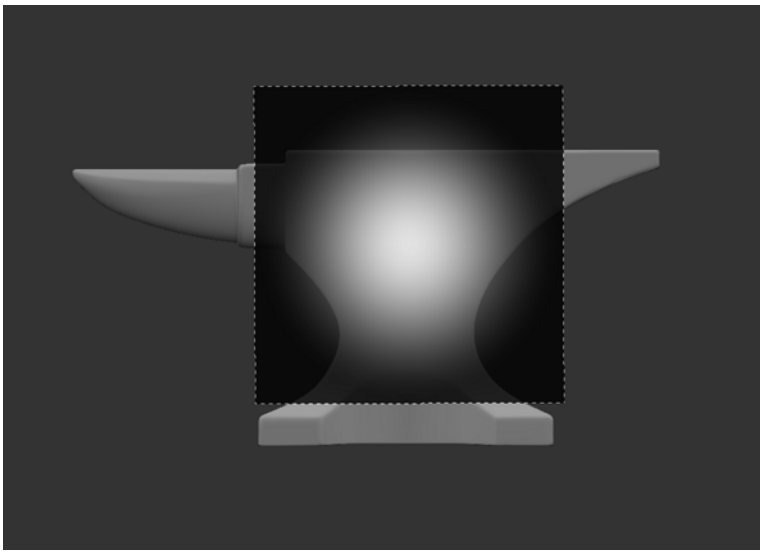
- **Nearest** — preserves edge detail, but gives quite "blocky" textures.
- **Bilinear** — gives good results, but can produce square artifacts at extreme zoom. This is the default setting.
- **Bicubic** — provides more rounded results, slightly blurrier but without the square artifacts.

As with the **Clone Stamp** tool, you can adjust the color grade of your source image as you paint.

TIP: See Clone Stamping for details of the **Clone Stamp** tool and using color grades.

About Using a Gradient

You can also use the **Gradient** tool to paint through a linear or radial color gradient instead of an image. For example, the following illustration shows a radial gradient being stamped onto the model:



Steps for Painting Through

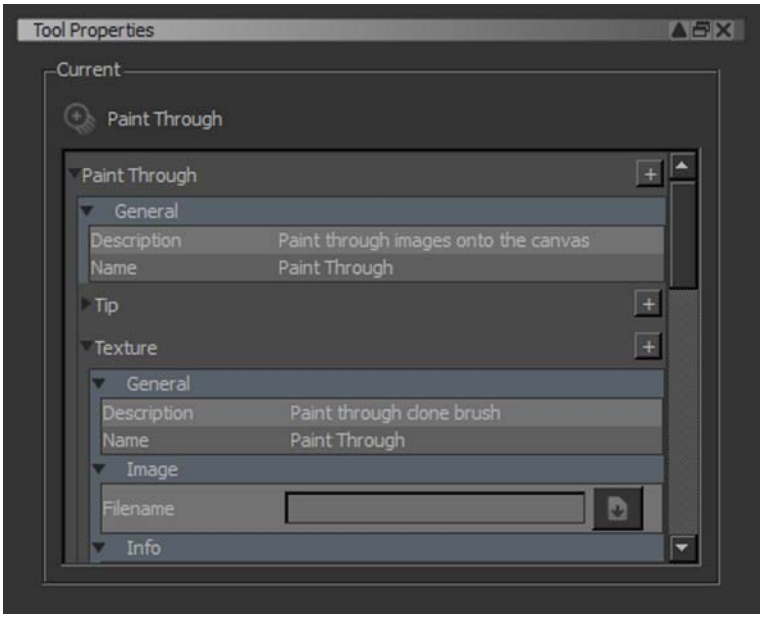
To paint through an image or color gradient in Mari, follow these steps:

1. Set the Paint Through Options
2. Paint Through an External Image
3. Clone from a Floating Image
4. Using Tint and Stencil Options
5. Paint Through a Gradient

Set the Paint Through Options

1. Start Mari and open your project.
2. Click to select the **Paint Through** tool.
3. Open the **Tool Properties** palette.

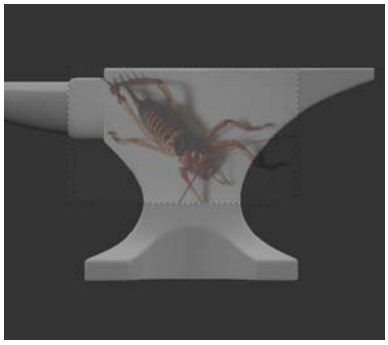
   *The current properties for **Paint Through** display. Scroll down to view them all.*



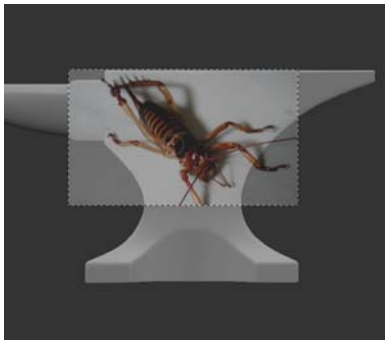
4. To customize the brush you're using for **Paint Through**, set the options under the **Tip** and **Geometry** sections.

   These are the same options available for brushes in general — see Configuring Brushes.
5. To change the prominence of the onscreen image that you're painting through, under **Texture** > **Preview**, set the **Preview Alpha**.

Higher values make the preview clearer, but make it harder to see the model underneath.



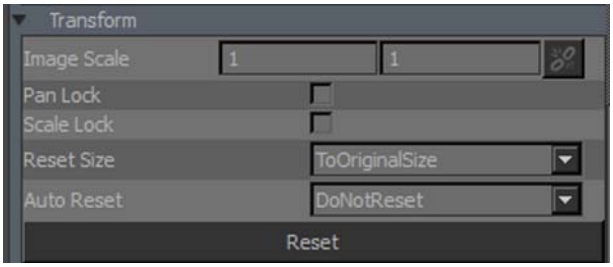
Preview alpha of 0.35



Preview alpha of 0.75

6. You can lock the source image proportions using the **Image Scale** button, so that any changes to scale are applied proportionately to both axes. If **Image Scale** is off, you can alter the image by different amounts on the vertical and horizontal axes.
7. Set Mari to automatically pan or scale the source image using the **Pan Lock** and **Scale Lock** settings.

   When the locks are enabled, Mari locks the image position and size relative to the model. If you pan or zoom the model in or out, the image that you're painting through pans or zooms in or out too.



   If **Pan Lock** and **Scale Lock** are disabled, the image position and scale does not change when you change the view of the model.
8. To set whether Mari resizes source images to fit the paint buffer, change **Reset Size** setting, under **Texture** > **Transform**:
   - **ToOriginalSize** — Displays and paints through the source image in its original size, in screen pixels. For example, a 1024x1024 image takes up 1024x1024 pixels on screen. This is the default.
   - **RelativeToPaintBuffer** — Displays and paints through the source image resized so that one pixel in the image matches one pixel in the paint buffer. For example, a 1024x1024 image in a 2k (2048x2048) paint buffer appears onscreen as half the size of the paint buffer.

9. To set whether Mari preserves transformations when you switch source images, change the **Auto Reset** setting, under **Texture** > **Transform**:
   - **DoNotReset** — Preserves any transformations (such as moving, resizing, or rotating) you have made to the source image that you're cloning, if you switch to using another source image. This is the default.
   - **Reset** — Resets the image to the default size, location, and rotation, each time you switch to another source image. For example, if you're using a 2k paint buffer (maximum size) and a 4k image, the image always appears to be twice the size as the paint buffer onscreen.

TIP: Use **DoNotReset** if you want to paint through several images of the same size. This is specifically useful if you want to switch between using multiple 4k textures, as it saves you having to resize the source image preview from the huge default every time you switch.

Now you've set up how the **Paint Through** tool works, you can get on and start painting.

Paint Through an External Image

1. Drag your source image from the **Image Manager** (or from a shelf) onto the canvas.

   The image "floats" above the canvas, ready to paint through.

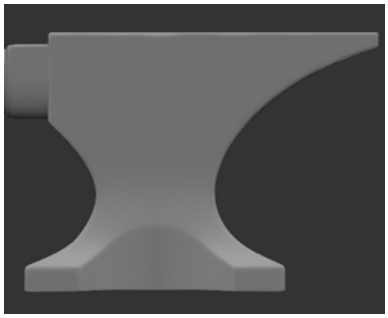
NOTE: If you do not have the **Paint Through** tool active when trying to drag an image onto the canvas from the **Image Manager**, Mari automatically switches you to the **Paint Through** tool to continue.

2. Get the image how you want it:

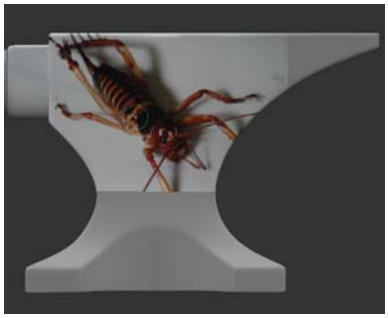
To...	You need to...
Move the image around the canvas	Hold down **Shift**, click on the image and drag it. Or, click on the white square in the middle of the image and drag it.
Resize the image, preserving the scale	Hold down **Ctrl**/**Cmd**+**Shift**, click anywhere on the canvas and drag. Or, hold down **Shift**, click on a side of the image and drag it.
Resize the image in one direction	Click on a side of the image and drag it.
Rotate the image	Hold down **Ctrl**/**Cmd**, click anywhere on the canvas and drag. Or, click outside the image and drag.

3. If you just want to stamp the image straight onto the model, press ' (apostrophe).

   Mari stamps down the image, as it is currently floating over the model, onto the surface.



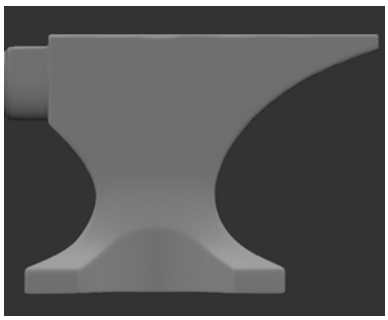
Model before painting.



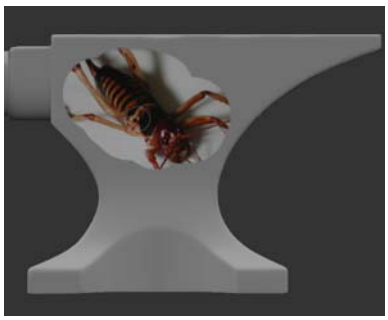
Texture stamped down.

4. To paint using the brush, just click and drag to paint normally.

   As you paint, your brush paints down the texture from the image at the point you're painting.



Model before painting



Texture painted through

TIP: Painting with the brush lets you more subtlety control how Mari applies the paint — for example, you can use a brush with a relatively low alpha, and "build up" the paint on the model using multiple strokes.

You can apply a color grade to the source image as you paint through. Set the color grade settings in the **Source Grade** area of the **Painting** palette. See Clone Stamping for details of how the color grade settings work and the effects you can achieve.

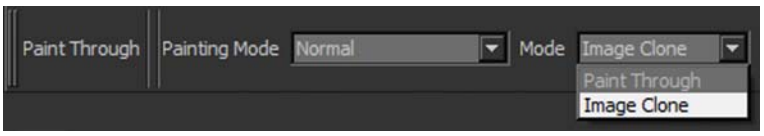
EXPERIMENT: Experiment with different brush settings and their effect on painting through. Adjust details such as opacity, alpha, and noise to affect the way the texture is painted onto the model.

5. You can apply a **Tint**, which allows you to combine a color with the image to apply a tinted version of the image using **Paint Through**.
6. You can also apply a **Stencil**. The stencil allows you to paint through an image to create a design of the image on the model.

   By default, there is **No Stencil** applied to the model.

Clone from a Floating Image

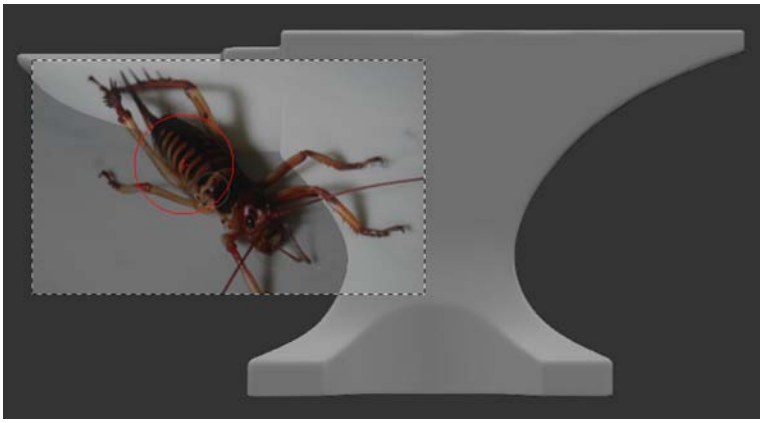
1. In the **Tool Properties** toolbar at the top of the screen, select **Image Clone** from the **Mode** dropdown:



2. Make any other changes you want to the size, rotation, stretch, or position of the source image.

   This is exactly the same as in the normal mode. You'll probably want to move the image next to where you'll be painting.
3. **Ctrl**/**Cmd**-click on the floating image to set the source point.

   The clone source preview displays in a red circle, while your brush is the white circle.

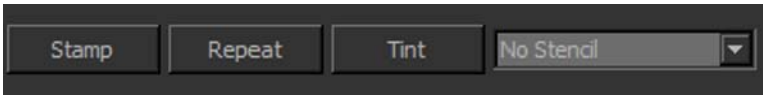


4. Paint normally.

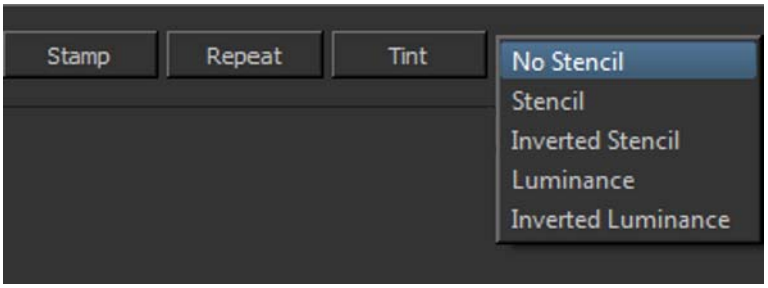
   Mari clones the texture as you paint, taking the resolution for the cloned texture from the source image. For example, a 4k image provides cloned texture at 4k resolution.

Using Tint and Stencil Options

1. On the **Paint Through** toolbar, there are additional buttons to the right of the main options. These give you **Stamp**, **Repeat**, and **Tint** options for the **Paint Through** functionality.



2. **Stamp** is a simple button that works the same as stamping down an image using a hotkey. You can drag your image around the canvas, resize it, and rotate as usual before using **Stamp** to apply the image directly to the model in full.
3. To repeat the image you wish to apply to the model, first press the **Repeat** button before painting on any part of the model. The image repeats across the painted parts of your model. To turn this off, simply press the button again.
4. To apply a **Tint**, press the **Tint** button and select your options from the following dropdown menu.



This allows you to combine a color with the image to apply a tinted version of the image.

- By default, **No Stencil** is the selected option, which simply tints the image color and does not change any other aspect.
- Selecting **Stencil** allows you to paint through an image to create a design on the model. **Stencil** ignores the color on the stencil and follows only the alpha value.
- Selecting **Inverted Stencil** allows you to color in all parts of the model where the stencil is transparent, leaving the stencil as the model's original color.
- Selecting **Luminance** allows you to paint through an image in much the same way as you would with a stencil. However, by setting the option to **Luminance**, this allows you to use an image's luminance as the alpha when painting. This works especially well for dirt, noise, blemishes, and other similar effects.

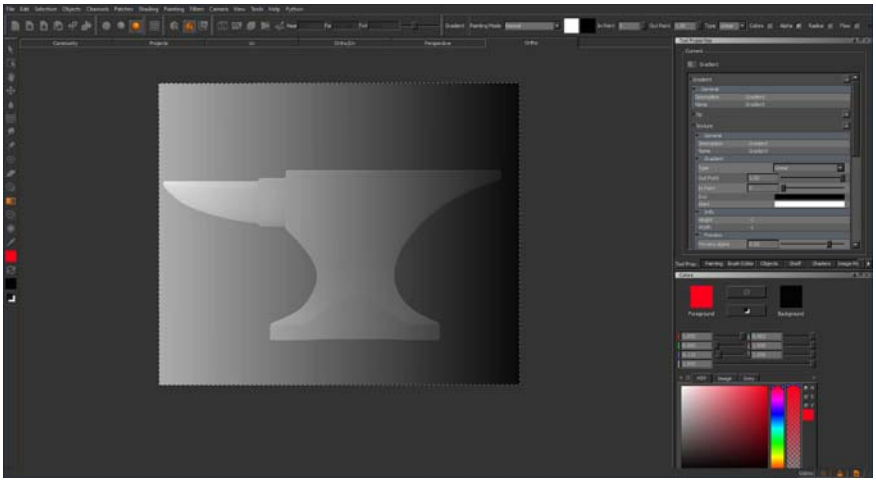
- Selecting **Inverted Luminance** allows you to create a similar effect as **Luminance** but uses the lighter parts of the image as alpha. This can be used to pick up scratches and fine lines.

Paint Through a Gradient

To paint through a color gradient (instead of through an image):

1. Click to select the **Gradient** tool.

   A gradient displays above the canvas.



2. To configure the gradient, change the settings on the **Tool Properties** toolbar at the top of the window.

You can set:

- The two colors for the gradient — click on the swatch to change the color.
- **In Point** — select a proportion of the gradient (left-to- right linear, or in-to-out radial) at which the starting color begins changing to the ending color (at 0.00, the transition begins at the far left linear or dead center radial; at 0.50 the transition begins halfway; at 1.00 there is no transition, it's all start color).
- **Out Point** — select a proportion of the gradient (left-to- right linear, or in-to-out radial) at which the starting color turns completely into the ending color (at 0.00, there is no transition, it's all end color; at 0.50 the transition ends halfway; at 1.00 the transition ends at far right linear, or the outer circumference radial).

- **Type** — select from the dropdown menu whether the gradient is **Linear** (from one side to the other) or **Radial** (from the center out).

As you change the properties the gradient shown onscreen updates.

3. Size, move, and rotate the gradient, in the same way as described in Set the Paint Through Options.
4. Paint through the gradient, in the same way as described in Paint Through an External Image.

7 Controlling the Way Mari Applies Paint to Your Model

When you paint, Mari saves your painting in a **buffer**, and then **bakes** it onto the surface of your model. You can learn About the Paint Buffer and transform paint in the buffer before baking, Mask What You Can Paint On, and apply Paint Blending Modes to control how paint in the buffer blends with what's on the surface when it bakes.

About the Paint Buffer

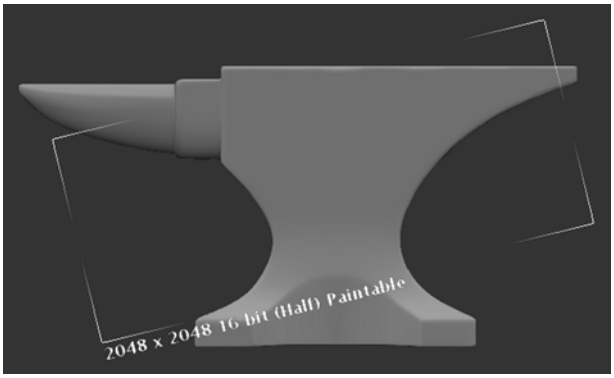
As you paint, Mari saves the painting since your last bake in the paint buffer. Then, when you bake, Mari saves the paint from the buffer, adds it to the surface underneath, and clears the buffer, ready for more paint.

While the paint is still in the buffer, you can make changes to it. If you don't like what you've done, you can erase sections using the **Eraser** tool or just blank the entire paint buffer.

Think of the buffer as floating above the canvas. When you bake, Mari adds the paint to the current layer — but until then you can edit the buffer, move the model around underneath it, or switch to another layer and bake the paint there instead. After baking, you can set your preferences to keep the transformations for new paint you add to the buffer, or automatically reset the buffer to the Mari defaults.

Boundaries

Mari shows the boundaries of the current paint buffer as a white rectangle. By default, the paint buffer is sized slightly larger than the window (that is, it covers everything you can see), so the boundaries are not visible. As you resize it, the boundaries and current details appear.



Paint buffer resized and rotated — note that depth and resolution details display underneath.

Depth and Resolution

The paint buffer has a specific color depth and resolution, which controls the color and resolution of the paint as you apply it (rather than that of the patches that you're painting onto). For instance:

- If the paint buffer has a color depth of 8-bit (256 colors), then that's the maximum number of colors that you can use when painting. Even if you're painting onto a patch with a color depth of 16 or 32 bits (65,536 or 16.7 million colors), the paint you're applying only has 256 colors.
- If the paint buffer has a resolution of 512x512, the total buffer as it appears on-screen has that resolution. Anything you paint in the buffer is at 512x512. Any patch with a higher resolution still only receives the paint at 512x512.

On the other hand, it's also true the other way around. If you're painting onto a 512 x 512 patch with 8-bit color, using a buffer at 1024x1024 and 16-bit color, Mari still saves the patch at 512x512 8-bit. The advantage to using a paint buffer with higher quality than the resulting patches is that you can "overpaint" and use the higher quality texture and color depth to ensure good results. You can use this to help smooth out transitions between colors (preventing stepping), or to ensure that your textures are sharp (that is, at the maximum resolution for the patch).

About Masking

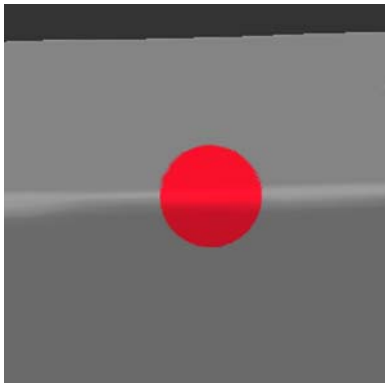
Within the buffer, you can control the paintable area. Mari lets you mask areas on the model. Areas covered by the mask can't be painted on. It's the electronic equivalent of putting masking tape over something you don't want to paint when you're repainting a wall.

Mari includes the following mask types:

- ambient occlusion mask
- depth mask
- backface mask
- fractal noise mask
- a configurable **edge mask**, which masks the areas on the model that are oblique to the current view, and
- a **channel mask**, where you create a channel for masking, paint in it, and use it to control where you can paint on another channel.

Edge Masks

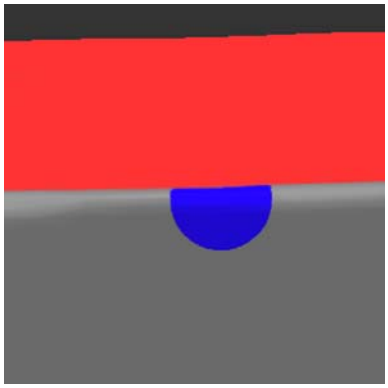
Mari projects paint directly onto the surface of your model based on your **view**. In other words, it applies paint to what you can see, from the angle you see it. If you paint something you can see, but you're not facing it directly, there might be **falloff**, where what you've painted has "smeared". For example, the images below show a spot painted onto a surface of an anvil. From the angle it was painted, it looks like a circle. But if you rotate it, you can see that it "stretched" over the edge.



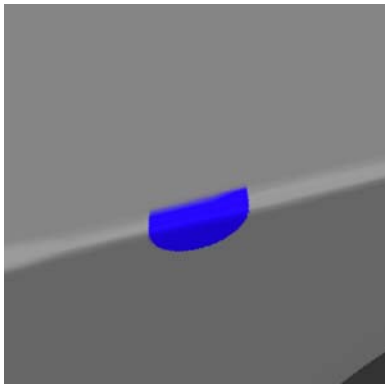
Circle painted front on.

Rotated, you can see the falloff.

To prevent this from happening, you can configure an **edge mask**, which masks the falloff area so you can't paint on it (or so that you can, but the falloff is minimized). The following illustration shows the edge mask tinged in red, and the result of the painting, again baked and rotated.



Circle painted front on, with edge mask.

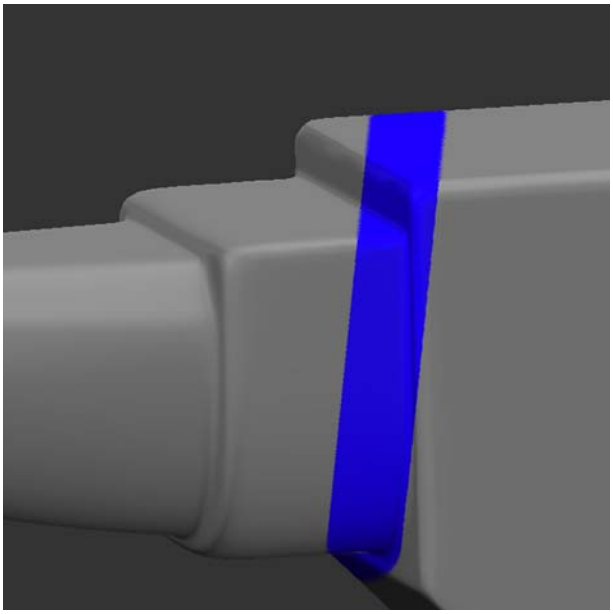


Rotated, you can see the mask prevented falloff.

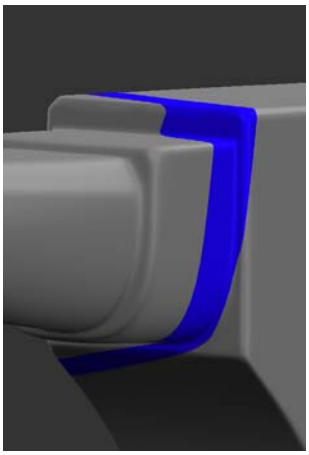
Generally, you wouldn't want such a sharp edge to the paintable area, so Mari lets you specify falloff start and end points to make it fuzzy (unlike the illustration above, where the start and end points are the same). The falloff **start** is where the masking begins, a proportion of where the projection deviates from directly facing the view. From there, the projection fades out

as the mask blends to the falloff **end**, at which point the projection ends completely (is completely masked) till it hits 90 degrees from facing. You can control how fast the masking falls off.

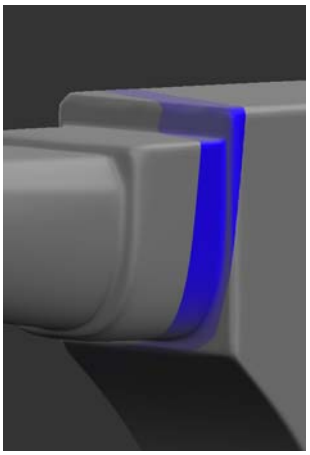
To see how this works, the following illustrations show the result of painting a stripe on the model, like this:



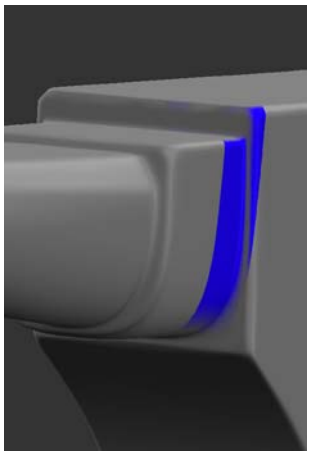
If we bake it, and then rotate to see how much "smeared" into the falloff area, you can see the results of using masks at falloff end/start points of 1.00/0.00 and 0.75/0.25:



No mask.



Mask Falloff: End1.00, Start 0.00.

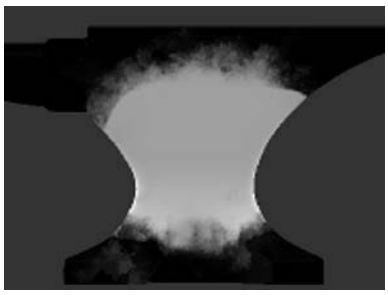


Mask Falloff: End 0.75, Start 0.25.

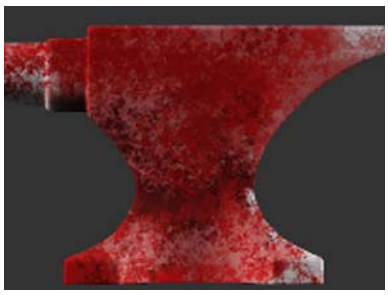
TIP: If you want to, you can set the end to a higher value than the start. This reverses the masking - the facing surfaces are masked and the oblique surfaces are paintable.

Channel masks

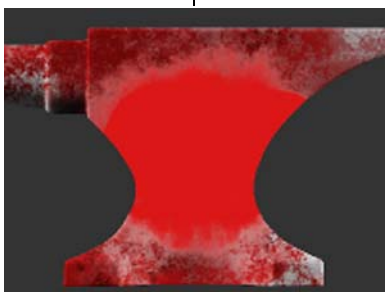
You can use a **channel mask** to manually define your own painting mask. You do this by painting into a channel and then using it to control where paint applies to the surface.



Channel mask.

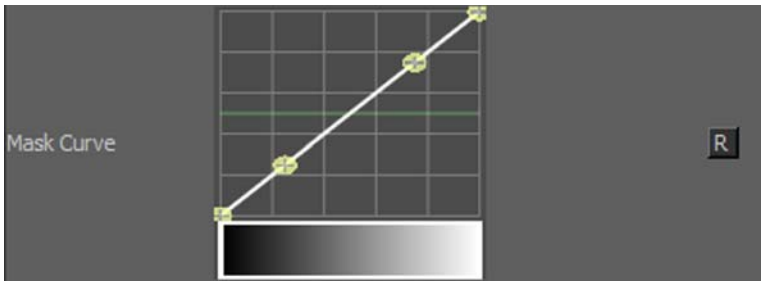


Paint buffer without channel mask.



Paint buffer with channel mask – see the red masked area where the white is on the mask.

Mari applies the channel mask based on color values on the surface of the channel. This is set up through a curve control:



By default:

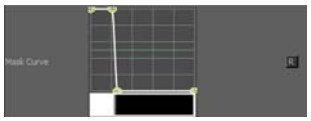
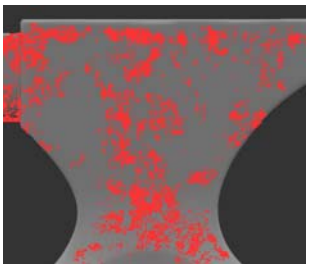
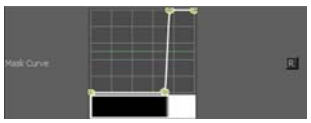
- White pixels (value of 1,1,1) are completely masked (totally unpaintable).
- Black pixels (value of 0,0,0) are completely unmasked (totally paintable).
- Other pixels are less masked as their color values approach 0, more masked as they approach 1. For example, 50% grey (0.5,0.5,0.5) creates a mask with 50% opacity.

Mask channel including colored mask data.

The resulting paint mask.

By altering the curve control, you can set how Mari masks different color values. For example, if you use a displacement map channel as your mask source, you can adjust the mask value to mask out everything except the darkest areas. This gives you a mask that covers everything except the "cracks" in your mask texture.

For example, here's the result of different settings using this displacement map as a channel mask:

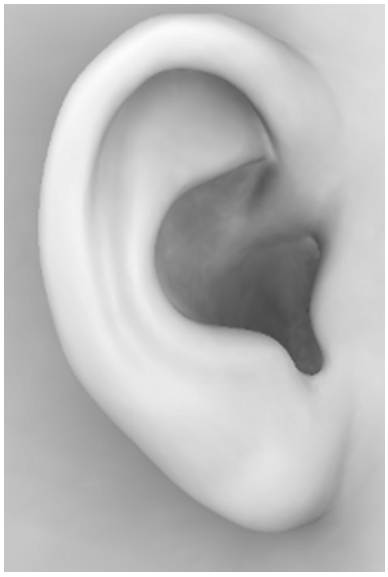
Setting	Result	Notes
		This paints into the dark areas – the cracks in the texture.
		This only unmasks the lightest (that is, the highest) points in the map.

You can also set the contrast for the mask. Mari applies this contrast to the mask channel when producing the final mask.

TIP: Mari expects masks to be black on white. That is, colors are less masked as they approach 0, more masked as they approach 1. However, if you prefer to paint your masks white on black, you can invert the mask input.

Ambient Occlusion Mask

The ambient occlusion mask lets you mask out the parts on your model that are covered by the ambient occlusion. Ambient occlusion is a way of mimicking the soft shadows produced by natural ambient light. The ambient occlusion mask lets you mask out the areas that are shadowed according to this calculation.



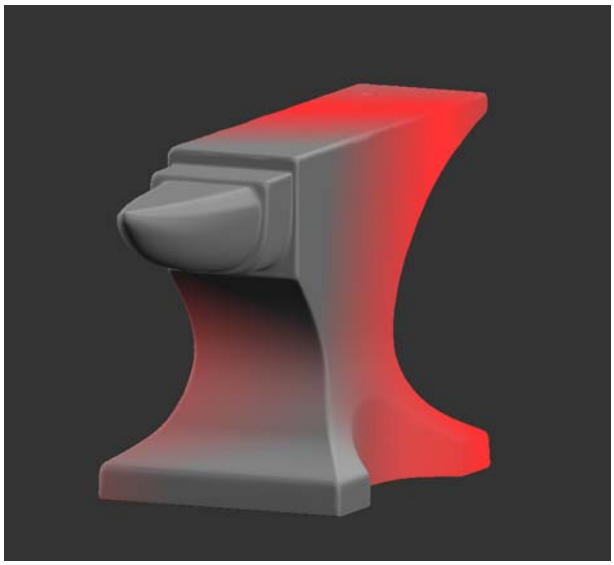
Shader showing the ambient occlusion on this part of the model.

Ambient occlusion mask — the darker the area on the original, the more it's masked.

If required, you can invert the mask, so as to mask out all the areas not covered by the ambient occlusion.

Depth Mask

The depth mask masks out areas on the model depending on how deep they are in the scene (that is, how far from the render camera). This lets you set start and end values and quickly mask out the region between them.

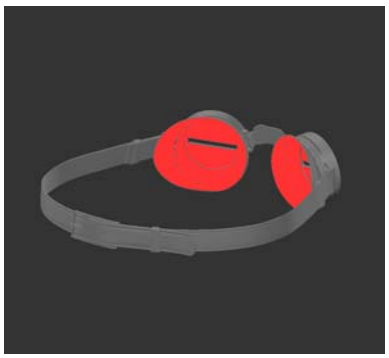


Using depth mask to mask out the far part of the object

Backface Mask

Turning this on simply masks out the backfaces on your model – so you can't paint on them. There are no other configuration options.

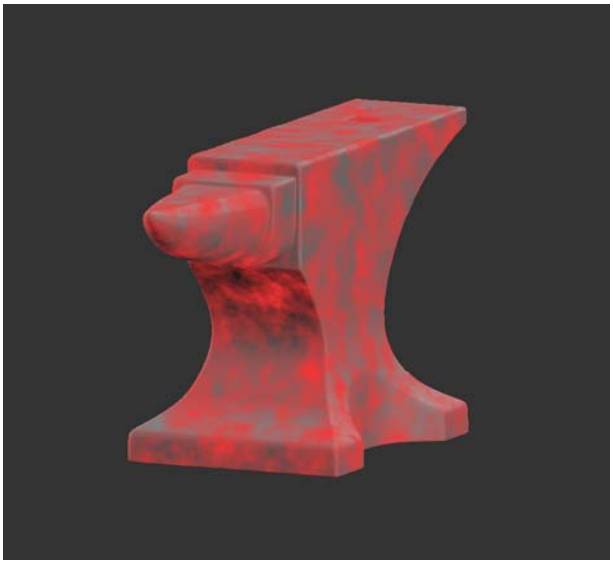
Backface mask off.



Backface mask on, masking the inside of the lens.

Fractal Noise Mask

The fractal noise mask is a user-controllable masking tool that uses generated noise to mask areas on the surface of an object while painting.



Using fractal noise mask to mask where paint is applied to the surface of the object

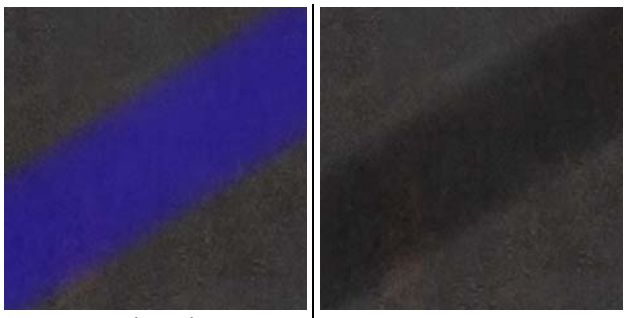
About Blend Modes

When you bake the paint buffer, Mari (by default) adds the contents of the buffer to the surface of the layer below. If you prefer, you can set the buffer to use any one of a number of other blend modes. These correspond to the layer blending modes used in 2D graphics programs such as Photoshop® or GIMP.

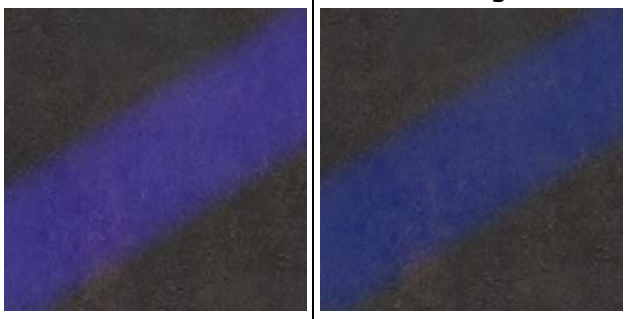
The default is for Mari to add the contents of the buffer to the surface. Other blend modes available include varieties of:

- painting the numeric difference between the buffer and the existing surface
- using the contents of the buffer as input for a dodge or burn on the surface
- using the contents of the buffer as input for a hard-light application on the surface.

For example, here's the same paint splash in different blend modes:



Default (over) mode. Burn Midrange mode.



Screen mode. Difference mode.

See Paint Blending Modes for details of all the blending modes available.

Steps for Controlling How Paint Applies to the Model

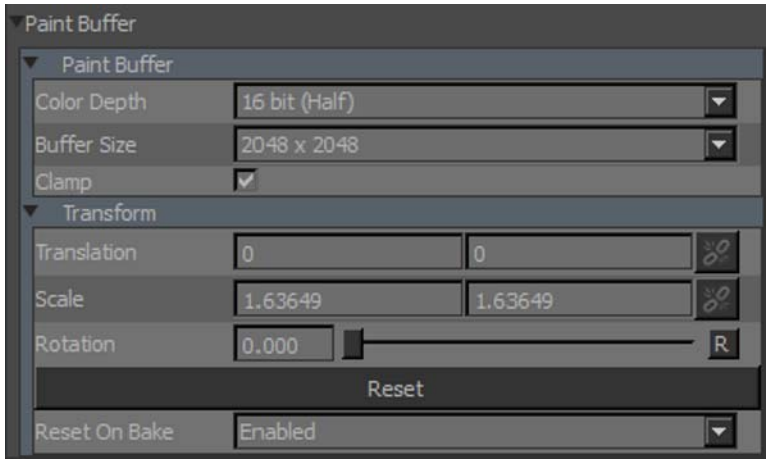
To control how your paint buffer works and how Mari bakes it to your model, follow these steps:

1. Configure the Paint Buffer
2. Erase Paint
3. Mask What You Can Paint On
4. Set the Paint Blending Mode
5. Paint Buffer Symmetry

Configure the Paint Buffer

1. Start Mari and open your project.
2. Open the **Painting** palette, scroll down, and expand the **Paint Buffer** section.

Mari displays basic properties of the paint buffer.



3. Set paint buffer properties:
   - **Color Depth** — controls how many colors the paint buffer can hold. Uncheck this if you want to clone from or paint through a source that has values higher than this range.
   - **Buffer Size** — controls the resolution of the buffer itself.
   - **Clamp** — if checked, Mari restricts the range of the paint buffer to values between 0 and 1.
   - **Transform (Translation, Scale, and Rotation)** — used to Move or Transform Paint in the buffer. But it's easier to use the **Transform Paint** tool.
   - **Reset on bake** — controls whether Mari resets the buffer to its defaults after baking. If enabled (the default), any transformations you've made to the paint buffer revert to the defaults. That is, after baking you get a new paint buffer (once again slightly larger than the visible screen). If you want to preserve your transformations after baking, change this to disabled.

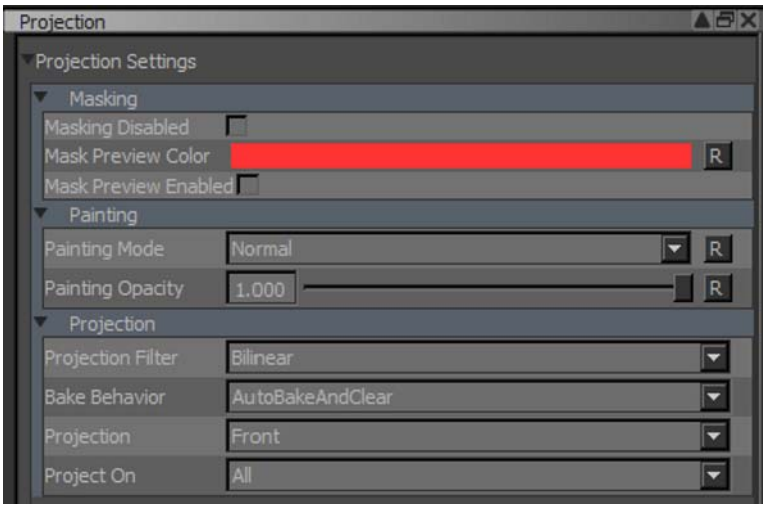
TIP: You should always try to set the color depth (and, if possible, buffer size) to at least as high as the highest values for the patches on your model.

Mari supports a maximum **Buffer Size** of 16384 x 16384. However, this setting is not available for all graphics cards. The availability of this setting is determined by the maximum texture size supported by your graphics card.

Please note that increasing the **Buffer Size**, even when your graphics card supports large textures, can slow Mari's performance.

If you are using patch resolutions higher than 4K, we recommend that you zoom in to the surface when painting, to keep the resolution sharp.

4. Open the **Projection** palette. This controls how Mari projects paint onto the model when you bake the paint, and mask settings.



5. Try changing the value for **Painting Opacity**.

   This controls how opaque your paint is in the buffer. At 1.0, you see the paint exactly as you painted it. At 0.5, the paint is half transparent, and at 0 it's completely transparent.

6. To set properties for baking the buffer, scroll down and expand the **Projection** section.

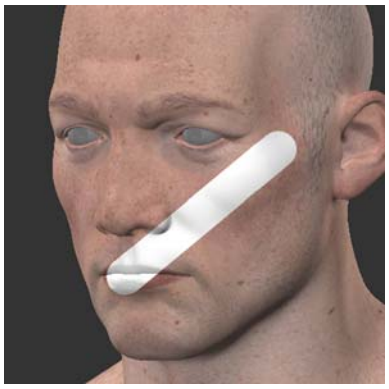
   The **Projection Filter** controls how Mari calculates the colors to apply to the surface when you bake the buffer down:

   - **Bilinear** — gives a smooth projection down onto the surface.
   - **Nearest** — gives a hard-edged projection down onto the surface.

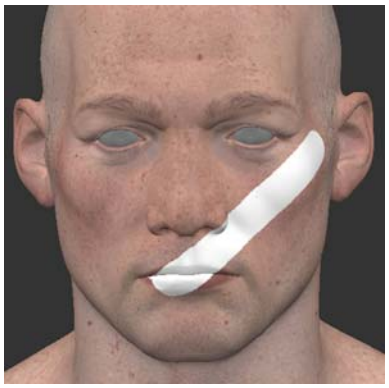
7. The **Bake Behavior** setting controls whether Mari bakes automatically when you change the view, and whether the buffer clears automatically once you bake. The options are:
   - **AutoBakeAndClear** — Mari automatically bakes and clears the buffer when you move the model.
   - **Manual** — You have to bake manually; and when you do, the paint stays in the paint buffer until you manually clear it.
   - **ClearOnly** — You have to bake manually; and when you do, the paint buffer clears automatically.

TIP: With **Manual** or **ClearOnly**, you can reposition the model underneath the buffer. This is useful, for example, if you realize that you need to get a better angle on a particular surface on the model.

8. The **Projection** setting lets you set whether Mari projects only onto the **Front** of the model (as you're seeing it) or whether paint goes straight **Through** the model (appearing on the back as well as the front).



The paint stroke, painted onto the left side of the face.



The result, projecting on the **Front**, rotated so you can see that it's only appearing in the front of the original view.

When projecting **Through**, the paint stroke appears on the back as well as the front.

9. In the **Project On** settings, select whether to project onto only the selected areas, or all patches/objects in the project. For example, if you set **Project On** to **SelectedOnly**, you can only paint on the currently selected areas (whether it's an area, patch, or object, depending on your selection mode).

   This is useful when, for example, painting a face so you don't have to worry about accidentally overpainting onto the eyes.

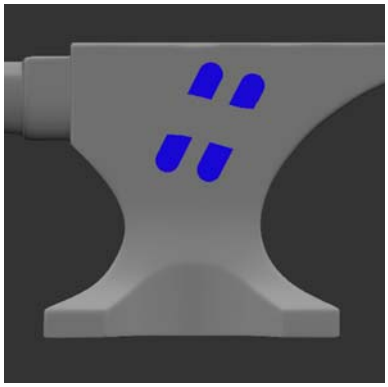
EXPERIMENT: Paint a couple of example strokes onto your model, so you can see the effects as you work.

Try:

- Setting Bake Behavior to **Manual** or **ClearOnly**, and then moving the model around underneath the buffer.
- The paint buffer "floats" above the model until you bake it on. For example, you could move it around to get a better angle on a particular surface that you're painting on, or to paint on a different section of the model.
- Using the **Zoom Paint Buffer** tool to zoom in on your model with the paint buffer locked and without baking the paint down.
- Changing channels (through the **Channels** menu or palette, or using the **PageUp** and **PageDown** keys). The paint buffer stays in front of the canvas, on the new channel.
- Setting **Projection** to **Through**. Paint some strokes on your model and bake them. Now rotate the model to see how the paint has "penetrated" it.
- Set **Project On** to **Selected**. Using the **Selection** tool, select a patch on your model. Paint a stroke that goes off the edge of the selected patch, and bake it. See how the paint that goes off the selection patch disappears when you bake.

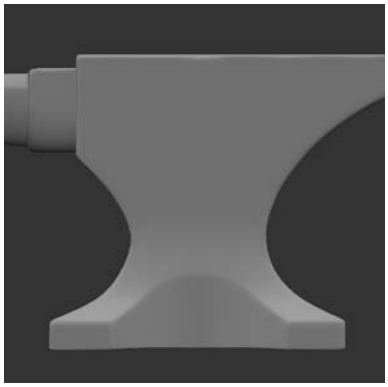
Erase Paint

1. To erase a section of paint, click on the **Eraser** tool.
2. Click and drag to erase paint from the paint buffer.
   This does not affect the underlying paint baked onto the model, only the paint in the buffer.



TIP: You can edit the brush details for the eraser (brush shape, size, and so on) the same as you would for any other brush.

3. To clear the entire paint buffer, click the **Clear the Paint Buffer** button.
   Mari clears the contents of the paint buffer.



NOTE: You can also clear the paint buffer by pressing **Ctrl/Cmd+Shift+C**.

Mask What You Can Paint On

1. Scroll to the top of the **Projection** palette.

   *Masking options are under the **Mask Preview**, **Channel Mask**, **Ambient Occlusion Mask**, **Backface Mask**, **Depth Mask**, and **Edge Mask** sections.*

2. If you want to change how masking appears on-screen, change the **Mask Preview** settings.
   - You can temporarily set the **Masking Disabled** feature by selecting the check box, or pressing **Ctrl/Cmd+M**. The allows you to see the geometry without any of the current masking channels. This overrides the **Mask Preview Enabled** feature, even if it is already selected.
   - You can set the **Mask Preview Color** — click the swatch to select a color for the mask from a color picker. The color includes an alpha value, so you can have the mask displayed semi-transparent.
   - To display the masking, click **Mask Preview Enabled** or press **,** (comma).

TIP: Layer masking, projection masks, and masks on projectors are all hardwired to use the red color component. If you want to use another color component for your mask value, the **Shuffle** adjustment layer allows you to change the RGBA components so that any can be replaced by another.

Additionally, the **Luminosity** adjustment layer allows you to convert an RGB input to a grayscale output.

When this is on, Mari shows all the masking you have turned on (including channel, edge, depth, and so on). When the masking is visible, the *icon displays in the status bar. Clicking this icon, as well as the button in the palette, hides the masking.*

Other icons show which masking is in use. They are:

for edge masking

for channel masking

for ambient occlusion masking

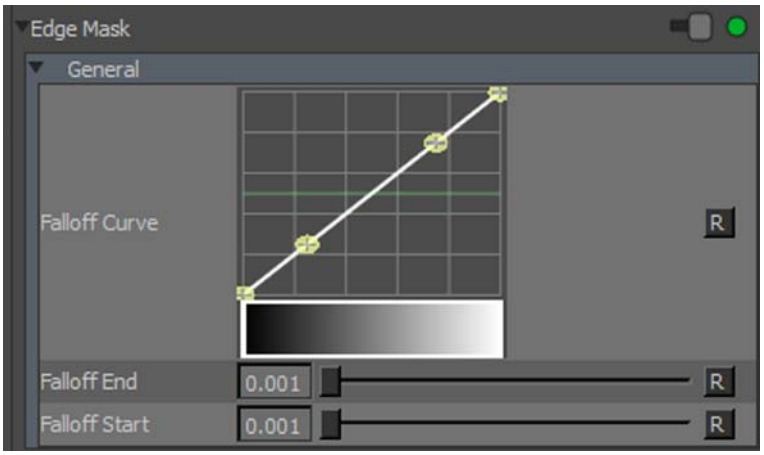
for depth masking

for backface masking

for masking disabled

Edge Masking

To use Edge Masks, set the options under **Edge Mask**:



- **Falloff Curve** — use the curve control to set how the masking falls off between the **Start** and **End** points. The start point is at the left of the curve, the end is at the right, and the degree of masking is on the vertical axis.
- **Falloff End** — where the projection completely fades and the painting is completely masked.
- **Falloff Start** — is where the masking begins, a proportion of where the projection deviates from directly facing the view, at which point the projection starts gradually fading as the masks blends to the falloff end.

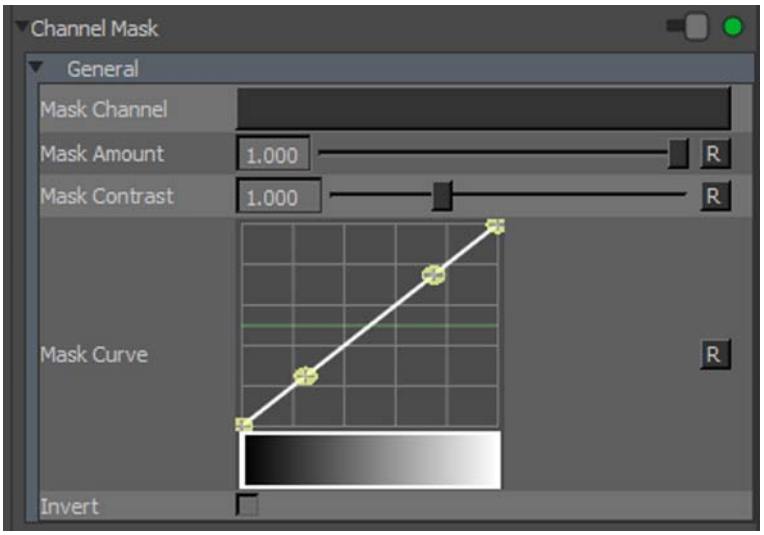
Enable the masking by turning on the toggle at the top of the section.

When enabled, the *icon displays in the status bar. Clicking this icon (as well as the checkbox in the palette) disables the edge mask.*

TIP: You can use shortcut keys to enable/disable the edge mask (**G**) and hide/show the masking (,).

Channel Masking

To use Channel masks, set the options under **Channel Mask**:



- **Mask Channel** — lets you select a channel to use as a mask (if you are using a channel mask, you'll want to create and paint a mask in a channel first).
- **Mask Amount** — controls the strength of the masked texture coming through, how much unmasked texture to apply. For example, at 0.5, Mari applies the unmasked paint with alpha of 0.5.
- **Mask Contrast** — controls the contrast used on the mask texture. This controls how sharply defined the mask is – at 1.0, this is just the original mask texture, lower values are fuzzier and higher values are sharper.
- **Mask Curve** — controls how the input pixel values relate to the degree of masking. The horizontal axis is the darkness of the input pixel (black to the left, white to the right), the vertical axis is the degree of visibility. By default, this is a direct line, where white pixels are totally masked, black pixels are totally unmasked, and 50% grey is 50% masked.
- **Invert** — applies the mask in reverse. Mari expects masks to be black on white, where the white areas are masked and black is unmasked. However, if you prefer to paint white on black, you can invert the mask input.

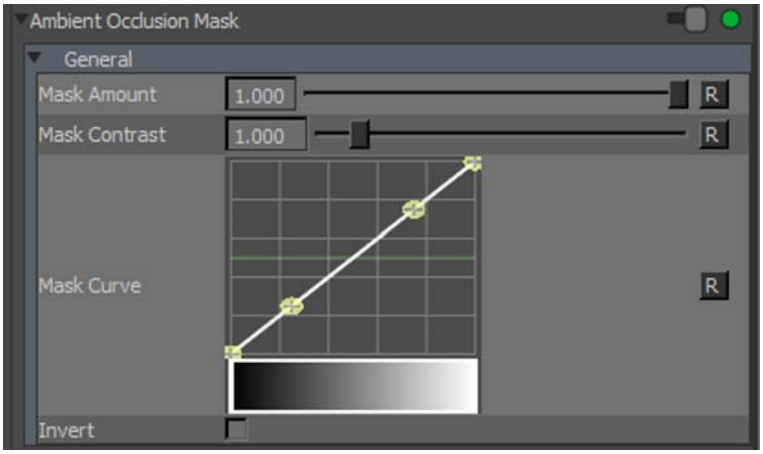
When enabled, the icon displays in the status bar. Clicking this icon (as well as the checkbox in the palette) disables the channel mask.

TIP: If you want to turn channel masking off, just select the blank entry from the **Mask Channel** list.

Ambient Occlusion Masking

Before you use an Ambient Occlusion Mask, you must calculate the ambient occlusion for the object. See Calculating Ambient Occlusion for more details.

To use an ambient occlusion mask, set the options under **Ambient Occlusion Mask**:



- **Mask Amount** — is the amount of masking to apply. This is from 0 to 1; higher values mask the areas that are covered by ambient occlusion, while lower values mask everything except the areas that are covered by the occlusion.
- **Mask Contrast** — controls how sharply defined the mask is. At 1.0, the mask is precisely the same as the ambient occlusion. Higher values mask the occluded areas more, lower values mask them less.
- **Mask Curve** — controls how the ambient occlusion pixel values relate to the degree of masking. The horizontal axis is the darkness of the occluded pixels (black to the left, white to the right), the vertical axis is the degree of visibility. By default, this is a direct line, where white pixels are totally masked, black pixels are totally unmasked, and 50% grey is 50% masked.
- **Invert** — if this is selected, the mask data is black on white rather than white on black.

When enabled, the icon displays in the status bar. Clicking this icon (as well as the checkbox in the palette) disables the ambient occlusion mask.

Depth Masking

To turn the depth masking on, set the options under **Depth Mask**:

- **Start** — is how far through the scene the masking begins. This is a proportion of the entire scene in the project, including all objects, lights, and so on.
- **End** — is how far through the scene the painting is completely masked.
- **Falloff** — sets how quickly the masking falls off between the start and end points. The interaction between the three settings can be subtle — you may need to play around with different settings to get the effect you want.

When enabled, the *icon displays in the status bar. Clicking this icon (as well as the checkbox in the palette) disables the depth mask.*

TIP: For details on creating new channels, see Channels.

EXPERIMENT: Experiment with the masking options. Create a channel to use as a mask, then use it to control where you can paint on the model. Try setting the falloff options for the edge mask to minimum and maximum values. Try setting the falloff options so that the forward facing areas are masked and the oblique areas are paintable.

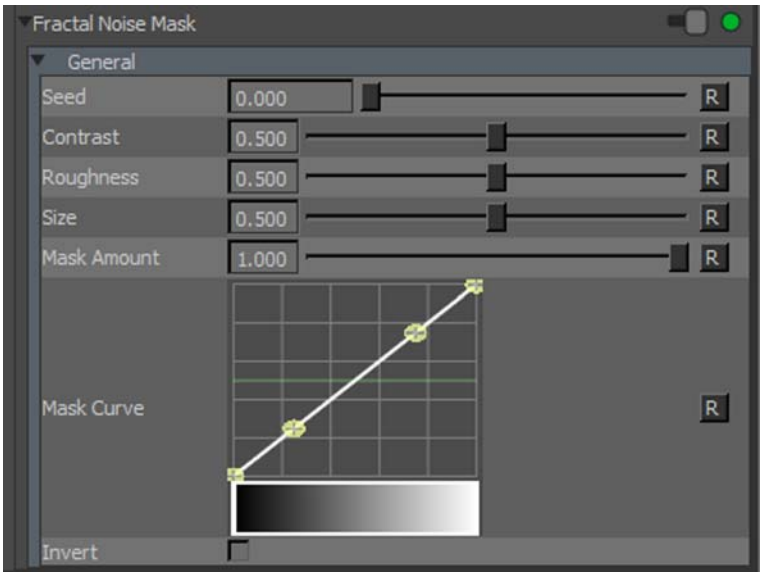
Backface Masking

To turn the Depth Mask on, next to **Backface Mask**, click to turn the toggle on.

When enabled, the *icon displays in the status bar. Clicking this icon (as well as the checkbox in the palette) disables the backface mask.*

Fractal Noise Masking

To turn fractal noise masking on, set the options under **Fractal Noise Mask**:

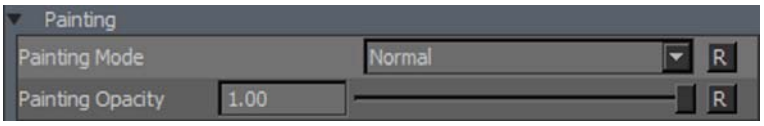


- **Seed** — changes the pattern of the fractal noise mask by moving the pattern in 3D space.
- **Contrast** — controls the level of contrast applied to the fractal noise features to derive the mask.
- **Roughness** — determines the roughness of the fractal noise features.
- **Size** — Determines the size of the fractal noise features.
- **Mask Amount** — the amount that the mask affects the paint buffer. 1.0 means that the mask absolutely controls where you can paint; the effects of the mask decrease as the value gets lower.
- **Mask Curve** — controls how the fractal noise relates to the degree of masking, based on the above fields. This allows you to fine tune the contrast and pattern appearance of the fractal noise mask.
- **Invert** — if this is selected, the mask data is black on white rather than white on black.

When enabled, the *icon displays in the status bar. Clicking this icon (as well as the checkbox in the palette) disables the fractal noise mask.*

Set the Paint Blending Mode

1. In the **Projection** palette, scroll to the **Painting** section.
   Mari displays the details of the current paint blending mode:



You can also set this in the **Tool Properties** toolbar.

2. Paint a stroke or two on your model (so you can see the effects of changing the settings).
3. Select a paint blending mode from the **Painting Mode** dropdown.

   The paint blending modes available are similar to many other paint packages. If you aren't familiar with the various modes, see Paint Blending Modes *for descriptions and examples.*

   As you change modes, the paint in the buffer updates to show the effect.

EXPERIMENT: Play around with the blend modes. As you change them, see how the paint in your buffer changes. Experiment with the results you can get with different blend modes, how they work with different types of brush strokes, paint alpha values, and so on.

Paint Blending Modes

Mari comes with several paint blending modes. The chart below uses the following example surface and painting to illustrate the effect of applying the different modes:

Unpainted surface.

Paint stroke in default blend mode.

There are a number of shortcuts that can help you switch between Previous Blend, Last Blend, or Next Blend modes (among others), as well as resetting the paint blend mode. For a list of available shortcuts, please refer to Keyboard Shortcuts on page 376.

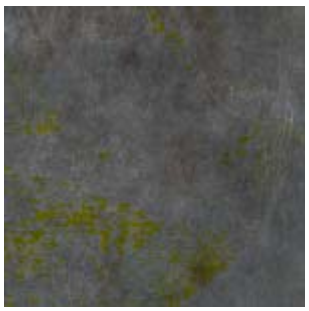
In the application, these effects are grouped by functional area (for example, all the light modes (hard light, soft light, and so on) are grouped together). This list is alphabetical to make it easier for you to find a description of a particular effect.

Blend mode	Description	Example
Add	Adds the values of the colors in the paint buffer to the values on the layer's surface.	
Add Normal Maps	Blends two RGB-encoded vector layers with the **Add** input by converting the raw values from the 0.0 to +1.0 color space-encoded range to the -1.0 to +1.0 vector range, applying the blend factor to the **Over** input, adding the values, then normalizing the values before converting it back to the 0.0 to +1.0 color space-encoded range.	
Burn Highlights	Burns the layer based on the highlights in the paint buffer.	
Burn Midrange	Burns the layer based on the middle range (that is, not the lightest or darkest pixels) of the paint buffer.	

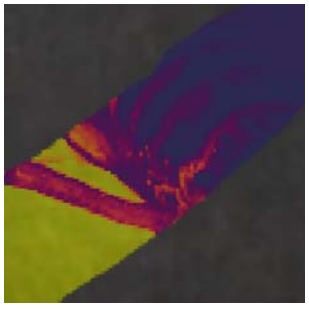
Blend mode	Description	Example
Burn Shadows	Burns the layer based on the contents of the paint buffer, with darker pixels being burned harder.	
Clear	Subtracts the opacity of the paint stroke from the current surface. For example, an 80% opaque stroke leaves a surface with 20% opacity.	
Color	Takes the luminance of the layer, and the color and saturation of the paint buffer.	
Color Burn	Burns the layer, using the contents of the paint buffer as input for the burn operation.	

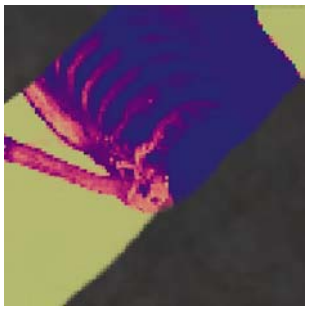
Blend mode	Description	Example
Color Dodge	Dodges the layer surface, using the contents of the paint buffer to control the degree of dodging.	
Contrast	The destination color moves away from the painted color by contrasting around the painted color. How much it contrasts depends on the alpha.	
Darken	Gives each pixel the darker of two possible values: the current layer surface or the contents of the paint buffer (whichever is darker).	
Decontrast	The destination color moves towards the painted color by decontrasting around the painted color. How much is decontrasts depends on the alpha.	

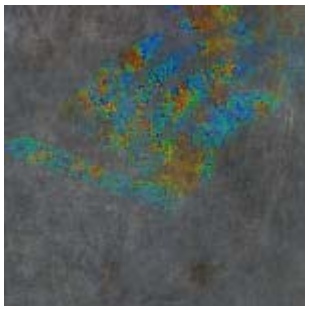
Blend mode	Description	Example
Difference	Inverts the colors. Mari subtracts the values in the paint buffer from those on the layer surface.	
Dodge Highlights	Dodges the layer based on the highlights in the paint buffer.	
Dodge Midrange	Dodges the layer based on the middle range (that is, not the lightest or darkest pixels) of the paint buffer.	
Dodge Shadows	Dodges the layer based on the contents of the paint buffer, with darker pixels being dodged harder.	

Blend mode	Description	Example
Exclusion	Inverts the colors, but with a lowered contrast.	
Hard Light	Mimics a harsh spotlight. Makes light areas lighter (using a screen effect), and dark areas darker (using a multiply effect).	
Hard Mix	First performs a vivid blend, then thresholds the colors to their extreme values. The result is that the pixels can be one of eight colors — black, white, red, green, blue, cyan, magenta, or yellow.	
Hue	Takes the luminance and saturation from the layer pixels, with the hue from the paint buffer.	

Blend mode	Description	Example
Inverse Difference	Subtracts the colors in the paint buffer from the layer surface, and then inverts the result.	
Invert	Uses the paint buffer as the input to invert the pixels on the base layer.	
Lighten	Gives each pixel the lighter of two possible values: the current layer surface or the contents of the paint buffer (whichever is lighter).	
Luminance	Takes the hue and saturation of the layer color, and the luminance of the paint buffer. (This is the opposite of the Color blend mode.)	

Blend mode	Description	Example
Mix Normal Maps	Blends two RGB-encoded vector layers with the **Mix** input by converting the raw values from the 0.0 to +1.0 color space-encoded range to the -1.0 to +1.0 vector range, applying the blend factor to the **Over** input, adding the values, then normalizing the values before converting teh value back to the 0.0 to +1.0 color space-encoded range.	
Multiply	Darkens the color. Mari multiplies the layer color by the color in the paint buffer.	
Normal	Replace values on the layer's surface with those from the paint buffer. (Mari's default mode.)	
Nudge Flow Vectors	Changes the paint buffer to tangent vector space. Keeps the vectors flat to the object's surface in 2D space. The **Nudge Flow Vectors** mode adds the vectors together to get the blend result, and is best for use with flow maps.	

Blend mode	Description	Example
Nudge Normal Vectors	Changes the paint buffer to tangent vector space. Allows the z value to face outward in 3D space, so that vectors face out from the object's surface anywhere on the model. The **Nudge Normal Vectors** mode adds the vectors together to get the blend result, and is best for use with normal maps.	
Overlay	Uses the patterns and colors from the paint buffer, but keeps the highlights and shadows from the layer.	
Paint Flow Vectors	Changes the paint buffer to tangent vector space. Keeps the vectors flat to the object's surface in 2D space. Unlike **Nudge Flow Vectors**, the **Paint Flow Vectors** mode blends between the vectors instead of adding them. This mode is best for use with flow maps.	
Paint Normal Vectors	Changes the paint buffer to tangent vector space. Allows the z value to face outward in 3D space, so that vectors can face out from the object's surface anywhere on the object. Unlike **Nudge Normal Vectors**, the **Paint Normal Vectors** mode blends between the vectors instead of adding them. This mode is best for use with normal maps.	

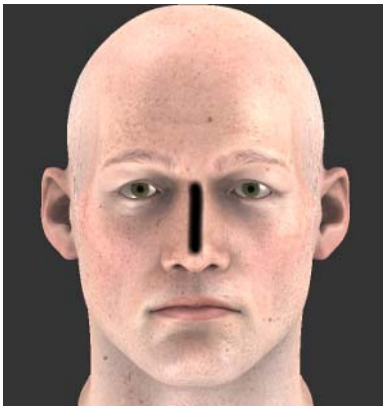
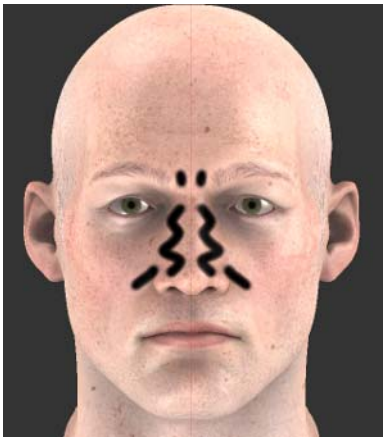
Blend mode	Description	Example
Pin Light	For light areas in the paint buffer, replaces pixels on the layer's surface that are darker than the corresponding pixels in the paint buffer. For dark areas in the paint buffer, replaces pixels on the layer's surface that are lighter than the corresponding pixels in the paint buffer. (Otherwise, leaves the layer surface unchanged.)	
Saturation	Takes the luminance and hue of the layer color, with the saturation from the paint buffer.	
Scale Vectors	This is most useful with the basic **Paint** tool, while preferably using grayscale paint. **Scale Vectors** uses the intensity of color to control the length of the normal in 3D space.	
Screen	Lightens the image. Mari divides the color on the surface of the layer by the value of the paint. (This is the opposite of Multiply.)	

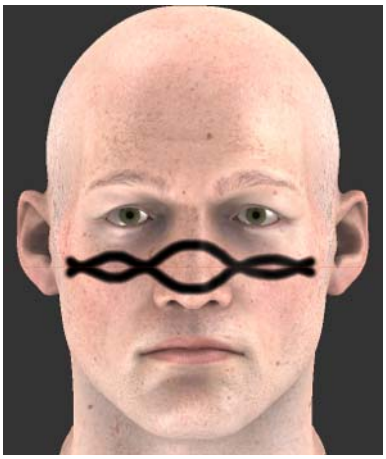
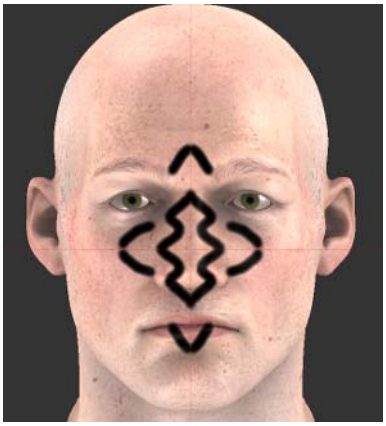
Blend mode	Description	Example
Soft Light	In dark areas on the layer, burns the paint buffer onto the layer surface. In lighter areas, dodges it on.	
Sponge Desaturate	Uses the paint buffer as the input to desaturate the pixels on the base layer.	
Vivid Light	In dark areas on the layer, adds the paint buffer with more contrast. In light areas, adds it with less contrast.	

Paint Buffer Symmetry

You can mirror paint strokes in the paint buffer. On the **Paint Buffer Symmetry** toolbar, four options control whether you want your paint strokes to be mirrored on the paint buffer axis and, if so, how the paint strokes should be mirrored. The toolbar, shown below, appears in Mari alongside other toolbars such as **Lighting** and **Navigation**.

The four options on the toolbar are included below, with example paint strokes illustrating the symmetry for each option:.

Symmetry Option	Description	Example
	Mari's default paint buffer setting is to have paint buffer symmetry disabled.	
	Mirroring left and right divides the paint buffer vertically. Paint strokes created on either side of the buffer mirrors the same strokes on the other side.	

Symmetry Option	Description	Example
	Mirroring top and bottom divides the paint buffer horizontally. Paint strokes created on either side of the buffer mirrors the same strokes on the other side.	
	Mirroring four ways divides the paint buffer into quadrants. Paint strokes created in any of the four quadrants mirrors in the other three.	

Painting in the paint buffer with symmetry enabled only applies to the actual paint strokes. If mirroring is used while in **Paint Through** mode or while using the **Clone Stamp** tool, only the paint strokes are mirrored; not the texture being painted through or cloned.

Paint buffer symmetry also mirrors only the paint buffer; it does not project paint onto the opposite side of the geometry.

8 Transforming and Warping Paint

Mari lets you transform and distort paint within the buffer with these four tools:

- **Transform Paint**
- **Warp**
- **Slerp**
- **Pinup**.

TIP: See Controlling the Way Mari Applies Paint to Your Model for details of how the paint buffer works.

Transforming the Paint Buffer

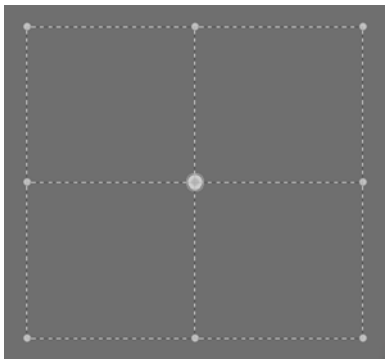
You can use the **Transform Paint** tool to resize and stretch the paint buffer as a whole. This lets you:

- resize the buffer (either proportionally or stretched)
- rotate it
- or just move it around.

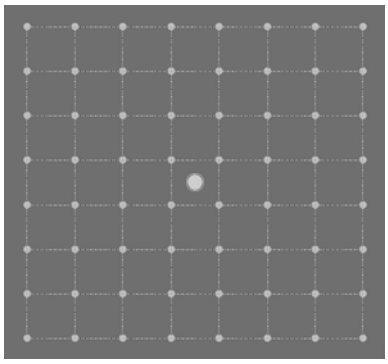
As you transform the paint buffer, its contents — that is, the paint as it appears on your model — changes too. For example, you can paint a stroke, then stretch it, rotate it, and position it exactly on your model, before finally baking it onto the layer.

Warping Within the Paint Buffer

The **Warp** tool lets you warp a selected area within your paint buffer. You create a **warp box** — a rectangle with between 4 and 64 **control points**.

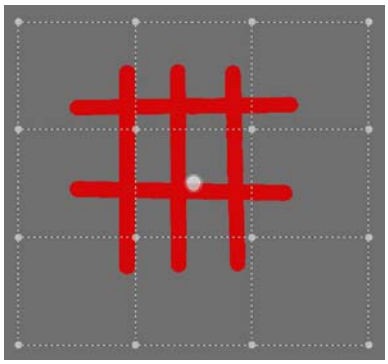


Warp box with four control points.

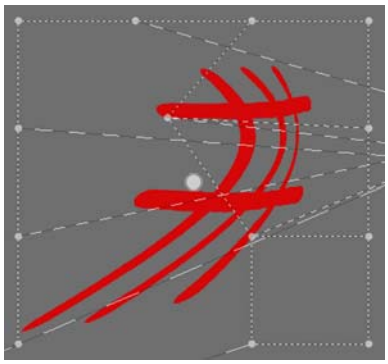


Warp box with 64 control points.

You can then warp the paint buffer under the box by moving the control points around.



Initial transform box (16 control points).



After some warping.

Pulling Paint Around with Slerp

The **Slerp** tool works like the Liquify tool in Photoshop®. It lets you "pull" the contents of the paint buffer around.

Initial contents of paint buffer.	Body pushed in to give a narrow waist.	Slerped using a big brush tip in an S motion.

Slerp uses a standard Mari brush tip, so you can fine-tune how to push things around. As well as pulling, Slerp lets you grow, shrink, and rotate the paint. You can also use it to selectively erase distortions you've already applied.

Pinning and Pulling with Pinup

The **Pinup** tool works like the **Warp** tool, but lets you set your own control points (pins) wherever you want. Think of it as turning the paint buffer into a rubber sheet, which you can pull around with the pins. You can use pins either to pull the paint around, or to hold it in place. So if you get a distortion that you're happy with in part of the buffer, you can set some pins around it and other distortions won't affect it.

You can move the pins around (either one by one or in groups), or rotate them around a central point. You can also move the point of rotation.

Initial contents of paint buffer, with pins set. Point of rotation is the big white circle.

Pins on the legs moved to the right, distorting the buffer but not around the head.

The same pins rotated to the right instead of moved, stretching the buffer up.

You can also change the "strength" of each pin. This sets how much the pin affects the texture around itself.

TIP: The **Transform** tool works on the entire paint buffer at once, while the **Warp**, **Slerp**, and **Pinup** tools let you select which area within the buffer to work on.

Steps for Transforming and Warping Paint

To transform or warp paint in the buffer, follow these steps:

1. Move or Transform Paint
2. Warp Paint Using a Grid
3. Pull, Smudge, Grow, and Shrink Paint
4. Distort the Paint with Pins

Move or Transform Paint

1. Start Mari and open your project.
2. Paint a couple of example strokes onto your model, so you can see the effects as you work.

3. Click to select the **Transform Paint** tool .
4. To transform the paint, you can do the following:

To...	You need to...	Example:
Move the paint buffer around	Click on the buffer and drag it.	
Resize the paint buffer, preserving the scale	Hold down **Ctrl/Cmd+Shift**, click anywhere on the canvas and drag. Dragging to the left makes the buffer smaller, to the right makes it bigger.	

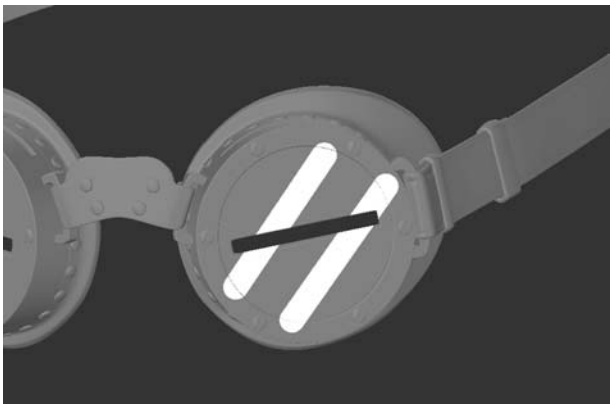
To...	You need to...	Example:
Stretch the buffer (resize without preserving scale)	Click on a side or corner of the buffer and drag it.	
Rotate the buffer	Either: • click outside the buffer and drag, or • hold down **Ctrl**/**Cmd**, click inside the buffer, and drag.	

TIP: You can also make these transformations by manually editing the values under **Transform** in the **Paint Buffer** section of the **Painting** palette. For example, editing the **Translation** values moves the buffer around on screen, changing the **Scale** resizes the buffer, and the **Rotation** control sets the rotation to specific degrees.

EXPERIMENT: Experiment with the various transformations you can make to the paint buffer. Try stretching, rotating, and moving the buffer, then baking the paint onto the surface of your model. Use both the **Transform Paint** tool and the controls under **Paint Buffer** in the **Painting** palette.

Warp Paint Using a Grid

1. If necessary, paint another couple of strokes on the model to experiment with.

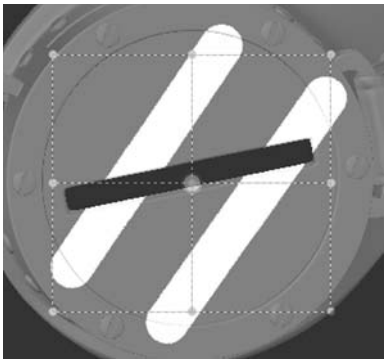
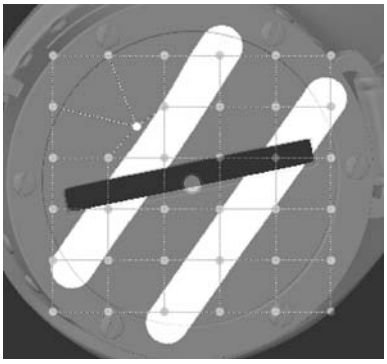
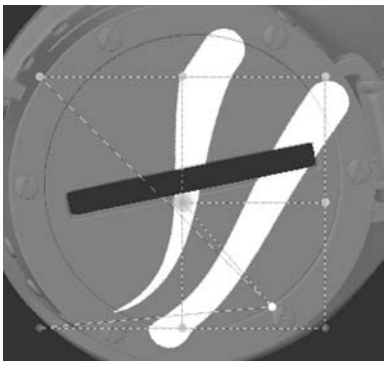


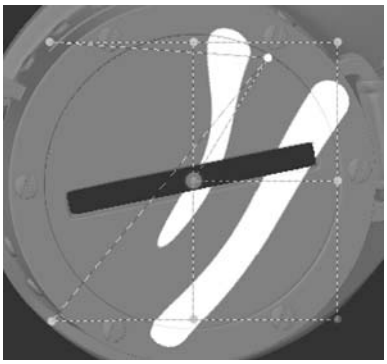
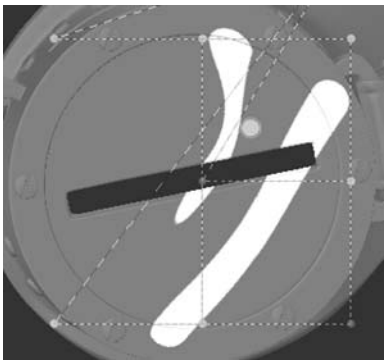
2. Click to select the **Warp** tool .
3. Click and drag to create a rectangle to warp.

   The warp rectangle displays, with nine control points, and a central rotation pivot (the large point in the center).

TIP: After you draw a warp box, to replace it with another warp box: hold down **Shift**, click and drag.

4. To warp your selection, you can do the following.

To...	You need to...	Example:
Increase or decrease the number of control points (up to 64)	press the **Up** or **Down** arrow keys (↑ ↓).	
Move a single control point	click and drag it.	
Move multiple control points	click and drag out a rectangle covering the control points, then click one of the points and drag it — the other points follow.	

To...	You need to...	Example:
Rotate around the central pivot	hold down the (**Windows**) key, then drag one or more points.	
Move the central pivot point	click and drag it. Be careful to click on the pivot point (the big circle), rather than the central control point.	
Remove the current warp	press ' (apostrophe).	

5. To complete the warp, do one of the following:
   - draw a new warp box (remember to hold down **Shift** when dragging to create the new box),
   - change to another tool, or
   - bake the paint.

TIP: You cannot undo individual stages of a warp. You can only undo the warp as a whole.

EXPERIMENT: Have a play with the warp tool.

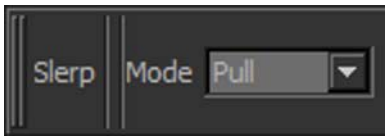
Try:

- moving one point
- clicking and dragging to select two points, then moving them together
- using the (**Windows**) key to rotate points.

Pull, Smudge, Grow, and Shrink Paint

1. The effects of the **Slerp** tool can be quite subtle, so we recommend you use a sample picture to see them clearly. Use the **Paint Through** tool to drag a picture over the model, then stamp it down with the ' (apostrophe) key.

2. Click to select the **Slerp** tool .
3. If it's not visible, show the **Tool Properties** toolbar. You can select the tool mode from the **Mode** field:



4. Select from the **Slerp mode selector** to use Slerp as follows:

To...	You need to...	Example:
pull paint around	select the (default) **Pull** mode, click and drag.	
make the paint in a specific area larger	select the **Grow** mode, click and drag.	
make the paint in a specific area smaller	select the **Shrink** mode, click and drag.	

To...	You need to...	Example:
rotate your paint around	select the **Rotate** mode, click and drag.	
undo the distortion in a specific area of the painting	select the **Erase** mode, click and drag.	n/a
undo all the distortions you've applied	press ' (apostrophe).	n/a
apply your changes to the paint buffer (that is, make them so you can't erase the distortions)	press ; (semicolon).	n/a

5. To complete the distortion, do one of the following:
   - press ; (semicolon),
   - change to another tool, or
   - bake the paint.

TIP: As with the **Warp** tool, you cannot undo individual stages of a Slerp. You can only undo the Slerp as a whole. Until you have completed the Slerp, using Undo actually undoes the last completed action.

EXPERIMENT: Try using Slerp's various modes. Each mode has radius and opacity options that you can change. Try adjusting these to see how dramatically that mode can change the texture.

Distort the Paint with Pins

The **Pinup** tool lets you create your own control points to distort the paint buffer. You can use pins to pull the paint around like a rubber sheet, or to hold areas of the buffer steady while you distort other parts.

1. Clear the paint buffer, and use the **Paint Through** tool to stamp another example texture onto your model.
2. Select the **Pinup** tool .
3. Use the **Pinup** tool as follows:.

To...	You need to...	Example:
add or remove a pin	**Shift**-click.	
select multiple pins	click and drag around the pins.	n/a
move pins around (distorting the paint)	click on one of the selected pins and drag.	

To...	You need to...	Example:
rotate pins around the central point of rotation	click on one of the selected pins, hold down the (**Windows**) key and drag.	
move the central point of rotation	click on the point of rotation (big dot) and drag it.	n/a
change the strength of a pin	click on the pin to select it, then press the **Up** or **Down** arrow keys. As you increase the strength of a pin, the preview circle around the pin gets bigger (or smaller as you lower the strength).	n/a
remove all the current pins	press **Ctrl**/**Cmd**+' (apostrophe).	n/a
undo all the distortions you've applied, moving the pins back to their original positions	press ' (apostrophe).	n/a
apply your changes to the paint buffer and remove all current pins	press **;** (semicolon).	n/a

4. To complete the distortion, do one of the following:
   - press **;** (semicolon),
   - change to another tool, or
   - bake the paint.

TIP: As with the **Warp** tool, you cannot undo individual stages of a **Pinup**. You can only undo the **Pinup** as a whole. Until you have completed the **Pinup**, using **Undo** actually undoes the last completed action.

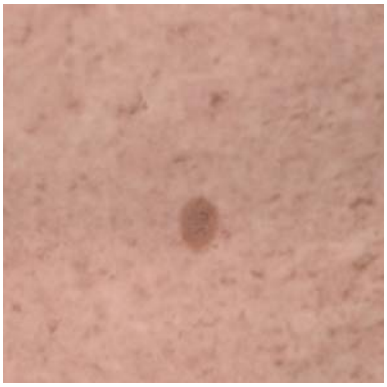
EXPERIMENT: Using pins is also hard to describe but quite easy to get the hang of. Try doing the following:

- Create some pins.
- Drag one pin around.
- Select multiple pins and drag them around.
- Rotate pins.
- Move the point of rotation, and rotate pins around the new point of rotation.
- Increase and decrease the strength of individual pins. See how stronger pins affect the texture more.

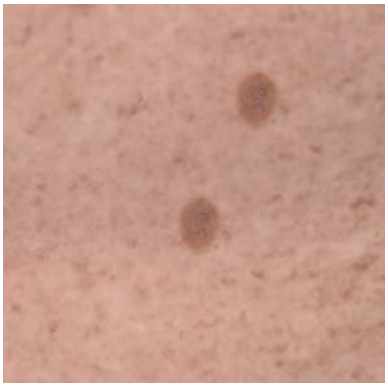
9 Towing Paint Around

The **Towbrush** is similar to the Healing Brush and Patch tools in Photoshop®. It lets you select areas of paint and drag them around the surface of your model. As you tow the paint around, it blends the edges of your selection with the surrounding paint. It works like the **Clone** tool, but blends in the edges of the cloned selection.

Put simply, it lets you grab paint and move it around on the surface, automatically blending in the edges as you go.



Original surface.



Mole cloned and moved, broken veins moved.

The **Towbrush** has three modes, allowing you to:

- **Clone** — clone from the selected region to another part of the surface.
- **Heal** — overwrite the selected region with another part of the surface.
- **Move Feature** — swap the contents of the selected region with another area on the surface.

There are limits to the amount of blending the **Towbrush** can do: as with the Healing Brush in Photoshop®, it's not magic. But it's very good at working with surfaces with regular textures, such as skin, rock, stone, and so on.

Steps for Towing Paint

To tow paint around on the surface, follow these steps:

1. Select and Tow Paint

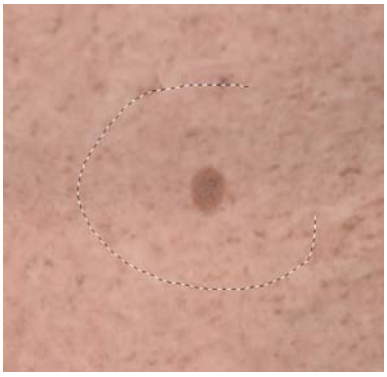
Select and Tow Paint

1. Start Mari and open your project.
2. If you have any unbaked paint on your model, either bake it or clear the buffer.

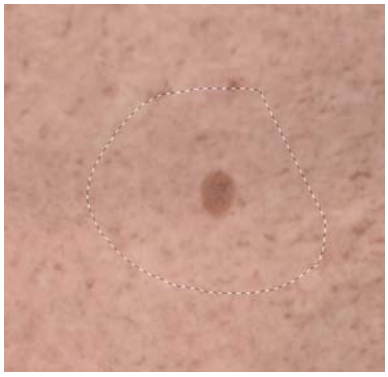
   The Towbrush only works on baked paint.
3. Click to select the **Towbrush** tool.
4. If it's not visible, show the **Tool Properties** toolbar. You can select the tool by clicking the icons:

   Select the mode from:

   - **Clone** – clones from the selected region to another part of the surface. *This is the default mode.*
   - **Heal** – overwrites the selected region with another part of the surface. That is, it clones the texture under your mouse over the selected area.
   - **Move Feature** – swaps the contents of the selected region with another area on the surface.
5. Click and drag on your model to select the area to tow.



You can drag any shaped area.



When you release the mouse, the selection area completes.

6. Click on the selection area and drag it around.

   As you tow the selection, the edges blend in with the surrounding texture.
7. You can adjust the settings for the **Towbrush**. You can set the:

   • **Falloff** — controls how the texture blends in from the edges of the patch. Higher values have sharper transition to the surrounding tex-

ture, lower values blend in more smoothly. Use { and } to lower and raise the falloff.

- **Value** — how much of the color of the original patch to preserve. Higher values keep more of the original color, lower values blend the whole patch in with the background as you move it. Use [and] to lower and raise the value.

8. To fix any mistakes:
   - If you want to clear your current selection, press ' (apostrophe).
   - If you want to undo a clone/move, just clear the paint buffer.
9. Bake your changes.

   *If you want to paint multiple strokes with the **Towbrush** tool, you must bake between each move.*

EXPERIMENT: As the Towbrush blends its edges dynamically, it's hard to see unless you actually have a go with it. Experiment with the brush and see what results you can get on a variety of textures.

10 Copying and Pasting Paint

Mari lets you:

- copy and paste single patches quickly, or
- copy multiple patches at once.

In both cases, you can copy between channels. When copying multiple patches, you can copy to other objects in your project.

Copying a Single Patch

Mari's quick copy function lets you copy a single patch and then copy it back onto the same object (on any channel). You can paste the copied patch back onto multiple target patches.

Copy Textures Between Channels and Objects

Mari's Copy Multiple Textures function lets you copy entire patches between places in your project. You can copy patches:

- between objects,
- between layers on the same object, or
- between patches on the same layer.

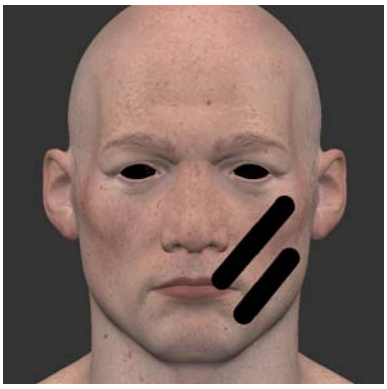
You can only copy textures on a patch-to-patch basis – you cannot copy one patch onto more than one other patch at once.

Using Offsets

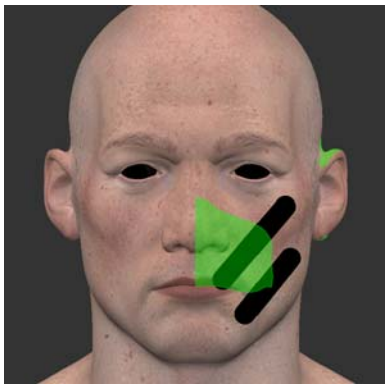
You can also use an offset. This is added to the source patch number to determine where to paste the texture to. For example, if you copied the texture on patch 1001 with an offset of 20, the texture would copy to patch 1021.

So, for example, if your model has a consistent numbering scheme, you can use this to paste from one side of the model to another. As you do this, Mari reverses the textures.

Here, we paint a couple of black stripes on the face, and then select patch 1002:



Black stripes painted.



Patch 1002 selected.

If we copy patch 1002 back onto the same channel, with an offset of 20, the paint copies to patch 1022 (the corresponding patch on the other side of the model's face). Mari reverses the texture as it pastes.

Steps for Copying and Pasting Paint

To tow paint around on the surface, follow these steps:

1. Copying and Pasting Single Patches
2. Copying and Pasting Multiple Patches

Copying and Pasting Single Patches

1. Select your source patch.

   This only works with single patches. You cannot copy multiple patches at once.
2. From the **Patches** menu, select **Quick Copy**.

3. Select your destination patch(es).

   This can be on the same layer or a different layer on the same object.

4. From the **Patches** menu, select **Quick Paste**.

   If you selected multiple patches, you may see a warning. If you choose to go ahead, the source patch is pasted across each of the target patches.

   Mari pastes a copy of the source patch onto the destination.

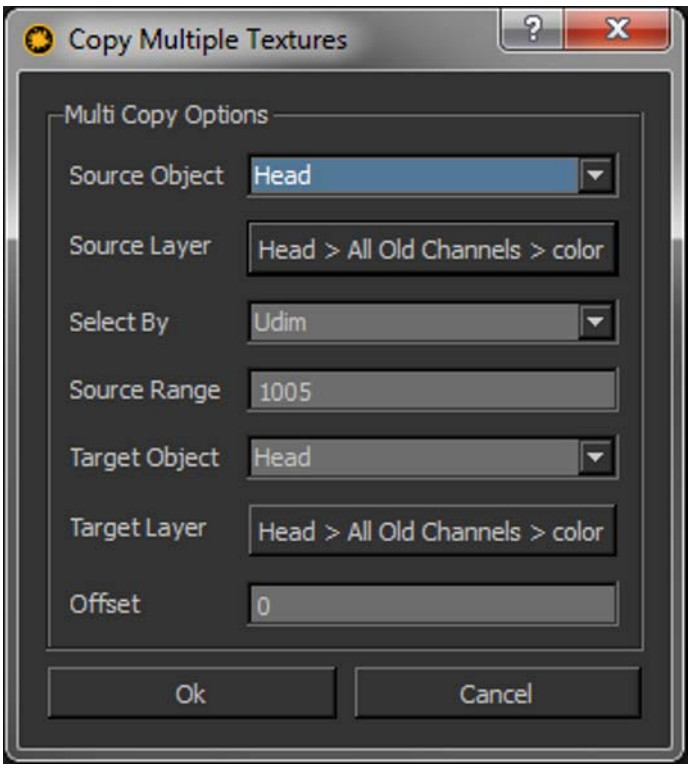
   Depending on how different the shapes of the two patches are, you can probably expect to see some blank areas or artifacts at the edges of the patch.

TIP: You can also find these options on the right-click dropdown menu on the canvas.

Copying and Pasting Multiple Patches

1. From the **Patches** menu, select **Copy Textures**.

   *The **Copy Multiple Textures** dialog box displays:*



2. Set the details of where to take the textures from:

- **Source Object** and **Source Layer** set the location of the source patches.
- Set the **Select By** field to the patch numbering scheme you want to use to select the patches to copy.
- In the **Source Range** field, enter the numbers for the patches to copy. You can separate patch numbers with commas, or use a hyphen to indicate a range. For example, this:

  `1001, 1003, 1005-1007`

  selects patches 1001, 1003, 1005, 1006, and 1007.

3. Set the details of where to copy the textures to in the **Target Object** and **Target Layer** fields.

   Both these fields can be the same as the source versions.

4. If required, set an **Offset**. This is added to the patch numbers when copying them. For example:
   - With an offset of 0, patch 1001 is copied to patch 1001 in the target layer.
   - With an offset of 20, patch 1001 is copied to patch 1021 in the target layer (which can be the same as the source layer).
5. Click **OK** to copy the textures.

   Mari copies the textures to the designated object, layer, and patches.

11 Editing Paint on Layers

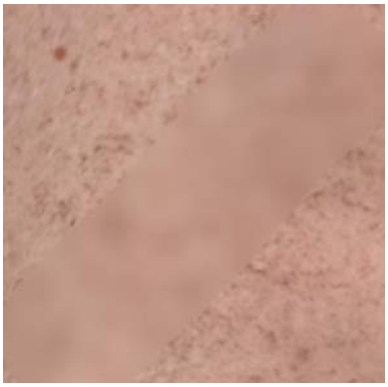
When you paint in Mari, you paint into the paint buffer — which floats above the surface of the model. Only when you bake is the paint actually applied to the model's surface.

Mari's **Blur** tool lets you edit the baked surface of a layer, while the **Clone Stamp** tool includes a mode to clone paint directly up off the surface of the layer into the paint buffer.

Blur

The **Blur** tool lets you apply a blur effect directly to the surface of your channel. You can use the **Blur** tool the same way as any other Mari brush, to apply a normal blur effect to any part of the surface.

Texture before blurring.



After blurring.

TIP: If you want to blur large areas of the surface, you may want to use the blur **filters** instead. These apply a controlled blur to entire patches. Mari includes several blur filters, including a controllable Gaussian blur.

For details, see Filtering Images and Paint.

Pulling Paint into the Buffer

The **Clone Stamp** tool has a mode that clones the surface of the current layer up into the paint buffer directly above the surface. This lets you grab the baked paint and make changes.

See Clone stamp for details on using the **Clone Stamp** tool to clone the layer

surface into the paint buffer.

Steps for Editing Paint on Layers

To paint a layer in Mari, follow these steps:

1. Blur Paint on a Layer

Blur Paint on a Layer

1. Start Mari and open your project.
2. Select a layer with some paint on it.
3. Select the **Blur** tool .
4. Click and drag to blur your paint.

EXPERIMENT: Experiment with different brush settings to see how this affects the final result. Particularly, try changing the brush:

- size
- shape
- opacity (affects the strength of the blur).

12 Vector Brush

The **Vector Paint** brush is useful for editing vector maps and painting directional information onto your models. With the vector-specific paint blends, paint is converted to tangent space. The vectors are then represented as diffuse RGB values. This results in specifically-colored paint strokes that represent color-encoded vectors.

In addition to using the **Vector Paint** brush, the basic Paint brush can be used together with vector-specific paint blending modes to achieve different effects.

Viewing vectors is especially important for the creation of flow maps and normal maps. Flow maps can assist in creating realistic textures or materials that simulate direction-specific patterns, such as feathers, scales, fur, hair, and water flow (to name a few). These have a pattern that tends toward a particular direction, or lie against another object in a particular manner, your textures should reflect this. Once you have identified how you want the effect to appear on your model, you can create flow maps that provide this information.

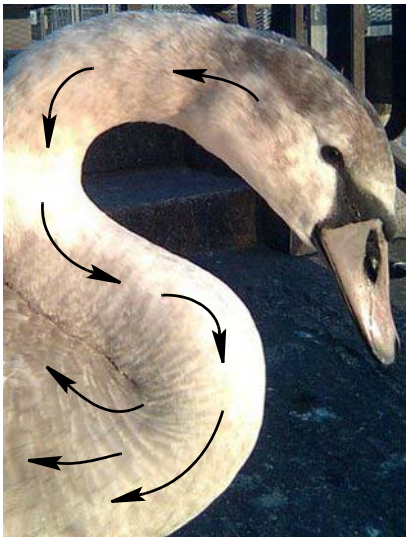


Figure 12.1: Arrows indicate the direction of the feathers on the swan's body, which vectors should mimic.

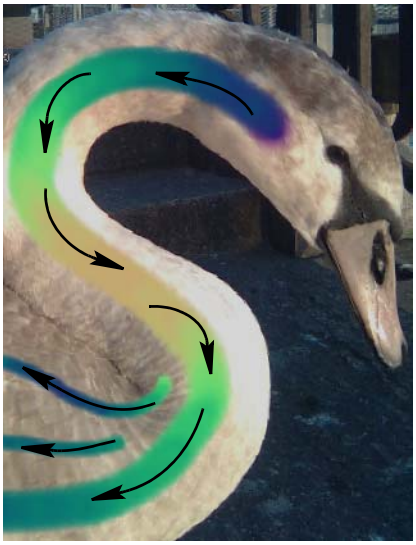
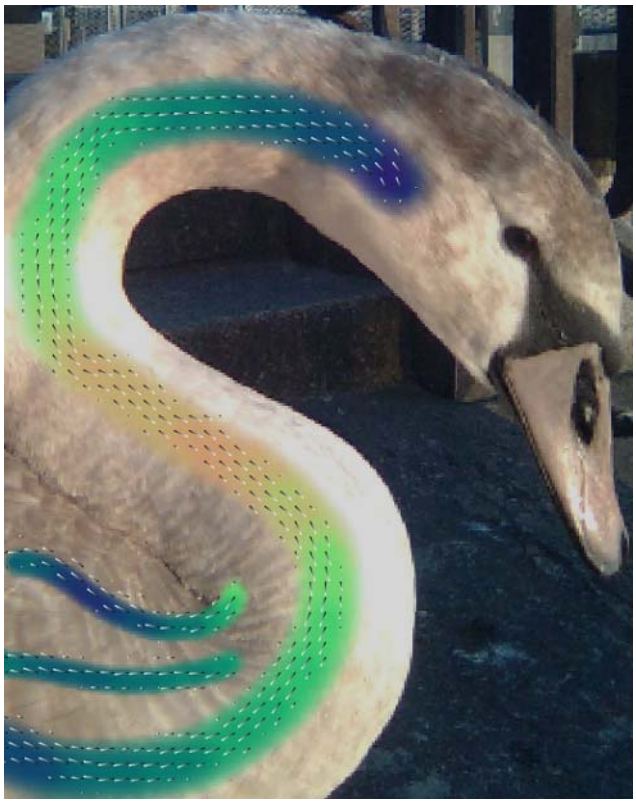


Figure 12.2: Arrows show the direction of painted vectors, which indicate the flow of vectors.

For example, in Figure 12.1 the feathers on the swan are determined to be following the curve of the neck. This impacts the feather pattern, so that the vectors in the texture curves around to display the natural flow pattern. In Figure 12.2 the vectors have been painted on the image to show how this flow pattern might appear.

Vector Inspector

The **Vector Inspector** tool allows you to see directional markers representing the vectors you are brushing onto the model. These markers ensure that you can see the effects of the vector brush or paint blending modes to achieve the effect you want. Vector lines can be turned on or off at any time, as well as adjusted to change the properties, such as spacing. Like the paint buffer, the **Vector Inspector** can be moved around the canvas or rotated using keyboard shortcuts.



Vector-related Paint Blending Modes

Seven unique paint blending modes allow you to specify how the vectors are baked onto a model. These paint blending modes are not for exclusive use with the **Vector Paint** tool, but can also be used with the basic **Paint** tool. These modes are available in the paint blending mode dropdown menu in both the **Paint** and **Vector Paint** toolbars and the other paint tools, such as **Clone Stamp** and **Paint Through**.

The **Paint Flow Vectors** and **Paint Normal Vectors** modes are an alpha blend between the vectors. The **Nudge Flow Vectors** and **Nudge Normal Vectors** modes add the vectors together to get the blend result. The paint flow and paint normal modes convert the painted vectors into the texture's tangent space before creating the associated blend. This conversion takes into account the orientation of the texture on the model's surface.

NOTE: Due to the fact that surface orientation plays such an important role, vectors baked down on a model may not be exactly the same as vectors painted. For example, a paint stroke from left to right on a model with a very high curvature may produce quite large changes in color when baked.

However, the **Scale Vectors** mode works differently to the above four modes. This mode uses the intensity of the color to control the length of the vector, and works best when painting in gray scale, with black representing short vectors, white representing long vectors, and gray being between the two. Paint **Scale Vectors** with the basic **Paint** tool.

The flow and normal vector modes refer to how the vectors are allowed to act in xyz space. Flow modes keep the vectors flat against the surface of the model. Normal modes allow the vectors to protrude outwards from the model in tangent z space. The type of vectors you want to paint may influence which paint blending modes you use. For example, flow modes are most often going to be used for flow maps, while you may prefer using normal modes for creating normal maps.

The **Add Normal Maps** and **Mix Normal Maps** modes blend two RGB-encoded vector layers with either the **Add** or **Mix** inputs and the **Over** input. Before the operation is performed the raw values are converted from the 0.0 to +1.0 color space-encoded range to the -1.0 to +1.0 vector range. The values are then added and normalized before converting back to the 0.0 to +1.0 color space-encoded range.

For more information on how to use these paint blending modes, see Paint Blending Modes on page 91 in the chapter on Controlling the Way Mari Applies Paint to Your Model.

Vector Adjustments and Procedurals

There are two adjustments and two procedurals in the **Layers** palette that allow you to set up your project for vector painting. The adjustments are **Tangent To Screen** and **Tangent to World**. These adjustments are where you can paint flow and normal maps within a set channel for your vector painting.

There are also two procedurals, **Vector** and **Flow**. These procedurals allow you to specify the properties for your vector visualization. **Vector** allows you to specify another color using the sliders in the layer properties. The **Flow** procedural acts as an adjustment would, and allows you to use your vector paint as surface flow over time. Input an image, preferably a tileable one, into the **Tile Image** field to apply a texture to your model for viewing flow maps. The **Time Offset** slider represents the flow of time, while the **Speed** slider represents the sensitivity of **Time Offset.**

Adjusting the scale and then dragging on the offset slider, allows you to see the effects your vectors play on the flow map, and you can enable the **Animation** attribute to see the flow over time.

For more information on what these shaders are and how to use them, see Vector Brushing, and Layer Types and Examples in the chapter on Layers on page 222.

Vector Shaders

In addition to the adjustments and procedurals listed above, there is also a method for quickly setting up default vector shaders and channels, with vector layers in the **Layers** palette. This method is accessible from two locations in the UI and is described fully in the Adding Vector Shaders section.

This shader setup creates two default shaders in the **Shaders** palette for creating flow maps and normal maps. The **Vector (Screen Space)** shader is for viewing vector (colors) in tangent space, while the **Vector (World Space)** shader is for viewing vector (colors) in world space. These shaders come with channels already plugged into the shader component inputs by default to get you started.

Vector File Space

Though vectors are often measured in the range -1.0 to +1.0 to represent the vectors in xyz space, Mari operates in the range 0.0 to 1.0. In order to accommodate vector brushing, the -1.0 to +1.0 range is converted into 0.0 to 1.0, and the specific RGB values that indicate vector directions are adapted to reflect this. Thus, -1.0 becomes 0, 0.0 becomes 0.5 and +1.0 stays as it is. The colors are converted to the corresponding number on the 0 to 1 scale to keep all the vector data the same.

In the **Channels** and **Image Manager** palettes, **File Space** fields allow you to set whether the channel or image should be exported as a **Normal** file (in the way Mari stores them), as a **Vector** file (-1.0 to +1.0 range), or as a **Vector (flipped Y)** file, which is the same as the **Vector** file in terms of range, but inverts the vectors in the Y direction. This allows you to easily export inverted vectors for use in other parts of your pipeline. Channel or image files exported in the **Vector** file space format can later be re-imported and changed back to the **Normal** file space format if desired.

NOTE: For **Vector (flipped Y)** this only inverts the vectors in the Y direction. The vectors in the X or Z direction are not changed.

Steps for Working with Vector Brushing

To use vector brushing in your Mari project, follow these steps:

1. Painting Vectors
2. Modifying Vectors with Paint Blending Modes
3. Inspecting Your Vector Work
4. Adding Vector Shaders
5. Adding Vector Adjustments and Procedurals
6. Changing the File Space
7. Creating Flow Maps on Multiple Objects

Painting Vectors

Begin by starting Mari and opening your project.

1. Make sure you have a paintable layer selected, then select the **Vector Paint** tool.
2. In the **Shaders** palette, ensure that the channel you are using for your vector paint is selected in the shaders **Vector** shader component.
3. If you want to see the directional markers while you paint, select the **Vector Inspector** icon in the **Vector** toolbar.

4. Select a brush from the **Brush Editor** palette. Once you have set up the brush options, paint in a direction across the surface of the model.

   A specific color is selected depending on the direction of your brush stroke.

NOTE: Think of the four main colors as being the four cardinal points on a compass. These have specific colors to represent their directions. Strokes between these points are blends of the two colors. The four main colors are:

- Left to Right: (RGB: 1, 0.5, 0.5)
- Right to Left: (RGB: 0, 0.5, 0.5)
- Top to Bottom: (RGB: 0.5, 1, 0.5)
- Bottom to Top: (RGB: 0.5, 0, 0.5)

These colors may vary depending on the lighting model you are using and any adjustments that are selected, for instance the **Tangent to Screen** adjustment.

You may find it useful to paint vectors while using a **Flat** lighting model to make accurate vector painting easier.

Modifying Vectors with Paint Blending Modes

To adjust the paint blending mode, follow these steps:

1. With unbaked paint on your model, select one of the following modes from the **Painting Mode** dropdown menu:
   - **Paint Flow Vectors**,
   - **Paint Normal Vectors**,
   - **Nudge Flow Vectors**,
   - **Nudge Normal Vectors**,
   - **Scale Vectors**,
   - **Add Normal Maps**, and
   - **Mix Normal Maps**.
2. Selecting a paint blending mode can be done in either the **Paint** or **Vector Paint** toolbars, as the dropdown menu is in both. Alternatively, select them from the **Painting Mode** dropdown in the **Projection** palette.

NOTE: As with other paint blending modes, the vector modes apply to paint that has not been baked down yet.

Inspecting Your Vector Work

To inspect your vector brush work, follow these steps:

1. Select the **Vector Inspector** tool .
   The directional markers appear.

NOTE: The **Vector Inspector** displays the channel that is selected in the **Vector** shader component of your current shader. If there is nothing selected in the **Vector** shader component, the shader displays the diffuse channel.

2. You can move the buffer around the canvas by simply dragging it around. You can also use the **Tool Help** shortcuts to modify it.
3. The **Vector Inspector** toolbar includes the following options:
   - **Enable** – selecting this checkbox enables or disables the directional markers of the **Vector Inspector**. Note that while in the **Vector Inspector** tool, this is not the case. The markers remain on until you change to a different tool. If you don't have the tool active and want to enable markers quickly, click the icon on the **Vector Painting** toolbar.
   - **Line spacing** – adjusts the space between the directional markers.
   - **Line length –** adjusts the length of the directional markers.
   - **Start Color** – changes the color at the base of the directional marker.
   - **End Color** – changes the color at the tip of the directional marker.
   - **Vector Space** – sets whether the vector space is converted to either **ScreenSpace**, **TangentSpace** (no change), or **WorldSpace.** Screen space is the most useful option for painting flow and normal maps.
4. In addition to the options on the toolbar, the following options are listed on the **Tool Properties** palette when the **Vector Inspector** tool is active:
   - **Rotation** – lets you adjust the rotation of the inspector buffer by either entering a value in the entry box or adjusting the slider.
   - **Translation** – adjusts the translation (position) of the inspector buffer.

NOTE: The **Rotation** and **Translation** options are both available in the **Tool Help** shortcuts whenever the **Vector Inspector** tool is active.

Adding Vector Shaders

To create vector brush default shaders, follow these steps:

1. Open the **Shaders** palette to manage newly-created shaders.
2. Create a default vector shader by either:

- clicking the icon on the **Vector Painting** toolbar, or
- navigating to **Python | Examples > Setup Vector Brush.**

*Clicking the icon or script automatically creates two shaders in the **Shaders** palette, three channels in the **Channels** palette, and the necessary layers for each channel in the **Layers** palette.*

The default created shaders are **Vector (World Space)** and **Vector (Screen Space)**, and each of these have the newly-created channels set to the corresponding shader component inputs.

During shader setup, the following three channels are created in the **Channels** palette:

- **Vector (Paint)**,
- **Vector (World Space)**, and
- **Vector (Screen Space).**

NOTE: Running the script changes the **Painting Mode** to **Paint Flow Vectors** and switches the paint tool to **Vector Painting,** if this is not already selected.

EXPERIMENT: If you prefer, you can create the shaders and channels manually. To do this:

1. Create the channels you want to use for your vector painting and add the **Vector**, **Tangent To Screen**, or **Tangent To World** adjustments and procedurals in the **Layers** palette.
2. Create your shaders and assign your vector channels to the **Diffuse Color** and **Vector** shader inputs.

   For example, the default vector shaders assign the **Vector (Screen Space)** channel to the **Diffuse Color** input and the **Vector (paint)** channel to the **Vector** input.
3. Once you've set up the shaders, go back to the **Vector (Paint)** channel and begin painting your normal or flow maps in the **Vector** layer.

Adding Vector Adjustments and Procedurals

Select one of the following default channels created with the setup vector brush script described in the Adding Vector Shaders instructions:

- **Vector (Paint)**
- **Vector (World Space)**
- **Vector (Screen Space)**

*Notice that the layers created by the setup vector brush script already show **Vector**, **Vector (Tangent To World Space)**, or **Vector (Tangent To Screen Space)** layers in the **Layers** palette.*

If you aren't using the setup vector brush script, and want to add new adjustments or procedurals, follow the steps below:

To add vector adjustments to your project, follow these steps:

1. Select the channel from the **Channels** palette that you are using in the shader component inputs described in Adding Vector Shaders, and open the **Layers** palette.
2. To add an adjustment:
   - from the **Layers** menu, navigate to **Add Adjustment Layer**,
   - right-click any layer in the **Layers** palette, navigate to **Add Adjustment Layer**, or
   - in the **Layers** palette, click the adjustment icon and select either **Tangent To Screen** or **Tangent To World** from the dropdown list.
3. Adjust the properties in the layer attributes pane of the **Layers** palette.

To add vector procedurals to your project, follow these steps:

1. Select the channel from the **Channels** palette that you are using in the shader component inputs described in Adding Vector Shaders, and open the **Layers** palette.
2. To add a procedural:
   - from the **Layers** menu, navigate to **Add Procedural Layer**,
   - right-click any layer in the **Layers** palette, navigate to **Add Procedural Layer**, or
   - in the **Layers** palette, click the procedural icon

     and select either **Basic** > **Vector** or **Procedural** > **Misc** > **Flow** from the dropdown list.
3. Adjust the properties in the layer attributes pane of the **Layers** palette.

NOTE: For a full description of the layer properties for both adjustments and procedurals, see the Layer Types and Examples section in the chapter on Layers on page 222.

Changing the File Space

Changing the file space before exporting can be done on channels, images and paintable layers. This converts the file space range from 0 to 1 (the Mari convention), to -1.0 to +1.0 (Vector convention) or -1.0 to +1.0 with inverted Y vectors (Vector inverted convention). To change the file space on channels, follow these steps:

1. Open the **Channels** palette and select the channel you want to change.
2. Under **Channel** > **Format** | **File Space**, click the dropdown menu and select either **Normal**, **Vector**, or **Vector (flipped Y)**.

   The file space is changed in all paintable layers in the channel except for shared layers.

To change the file space on images, follow these steps:

1. Open the **Image Manager** palette and select the image you want to change.
2. Under **Image Info** > **MriImage** > **Info** | **File Space**, click the field and select either **Normal**, **Vector**, or **Vector Y Flip** from the dropdown menu.

Creating Flow Maps on Multiple Objects

It may often be necessary to create flow maps for different objects in a project, effectively separating the vector data into more than one channel. Following the steps below prevents the vector markers from appearing on multiple objects when attempting to focus on creating flow maps on only a single object.

1. To set up a basic channel on objects that do not need flow maps, in the **Channels** palette, either:
   - right-click on the palette and select **Add Channel** from the dropdown menu, or
   - click on the add channel button.

   *Mari displays an **Add Channel** dialog box.*

NOTE: *Ensure that you have the correct object(s) selected before you begin, to avoid creating any unnecessary channels on the wrong object.*

2. Create a channel, called "gray" or similar, and set the **Color** to mid-gray (RGB: 0.5, 0.5, 0.5) with a Scalar **Color Space**. Create the channel for only the selected object, for this example, called Object A.

   Using the gray **Quick Channel** can simplify the process, but if you have multiple quick channels in the **Channels** palette, make sure you rename it

to avoid any confusion when setting up the shader in the instructions below.

TIP: *Create the channel or quick channel with a 256x256* ***Size*** *to avoid taking up unnecessary space.*

3. Set up vector default shaders by navigating to **Python** > **Examples** > **Setup Vector Brush** or by clicking the icon in the **Vector Painting** toolbar.

   The script creates two default shaders, and associated channels and layers in each of the ***Shaders****,* ***Channels****, and* ***Layers*** *palettes. These allow you to quickly set up the shaders for vector painting and flow maps.*
4. With Object A still selected, in the **Shaders** palette, select the **Vector (World Space)** shader that was created by the vector default shader script.

   The ***Diffuse Color*** *shader component should already be filled in.*
5. Click on the dropdown menu for the **Vector** shader component and select the "gray" channel you created in the **Channels** palette.

   The ***Vector*** *shader component, when set up this way, blocks out the vector inspector markers on objects you don't want to create a flow map for.*
6. Lock Object A by clicking on the padlock icon in the **Objects** palette. Due to the fact that vector paint can still be applied to the object - even if vector inspector directional markers aren't shown - this ensures you don't paint over your textures.
7. Select a second object for which you want to create a flow map. For this example, the second object is called Object B. Create default vector shaders, channels, and layers using the script in step three above.

   The ***Vector (Paint)*** *channel is already set to the* ***Vector*** *shader component in the* ***Vector (World Space)*** *and* ***Vector (Screen Space)*** *shaders. This allows you to see the flow map channel where the vector markers are present, without affecting other objects.*
8. If you don't already have them activated, turn on the vector painting directional markers by clicking on the icon in the **Vector Painting** toolbar before painting your flow maps.

If you paint on the model now, paint is applied to all unlocked objects. However, only objects with the **Vector (Paint)** channel listed in the shader's

Vector shader component field show the vector inspector markers.

NOTE: *For more information on shaders and shader components, please see the chapter on* Shaders on page 281.

13 Exporting and Importing Textures

Importing is how you can pick up an existing set of textures to work on. Similarly, exporting is how your work moves on into the next step in the pipeline:

- Importing loads images into the current channel or layer, or as new channels and layers on your model.
- Exporting saves out the paint on your model as a set of image files (one file per UV patch).

Exporting and importing can be done for both a single channel or layer, as well as multiple channels, layers, even objects in a project. In essence, you can:

- export or import the entire channel (including all layers),
- export or import selected layers, and
- export all channels or objects in a project, or all layers in a layer stack.

Mari supports standard image formats for export and import (such as **.tif**, **.exr**, **.psd**, **.png**, **.jpg**, **.tga**, and **.dds**). You can find a full list of supported file formats in the import and export dialogs.

Importing Textures When Creating Channels

When you create a set of new channels, either when creating your project or when using the **Channel Presets** button, you can import a set of existing textures. See Channels on page 264 for more information.

Steps for Importing and Exporting Textures

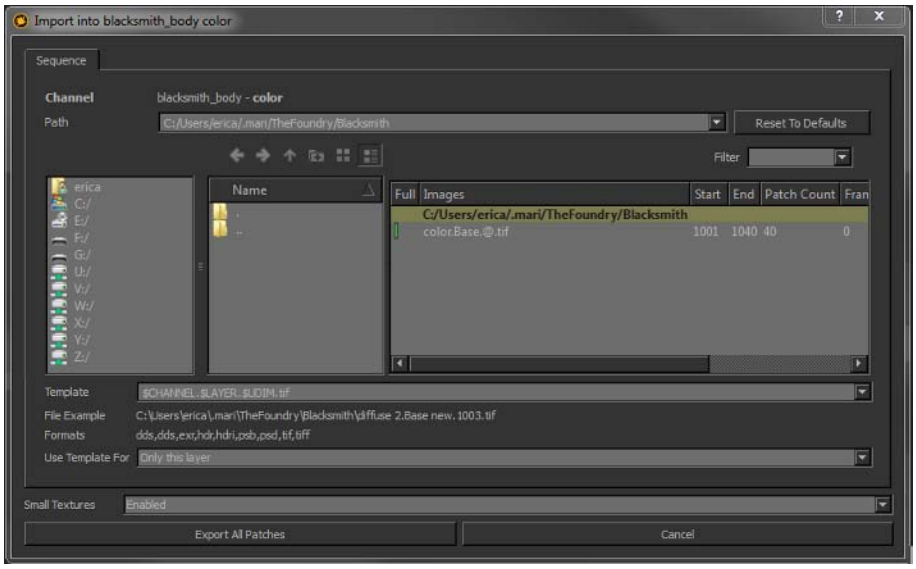
To import and export textures in Mari, follow the instructions below:

1. Import Existing Textures to Channels
2. Import Existing Textures to Layers
3. Export Textures from Channels
4. Export Texture from Layers
5. Importing and Exporting Ptex Files
6. Export to Maya

Import Existing Textures to Channels

1. Start Mari and open your project.
2. To import, select a channel from the **Channels** palette and do one of the following:
   - from the **Channels** menu, select **Import** > **Import into Layer Stack** to import textures into the current layer stack of the selected channel, or
   - from the **Channels** menu, select **Import** > **Import into New Channel** from the **Channels** menu to import textures into a newly created channel.

   *If you select **Import into Layer Stack** the **Import** dialog displays. If you select **Import in New Channel** the **Add Channel** dialog displays first, allowing you to set the options for the new channel, before opening the **Import** dialog.*



3. Now you can select Import Individual Files, or Import a Sequence of Files.

NOTE: For more information on setting the options for a newly created channel, please see Create and Delete Individual Channels on page 267.

TIP: The import menu options are also available from the right-click dropdown menu on the main canvas and in the **Channels** palette.

Import Individual Files

If the object has less than 20 UV patches, the **Import** dialog box has a **Named Files** tab. This lets you individually pick which files to load for each patch.

1. Click on the **Named Files** tab.

   The tab shows all the patches on the object.

2. For each patch, set the file you wish to import.

   You can either:

   • type the file path and name directly, or

   • use the open button to open a navigation window to find the file.

You can now set resize details and import the textures.

TIP: By default, if your model has more than 20 patches, the **Named Files** tab does not display.

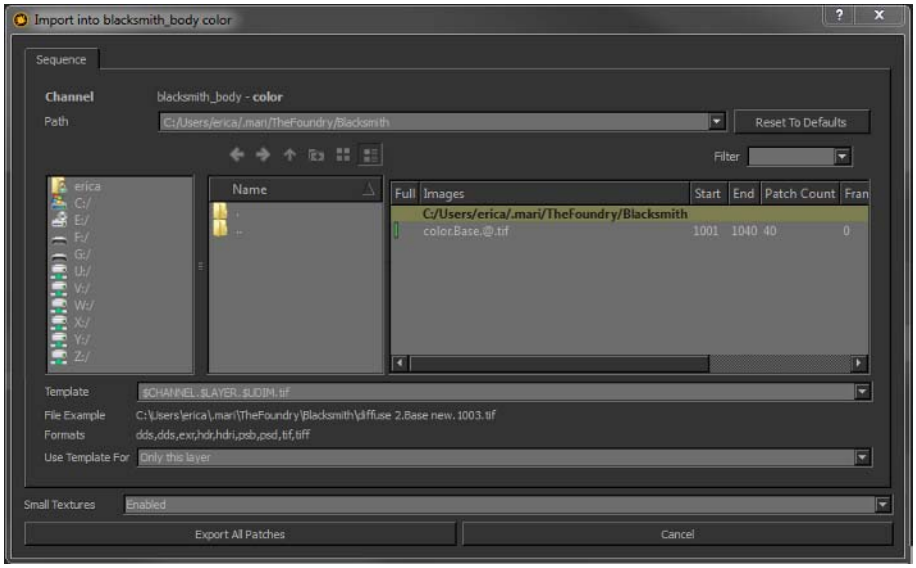
To change this, set the **Patch Cutoff** preference to a number greater than the number of patches in the file. Alternatively, you can use the MARI_NAMEDFILEIMPORT_SEQUENCELIMIT environment variable to override the preference setting. Please see the section on Environment Variables That Mari Recognizes on page 370 for more information on environment variables.

Import a Sequence of Files

If your patches have a consistent naming/numbering system, you can import them as a sequence.

1. Click on the **Sequence** tab.

   The tab shows all the patches on the object.

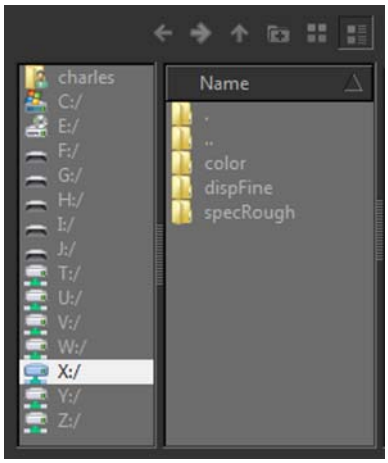


2. Enter the location of the files to import in the **Path** field.

NOTE: This isn't the name of the files themselves. It's the name of the directory in which the sequence of files exists.

You can either:

- enter the full path to the directory containing the files (or pick from the dropdown), or
- use the navigation controls to navigate to the directory:



3. When you've selected the path, the file area shows all the existing image sequences under that path.
4. You can use the **Filter** field to narrow down the list of textures shown. Enter filter text, and the display updates to only show the textures with that text in their name.
5. Set a **Template** for Mari to use when gathering the names of images in the selected sequence.

   You can either:

   - Edit this line manually. As you edit, you'll see the **File Example** update with the name of an example file in the sequence.
   - Click on an existing set of images in the main list. The **Template** automatically populates with the corresponding values.

   If you edit the line manually, you can use any of the following variables, which Mari replaces with the appropriate values when it imports the images:

   - $ENTITY - the name of the object.
   - $CHANNEL - the name of the channel.
   - $LAYER - the name of the layer.
   - $UDIM - the UDIM patch value.
   - $FRAME - the animation frame number.
   - $NUMBER - the number of the file within the batch (for example, "$NUMBER of $COUNT" gives strings like "22 of 28").
   - $COUNT - the total number of files in the channel.
   - $[METADATA VALUE] - any user-defined variables (for example, if a patch has a user attribute called "PROJECT", with a value of "Project1", Mari replaces the variable "$PROJECT" with "Project1").

NOTE: For more information on how the UDIM patch values are allocated, please see the section on Using UDIM Values on page 188.

NOTE: If you choose to import a layered **.psd** file, layers are imported directly into the selected channel. If attempting to import layers with the same name, Mari asks whether to update the layers or create new ones. You can now set resize details and import the textures.

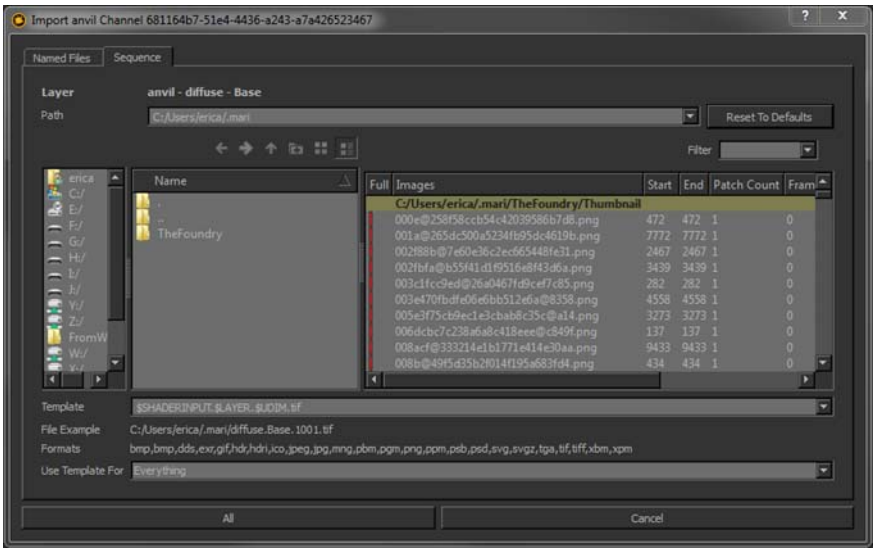
6. Choose whether you want to **Use Template For** only a single layer when importing or for everything.
7. Click **Import All Patches** to import the textures.

   Mari imports the images and loads them into the layer stack of the selected channel.

Import Existing Textures to Layers

1. Start Mari and open your project.
2. To import, select a layer from the **Layers** palette and do one of the following:
   - from the **Layers** menu, select **Import** > **Import into Layer** to import textures into the currently selected layer, or
   - from the **Layers** menu, select **Import** > **Import into Layer Stack** to import textures into the layer stack as a newly created layer.

   *The **Import** dialog displays.*



3. Now you can select Import Individual Files, or Import a Sequence of Files, following the steps described previously in this chapter.

NOTE: The **Import into Layer Stack** option occurs in both the **Channels** and **Layers** menus, and the right-click menus in either palette. The result of importing textures into the selected channel's layer stack occurs regardless of which menu option you use.

TIP: The import menu options are also available from the right-click dropdown menu on the main canvas and in the **Layers** palette.

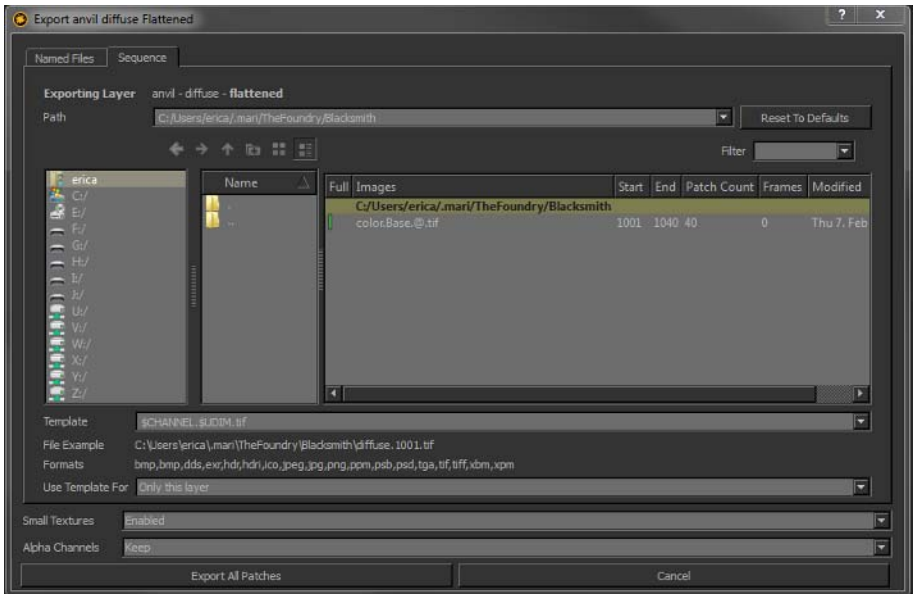
Export Textures from Channels

Once you've finished working on your textures, to export the files (for example, for use in the next stage of the pipeline) select the channel(s) you want to export.

From the **Channels** menu, select **Export** or **Export Flattened**.

1. To export the channels without flattening them, do one of the following:
   - from the **Channels** menu, select **Export** > **Export Current Channel** to export the currently selected channel, or
   - from the **Channels** menu, select **Export** > **Export All Channels** to export all channels in the **Channels** palette, or
   - from the **Channels** menu, select **Export** > **Export Everything** to export all channels for all objects in the project.
2. To flatten the channels before exporting them, do one of the following:
   - from the **Channels** menu, select **Export Flattened** > **Export Current Channel Flattened** to flatten and export the currently selected channel, or
   - from the **Channels** menu, select **Export Flattened** > **Export All Channels Flattened** to flatten and export all channels in the **Channels** palette, or
   - from the **Channels** menu, select **Export Flattened** > **Export Everything Flattened** to flatten and export all channels for all objects in the project.

   *The **Export** dialog displays.*



3. Now you can select Export Individual Files, or Export a Sequence of Files.

TIP: The export menu options are also available from the right-click dropdown menu on the main canvas and in the **Channels** palette.

Export Individual Files

If the object has less than 20 UV patches, the **Export** dialog box has a **Named Files** tab. This lets you individually pick the patches to export, and where to export them.

1. Click on the **Named Files** tab.

   The tab shows all the patches on the object.

2. For each patch, set the file to export it to.

   You can either:

   • type the file path and name directly, or

   • use the open button to open a navigation window to create a new file in a directory, or select an existing one to overwrite.

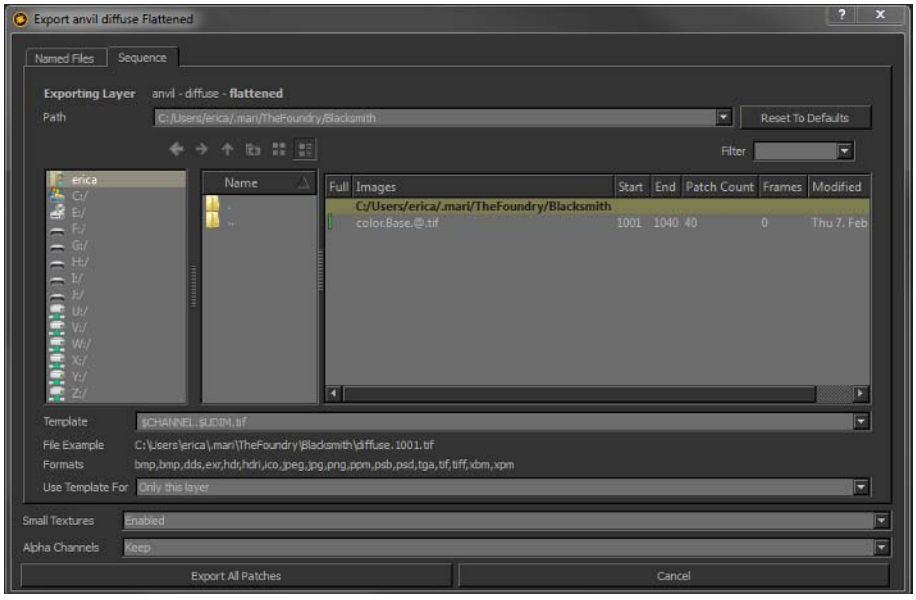
You can now Set Small Texture Preferences and Export the textures.

TIP: By default, if your model has more than 20 patches, the **Named Files** tab does not display.

To change this, set the **Patch Cutoff** preference to a number greater than the number of patches in the file. Alternatively, you can use the MARI_NAMEDFILEIMPORT_SEQUENCELIMIT environment variable to override the preference setting. Please see the section on Environment Variables That Mari Recognizes on page 370 for more information on environment variables.

Export a Sequence of Files

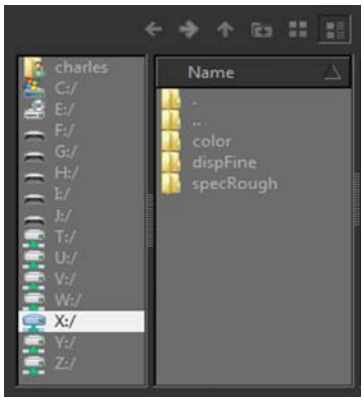
1. Click on the **Sequence** tab.



2. Enter the location to export the files to in the **Path** field. You can either:

   • enter the full path to the directory (or pick from the dropdown), or

   • use the navigation controls to navigate to the directory.



3. When you've selected the path, the file area shows all the existing image sequences under that path.
4. You can use the **Filter** field to narrow down the list of textures shown. Enter filter text, and the display updates to only show the textures with that text in their name.
5. Set a **Template** for Mari to use when generating the names of images in the selected sequence.

   You can either:

   - Edit this line manually. As you edit, you'll see the **File Example** update with the name of an example file in the sequence.
   - Click on an existing set of images in the main list. The **Template** automatically populates with the corresponding values.

   If you edit the line manually, you can use any of the following variables (which Mari replaces with the appropriate values when it exports the images):

   - $ENTITY - the name of the object exported.
   - $CHANNEL - the name of the channel exported.
   - $LAYER - the name of the layer exported.
   - $UDIM - the UDIM patch value.
   - $FRAME - the animation frame number.
   - $NUMBER - the number of the file within the batch (for example, "$NUMBER of $COUNT" gives strings like "22 of 28").
   - $COUNT - the total number of files in the channel.
   - $[METADATA VALUE] - any user-defined variables (for example, if a patch has a user attribute called "PROJECT", with a value of "Project1", Mari replaces the variable "$PROJECT" with "Project1").

6. Set the **Use Template For** field to determine if the template above is used for **Only this layer** (the selected layer in the channel's layer stack) or **Everything** (to include all layers in the stack).
7. You can now Set Small Texture Preferences and Export the textures

Exporting to a Layered .psd File

If you want to export the channels in your project to a layered **.psd** file, simply change the file extension to **.psd** in the **Export** dialog.

NOTE: When exporting multiple channels to a layered **.psd** file, all channels must have the same resolution and bit depth.

The $CHANNEL **Template** environment variable does not work when exporting multiple channels to a layered **.psd** file.

You can now Set Small Texture Preferences and Export the textures.

EXPERIMENT: Experiment with the different **Template** variables, and see how the **File Example** changes to show how Mari generates exported filenames.

Set Small Texture Preferences and Export

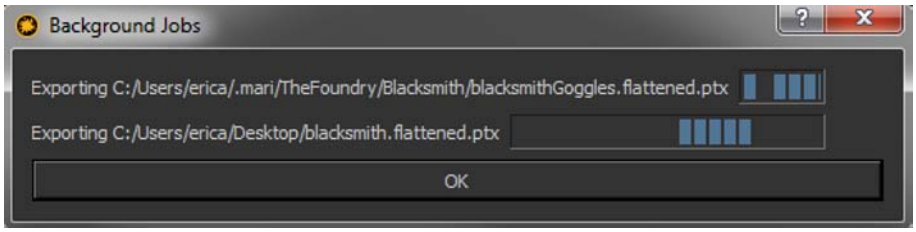
1. Select whether to enable **Small Textures**.

   With the small textures dropdown set to enabled, Mari exports any patches filled with a constant color as 8x8 pixel textures, no matter what resolution the patches are in Mari.

   - Enabling **Small Textures** saves disk space if you're exporting a channel that hasn't been fully painted.
   - Disabling **Small Textures** lets Mari always export patches at their full size (even if they haven't been painted).
2. Select whether to **Keep** or **Remove** alpha channels when exporting textures. This can help decrease the resulting file size when exporting images that don't need **Alpha Channels**.
3. Click **Export All Patches** to export the textures.

   Mari exports your textures to disk in the background.
4. To check the progress of the export click the icon at the bottom right of the main window.

   Mari shows the export progress.



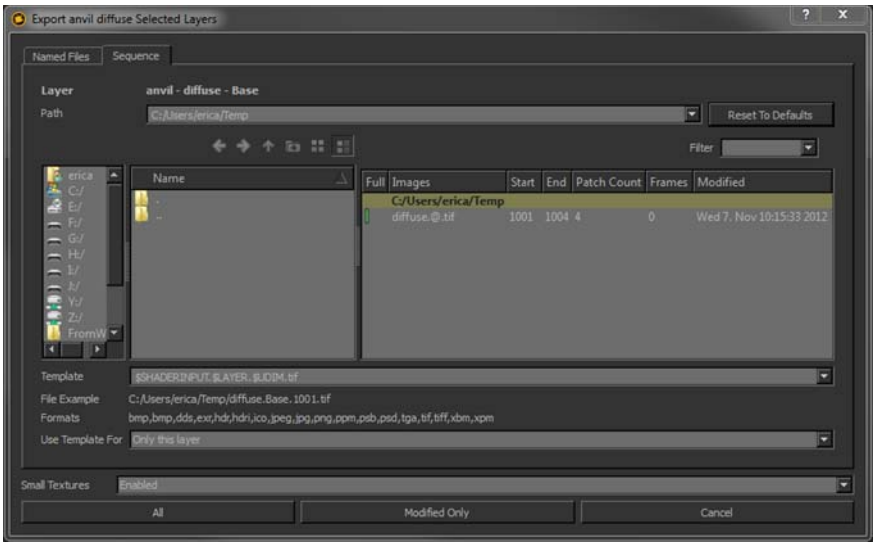
Export Texture from Layers

Instead of exporting work on whole channels, you may wish to export only a selection of layers by selecting them from the list in the **Layers** palette. As with channels, you can export multiple layers as they are in your layer stack or flattened into a single file.

From the **Layers** menu, select **Export** or **Export Flattened**.

1. To export layers without flattening them:
   - from the **Layers** menu, select **Export** > **Export Selected Layers** to export the currently selected layers, or
   - from the **Layers** menu, select **Export** > **Export All Layers** to export all layers in the layer stack.
2. To flatten the layers before exporting them:
   - from the **Layers** menu, select **Export Flattened** > **Export Selected Layers Flattened** to flatten and export the currently selected layers, or
   - from the **Layers** menu, select **Export Flattened** > **Export All Layers Flattened** to flatten and export all layers in the layer stack.

   *The **Export** dialog displays.*



3. Now you can select Export Individual Files or Export a Sequence of Files from this chapter.

NOTE: Since exporting all the layers in a layer stack would be the equivalent of exporting an entire channel, the **Export All Layers** and **Export All Layers Flattened** options in the **Layers** menu exports the same result as the **Export Current Channel** and **Export Current Channel Flattened** options in the **Channels** menu.

TIP: The export flattened menu options are also available from the right-click dropdown menu on the main canvas and in the **Layers** palette.

Importing and Exporting Ptex Files

As Mari supports **.ptx** files, it is also possible to import and export Ptex files in Mari. This can only be done for a Ptex project. However, unlike the steps described in this chapter, importing and exporting Ptex files behaves a little differently.

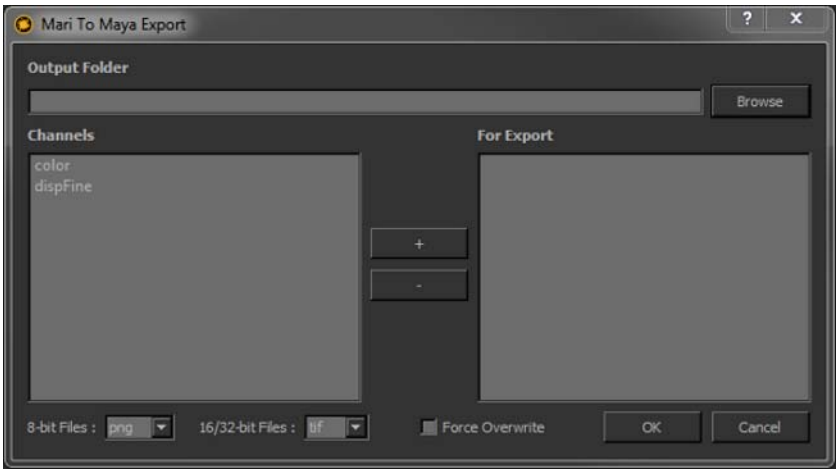
For more information on how to import and export Ptex files, see Export a Ptex Channel or Layer on page 299 or Import a Ptex Channel or Layer on page 301 in this guide.

Export to Maya

Mari can also export data for use in Maya. It does this by exporting textures and creating a custom **.ma** file that references them. All exported files contain UDIM offsets so that Maya can import and read the UV patches correctly.

To create the **.ma** file for use in Maya follow the steps below:

1. Navigate to *Menubar*| **Python** > **Examples** > **Export for Maya**.
   *The **Mari To Maya Export** dialog displays.*



2. In the **Output Folder** pane, either enter the filepath or click **Browse** to find the location to which you would like the files to be exported.
3. From the list in the left pane, select which channels you want to export.
4. Once you have selected the channel and the filepath, click **+** (plus).
   *The selected channel and filepath are added to the **For Export** pane on the right.*
5. If you have added a channel by mistake, or want to edit the filepath, simply select the channel from the **For Export** pane and click **-** (minus).
6. At the bottom of the dialog, the **8-bit Files** and **16/32-bit Files** dropdown menus list all of the file formats in which you can export your channels for use in Maya. Before you select **OK**, make sure you set your desired file format.
   *If you have already exported these files to the same file location, you can opt to select the **Force Overwrite** checkbox to export over and replace them.*
7. Select **OK**.
   Your channel is exported to the selected file location in your choice of file format. The textures, regardless of whether they are diffuse or displacement, are exported as UV patches.

Using Your Textures in Maya

Once the **.ma** file has been created, you can load your textures into Maya. Follow the simple steps below to set up your textures:

1. In your Maya scene, import the **.ma** file that was created after export from Mari.

   This can be found under the directory you saved the exported file to.

2. Navigate to your Hypershade. You should now see that for each channel you exported out of Mari, a Lambert shader was created containing the channel.
3. You can hook up the layered texture element to different parts of your other, independent shader to achieve the desired look.

14 Storing Resources Using Shelves

You can store just about anything you can grab from within Mari, in **Shelves**. Most artists like to store their favorite brushes, colors, and images (for clone stamping or painting through). Power users can also add any preset *Mari function* to a shelf.

By default, the Mari **Shelf** palette comes with six shelves:

- **Menu** — items that you can select from the F9 pie selection control menu.
- **Personal** — selected items you use regularly.
- **Basic Brushes** — a set of predefined basic brushes.
- **Hard Surface Brushes** — a set of predefined hard surface brushes.
- **Organic Brushes** — a set of predefined organic brushes.
- **Project** — items just for the current project.

You can also create any number of customized shelves.

Your shelves display in both the **Shelf** palette and on the **Shelves** tab in the **Brush Editor** (see Configuring Brushes on page 32). You can also make any shelf into a separate, custom palette. Mari also lets you export and import entire shelves and items within shelves, for example to share with other users.

TIP: For details on using the pie selection control menu, see Using Shortcuts.

Steps for Using Shelves

To use shelves within Mari, follow these steps:

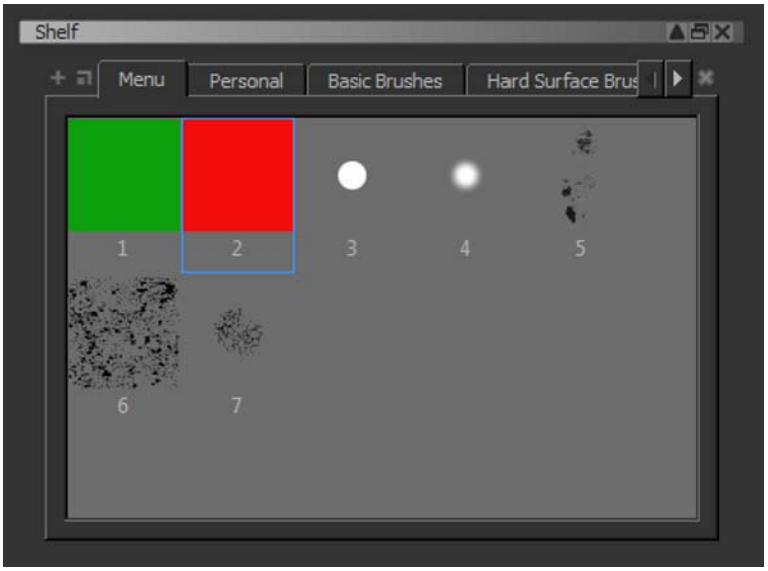
1. Open Shelves
2. Add a Brush to a Shelf
3. Add a Color to a Shelf
4. Add an Image to a Shelf
5. Create a Custom Shelf
6. Modify Custom Shelves and Their Contents
7. Import and Export Shelves and Items
8. Create a New Shelf Palette
9. Add Any Mari Function to a Shelf

Open Shelves

1. Start Mari and open your project.
2. If the Shelf palette is not already open:

- from the **View** menu, select **Palettes** > **Shelf**, or
- right-click in the toolbar area and select **Shelf** from the dropdown menu.

*The **Shelf** palette displays.*



TIP: The default layout in Mari has the **Shelf** palette already open.

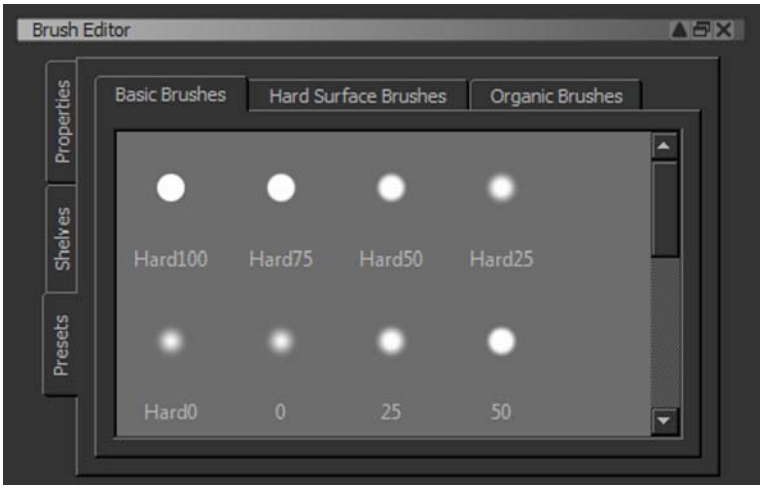
As described above, the **Shelf** starts with six default shelves: **Menu**, **Personal**, **Basic Brushes**, **Hard Surface Brushes**, **Organic Brushes**, and **Project**. The **Menu** and **Personal** shelves are empty when you first start Mari. The **Project** shelf only displays when you have a project open (and is empty when you start a new project).

Add a Brush to a Shelf

To add a brush to a shelf:

1. Open the **Brush Editor** palette:
   - from the **View** menu, select **Palettes** > **Brush Editor**, or
   - right-click in the toolbar area and select **Brush Editor** from the drop-down menu.

   *The **Brush Editor** palette displays.*



2. On the **Presets** tab, click to display the tab in the **Brush Editor** with the brush you want to copy.
3. Click the shelf in the **Shelf** palette you want to copy the brush to (**Personal**, **Project**, or Create a Custom Shelf).
4. Drag and drop the brush from the **Brush Editor** to the **Shelf** palette.

   You now have easy access to that brush whenever you want to use it.

TIP: You can also change the properties of a preset brush, and then save it to your **Personal** shelf, using the **Brush Editor** — see Configuring Brushes.

Add a Color to a Shelf

To add a color to a shelf:

1. If the **Colors** palette is not already open:
   - from the **View** menu, select **Palettes** > **Colors**, or
   - right-click in the toolbar area and select **Colors** from the dropdown menu.

   *The **Colors** palette displays.*

TIP: The default layout in Mari has the **Colors** palette already open.

2. Click the shelf in the **Shelf** palette you want to copy the color to (**Personal**, **Project**, or Create a Custom Shelf).
3. When the color you want to copy is in the **Foreground** or **Background** color swatch, drag and drop it from the **Colors** palette to the shelf where you want to store it.

TIP: The swatch on the shelf only holds the color values, not the alpha. Swatches on shelves always have an alpha of 1.0. You can also drag and drop color swatches from anywhere else they appear in Mari (such as the **Properties** palette or **Select Color** dialog box).

You can display a large array of color swatches in a shelf by minimizing the icon size: right-click anywhere in the shelf, and select **Toggle Icon Size** from the dropdown menu. Icons switch from large to small (or vice versa).

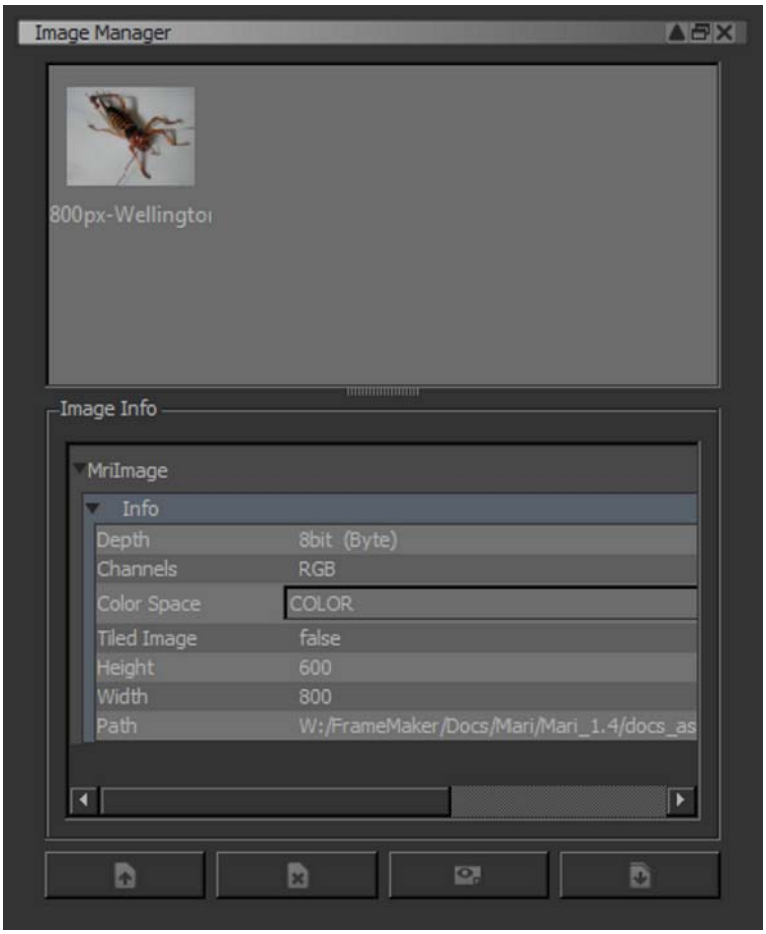
Add an Image to a Shelf

To add an image to a shelf (for example, for painting through or clone stamping):

1. If the **Image Manager** palette is not already open:
   - from the **View** menu, select **Palettes** > **Image Manager**, or

- right-click in the toolbar area and select **Image Manager** from the dropdown menu.

*The **Image Manager** palette displays.*



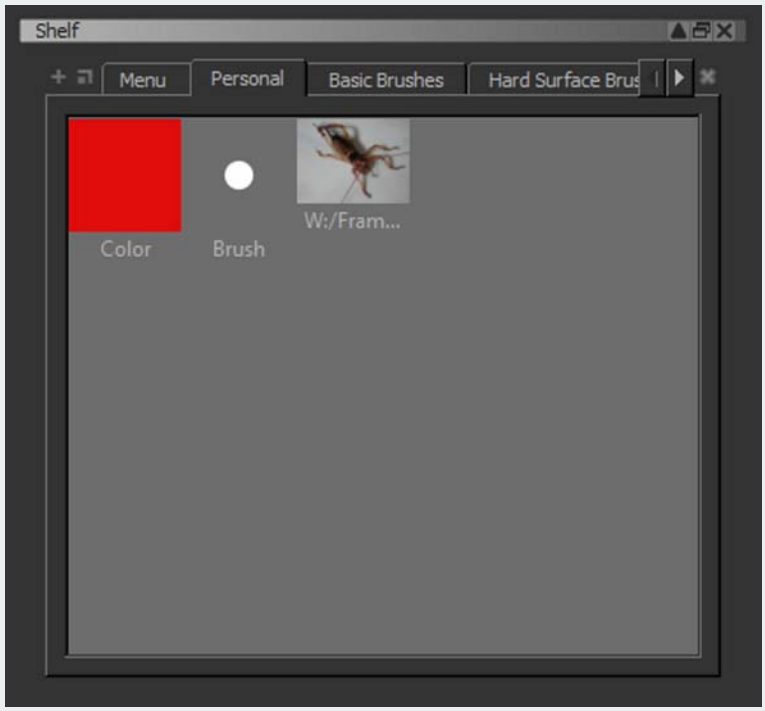
TIP: The default layout in Mari has the **Image Manager** palette already open. (Click to give it focus.) See Managing Images in Mari for instructions on loading images into the **Image Manager**.

2. Click the shelf in the **Shelf** palette you want to copy the color to (**Personal**, **Project**, or Create a Custom Shelf).

3. Drag and drop an image from the **Image Manager** to the shelf where you want to store it.

TIP: You cannot copy temporary, cropped images from the **Image Manager** to a shelf — unless you save them first.

Below is an example of a color, brush, and image copied to the **Personal** shelf.



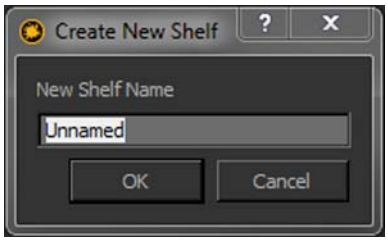
TIP: You can rename an item in a shelf, by double-clicking its name and typing over. You can also drag any item from any shelf to the **Personal**, **Project**, or custom shelves.

Create a Custom Shelf

To create custom shelves (for example particular sets of color swatches, images, or brushes):

1. In the **Shelf** palette, click + at top left.

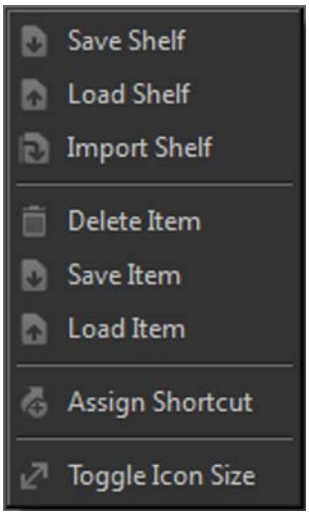
   *The **Create New Shelf** dialog box displays.*



2. Type a name for the shelf and click **OK**.
   *The new shelf displays at right in the **Shelf** palette.*

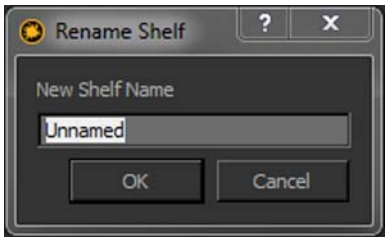
Modify Custom Shelves and Their Contents

The **Shelf** palette includes a right-click dropdown menu with options to rename, delete items from, and assign shortcut keys to items in the **Personal**, **Project**, or custom shelves. (It also includes features to Import and Export Shelves and Items.)



TIP: Some of the customization features are not available for some of the preset brushes shelves (their name and contents cannot be changed).

1. To rename a shelf, right-click anywhere in the shelf and select **Rename Shelf**.
   *The **Rename Shelf** dialog box displays.*



2. Type the new name, and click **OK**.

   Mari renames the shelf.

3. To delete an item from a shelf, right-click it and select **Delete Item**.

   Mari removes that item from the shelf.

4. To assign a shortcut key to an item in a shelf, right-click it and select **Assign Shortcut**.

   *The **Assign Keyboard Shortcut** dialog box displays.*

TIP: Resize columns and the dialog box to better view shelf names and the **Shortcut** column.

5. Double-click in the **Shortcut** column for the selected item, type a shortcut key, and click **OK**.

   You can now use that shortcut to select that item.

6. To delete a shelf, open it, and click at right. Mari asks you to confirm deleting the shelf and all its contents.
7. Click **OK**.

   Mari deletes the shelf.

EXPERIMENT: As a learning exercise, try this:

- create a custom shelf,
- rename it,
- add an item to it,
- rename the item,
- delete the item, then
- delete the shelf!

Import and Export Shelves and Items

You can import and export shelves, and items in shelves, for example to share with other Mari users.

TIP: You can "Import" or "Load" all items from an exported shelf into a selected shelf. "Import" means to **add** the items you're importing to those already there, and "Load" means to **replace** all items there with the ones you're loading.

1. To export a shelf, right-click anywhere in the shelf and select **Save Shelf**.

   *The **Save Shelf** dialog box displays.*
2. Navigate to where you want to save the shelf, give it a name, and click **Save**.

   *Mari saves the shelf as an **.msh** (Mari shelf) file.*
3. To import all items from a shelf that's been exported, into the **Personal**, **Project** or a custom shelf, right-click anywhere in that shelf and select **Import Shelf**.

   *The **Import Shelf** dialog box displays.*
4. Navigate to the folder that contains the **.msh** file you want to import, select it and click **Open**.

   Mari adds that shelf's items to the selected shelf.
5. To replace all items in the **Personal**, **Project** or a custom shelf, with items from a shelf that's been exported, right-click anywhere in that shelf and select **Load Shelf**.

   Mari warns you that all items in the current shelf will be replaced.
6. Click **OK**.

   *The **Load Shelf** dialog box displays.*
7. Navigate to the folder that contains the **.msh** file you want to load, select it and click **Open**.

   Mari replaces all items in the selected shelf with those from the shelf you loaded.
8. To export an item from a shelf, right-click it and select **Save Item**.

   *The **Save Item** dialog box displays.*
9. Navigate to the folder where you want to save the item, give it a name and click **Save**.

   *Mari saves the item as an **.msi** (Mari shelf item) file.*
10. To import an item that's been exported, to the **Personal**, **Project** or a custom shelf, right-click anywhere in that shelf, and select **Load Item**.

    *The **Import Shelf** dialog box displays.*

11. Navigate to the folder that contains the **.msi** file you want to import, select it and click **Open**.

    Mari adds that item to the selected shelf.

NOTE: Importing custom Photoshop brushes automatically displays them in Mari in a custom shelf. For details on importing custom brushes into a new shelf, please refer to Import a Custom Photoshop Brush on page 44.

EXPERIMENT: Another learning exercise:

- create a custom shelf,
- add an item to it,
- export the item,
- export the shelf,
- create another custom shelf,
- import the item you exported from the first shelf into the second shelf,
- import all items you exported from the first shelf into the second shelf (import shelf),
- replace all items in the second shelf with the items you exported,
- from the first shelf (load shelf), and
- delete both shelves!

Create a New Shelf Palette

To turn any shelf into a custom palette:

- With the shelf selected, click on the left.

  Mari creates a new palette for that shelf.

TIP: Mari adds "spawned" palettes to the **View** > **Palettes** and the dropdown **Palettes** menus.

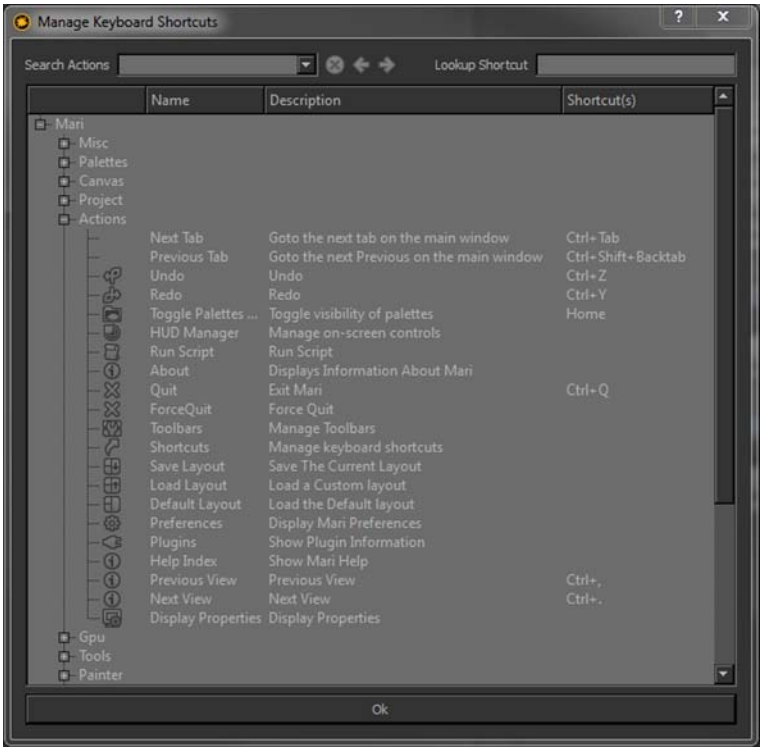
If you rename a palette, Mari renames it in all places (**Shelf** palette, spawned palette, and menus).

EXPERIMENT: Spawn a couple of shelves and drag items between them. Try adding an item to the spawned palette and see how this affects the original shelf.

Add Any Mari Function to a Shelf

To add any Mari function to the **Personal**, **Project** or a custom shelf:

1. From the **Edit** menu, select **Shortcuts**.
   *The **Manage Keyboard Shortcuts** dialog box displays.*



TIP: Resize columns and the dialog box to better view the names and descriptions of Mari functions.

2. Click to expand the hierarchical list of Mari functions (actions, tools, palettes, and so on.)
3. Click to open the shelf you want to drag a function to.
4. Drag and drop the function from the **Manage Keyboard Shortcuts** dialog box to the shelf.

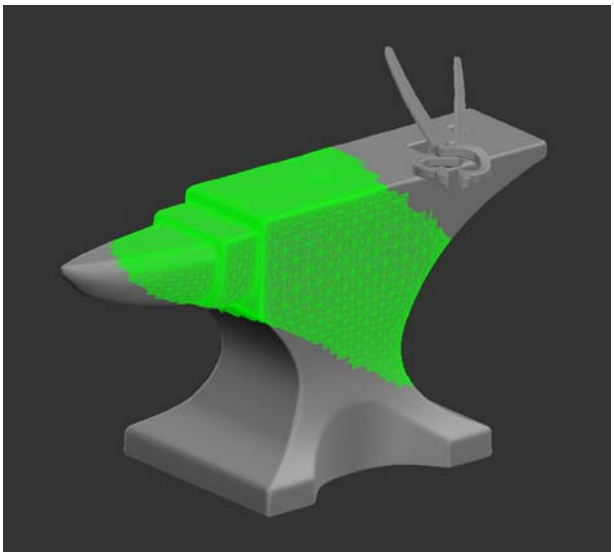
15 Selecting Items

Mari has two selection tools:

- **Select** – this lets you select areas on the model(s) in your project. You can select whole objects, patches, or areas on the surface of the objects.
- **Marquee Select** – this lets you select areas on the screen.

Selection Tool

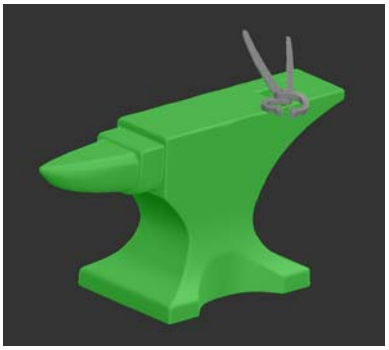
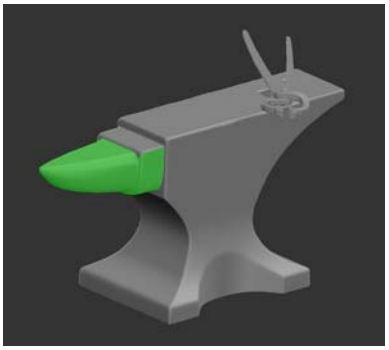
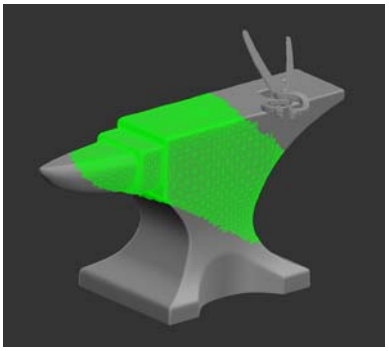
The selection tool lets you select areas on the objects in your project. Once you have made a selection, you can choose to show or hide the selected areas, or to lock them for editing.



Area selected on the model

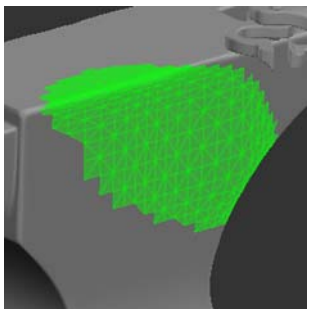
Selection Modes

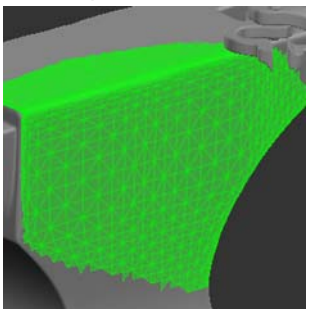
Mari has three selection modes. These control how you select things in your project, from whole objects to sections of surface.

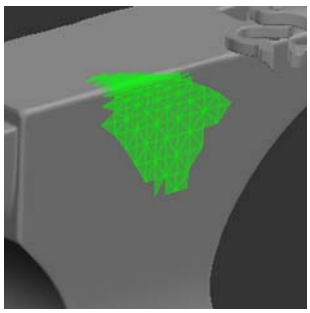
Mode	Description	Example
Object	lets you select whole objects at a time. Clicking on an object selects the whole of that object – every patch, every point on it.	
Patch	lets you select individual patches on an object. Clicking on a patch selects only that patch (and all points within the patch).	
Face	lets you select areas on the objects. You can use standard marquee and loop select tools to select parts of your objects.	

In all three modes, you can add to, or remove from, the current selection. You also have the option of selecting all items or none, or invert the current selection.

In **Face** selection mode, you can grow or shrink the current selection.


Initial selection.


Selection grown.


Selection shrunk.

There are also quick menu items for selecting large areas on your model at once. In the **Selection** menu, you can opt to:

- **Select All** - to select all of an object, patch or face.
- **Select None** - to de-select patches and faces.
- **Select Invert** - to select the inverse of the selected area.
- **Select Visible** - to select the visible area of a patch, face, or object.

Smart Selection

The smart selection mode of the Select tool lets you create selections based on the surface of the model. Similar to how Photoshop's magic wand tool lets you select areas of similar color, this lets you select areas that face in the same direction.

You can base your smart selection on:

- Connectedness
- Edge Angles
- Orientation

If you are working with the **Select** tool in **Face** mode, you can also create a smart selection by double-clicking on the face of the model. Double-clicking creates a smart selection (to select faces connected in UV) based on the settings of the **Smart Type** dropdown, listed above.

Visibility and Locking

You can show or hide things based on whether they are selected. For example, you can select a patch or area on an item, and then hide everything not selected.

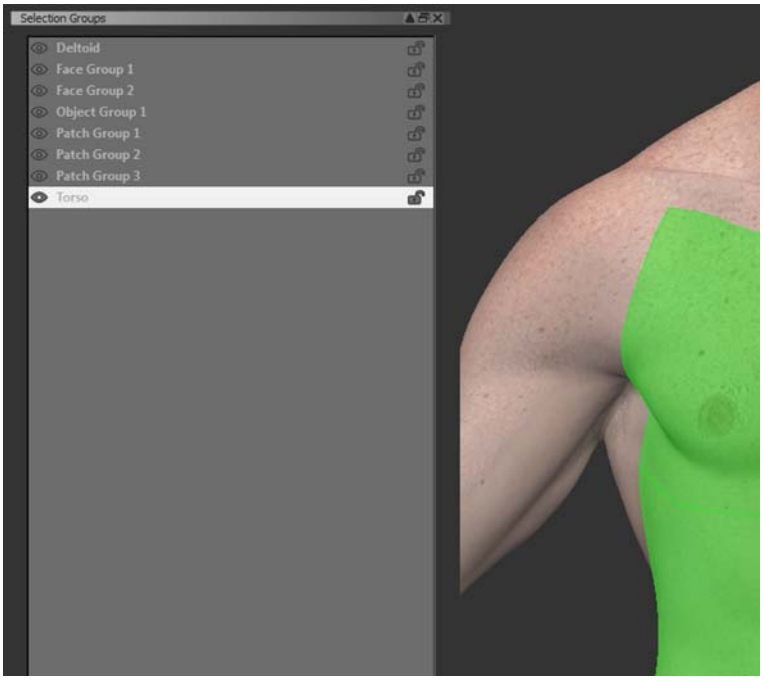
Similarly, you can lock objects and areas based on whether they are selected or not.

Selection and Painting

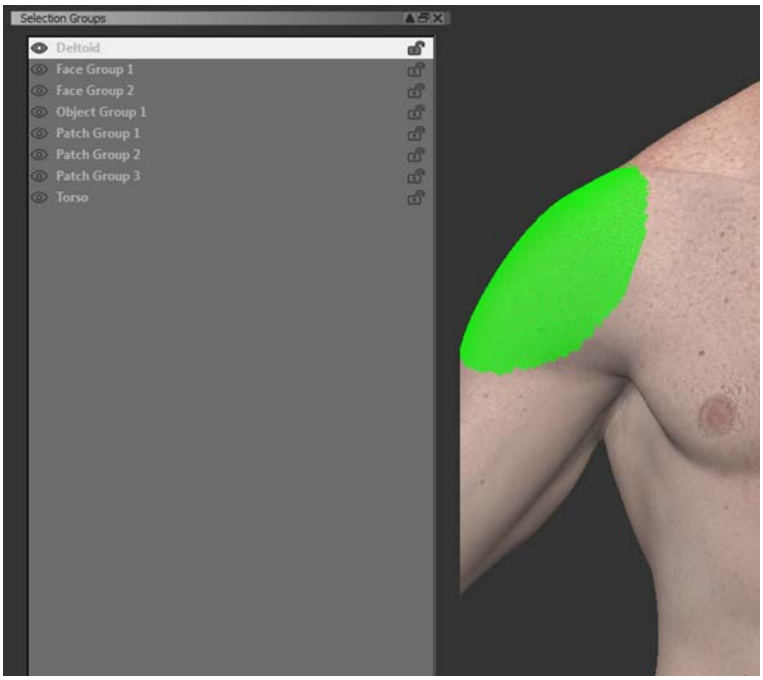
You can use the selection to control where paint can bake onto the surface of your model. If **Project On** (on the **Projection** palette) is set to **Selected**, then Mari only bakes paint onto selected areas.

Saving Selected Areas

Mari lets you save selections and come back to them later. Once you've made a selection (in any mode — objects, patches, or faces), you can create a selection group. Clicking on a selection group selects the items in that group.



Example of a selection group containing patches

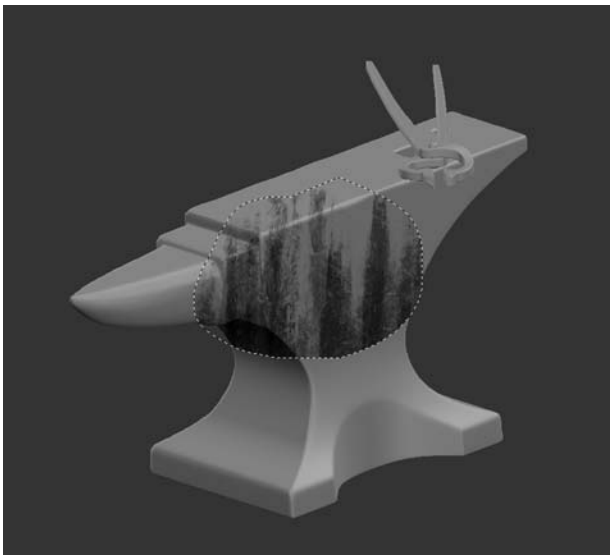


Example of a selection group containing faces

You can use this to set up face selections of specific areas on your model, and then to reuse these selections. This lets you define your own selection areas for relevant features that aren't necessarily reflected in how the patches on the model are put together. For example, you could use this to create a selection for the blacksmith's deltoid muscle, or his collarbones.

Marquee Select Tool

The **Marquee Select** tool lets you select an area onscreen, to control where you can apply paint. When you've made a selection with the **Marquee Select** tool, paint only bakes down within the selected areas.



Marquee Select — paint only shows within the selection area.

TIP: This works like the **Select** tool when **Project On** is set to **Selected**, except that you're selecting areas on the screen rather than on your model.

You can't use the **Marquee Select** tool to select areas to show/hide or to lock.

Steps for Making Selections

To make a selection within Mari, follow these steps:

1. Selecting Objects, Patches, or Faces
2. Saving Selections on the Model
3. Selecting Areas Onscreen

Selecting Objects, Patches, or Faces

1. Start Mari and open your project.
2. Choose the **Select** tool .
3. You can use the **Selection** toolbar to switch selection modes.

*If you can't see the **Selection** toolbar, right-click on the toolbar area and choose **Selection** from the dropdown menu.*

4. Set the selection mode.

In this mode	You can...
Object	click on an object to select it.
Patch	click on a patch to select it, or click and drag a selection to select all the patches under that selection.
Face	click and drag to make the selection.

5. On the **Tool Properties** toolbar, set the selection details:
   - **Facing** — whether to only select the (visible) front of the model, or to select "through" the model, including the back side.
   - The selection tool shape – either:
     - a square selection box,
     - a lasso selection (allowing you to draw any shape of selection), or
     - smart selection (letting you select areas based on the shape of the model).

   *Smart selection only works in **Face** selection mode.*
6. Click and drag to make your selection.
7. You can use modifier keys to add to, remove from, or invert the selection:

Hold down...	To...	Effect
Shift	**Add** to the selection	Areas that were unselected become selected, areas that were already selected stay selected.
Ctrl/Cmd	**Remove** from the selection	Areas that were selected become unselected, areas that were already unselected stay unselected.
(**Windows**)	**Intersect** the selection	Areas that overlap with the current selection become unselected, areas that were unselected become selected.

8. You can select all, none, or invert the current selection. Use the buttons on the **Tool Properties** toolbar, the options in the **Selection** menu, or the right-click menu on the canvas.
9. In the **Face** selection mode, use the **Grow** and **Shrink** buttons to change the size of the current selection.

   *You can use the **Grow/Shrink by** field to set how these work. **Edges** grows along the edge of the current selection, **Vertices** grows using the vertices as a guide.*

TIP: You can only grow the selection up to the edge of the patch(es) that your face selections cover.

The **Smart Selection** mode works slightly differently from the other two modes. To use it:

1. In **Face Selection** mode, click .
2. In the tool properties toolbar, set the **Smart Type**. This sets how to create the selection area:
   - **Connectedness** — selects the areas on the model connected to the selected face. When you look at the area in the UV view, this selects the whole connected area within the current UV patch. If the UV patch holds several different areas, only those areas you click on are selected.
   - **Edge Angle** — selects based on the degree of change between neighboring faces. The selection goes until it hits an angle higher than the **Smart Angle**.
   - **Orientation** — selects the area that faces in the same direction as your initial selection.
3. Set the **Smart Angle** — this defines the maximum angle for the smart selection.
   - For **Edge Angles**, this sets the maximum angle between areas on the model surface. For example, if the angle is set to 30, this selects areas up to a 30 degree change of facing.
   - For **Orientation**, this sets how far from the facing of your original selection the selection goes to. For example, if the angle is set to 30, this selects areas up to 30 degrees away from the facing of your original selection.
4. Click and drag to make the selection.

   Mari creates a selection around the area you drag.

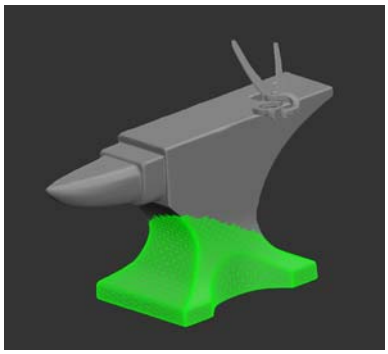
Alternatively, you can use the buttons on the **Tool Properties** toolbar to

quickly select patches. To do this:

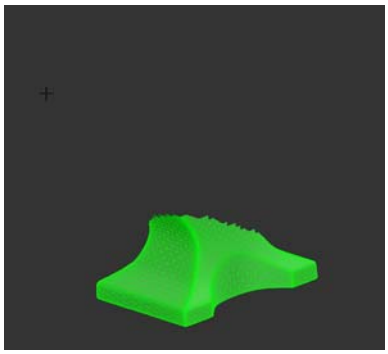
1. In **Patch Selection** mode, click any of the selection modes in the **Tool Properties** toolbar (Rectangle, Lasso, Smart).
2. To quickly select all patches, click the All button on the **Tool Properties** toolbar.
   All patches on your current object are selected.
3. To quickly clear your selection so that none of your patches are highlighted, click on the None button on the **Tool Properties** toolbar.
   Any patches you have selected are unselected.

Hiding and Locking

1. In either the **Patch** or **Face** selection modes, select an area on your model.



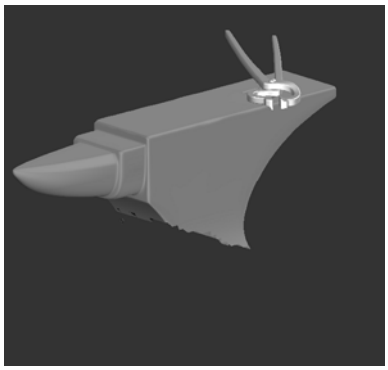
2. From the **Selection** menu, select **Hide Unselected**.
   Mari hides everything except your selection.



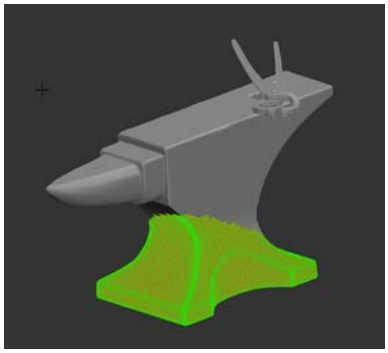
You can clear the selection, and the other areas remain hidden.

3. Conversely, from the **Selection** menu, select **Hide Selected.**

   Mari hides only the selected areas.



4. To show the hidden patches again, from the **Selection** menu, select **Show Selected**, **Show All**, or **Show Entire Object,** to restore visibility of faces.
5. To lock the selection so that you can't paint on the locked areas, from the **Selection** menu, select **Lock Selected**.



   Mari locks the selection. Try painting a few strokes over the model — the paint does not "stick" to the locked areas.

6. As with hiding, you can also lock the inverse of your selection by selecting **Lock Unselected** from the **Selection** menu, or if you want to lock the whole model in order to work on something else, you can **Lock All**.
7. To unlock the selection, from the **Selection** menu, select **Unlock Selected**, or unlock the whole geometry by selecting **Unlock All.**

8. If you've locked multiple patches, faces, and even objects and want to quickly unlock everything in your project, select **Unlock Entire Object** from the **Selection** menu.

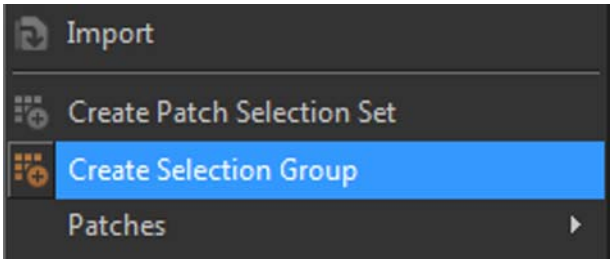
TIP: You can also show/hide and lock selections from the right-click menu on the canvas.

Saving Selections on the Model

1. With the **Select** tool, create your selection.

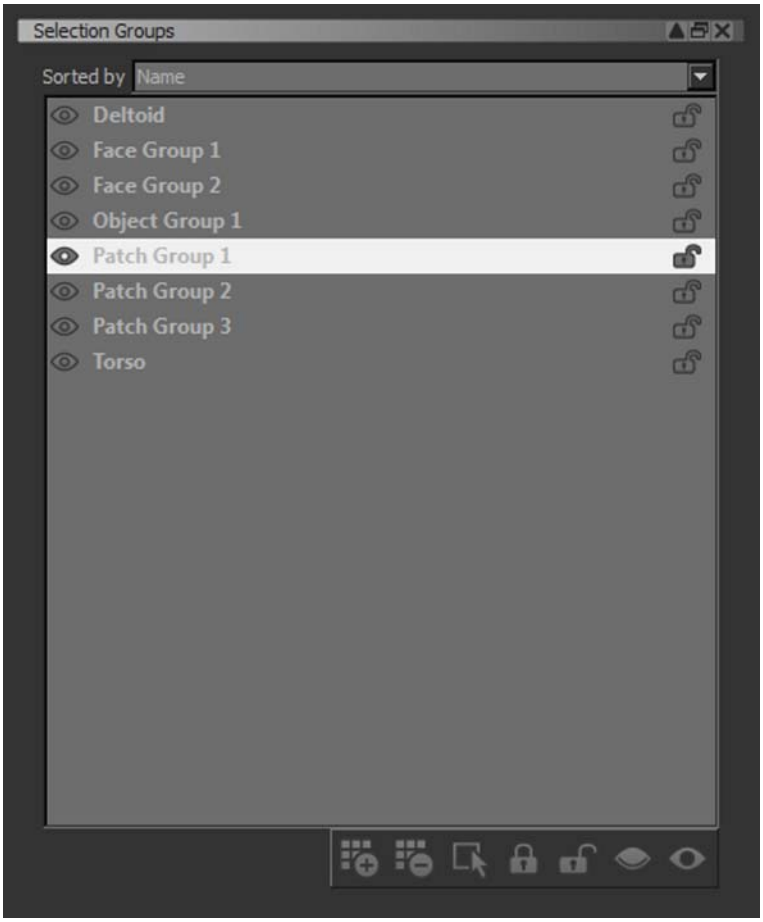
   You can select in any mode — object, patch, or face.

2. Right-click on the selection. From the dropdown menu, pick **Create Selection Group**.



3. Open the **Selection Groups** palette.

This displays all the selection groups for your project.



4. Click to select a selection group.

   When you click on the selection group, Mari changes to show that selection. You can switch between selection groups by clicking them in the list.

   Object groups can be added to selection groups. You can create up to 200 of these groups.

5. If you have a selection group highlighted in the list, but have used the **Select** tool to make another selection, you can reload the selection group by clicking on the button.

6. You can also lock and unlock selection groups, as well as showing and hiding them.

To...	Click on...
lock the selection group	
unlock the selection group	
hide the selection group	
show the selection group	

TIP: You can also create patch selection sets by right-clicking on your selection and selecting **Create Patch Selection Set**. This can also be done in the **Patches** palette by right-clicking on your selection and selecting **Create Set**.

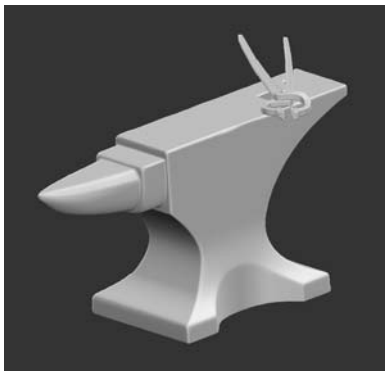
Selecting Areas Onscreen

Use the marquee select tool to select an area onscreen, rather than on the model. The marquee select tool lets you build up your selection (adding and removing to the selection as required), then transform it – moving it around, rotating it, or resizing it.

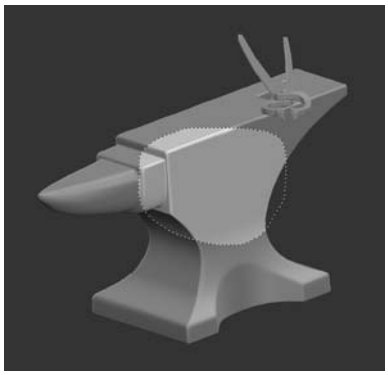
1. Paint a few strokes onto your model, so you can see the effects when you start drawing marquee selections.
2. Select the **Marquee Select** tool .
3. In the **Tool Properties**, select the tool type. You can select a rectangle, lasso, ellipse, or wand.

Tool	Lets you
	Draw a rectangular selection.
	Draw the outline of your selected area. You can draw any shape you want.
	Draw an elliptical selection.
	Select by color. When you click, Mari creates a selection around the point you clicked. The selection is based on color – areas with a similar color to the original point are selected. You can change the color threshold for the selection.

4. Click and drag to create your initial selection.



Initial buffer, with unbaked paint.



Marquee select — only the paint within the selection is visible.

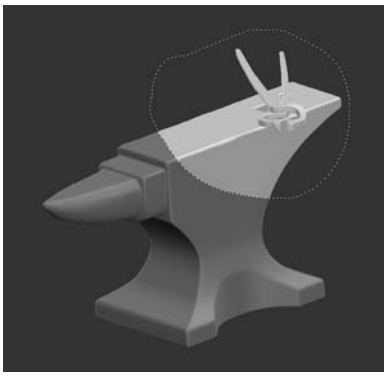
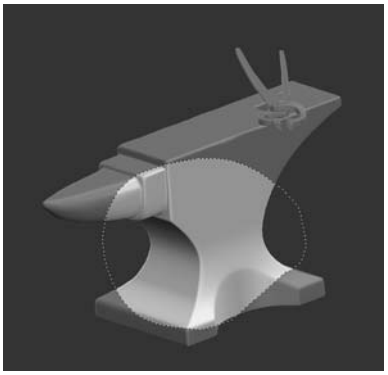
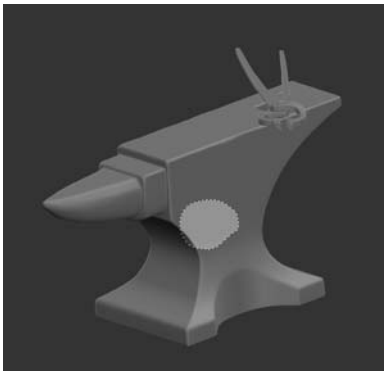
5. To edit the shape of the selection, change the **Mode** in the **Tool Properties**. You can set this to:

Mode	Does	Notes
Replace	the new selection replaces the existing selection.	In **Replace** mode (the default), you can: • hold down **Shift**, click and drag to add to the current selection, or • hold down **Ctrl**/**Cmd**, click and drag to remove from the current selection.
Transform	lets you move your selection area around (move, rotate, or scale the selection)	In **Transform** mode, you can: • hold down **Shift**, click and drag to move the current selection, • hold down **Ctrl**/**Cmd**, click and drag to rotate the current selection, or hold down **Shift**+**Ctrl**/**Cmd**, click and drag to scale the current selection.

6. If you want to soften the edges of the selection, turn up the **Feathering**. Higher values give the selection a softer, fuzzier edge. At 0, the selection has a hard edge.
7. In Wand mode, you can change the **Color Threshold** (how close the colors need to be to be selected when you click). At 0, only areas of the exact shade as the pixel you click on are be selected. As the value increases, more colors are selected when you click.

Moving and Distorting Marquee Selections

To move or distort the selection, set the **Mode** to **Transform**.

To	Do this:	Example
move the selection	hold down **Shift**, click and drag	
rotate the selection	hold down **Ctrl/Cmd**, click on your desired point of rotation, and drag	
scale the selection up or down	old down **Shift+Ctrl/Cmd**, click and drag	

16 Working With Patches

Models that you paint in Mari are divided into patches. You can change the properties of the patches, such as the patch resolution. You can also edit patches as a whole – by copying and pasting between patches, filling patches with color, or flipping the paint on them.

Patch Resolution

Each patch on a channel is stored at a particular resolution. Resolution is a determination of how many pixels are used for an item. For example, a patch may have a resolution of 512 x 512. This patch is stored as an output file 512 pixels wide by 512 pixels high. Higher resolutions take more memory and require more storage, but provide more detail.

Resolutions available in Mari range from 256 x 256 to 32k x 32k (32768 x 32768). Resolutions in Mari are always "square", with the width equal to the height.

You set the resolution for a channel when you create it. You can however change the resolution later, for example downsizing if you find the file's getting really big and you don't need so much detail, or upsizing if the shot focuses on something that you find needs more detail. You can either:

- change the resolution of the entire channel at once (that is, all patches in the channel), or
- resize specific patches within the channel.

Changing the resolution of a patch in one channel does not affect the resolution of the same patch in another channel. For example, a particular patch could be at 512 x 512 in the bump channel and 2k x 2k in the diffuse channel. All layers in a channel or patch are resized when the channel or patch is resized, but you cannot resize individual layers.

TIP: For more details on working with channels, see Channels.

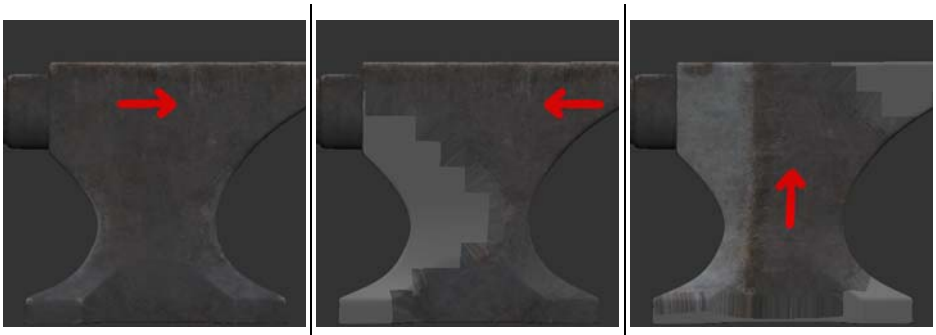
Changing Patches as a Whole

Mari lets you change patches as a whole. You can:

- copy textures from one patch to another
- fill patches with a single color
- rotate or flip the paint on a patch

- mirror paint from one side of a patch to the other
- link patches together.

Here's an example.



The original patch. | Flipped horizontally. | or rotated 90 degrees counter-clockwise.

TIP: Edits to patches only apply to baked paint. Unbaked paint in the paint buffer is not affected.

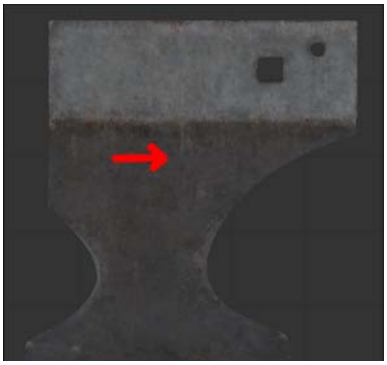
When you are copying patches onto other patches, unless your patches are identically shaped, you can see:

- blank areas at the edges, where the texture from the source patch runs out due to the change of shape, and
- traces of the "overpaint" around the edges of the patch.

You can also see these when transforming paint on patches unless your patches are square.

The overpaint is used to ensure that the patches fit together without visible gaps. You can view the overpaint for patches in the UV view. Turn the UV paint display on in the **Display Properties** dialog box (right-click on the canvas, select **Display Properties** from the dropdown menu, and turn on **Render UV Image**).

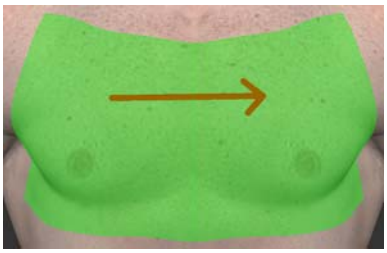
Note the blank patches and "bleed" from the overpaint areas.



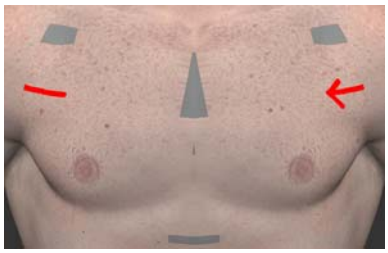
The original patch.

Rotated 90 degrees.

Paint transforms only apply within each patch. If you have more than one patch selected, each patch transforms independently. For example, if you flip two side-by-side patches horizontally, each patch flips separately.



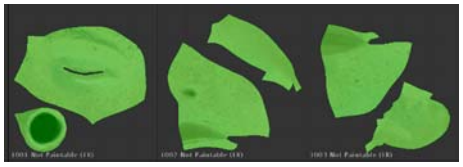
Two patches selected.



Flipped horizontally.

Saving Images of UV Masks on a Patch

Mari has a function that allows you to save an image of the outline of a UV mask. You can then save these images for use as a mask in another program, if required.



Patches selected in UV view.

B/W UV masks in the **Image Manager.**

Bleeding Patch Edges

By default, Mari creates an overspill area at the edge of UV patches to prevent seaming. In some cases, the overspill may not be large enough to prevent seaming artifacts, or you may get render artifacts if your renderer expects a larger bleed area.

For example, from some angles, Mari's blacksmith demo asset shows a seaming artifact in the hair just above the left ear when viewed front on. This is because the bleed for that edge of the UV patch is slightly too small.

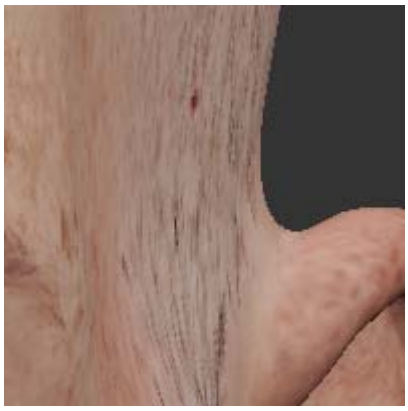
From front on, you can see a slight line at the patch edge.

This is caused by a too small overspill edge.

TIP: *You can view the overspill bleed by turning on **Show UV Patches** in the Display Properties dialog box.*

If you are experiencing problems with seaming artifacts (either within Mari or after rendering) try conducting a full patch bleed. This extends the bleed area across the entire UV patch.

UV patch after full bleed.



And the artifact is eliminated.

NOTE: Mari does not do a full bleed by default because it takes much longer to calculate.

For performance reasons, Mari divides large patches into smaller, more manageable 256x256 tiles. When baking paint into a channel, Mari always performs an individual edge bleed for every tile affected by the paint. The bleed operation fills the tile but does not affect surrounding tiles.

When bleeding is done per tile, some exceptional conditions may occur depending on how the tile lines up with the geometry shell:

- As bleed width is extended from the shell to the tile boundary, it may vary depending how close the shell boundary is to the tile boundary.
- Resizing a patch changes the tile grid causing it to line up differently with the geometry shell, which can affect bleed results.
- Tile corners that just touch the outer shell of the geometry can result in unexpected bleed behavior.

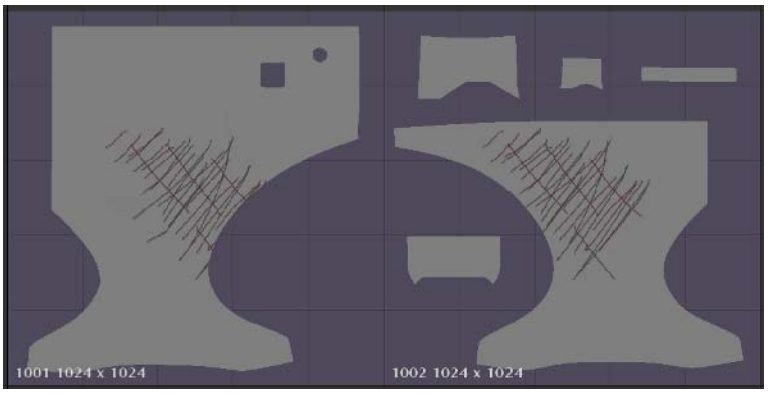
Edge bleeding per patch is different because it renders the entire patch first and then performs a full bleed on it. This avoids the conditions mentioned previously but requires much more memory and processor time, especially when bleeding large patches.

The per tile method is the default behavior and ensures that normal paint-bake operations are performed quickly. Full patch bleeding should only be used in situations where exported tile-bled patches are causing problems in third party applications.

Linked Patches

Mari has the ability to link patches together to provide a way of sharing the same underlying image data between multiple patches quickly and easily. A patch is given the same paint as the patch it is linked to if the linked patch is painted after they have been linked. This function can be found within the **Patches** palette. It is best to view the model in **UV** view when attempting to link or unlink patches.

The linked patches feature works best when the underlying UV maps are identical. If they are not, then the differing UV maps result in different edge bleeds, which could manifest as bleeding artifacts on linked patches. If you need to avoid edge bleeding artifacts, you can use the Whole Patch Projection option in the UV view.



NOTE: Please be aware that if painting on more than one linked patch, any overlap of paint can cause baking artifacts. If you have trouble painting on linked patches because of these overlaps, you can lock the patches you don't want to paint on directly.

TIP: If you notice paint conflicts and you are already taking care to avoid overlapping paint, try locking neighboring linked patches to the one you are painting on to avoid conflicts.

Steps for Working with Patches

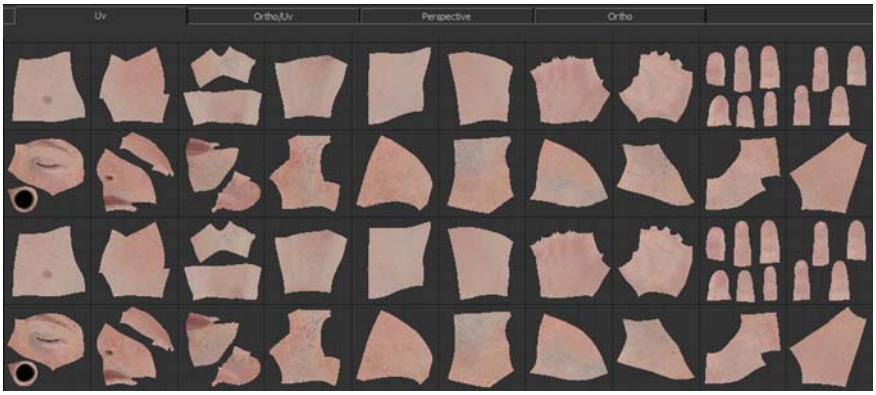
To manage the patches in your Mari project, follow these steps:

1. View and Resize Patches
2. Using UDIM Values
3. Copy and Paste Patches
4. Extract Patches to the Image Manager
5. Fill Patches with Color
6. Flip and Rotate Painting
7. Mirror Painting
8. Save Images of the UV Masks
9. Bleeding Across Patch Edges
10. Link or Unlink Patches

View and Resize Patches

1. Start Mari and open your project.
2. To open the UV view, click either the **UV** or **Ortho/UV** tab at the top of the canvas.

The UV view displays all individual patches on the model, and labels the patches with the size format in an abbreviated mode, such as 4K instead of 4096x4096. The label also lists all active patch sizes in a comma-separated list.



3. Zoom in to view the details of a specific patch more easily.

   Once you zoom in enough, Mari displays the patch details (such as resolution and color depth).

4. If you select one or more patches and you want to switch the view to display all of the selected patches, press **A**.

   Mari focuses the view on the patches that are selected.

   If you don't have any patches selected, the view focuses on the model as a whole (changing to show the whole model).

TIP: If you find that the view starts cutting through the front clipping plane, try pressing **A**.

Resize Patches

1. Select the patch(es) to resize.

TIP: You can select the patches in any view — you don't have to be in the UV view to do this.

2. From the **Patches** menu or the right-click dropdown menu on the canvas, select **Resize Selected** and then a resize option. You can select a specific resolution from the list (up to the maximum resolution for the channel), or choose to halve or double the resolution.

   If you try to double the size of a selection already at the channel's maximum resolution or halve the size of one at 256 x 256, nothing happens.

NOTE: If attempting to resize patches in a channel that contains layers shared from other sources, the shared layers are not resized; all other layers in the channel are resized.

NOTE: If you don't select a patch or a layer when resizing, Mari asks if you want to resize all patches or layers before continuing.

Using UDIM Values

Each patch represents one square unit in UV space; for instance, a square with dimensions 1x1. UDIM values are a way of representing the integer coordinates of that square, from the coordinates of its bottom-left corner in UV space.

Channels can contain up to ten patches across, and any number of patches upwards. This means that patches can have U indices between 0 and 9 inclusive, and V indices can be zero or any positive integer. With these values, the UDIM for a patch can be calculated using the formula:

udim = 1001 + u + (10 * v)

NOTE: The U index limit of ten is currently hardwired.

The UDIM value of the bottom-left patch, which represents the UV space region (0,0) to (1,1), is 1001. The next patch to the right has a UDIM value of 1002, and the patch directly above the bottom-left is 1011. For example, the patch representing the UV space region (2,5) to (3,6) has a U index of 2 and a V of 5, so replacing the values in the formula, we get:

udim = 1001 + 2 + (10 * 5) = 1053

(...)									
(0,1)									
(0,0)	(1,0)	(2,0)							(9,0)

Copy and Paste Patches

See Copying and Pasting Paint for details on how to copy and paste individual patches.

Extract Patches to the Image Manager

To extract one or more patches to the **Image Manager**:

1. Select the patches to extract.
2. From the **Patches** menu, select **Extract Selected**.

   *Mari copies the patches to the **Image Manager**. See* Managing Images in Mari*.*

TIP: You can only copy patches up to 8K resolution.

Fill Patches with Color

To fill one or more patches with a color:

1. Set either your foreground or background color to the color you want to fill.

   See Managing Colors in Mari *for details on selecting colors.*
2. Select the patch(es) to fill.
3. From the **Patches** > **Fill** menu, select either:
   - **Black** - to fill the patches with a constant black color.
   - **Gray** - to fill the patches with a constant gray color.
   - **White** - to fill the patches with a constant white color.
   - **Foreground** - to fill the patches with the foreground color.
   - **Background** - to fill the patches with the background color.
   - **Transparent** - to make the patches transparent.

- **UV Mask** - to make patches a UV mask.
- **Wireframe** - to fill patches with a wireframe.

Mari fills the patches with the selected color, mask, or wireframe.

Flip and Rotate Painting

1. Select one or more patches with baked paint.
   See Selecting Items *for details on selecting patches.*
2. From the **Patches** > **Transform** menu, select the transformation:
   - **Flip Vertical** — to flip the selected patch(es) vertically.
   - **Flip Horizontal** — to flip the selected patch(es) horizontally.
   - **Rotate 90 CCW** — to rotate the selected patch(es) 90 degrees counterclockwise.
   - **Rotate 90 CW** — to rotate the selected patch(es) 90 degrees clockwise.
   - **Rotate 180** — to rotate the selected patch(es) 180 degrees.

NOTE: The transform functions in the **Patches** menu are applied to selected patches for the current and selected layers. If you don't select a patch or a layer, Mari asks if you want to apply the transform to all patches or layers before continuing.

Mirror Painting

1. Select a patch with baked paint.
   See Selecting Items *for details on selecting patches.*
2. From the **Patches** > **Mirror** menu, select the mirror operation:
   - **Mirror Left to Right** — to mirror the selected patch from left to right.
   - **Mirror Right to Left** — to mirror the selected patch from right to left.
   - **Mirror Top to Bottom** — to mirror the selected patch from top to bottom.
   - **Mirror Bottom to Top** — to mirror the selected patch from bottom to top.

NOTE: The mirroring functions in the **Patches** menu are applied to selected patches for the current and selected layers. If you don't select a patch or a layer, Mari asks if you want to mirror to all patches or layers before continuing.

EXPERIMENT: Experiment with flipping, rotating, and mirroring patches. Apply paint first to see what happens to the paint when the patch is changed.

Save Images of the UV Masks

1. Select one or more patches.

   See Selecting Items *for details on selecting patches.*
2. From the **Patches** menu, select **UV mask to Image Manager**.

   Mari takes a snapshot of the UV outlines on the selected patches and puts it into the ***Image Manager****. It creates a separate image for each patch selected.*

   You can now use the images or save them to disk. See Managing Images in Mari *for details on using the* ***Image Manager*** *palette.*

Bleeding Across Patch Edges

If you are seeing seaming artifacts at the edge of your patches, try doing a full bleed across the affected patches.

1. Select the patches to bleed.

   See Selecting Items *for details on selecting patches.*
2. From the **Patches** menu, select **Bleed Patch Edges**.

   Mari calculates a full bleed for the selected patches, taking the existing textures next to the patch on the model into account. This may take a few seconds.

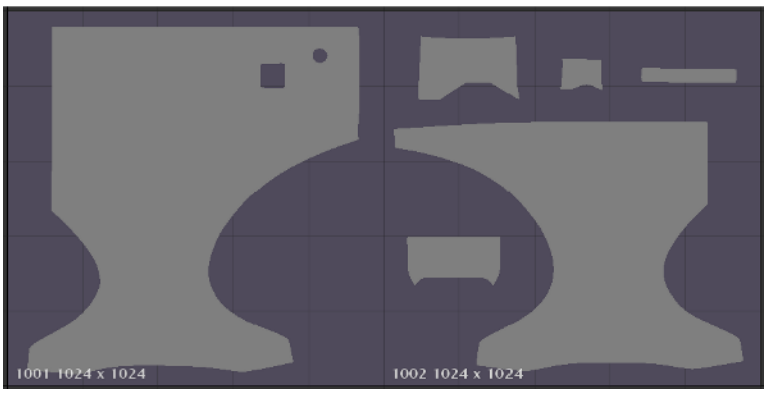
Link or Unlink Patches

To link together two or more patches:

1. Within the **Patches** palette, select the patches you want to link together. You can select the patches by clicking on them in either the palette channel or on the canvas.

   This is best done in UV view for easier selection visibility.
2. Click the **Link Selected Patch Images** icon to link the selected patches.

   In the UV view, a colored background displays behind the selected patches to denote which patches have been linked.



To unlink patches:

1. Within the **Patches** palette, select the patch or patches that you want to unlink from the linked selections.
2. Click the **Unlink Selected Patch Images** icon to unlink the selected patch from any other patches.

   In UV view, the colored background no longer shows behind the unlinked patch. Any other linked patches still show the colored background behind them.
3. If you want to unlink all patches in the project, right-click the **Patches** palette and select **Unlink All Linked Patch Images** or right-click on the canvas and select **Patches > Link | Unlink All Linked Patch Images.**
4. If you want to specify that a particular patch be used as a "master" patch, from which the other linked patches can be initially copied, you can do this by first selecting the desired "master" patch on its own and linking it using the **Link Selected Patch Images** button. You can then select the master patch and the rest of the patches to re-link them using the **Link Selected Patch Images** button again.

NOTE: When linking patches, if any patches have been previously linked, Mari determines which set of linked patches has the most patches in the selection set and retains those links while re-linking the other selected patches.

TIP: You can also find all of the options discussed in this chapter in the right-click dropdown menu on the canvas.

17 Configuring the User Interface

Mari provides a fully customizable GUI. You can set it up to suit your working style and preferences.

The main GUI elements that you can customize are:

- **palettes** — areas that contain controls and information, for example to view and configure tool properties, colors, or project elements. You can select which palettes to display and where to put them.
- **toolbars** — panels that contain Mari tools and common functions, for example to paint, erase, open or close a project. Toolbars contain icons you click to quickly access common tools and functions. You can create new toolbars, with shortcut buttons to your favorite functions.
- **HUD** — the heads-up display (HUD) displays information about the current tool and other Mari and project information at the top of the canvas.
- **status bar** — the status bar displays information about current processes, as well as progress bars and error warnings.

Palettes and toolbars can be either *docked* (fixed in one place) or *undocked* ("floating" above the canvas). Palettes can be docked to:

- any side (including top or bottom) of the Mari window, or
- each other (in a separate window).

Docked palettes can also be *stacked* — in the space of a single palette, with tabs to select which palette appears on top.

Similarly, toolbars can be docked on the top, left, or right of the Mari window (but not the bottom). By default, toolbars appear at the top, but can be moved.

Once you have your workspace laid out properly, you can save the layout for later use. If you decide that you don't like your custom layout, you can revert to the default layout.

Steps for Customizing Your Workspace

To customize your workspace, follow these steps:

1. Choose and Organize Palettes
2. Choose and Organize Toolbars
3. Create Custom Toolbars
4. Configure the HUD
5. Save Your layout
6. Understanding the Status Bar

Choose and Organize Palettes

To select and position palettes:

1. To select which palettes to display:
   - from the **View** menu, select **Palettes**, and then a palette from the sub-menu, or
   - right-click an empty spot on the toolbar area, and select a palette from the dropdown menu.

   The dropdown menu lists palettes at top, and toolbars below.

TIP: When you open a palette, it displays where it was the last time it closed.

2. You can do the following to position a palette:
   - **move** — click in the title bar and drag.
   - **undock** — click in the title bar and drag to the middle of the canvas, or outside the main Mari window.
   - **dock** — drag to an edge of the canvas (left, right, top, or bottom).

     The side of the canvas expands to "grab" the palette
   - **dock beside another palette** — drag onto the side of another undocked palette, between docked palettes, or between a docked palette and an edge of the canvas.

     Palette(s) "shuffle over" to make room for the new palette, if there is enough room, otherwise they stack (see below).
   - **dock on top (stack)** — drag on top of a docked palette. Palette(s) "shuffle up" slightly, to display tabs below for selecting which palette displays (on top).

TIP: If you dock two floating palettes together, they appear as a separate palette window.You can also use the standard controls at the top right of the palette to minimize, maximize, switch between floating and docked, and close the palette.

Mari also has a show/hide palette function: press the **Home** key (or select from the **View** menu) to toggle between showing and hiding the current palettes.

TIP: Palette behavior is customizable. Experiment with the palettes to see how they can be docked, undocked, moved, and stacked.

Choose and Organize Toolbars

To select and position toolbars:

1. To select which default toolbars to display, right-click an empty spot on the toolbar area, and select from the dropdown menu (as for opening palettes, above).

TIP: The default toolbars are:

- **Ptex** - ptex settings (changing face resolution, texel density, and so on).
- **Channels** - buttons to switch between the four default views for painting (Channel, Stack, Layer, and Paint).
- **Navigation** - buttons to set your navigation preferences while moving around the canvas.
- **Tool Properties** - lets you set the properties for the current tool.
- **Project** - common project functions (New project, Open, Save, and so on).
- **Lighting** - buttons to switch between the three lighting modes and to toggle shadows on or off.
- **Painting** - buttons to clear the paint buffer or open the Brush Editor.
- **Tools** - all the painting tools.
- **Selection** - buttons to switch between three selection modes (objects, patches, and faces) when using the Select tool.
- **Canvas** - view options for the UV and 3D views.
- **Mirroring** - buttons to switch between four paint mirroring settings.
- **Vector Painting** - enable the vector grid and quickly set up vector shaders.
- **Color Space** - lets you specify your color space and the settings associated with your choice.

2. To position a toolbar, click the drag control at its left or top edge, and:
   - **move** — drag to another position.
   - **undock** — drag to the middle of the canvas, or outside the main Mari window.
   - **dock** — drag to an edge of the canvas (left, right, or top — not bottom); the side of the canvas expands to "grab" the toolbar.
   - **resize** — drag left or right, or up or down.

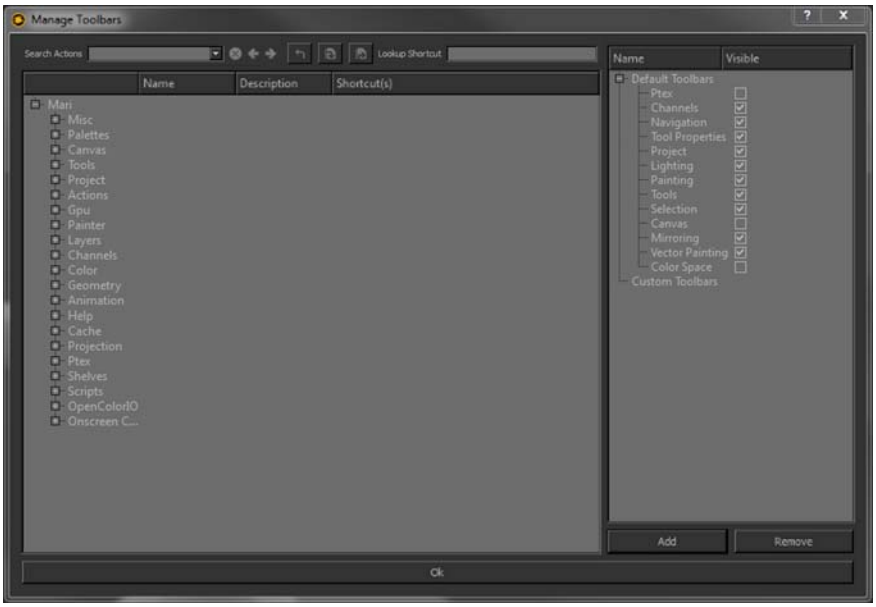
TIP: If the toolbar is too small to fit all of its items, a double chevron appears at the end (»). Click this to see all the tools in the bar, or resize and position the toolbar to see all items.

Create Custom Toolbars

If you want quick access to functions not included on the default toolbars, you can create as many additional toolbars as you need. To create a new toolbar:

1. From the **Edit** menu, select **Toolbars**.

   *The **Manage Toolbars** dialog box opens.*

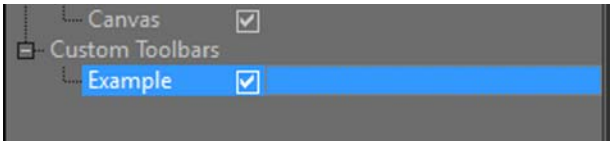


2. Click **Add** to create a new toolbar.

   Mari prompts you to name the toolbar.

3. Give your toolbar a name, and click **OK**.

   *The new toolbar displays under **Custom Toolbars** in the **Manage Toolbars** dialog box, and an empty toolbar displays for it on the main screen.*



TIP: If the empty toolbar does not display, make sure that the **Visible** checkbox in the **Manage Toolbars** dialog box is ticked.

Also note that the new toolbar may display at far right, and you may have to drag its handle to the left to resize it, to make room for new icons.

4. Add functions to your toolbar by dragging from the list on the left in the **Manage Toolbars** dialog box, onto the empty toolbar on the main screen.

TIP: Click **+** to expand the nodes in the list to see the functions available. At the moment, items cannot be removed from custom toolbars.

5. Click **OK** to close the **Manage Toolbars** dialog box when you're happy with your new toolbar.

EXPERIMENT: Try this to acquaint yourself with managing toolbars:

- create a new toolbar,
- add a few items to it,
- resize it,
- undock it, move it, and re-dock it somewhere else,
- hide it from the display, then
- remove it.

Configure the HUD

To configure the "heads-up display" (HUD):

1. From the **Edit** menu, select **HUD Manager**.

   *The **HUD Manager** dialog box opens. The information you're most likely to want to display is under **Tool Manager** and the current project (in the illustration, **Example Project**).*

TIP: Many of the options in the **HUD Manager** are for debugging purposes only. For an explanation of the different options, see the Mari *Reference Guide*.

2. Click the checkboxes for the options you want to include in the heads-up display at the top of the canvas, then close the **HUD Manager** dialog box.

   *Mari displays information in the HUD as you select it in the **HUD Manager**.*

Save Your layout

A layout is a record of how your Mari workspace is set up. Once you have your workspace set up, you can save the layout so you can easily recall it later. Alternatively, you might want different layouts for painting different types of objects.

1. From the **View** menu, select **Save Layout**.
   *A standard **Save** dialog box opens.*
2. Enter a filename and select a location for your saved layout.
3. To reload the saved layout at any time: from the **View** menu, select **Open Layout**.

TIP: To revert to the default layout: from the **View** menu, select **Default Layout**.

EXPERIMENT: Try moving some palettes and toolbars around, then saving the layout. Revert to the default layout, then re-load your saved layout.

Understanding the Status Bar

The status bar is a fixed panel of icons that appears in the bottom-right corner of the Mari window. It displays information about the project as icons, including progress bars for current processes, error warnings, and features that can be toggled.

All icons display tooltips when the cursor hovers over the icon. Some can be clicked to toggle the displayed functionality. Though most icons are unique to a single error warning or feature, there are a few noted in the list below that are not.

Status Bar Icons

Icon	Description	Notes
	Displays the UDIM number of the patch you have selected. If nothing is selected, then there is nothing listed after **Udim**.	
	Notifies you that there is unbaked paint in the paint buffer. Clicking on this icon bakes the current painting.	This icon only displays in the status bar if there is paint in the paint buffer.
	Notifies you that your painting is hidden.	
	Notifies you that background jobs are currently running. Clicking on this icon displays a dialog for the progress bar.	

Icon	Description	Notes
	Notifies you that the project has changed and allows you to click on the icon to save changes.	
	Notifies you that color management is active. More information on color management can be found under Set How Colors are Displayed Using the Color Manager on page 216.	
	Notifies you that you are currently projecting on the front of objects. Clicking on this icon toggles to Project Through Objects. Clicking on this icon toggles between projecting through objects and projecting on the front of objects. The icon takes the default icon's place when switching to project through. More information for projecting on or through objects can be found under the Projectors on page 318 chapter.	
	Notifies you that you currently have edge masking enabled. Clicking on this icon disables edge masking. More information on edge masking and the edge masking icon can be found under Edge Masking on page 86.	This is not a unique icon. It also displays to indicate that fractal noise masking is enabled. If both masks are being used, the icons appear separately on the status bar.
	Notifies you that you currently have channel masking enabled. Clicking on this icon disables channel masking. More information on channel masking and this icon can be found under Channel Masking on page 87.	
	Notifies you that you currently have ambient occlusion masking enabled. Clicking on this icon disables ambient occlusion masking. More information on ambient occlusion masking and this icon can be found under Ambient Occlusion Masking on page 88.	
	Notifies you that you currently have depth masking enabled. Clicking on this icon disables depth masking. More information on depth masking and this icon can be found under Depth Masking on page 89.	
	Notifies you that you currently have backface masking enabled. Clicking on this icon disables backface masking. More information on backface masking and this icon can be found under Backface Masking on page 89.	
	Notifies you that you currently have fractal noise masking enabled. Clicking on this icon disables fractal noise masking. More information on fractal noise masking and this icon can be found under Fractal Noise Masking on page 90.	This is not a unique icon. It also displays to indicate that edge masking is enabled.
	Notifies you that you currently have the global mask preview enabled. Clicking this icon disables the global mask preview. More information on the mask preview and this icon can be found under Mask What You Can Paint On on page 85.	

Icon	Description	Notes
	Warns you that a low memory status has been detected. Low memory affects Mari's performance and may make it unstable. Try freeing memory or closing and restarting Mari to clear this issue.	This is not a unique icon. It also displays to warn you that the cache disk is critically full.
	Notifies you that there are warning messages present.	Clicking on this icon displays these warnings.
	Warns you that the cache disk is critically full. If you don't free space, data loss may occur. To free space, try: • closing and reopening the project. • freeing up space on the disk. • placing your cache on a file system with more free space.	This is not a unique icon. It also displays to warn you that a low memory status has been detected.
	Hovering the cursor over this icon displays the tooltip **No space left for this operation.** There are a few reasons that this might display, including: • The virtual texture size is set too low in the **Preferences.** • There are too many channels in the **Channels** palette. • The patch resolution is set too high on some patches.	This is not a unique icon. It also displays to indicate a higher bit-depth than what is configured. Attempting to click on the icon for the Overload warning displays nothing further.
	Hovering the cursor over this icon displays the tooltip **Channels are higher bit-depth than what the virtual texture is configured for.** Clicking on the icon increases the bit-depth of the virtual texture to match that of the highest bit-depth and removes the status bar warning.	This is not a unique icon. It also displays to indicate virtual texture overload. Hovering over the icon for a tooltip indicates which warning it is.
	Notifies you that Mari is currently loading data from the disk.	
	Notifies you that Mari is currently loading data from the RAM to GPU memory.	
	Notifies you that Mari is listening for commands on [COMPUTER NAME] port [PORT NUMBER].	Clicking on this icon shows you what computer name and port number on which Mari is listening for commands.
	Notifies you that there was an error while Mari was listening for commands.	

18 Managing Images in Mari

Mari lets you use external images as a source for:

- clone stamping
- painting through
- picking colors in the **Color Manager**.

Mari has a palette, the **Image Manager**, which stores images in use in the current project. This gives you quick access to the images, and very basic editing. For each image, the **Image Manager** shows a small preview and information such as the location of the image on disk.

When you open a project, the **Image Manager** loads its images from source files on the disk and keeps them in memory, ready to use. If any of those source files change after you open a project, the changes only appear in the **Image Manager** when you next open the project. If Mari can't find a source file for an image in the **Image Manager** when you open a project, it removes that image from the **Image Manager**.

You can also create new images in the **Image Manager** by:

- Cropping them from existing images,
- Running a script on an existing image, or
- Generating them via a custom Texture Generator.

Mari stores these with the project (rather than loading them from a file on disk - unless you specifically save them on disk).

TIP: If you need to use a common set of images for multiple projects in Mari, you can drag them to a personal shelf. See Storing Resources Using Shelves for details.

Steps for Managing Images

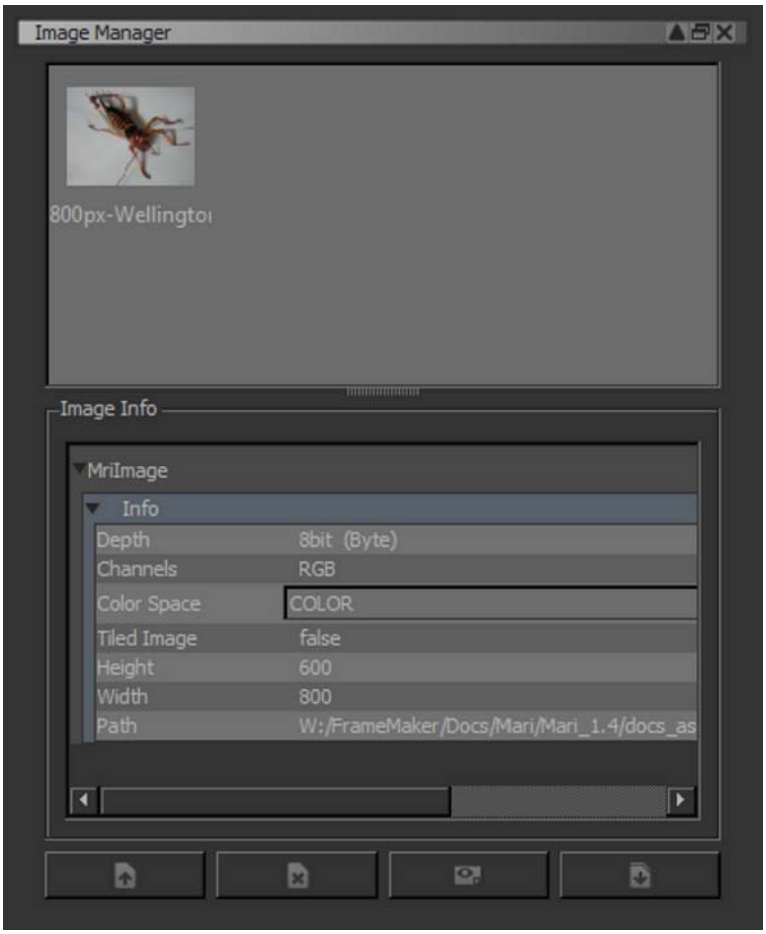
To manage the images in use in your project, follow these steps:

1. Open the Image Manager Palette
2. Load and Select Images
3. Crop and Filter Images
4. Run Scripts on Images

Open the Image Manager Palette

1. Start Mari and open your project.
2. Open the **Image Manager** palette:
   - right-click on the toolbar, and select **Image Manager** from the drop-down menu, or
   - from the **View** menu, select **Palettes** > **Image Manager**.

   *The **Image Manager** palette displays, showing images currently in use in the project.*



Load and Select Images

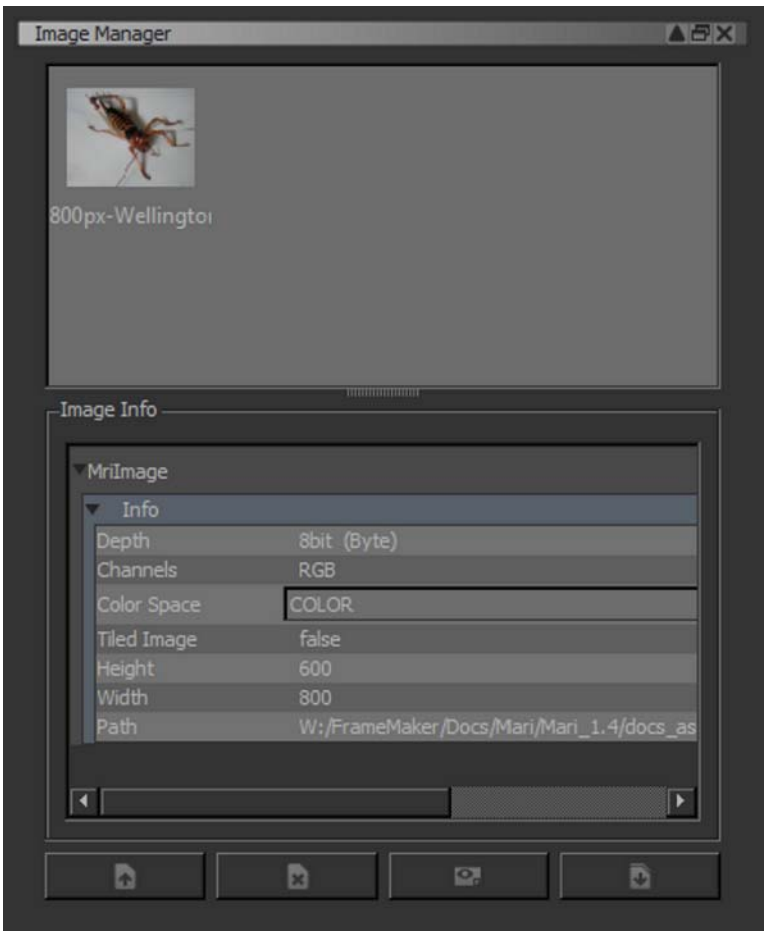
1. To load one or more images, click .

   *The **Open** an Image dialog box displays.*
2. Select the image(s) you want to load.

*The **Image Manager** shows a preview of the image(s). (The actual image itself may be larger or smaller than the preview.)*

NOTE: If you load a layered **.psd** file into the **Image Manager**, each layer is imported as a separate image.

3. Under **Advanced Options** select whether you would like to apply a **ColorSpace Conversion** (**Linear to sRGB**) to the image before you import it, and then click **Open**.
4. Click on a preview to view information about that image.



Information displayed includes:

- Color Depth
- Color Channels
- ColorSpace (which you can set to either **COLOR** or **SCALAR**)

- the image height and width in pixels
- the path for the source file (from which Mari loads the image when you open the project).

NOTE: On Windows, file paths have a limit of 32,767 characters in length. If you load an image into the **Image Manager** that exceeds this length, the message **Invalid Image Path** is displayed in the **Path** field. This does not affect the image data or its properties, and you may continue to use it as normal.

5. To remove images from the **Image Manager**, select the image (**Ctrl**/**Cmd**-click or click and drag to select multiple images), and click .

   *The image(s) disappear from the **Image Manager**. This has no effect on the image source files — it just means you're not using those images in your current Mari project.*

6. To view a larger version of an image, click .

   The larger preview opens in a separate window. You can change the size of this preview by changing the size of the window. You can also crop the image from this window (see the next section).

7. To save an image under a new filename, click .

   *The **Save an Image** dialog box displays.*

8. Enter a new name for the image and click **Save**.

   Mari saves the image. From now on, Mari loads the image from the new filename when you open this project.

TIP: You can also **Open**, **Save**, **Save As**, or **Close** images by right-clicking on the **Image Manager** and selecting from the dropdown menu. There is an extra shortcut to open new images as well — double-clicking on an empty part of the **Image Manager**. And you can do all of these on multiple images at once (**Ctrl**/**Cmd**-click or click and drag to select multiple images). You can even drag and drop images into the **Image Manager** from your web browser.

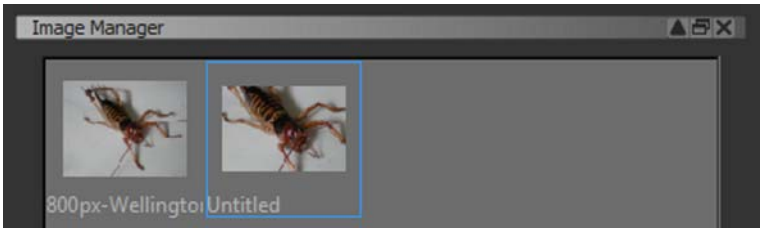
Crop and Filter Images

1. To create a new image by cropping an image from the **Image Manager**, click to open the image preview window.

TIP: Clicking on the image in this window sets the foreground color to the color at the spot you clicked.

2. Select the crop mode that you want to use. You can select from the following options:
   - **Arbitrary** - Click and drag on an arbitrary area of the image.
   - **Fixed** - Enter a fixed size for the crop box (in pixels) and drag it to the area you want to crop.
   - **Aspect** - Enter a fixed aspect ratio for the crop box (in pixels) and drag it over the area you want to crop.
3. Now click and drag to select the area to crop, select the **Output Size** and click .

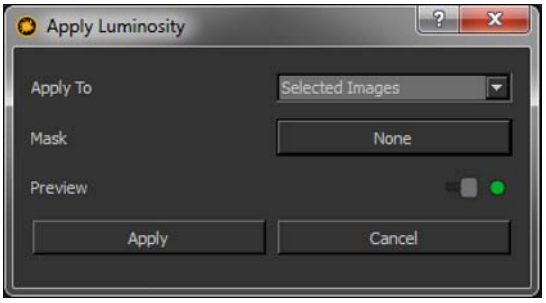
The selected area appears as a new image in the **Image Manager**.



TIP: Mari saves a cropped image as part of the project, not as a separate file on disk — unless you specifically save it with a new filename.

4. To apply a filter to an image, click to select it in the **Image Manager** and, from the **Filters** menu, select the filter to apply.

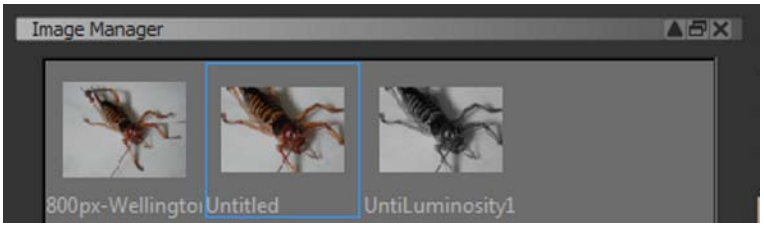
*The **Apply** dialog box displays.*



5. Make sure that **Apply To** is set to **Selected Images**.

TIP: For details of the filters available and how to apply them, see Available Filters.

6. Set filter options, and click **Apply**.
   *Mari applies the filter to the image in the **Image Manager**.*



TIP: You can filter multiple images at once. Mari applies the same filter to all the selected images.

Filtering an image in the Image Manager breaks the connection between the image and the original file. If you want a copy of your updated image on disk, save it with a new filename.

Run Scripts on Images

The **Image Manager** has a right-click option to run scripts on images. This lets you run custom scripts (for example, a Nuke or ImageMagick transform) on the images.

To run a script on an image:

1. Right-click on the image and select **Run Script** from the dropdown menu.
   *The **Run Image Script** dialog box displays.*

2. Type in the script command to run, or select from the dropdown list. The list holds the last 10 scripts run.

   Use the $FILENAME variable for the name of the image file.

TIP: Mari runs the script command and then loads the $FILENAME file. So all commands must run in place on $FILENAME.

*Mari runs the script, then loads the resulting image into the **Image Manager**: Initially, the previous version of the image also appears in the **Image Manager**.*

Initial image to the left, modified image to the right.

TIP: You can run scripts on multiple images at once. **Ctrl**/**Cmd**-click or click and drag to select multiple images.

EXPERIMENT: Run some basic scripts on your images. For example, try:

- **/usr/bin/convert $FILENAME -flop $FILENAME** — to flip the image horizontally.
- **/usr/bin/convert $FILENAME –blur 10 $FILENAME** — to apply a slight blur.

19 Managing Colors in Mari

Mari lets you control both how colors display, and how you select them.

For color (not scalar) channels, you can use the color management functionality provided by the **Color Manager** or the **ColorSpace** toolbar to apply various color profiles (preset or custom), LUTs (look-up tables), or colorspace conversions to the painting displayed on the screen. Mari comes with a selection of preset color profiles, and you can configure your own too. Mari also lets you select a "split point" - where to split the display between corrected and uncorrected colors.

You can also have Mari display an onscreen histogram, showing the color distribution in your painting.

NOTE: The color management functionality provided by the **Color Manager** and the **ColorSpace** toolbar is for display purposes only. The color profiles, LUTs, and colorspace conversions applied here do not affect the paint on your model. To apply filters to the paint on your model, and bake the changes down, please refer to the Filtering Images and Paint chapter.

Mari always has two colors selected, "foreground" and "background". These display in the **Tools** toolbar, and on the **Colors** palette. By default, painting tools use the foreground color.

For picking colors, Mari provides:

- a standard "eyedropper"-style **Color Picker** tool.
- the **Pixel Analyzer** palette, which supplements the **Color Picker** with a range of colors you've selected, showing their average, minimum, and maximum color values.
- the **Colors** palette, which lets you pick colors interactively from a selection of pickers (including HSV, color values, greyscale, blends, and from images) or just by entering specific color values.
- the ability to select colors from images in the **Image Manager** or a shelf.

TIP: You can also change the color depth of a channel if you need to. See Channels for details.

About the ColorSpace Toolbar

The **ColorSpace** toolbar is provided as an efficient way to apply colorspace conversions and LUTs to the painting displayed on your screen. While this functionality is also available from within the **Color Manager** (under the preset **ColorSpace** color profile) the toolbar is conveniently placed to make quick adjustments while painting.

The **ColorSpace** toolbar utilizes the OpenColorIO standard originally developed by Sony Pictures Imageworks. For a more comprehensive explanation of OpenColorIO, including LUT generation and suggested workflow strategies, please visit http://opencolorio.org/.

You can quickly toggle overall color management on/off via a button on the toolbar, and conveniently load custom color configuration files and custom LUTs. There are dropdown menus available for applying colorspace conversions, and a number of other controls for finely tuning them.

Steps for Managing Colors

To manage the colors you use in Mari, follow these steps:

1. Pick Colors from Paint on the Model
2. Select Colors from a Picker or Image
3. Set How Colors Are Displayed Onscreen

Pick Colors from Paint on the Model

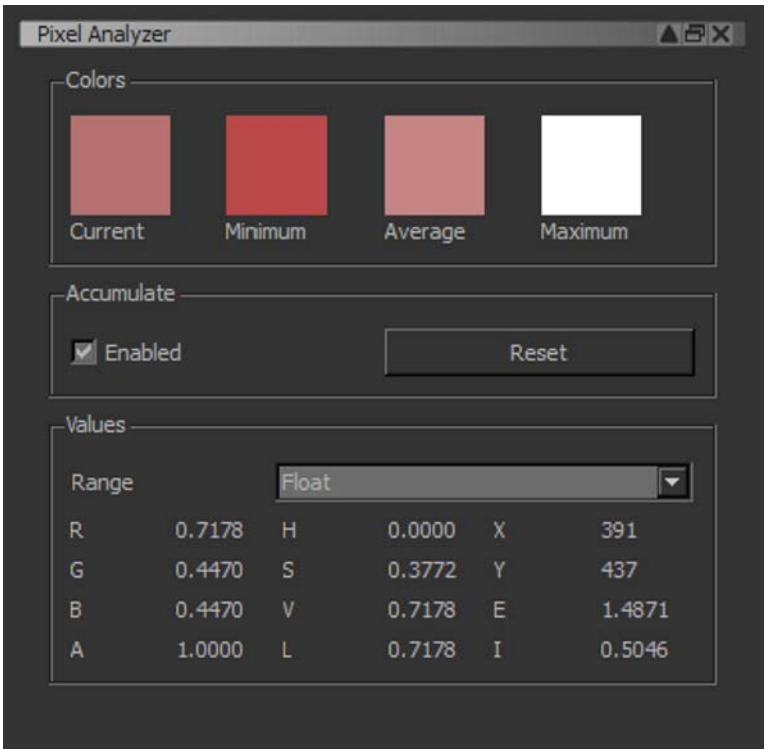
1. Start Mari and open your project.
2. To pick a single color from the paint already on the model, select the **Color Picker** tool , and click on the model.

   Mari sets the foreground color to the color at the point you clicked.

TIP: Mari sets the color to what's actually on the model's surface where you clicked. This may not be exactly the color you see on screen. For example, if you use full lighting and the area is in shade, it doesn't appear darker than it actually is.

3. Open the **Pixel Analyzer** palette:
   - right-click on the toolbar, and select **Pixel Analyzer** from the dropdown menu, or
   - from the **View** menu, select **Palettes** > **Pixel Analyzer**.

   *The **Pixel Analyzer** palette displays details of the currently selected color.*



The **Values** section displays the color's exact numeric value, in the selected **range**.

4. Under **Accumulate**, click the **Enabled** checkbox.

   With this option enabled, Mari keeps track of the colors you select. As you click on the model, the **Colors** fields update to display the **Current** color selected, plus the **Minimum**, **Average**, and **Maximum** color values from the tracked series of clicks. (If you drag across the model, Mari still accumulates colors, as if it were a series of clicks.) You can then click on any of these swatches to set the foreground color to that value.

5. Click **Reset** to clear the buffer and start again.

Select Colors from a Picker or Image

1. Open the Colors palette:

   • right-click on the toolbar, and select **Colors** from dropdown menu, or

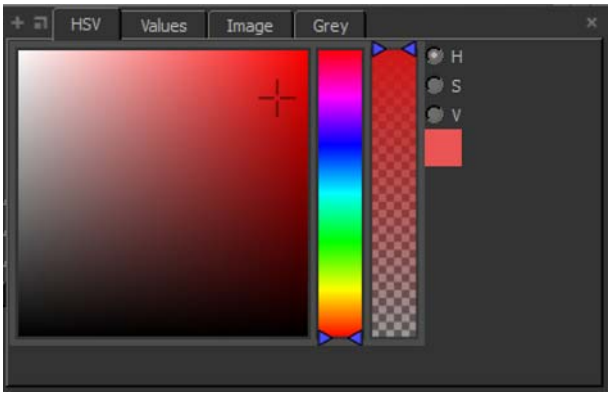
   • from the **View** menu, select **Palettes** > **Colors**.

   *The **Colors** palette displays colors and color pickers.*

2. Select a color:
   - manually set the numeric values (either type them into the entry boxes or move the sliders) for the various color attributes — red, green, blue, alpha; or hue, saturation, and value, or
   - click a color field in the tabbed area.

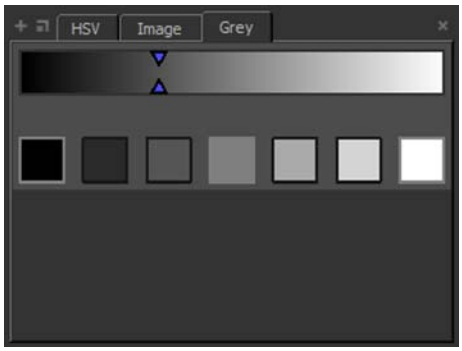
   The control dynamically updates as you change the settings.
3. Click to navigate through the tabs available for the color pickers.

   These include:
   - **HSV** — to select hue, saturation, and value settings.

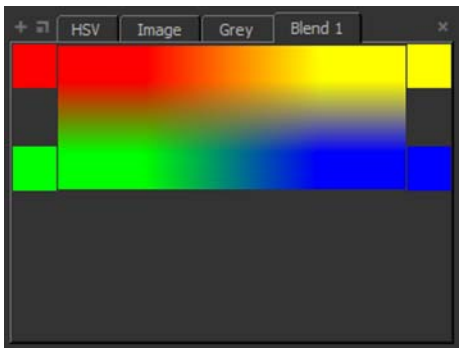


- **Values** — to pick from **Byte (8 Bit)**, **Half (16 Bit)**, or **Float (32 Bit)** color values.
- **Image** — to pick a color from an image (right-click to load an image, or drag an image from the **Image Manager**).

- **Grey** — to select greyscale values (including predefined grey settings, at the bottom, in steps from black to white).



- **Blend** — to pick from a field blending four colors (select which colors by clicking the swatches in the corners to open another color picker control).

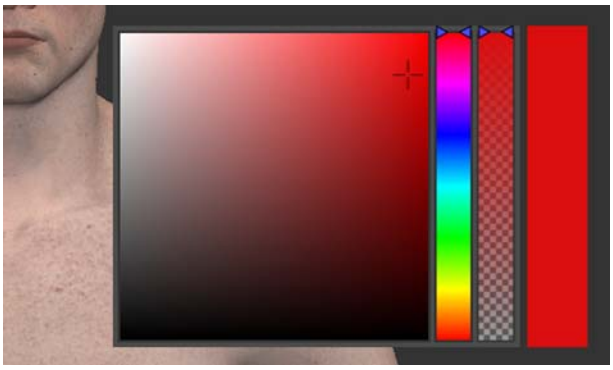


TIP: By default, Mari opens with one **HSV** tab, one **Image** tab, and one **Grey** tab. You can add additional color tabs:

- To open other tabs, including **Blend** tabs, click +.
- To open a tab as a floating window, click .
- You can also pick colors from images by double- clicking on them.

4. To display the color picker menu when painting, press and hold **j**.

   The color picker menu displays under your mouse cursor. The bar at right shows the selected color (without a border — so you can compare directly with what's already painted).



5. To pick colors from an image directly from the **Image Manager** or a shelf, double-click on the image. When the image window opens, click within the image to set the foreground color.

TIP: See also Storing Resources Using Shelves for instructions on making a custom shelf with small icons of selected color swatches.

EXPERIMENT: Try the steps below to select new colors:

- Pick a color from the **Colors** palette. Notice as you drag the cursor across a field, or slide a slider, the Foreground swatch changes and the RGB values change.
- Load an image into the **Image** tab in the **Colors** palette, and pick a color from it.
- Create a custom, floating **Blend** window with different colors than the defaults.

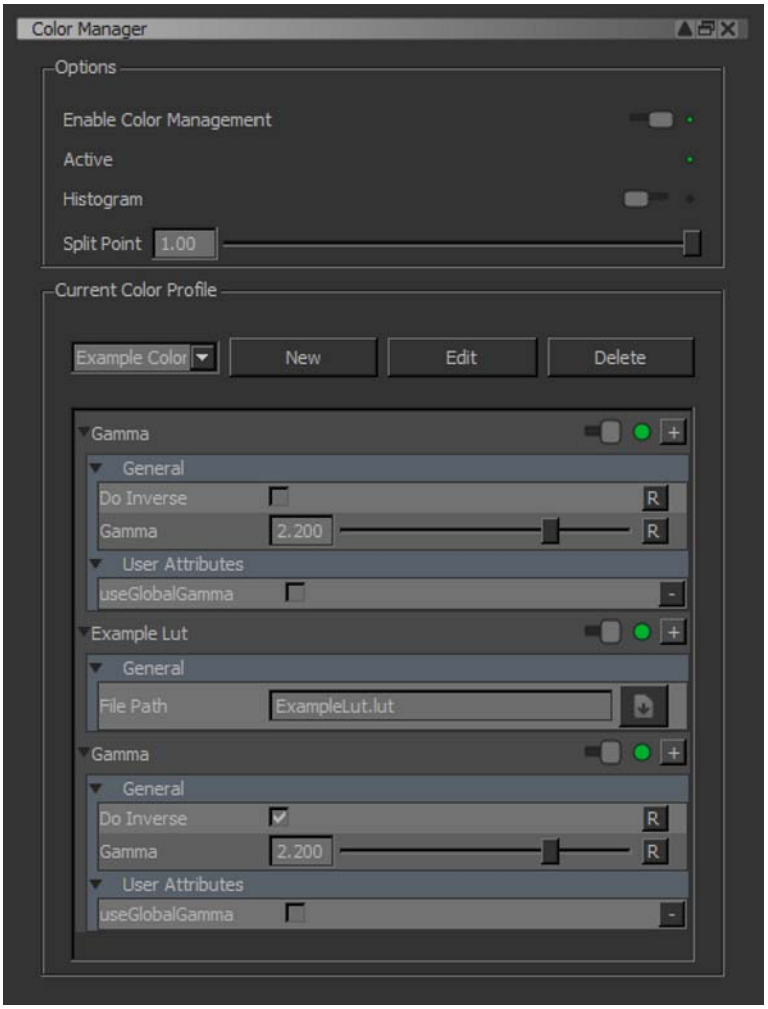
Set How Colors Are Displayed Onscreen

Mari sets how colors are displayed for each project separately. You can set this using either the **Color Manager** or the **ColorSpace** toolbar.

Set How Colors are Displayed Using the Color Manager

1. Open the **Color Manager** palette:
   - right-click on the toolbar, and select **Color Manager** from the drop-down menu, or
   - from the **View** menu, select **Palettes** > **Color Manager**.

   *The **Color Manager** palette displays color-display settings for the current project.*



2. Under **Options**, select the main display options:

- **Enable Color Management** — when selected, applies the color profile selected in the **Current Color Profile** section (see below).
- **Histogram** — when selected, a histogram displays in the bottom left of the canvas, showing details of the color balance in the current channel.
- **Split Point** — where (and whether) to split the canvas between color-corrected and uncorrected. The default is with the slider at the far right, at 1.00, showing the entire canvas *with* color correction. Moving the slider changes the split. For example, moving it halfway along (to 0.50) makes Mari display a split halfway across the screen, with color-corrected on the left and uncorrected on the right.

TIP: Color correction only applies to color channels. Scalar channels never use corrected colors. Even if color correction is on, scalar channels display the actual color values painted on the surface.

3. Under **Current Color Profile**, select a color profile from the list, or click **New** or **Edit** to create a new color profile or edit the current one.

   *The **Edit** dialog box displays the filters available for building up a color profile. Three filters – **Gain**, **LUT**, and **Display** – are selected by default and cannot be deleted.*

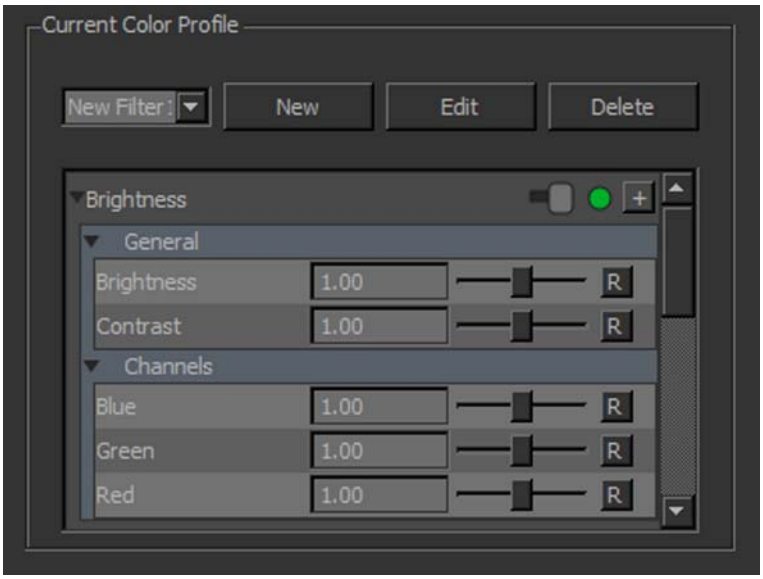
NOTE: You can delete color profiles from the list by selecting a profile and clicking **Delete**.

4. Select filters to use from the **Available Filters** list, and click the right arrow button to move them to the **Selected Filters** list. Choose the order

in which to apply the filters in the **Selected Filters** list, using the up and down arrow buttons. Then click **OK**.

The **Current Color Profile** dialog box lists the selected filters.

5. To view and configure how Mari applies a selected filter, click to expand it, then set its properties.



TIP: For more details on Mari's filters, see Filtering Images and Paint.

Set How Colors are Displayed Using the ColorSpace Toolbar:

1. Click or select **Enable Color Management** in the **Color Manager** palette.
2. Select a custom OpenColorIO (**.ocio**) configuration file by clicking or use Mari's default configuration.

   For more information on OpenColorIO, including the OCIO file format, please visit http://opencolorio.org/.
3. Select the colorspace of the current scene using **Input ColorSpace** dropdown.
4. Set the display device used to view the scene using the **Display Device** dropdown menu.
5. Select the colorspace transform to apply to the scene from the **View Transform** dropdown menu.

6. Use the **Component** dropdown menu to see the individual color components in the scene.
7. Use the **Gain** controls to set the amount of exposure adjustment applied before the display transform by either entering a multiplier (exposure value), dragging on the slider, or adjusting the F-Stop value.
8. Finally, set the amount of **Gamma** correction applied after the display transform by entering a gamma level or by dragging the gamma slider.

EXPERIMENT: Try changing the color profile on a project. First select a couple of the other predefined profiles, then create one of your own. Tweak the properties on the filters you added and notice what happens. Then, load a custom color configuration file via the **ColorSpace** toolbar, tweak the properties again and notice how your changes affect the colors onscreen.

20 Project Conversion

If you are an existing user of Mari and upgrading to Mari version 2.0v1 or later, this chapter is designed to help you upgrade your previous projects for use in Mari.

It is highly recommended that before you convert any existing projects for use in Mari 2.0v1, you should take the opportunity to create a new project, or use the example project that ships with Mari, to familiarize yourself with the recent changes. This gives you the chance to play around with a project you won't be worried about experimenting on.

Before Conversion

Once you are ready to convert your project, ensure that you archive your pre-2.0v1 version. To do this, right-click the project in the **Projects** tab and select **Archive** from the dropdown menu. This archives the project as a **.mra** file in the location specified in the **Archive** dialog.

Converting a project to be compatible with Mari version 2.0v1 or later cannot be undone. You must have an archived version of the project in order to roll back any changes made to the project during conversion.

WARNING: If you convert a project without archiving the pre-2.0v1 version, you cannot undo the conversion at *any* time. In this instance, once a project has been converted, the changes are permanent.

Upgrade Your Project

Projects created in previous versions of Mari, must be upgraded if they are to be edited within Mari 2.0v1 or later. Mari does this automatically when you load the project and confirm that you have archived it (or not), as you see fit.

All the information, such as shader and texture data, that the previous version of the project contained is upgraded to fit in with Mari's manner of using channels, layers, and shaders. Textures should be relatively similar to the previous version of the project, but some small differences may occur in how Mari displays lighting, displacement, and bump, among other features.

NOTE: The paint texture, that is, the actual pixel data has not changed. The difference is in the appearance of the shaders.

Old paint on the model is now contained in a channel labeled **All Old Channels** in the **Channels** palette. Your layer setup may require some editing to give the project the same look it had before the conversion.

Shaders, as they were known by and used in pre-2.0v1 releases, are also converted to use the adjustment or procedural layers that match in the converted project.

For more information on the way channels, layers, and shaders are used together in a project, please refer to the section on Layer Integration on page 222 in the Layers chapter.

21 LAYERS

Layers are the primary system for painting in Mari. At its most basic, the layer system can be used to set up simple stacks for ordering different sets of paint, and to combine effects in a non-destructive manner. However, the real strength of the layer system lies in the way layers integrate with shaders and channels.

Layer Integration

Mari's layer system does not function in isolation; instead, it works together with shaders and channels to create a cohesive structure for painting. Layers are entirely dependent on channels and need to have diffuse, specular, or bump channels already set up in order to be created.

As in previous versions of Mari, channels are created with the choice of channel type, size, and depth; however, instead of painting directly into the channel as before, channels now allow the use of separate layers within them to create your texture. This gives you more control over how you paint, and gives you the option of creating non-destructive textures that can be integrated into the rest of your project. Channels are your foundation for working with layers, but what are these layers capable of, and what are your options?

Layers can be divided into a few categories: paint layers, layer masks, adjustments, and procedurals. In turn, these layers can be ordered into groups, as well as shared, merged, or exported, to name only a few features. Layers can even be converted into new channels with existing paint in the base layer. Experiment with them more to discover what you can do.

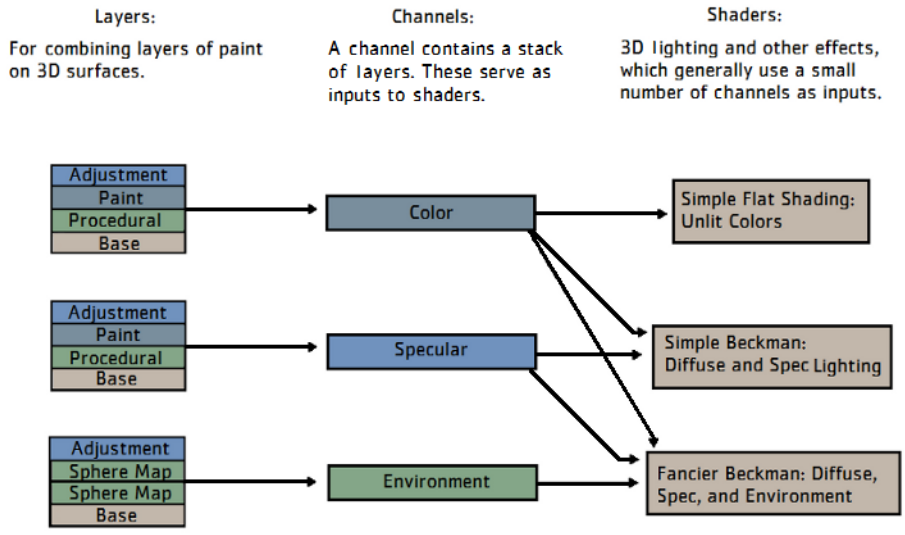
For more information about channels, please see Channels on page 264.

Shader Dependence

Shaders are also important in the use of channels and layers, but they have received a makeover compared to their use in previous versions of Mari. Shaders now allow you to set up lighting and specify which channels should be used for each channel type in the shader system. Depending on the lighting system used, you can also control elements that affect your channels, such as bump weight, reflectiveness, and ambient occlusion.

Shaders also serve the vital purpose of giving you a quick way of comparing

your texture under different conditions. Switching between the pre-existing shaders gives you a fast way of viewing your textures within the lighting shader you've set up, or simply viewing the current channel or layer stack.



Co-dependence of channels, layers, and shaders.

For more information about shaders, please see Shaders on page 281.

Getting Started with Layers

You can find most of the new features regarding layers and masks within the **Layers** palette or the **Layers** menu. The **Layers** palette is divided into two panes. The top pane displays all the layers for that channel, and the bottom pane provides information and controls to adjust the selected layer, when applicable.

All the controls for adding, editing, or deleting layers can be found on the right-click menu or the buttons on the palette. Adding layers and masks immediately adds the selected component, whereas adding adjustments and procedurals opens a dropdown menu for further selections.

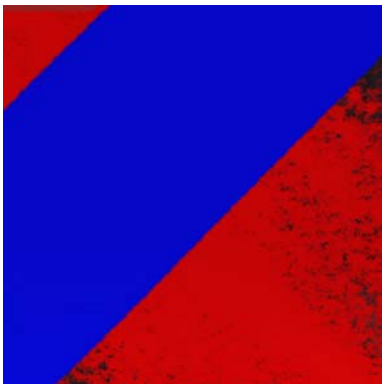
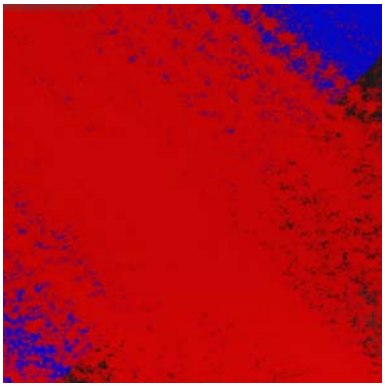
Blend modes are also found on the **Layers** palette, as well as advanced blending options. Unlike the **Paint Mode**, found on the Paint toolbar, these blend options don't affect the whole model, but only the selected layer(s).

Ordering Layers

Mari applies the layers in the order they appear in the palette, from the bottom of the list up (as in Photoshop®). You can drag and drop them around in the palette to change the order.

Every channel that you've created automatically has a base layer in the layer stack. This is the foundation all other layers are built on. If the base layer is deleted, the object displays the transparency checkerboard wherever paint from the above layers doesn't cover the model.

The following table illustrates a basic layer stack with two layers in a diffuse channel. One layer shows a red stripe, the other shows a blue stripe. The order of the two layers determines which texture appears on top. The table shows the results of swapping the order of the layers.

Layer Order	Result
	 *The diffuse texture (Base) is on the bottom, then the Red, then the Blue.*
	 *The diffuse texture is on the bottom, but this time the Red is on top of the Blue.*

If you like the look of a layer and want to replicate it elsewhere in your project, you can copy and paste the layer into the layer stack or another stack. In addition, layers can also be duplicated within the stack.

NOTE: For those unfamiliar with layers, the nearer the layer is to the bottom of the stack, the further down it sits in the paint order. Any overlapping paint on layers higher in the stack covers the original paint lower in the stack.

Filter and Search for Layers

In the **Layers** palette, there are four methods for quickly finding individual layers in a large layer stack: **Name**, **Type**, **Attribute**, and **Color Tag**. You can choose to filter by name, or to select a layer type or attribute, such as only procedurals, or layers that are visible. Alternatively, you can assign layers with one of eight color tags, and filter according to color.

Locked and Hidden Layers

Layers can be locked to protect them from being mistakenly deleted or edited. If the layer being locked is part of a group, only that layer is locked; however, if the layer being locked is the parent layer of the group, then all the child layers are locked too.

Hiding layers, on the other hand, allows you to examine your work in isolation. Hiding a layer non-destructively removes the texture from the object so that you can see the results of the rest of the stack without it.

For more information about locking or hiding other selected items, see Visibility and Locking on page 167.

Layer Blend Modes

Near the top of the palette there are blend mode options in the dropdown menu. This mode can be set for each individual layer, setting it apart from the **Painting Mode** in the Paint toolbar. The key difference is that where **Painting Mode** applies to the paint strokes that are baked down onto the model, the blend modes on the **Layers** palette apply to paint in the entire layer; not just what is baked.

NOTE: If the blend mode applied to the layer affects the appearance of the overall stack, ensure that the layer is placed in the ideal order in the layer stack. If necessary, the layer can be moved after the blend mode has been set.

Layer Masks

Layer masks allow you to mask out the paint you've already created in that layer. The mask uses a simple black and white map, which is visible by clicking on **Current Paint Target** in the **Shaders** palette. The mask uses black to completely mask out the texture, whereas white completely unmasks the texture.

Creating a mask on a layer (painted in black and white) and deriving alpha values from the mask (where the alpha on a pixel is controlled by the shade on the original mask), combines the alpha values with the diffuse color from the layer to create results as shown below:

Initial B/W mask, shown in **Current Paint Target**

Diffuse layer.

Result of creating a layer mask.

Any other color used only partially masks out the texture, with the intensity of the mask depending on the amount of black or white in the color.

NOTE: It's not necessary to switch to **Current Paint Target** in the **Shaders** palette when painting a layer mask. You can still paint in the layer as you would normally, but **Current Paint Target** provides you with an easy way to examine your mask in isolation.

TIP: We recommend that you create:

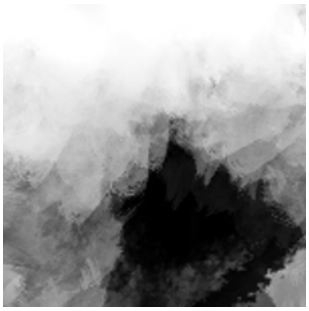
- mask channels with a white background — so you can paint the mask data black.
- displacement channels with a 50% gray background — this corresponds to the default surface. Mari treats darker colors as negative displacement (going into the surface) and lighter colors as positive displacement (coming out from the surface).

Alpha and Masks

To make creating masks easier, Mari has another function to easily convert between alpha and mask values.

Creating a mask **From Alpha** does the opposite of a standard mask. It converts a layer with alpha values to a black and white mask, where the shade on each pixel is controlled by the alpha on the original layer to give the results shown below:

Initial channel with alpha values.



Result of **Alpha to Mask.**

Layer Groups

Multiple layers can be grouped together either by selecting the existing layers and creating a group with them, or by creating a new group without any initial layers and moving layers into them later. Layers can also be moved out of a layer group by simply dragging them back to the main layer stack or into another group.

Mask Stacks

You can also create mask stacks by turning an existing mask into a mask stack. You must already have a mask attached to a layer to create a mask stack, but once you do, you can open a separate **Mask Stack** palette to see all the mask layers in the group.

Flatten Groups

Either for organizational or performance reasons, you may decide you want to flatten a group into a single layer. Layers that were part of a group appear as if they are a single layer once flattened. Once a group has been flattened, it can be added to other groups or used to create a new group as with any other layer.

Mask Stacks can also be flattened. The only difference between flattening a layer group and flattening a mask stack is when a mask stack has been flattened, the group icon disappears from the layer and is replaced with the mask icon again. All the mask layers that were part of the mask stack now exist in one single mask.

Merge Layers

Merging layers is similar to flattening layers, but can be done with any type of layer. Instead of flattening a group of layers into a single layer, merging allows you to combine the textures from two or more layers into a single layer, including any masks or adjustments that might have been applied to them. However, be aware that this is a destructive process, and the results may not be the same as anticipated in the layer stack.

NOTE: You cannot merge a layer with a layer group that has not been flattened. If you want to merge a group with another layer or layers, you need to first flatten the group.

Adjustment Layers

Adjustment layers are filters that can be added to the layer stack to affect certain layers in the stack. Adjustment layers are location-dependent in the layer stack and affect only the layers below them.

In addition to adding adjustment layers to the layer stack, adjustments can also be added to selected layers. These adjustments are exclusive to the layer they were added to. Whenever an adjustment is added to an existing layer, it automatically creates an adjustment stack that can be opened in a separate palette.

Secondary Adjustments

An adjustment layer with a mask on the layer can have a secondary adjustment added to it to apply another adjustment to masked out areas. Like layer-specific adjustments, these are applied directly to the selected adjustment layer and can be modified in the lower pane of the palette.

For a full list of adjustment layers and a more detailed description please refer to Layer Types and Examples on page 243.

Procedural Layers

Procedural layers allow you to add texture patterns, grid patterns, environments, and masks to the layer stack using a variety of parameter settings. Procedural layers behave similarly to paint layers, with the exception that their image content cannot be painted on - it can only be modified by changing the parameters of the layer.

For a full list of procedural layers and a more detailed description please refer to Layer Types and Examples on page 243.

Cube Mapping

Cube maps provide a context for reflecting images of surrounding environments on the model, similar to the **Sphere Map** procedural layer. The difference is that the environment is modelled by six textures mapped on a cube surrounding the object as opposed to a single texture mapped on a sphere surrounding the object. Cube mapping uses the **.dds** file format to load files into the **Cube Map** procedural layer. As with the sphere map, the cube allows you to modify the falloff starting and ending points to create the exact level of reflection you want on your model.

Projection Shaders

Cubic and spherical projection procedural layers allow you to import a texture into the scene and project it onto the geometry. Using multiple **Cube Map Projector** or **Sphere Map Projector** procedurals enables you to get the best possible projection from the different camera locations in a scene. Using multiple camera locations allows you to account for occlusion and perspective when projecting textures onto the geometry.

There are three projection procedurals:

- **Cube Map Projector**,
- **Sphere Map Projector**, and
- **Triplanar Projection**.

You can also use masks with the projection procedurals to mask out parts of the projection. This is helpful in eliminating unwanted artifacts, for example, where the projection overlaps with other projections in the scene.

Each projection procedural allows you to control:

- texture offset and rotation,
- edge and distance falloff start and end points, and
- falloff curve shapes, using the curve editors.

NOTE: Adjusting options such as falloff and texture offset or rotation affects the whole scene.

Vector Brushing

A Python example script for setting up default vector shaders can be found under **Python** > **Examples** > **Setup Vector Brush** or by clicking the icon on the **Vector Painting** toolbar. This script automatically creates two Vector shaders in the **Shaders** palette, three channels in the **Channels** palette, and layers to get you started in each of these channels. For more information on

using the setup vector brush script and the default vector shaders, refer to the section on Adding Vector Shaders on page 133.

The two vector brush shaders are **Vector (World Space)** and **Vector (Screen Space)**. The three channels are **Vector (Paint)**, **Vector (World Space)**, and **Vector (Screen Space)**, and these are automatically assigned to the shader component inputs for the relevant shaders created by the script. Each of the channels has layers in the layer stack to get you started. These layers include **Vector**, **Vector (Tangent To Screen Space)**, and **Vector (Tangent To World Space)**.

These channels and layers assist in mapping textures according to direction, by converting pixels on the object's surface to RGB values representing -1 to 1 in xyz space. For more information on using the shaders, channels, and layers together with the **Vector Painting Brush**, refer to the *Vector Brush* chapter in the Mari *User Guide*.

Additionally, you can opt to add a **Flow** procedural, which allows you to see the effects of your vector paint over time. The **Time Offset** slider represents the flow of time, while the **Speed** slider represents the sensitivity of **Time Offset.** Adjusting the sliders allows you to see the effects your vectors play on the flow map, though animating this also displays the effect continuously. For more information on the vector adjustments and procedurals, as well as their layer property fields, refer to the section on Layer Types and Examples on page 243.

Mipmap Behavior

For the **Cube Map** procedural, **.dds** files with missing mipmaps or partial mipchains continue to load, but the behavior for these chains is slightly different. Mari disregards all other mipmaps in the chain; instead, it regenerates the chain from the top level mip.

In this way, Mari continues to load partial mipmap chains in a workable manner for **.dds** files.

Layer Caching

Layers can be cached in order to prevent Mari from slowing down. A large number of layers, or computationally-expensive layers, can lower performance. Fortunately, caching layers can mitigate this.

Each layer displays a colored bar to the right of the layer. This tells you how expensive the layer is and its cached state. Inexpensive layers and cached layers are green, layers cached using **Cache Up To Here** are blue, and as the

layers become more complex or higher up in the layer stack they progress to yellow, orange, and red.

When a layer has been cached, that layer is locked. Any change you may wish to make requires you to unlock the layer.

For more information about locking other selected items, see Visibility and Locking on page 167.

Layer Sharing

If you want to duplicate a layer as a shared (connected) layer in your layer stack, you can use the **Share Layer** option from the context menu. This allows you to link the layers so that any changes made to the original layer are also produced on the shared layer. Unlike simply duplicating a layer, sharing a layer lets you make changes to multiple copies by changing only a single linked layer.

If you want to duplicate finished layers as shared layers in a new channel, you can select **Share Layers As Channel** from the context menu or **Layers** menu. As with the shared layer in a layer stack, any changes made to the original layers are also made to the shared layers in the new channel.

If you want to make changes to the original layers and don't want them to be copied over to a shared layer, you can select **Unshare Layer** from the context menu to stop sharing the layer, before continuing your work.

Dragging Layers for Moving, Copying, and Sharing

You can move, copy, and share layers between different layer stacks - even between layer stacks of different channels - by using modifier keys when dragging:

- **Ctrl**/**Cmd**+**Shift**+drag to share layers.
- **Alt** +drag (or **Ctrl**/**Cmd**+**Alt**+drag) to copy layers.
- Drag (without any modifiers) to move layers.

Note that the modifier keys need to be held down until the layers are dropped, otherwise they have no effect.

To drag layers between the layer stacks of different channels, you need to open those stacks in their own layer stack palettes in advance. Remember to pin the layer stack palettes using the button in the top-left corner so that they do not automatically disappear. Alternatively, you can drag and hover over the relevant channel in the **Channels** palette to activate its layer

stack in the **Layers** palette, and then continue dragging and drop the layers there.

Substacks, such as adjustment stacks or mask stacks, automatically pop up additional dialogs if you drag your layers over their icons, so you don't need to open these pop-ups in advance.

Layer Properties

Any layer in the **Layers** palette can be inspected to view the layer properties, such as **File Space**, **Color Space**, and information about the channel to which the layer belongs. To view the layer properties, right-click on a layer in the **Layers** palette and select **Layer Properties** from the dropdown menu. The **Layer Properties** dialog appears with the layer format and channel information for the selected layer.

Export and Import

Exporting layers to work on in another application is possible on both an individual and collective layer basis. Importing channels also allows you to import textures that have already been worked on or that come from another source.

Steps for Working with Layers

To use layers in your Mari project, follow these steps:

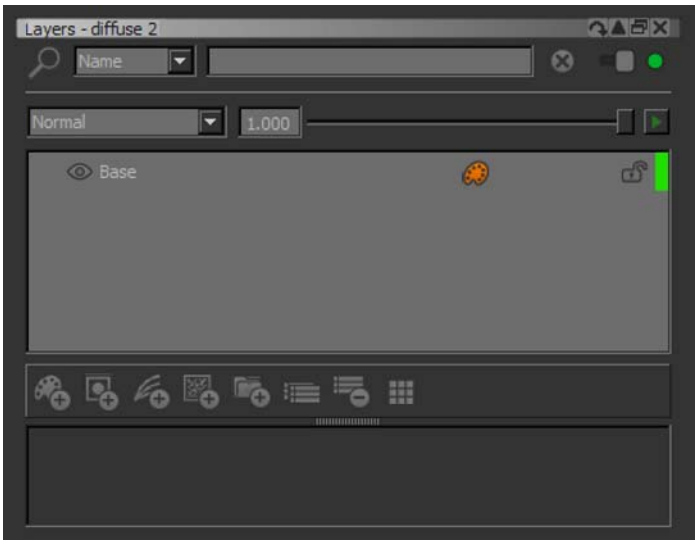
1. Open the Layers Palette
2. Add Layers and Masks
3. Add Adjustments and Procedurals
4. Remove and Disable Layers
5. Add or Flatten Groups
6. Share Layers
7. Cache and Uncache Layers
8. Export and Import Layers
9. Convert Masks

This chapter also includes a reference table of Layer Types and Examples.

Open the Layers Palette

1. Start Mari and open your project.
2. Set up the shaders, channels, and layers, as described in Layer Integration on page 222.
3. Open the **Layers** palette:
   - right-click on the toolbar and select **Layers** from the dropdown menu,
   - from the **View** menu, select **Palettes** > **Layers.**

   *The **Layers** palette displays, with a default base layer in the layer stack.*



Add Layers and Masks

1. To add a new layer, either:
   - from the **Layers** menu, select **Add New Layer**,
   - right-click any layer in the **Layers** palette and select **Add New Layer**, or
   - in the **Layers** palette, click .

   The new layer appears in the layer stack, with the paintable layer icon.

2. To add a layer mask, either:
   - from the **Layers** menu, select **Layer Mask** > **Add Mask** > **Reveal All** or **Layer Mask** > **Add Mask** > **From Alpha**,
   - right-click the desired layer for the mask, and select **Layer Mask** > **Add Mask** > **Reveal All** or **Layer Mask** > **Add Mask** > **From Alpha**, or

- in the **Layers** palette, click .

The layer mask is added to the selected layer, with the mask icon next to the paintable icon.

NOTE: You can right-click any of the layers in the **Layers** palette to access the dropdown menu for more layer options. Right-clicking an existing layer also selects it.

Add Adjustments and Procedurals

1. To add an adjustment layer to a layer stack, either:
   - from the **Layers** menu, navigate to **Add Adjustment Layer** and select the filter from the dropdown menu,
   - right-click any layer in the **Layers** palette, navigate to **Add Adjustment Layer** and select the adjustment filter from the dropdown menu,
   - in the **Layers** palette, click , or
   - with the **Layers** palette open, press **Tab** and begin typing the adjustment you want to add. The entry box is populated with the adjustment.

   The adjustment layer appears in the layer stack, with the adjustment icon where the paintable layer icon would normally reside.

2. To add an adjustment to a layer:
   - with the layer selected, from the **Layers** menu, navigate to **Adjustment Stack** > **Add Adjustment Stack** and select the filter from the dropdown menu,
   - right-click the desired layer, navigate to **Adjustment Stack** > **Add Adjustment Stack** and select the filter from the dropdown menu, or
   - in the **Layers** palette, click , and select the filter from the dropdown menu.

   The adjustment filter is added to the selected layer, with the adjustment stack icon one space down from where the mask icon would appear.

NOTE: Each filter has adjustment controls located in the bottom pane of the **Layers** palette. Use these to modify how strongly the filter affects your texture.

3. When an adjustment or adjustment stack has been added to an existing layer, you can flatten the adjustment or stack into the layer. To do this:
   - with the layer selected, from the **Layers** menu, select **Adjustment Stack** > **Bake Adjustment Stack**, or
   - right-click on the layer and select **Adjustment Stack** > **Bake Adjustment Stack** from the dropdown menu.
4. To add a procedural layer, either:
   - from the **Layers** menu, navigate to **Add Procedural Layer** and select a procedural from the dropdown menu,
   - right-click any layer in the **Layers** palette, navigate to **Add Procedural Layer** and select a procedural from the dropdown menu,
   - in the **Layers** palette, click , or
   - with the **Layers** palette open, press **Tab** and begin typing the procedural you want to add. The entry box is populated with the procedural.

   The procedural layer appears in the layer stack, with the procedural icon where the paintable layer icon would normally reside.

Remove and Disable Layers

1. To remove a layer:
   - with the layer selected, from the **Layers** menu, select **Remove Layers**,
   - right-click on the layer and select **Remove Layers**,
   - select the layer and press **Delete** on the keyboard, or
   - in the **Layers** palette, click .
2. To remove masks from existing layers:
   - with the layer selected, from the **Layers** menu, select **Layer Mask** > **Remove Mask**, or
   - right-click on the layer and select **Layer Mask** > **Remove Mask** from the dropdown menu.

3. To only disable the mask on the layer, so you can compare the results of the layer without the mask in place:
   - with the layer selected, from the **Layers** menu, select **Layer Mask** > **Disable Mask**, or
   - right-click on the layer and select **Layer Mask** > **Disable Mask** from the dropdown menu.

   Once you want to re-enable the mask visibility again, use the same methods above to navigate to **Layer Mask** > **Enable Mask**.
4. To remove the adjustment stack from an existing layer:
   - with the layer selected, from the **Layers** menu, select **Adjustment Stack** > **Remove Adjustment Stack**, or
   - right-click on the layer and select **Adjustment Stack** > **Remove Adjustment Stack** from the dropdown menu.
5. To only disable the adjustment stack, so you can compare the results in the layer without the stack in place:
   - with the layer selected, from the **Layers** menu, select **Adjustment Stack** > **Disable Adjustment Stack**, or
   - right-click on the layer and select **Adjustment Stack** > **Disable Adjustment Stack** from the dropdown menu.

Once you want to re-enable the adjustment stack visibility again, use the same methods above to navigate to **Adjustment Stack** > **Enable Adjustment Stack**.

Add or Flatten Groups

1. To add an empty layer group, either:
   - from the **Layers** menu, select **Add Empty Layer Group**,
   - right-click any layer in the **Layers** palette and select **Add Empty Layer Group** from the dropdown menu, or
   - in the **Layers** palette, click .
2. To create a group from existing layers:
   - with layers selected, from the **Layers** menu, select **Group Layers**, or
   - right-click the selected layers and select **Group Layers** from the dropdown menu.
3. To flatten a layer group into a single layer:
   - with the group selected, from the **Layers** menu, select **Flatten Layer Group**, or
   - right-click on the group and select **Flatten Layer Group** from the dropdown menu.

4. To add a mask stack to a layer, in the **Layers** palette, click . To create a mask stack from an existing mask on a layer:
   - with the layer selected, from the **Layers** menu, select **Layer Mask** > **Make Mask Stack**, or
   - right-click on the layer, and select **Layer Mask** > **Make Mask Stack** from the dropdown menu.

   The mask stack *icon takes the place of the mask icon in the layer list. Click on the icon to open the mask stack palette.*

5. To flatten a mask stack into a single mask:
   - with the layer selected, from the **Layers** menu, select **Layer Mask** > **Flattened Mask Stack**, or
   - right-click on the layer with the mask stack and select **Layer Mask** > **Flatten Mask Stack** from the dropdown menu.

   The mask stack icon reverts back to the normal mask icon and the mask stack is now only a single mask.

1. To duplicate layers, in the **Layers** palette, click .

   The layer is duplicated as a copy.
2. To merge layers, right-click on the selected layers, and select **Merge Layer**s.

   The selected layers are merged into a new layer.

Share Layers

1. To share a layer in the same layer stack:
   - with the layer selected, from the **Layers** menu, select **Sharing** > **Share Layer**, or
   - right-click on the layer and select **Sharing** > **Share Layer** from the dropdown menu.

   A new channel appears in the channels list. Selecting the channel displays the shared layer in the layer stack.
2. To share a layer in a different layer stack:
   - use **Sharing** > **Share Layer** (as outlined above) to create a shared layer, and then drag that to the stack where you need it, or
   - use modifier keys and dragging as outlined in Dragging Layers for Moving, Copying, and Sharing on page 231.
3. To share a layer, or layers, as a new channel:
   - with the layer(s) selected, from the **Layers** menu, select **Sharing** > **Share Layers As Channel**, or
   - right-click on the layer and select **Sharing** > **Share Layers As Channel** from the dropdown menu.

NOTE: For layers shared as new channels, you can make the new channel your current channel by selecting **Sharing** > **Make Shared Channel Current** from either of the menus above.

4. To unshare a layer:
   - with the shared layer select, from the **Layers** menu, select **Sharing** > **Unshare Layer**, or
   - right-click the shared layer and select **Sharing** > **Unshare Layer** from the dropdown menu.

NOTE: A shared layer is denoted by the link icon on the layer.

TIP: With the possibility of multiple shared layers, it can be difficult to keep track of them. Ensure that you rename any relevant layers or channels in order to limit confusion.

Cache and Uncache Layers

1. To cache a layer, or layers:
   - with the layer(s) selected, from the **Layers** menu, select **Caching** > **Cache Layers**, or
   - right-click on the layer and select **Caching** > **Cache Layers** from the dropdown menu.
2. To cache all layers up to a point in the layer stack:
   - with the layer selected, from the **Layers** menu, select **Caching** > **Cache Up To Here**, or
   - right-click on the layer you want to cache up to and select **Caching** > **Cache Up To Here** from the dropdown menu.

   Like caching a single layer, all layers cached using **Cache Up To Here** are locked and cannot be edited until uncached.

TIP: You can also combine these two functions in order to work more quickly on your layer stack.

3. To uncache a layer, or layers:
   - with the layer selected, from the **Layers** menu, select **Caching** > **Uncache Layers**,
   - right-click on the layer and select **Caching** > **Uncache Layers** from the dropdown menu, or
   - click the locked padlock icon .

   The cached layer is unlocked and uncached.
4. To uncache all layers that have been locked with **Cache Up To Here**:
   - with the layer selected, from the **Layers** menu, select **Uncache Up To Here**,
   - right-click on the layer you locked with **Cache Up To Here**, and select **Uncache Up To Here** from the dropdown menu, or
   - click the locked padlock icon .

The cached layer stack is unlocked and uncached.

NOTE: If you have used the **Cache Up To Here** option for your caching, you can only right-click on the top layer in the cached stack to uncache. This layer is indicated by a blue cache bar.

Alternatively, you can uncache and unlock a layer by clicking on the padlock icon . This uncaches and unlocks all the cached layers locked by **Cache Up To Here**.

EXPERIMENT: If you want to try caching and uncaching layers while using both the **Cache Layers** and **Cache Up To Here** options, try the following:

- **Cache Up To Here** in your layer stack when, for instance, you need to increase the frame rate while working on a large layer stack.
- If you want to make changes to a layer under the **Cache Up to Here** layer but want to keep your frame rate low, **Cache Layers** on any computationally expensive layers around the layer you want to edit.
- **Uncache Up To Here** on your original, top layer in the cached layer stack.

You can now edit just that one layer, while still having some of the expensive layers around it cached to prevent your performance suffering.

Export and Import Layers

You can choose to either export layers normally or export them in a flattened state. If you export layers normally, Mari exports the selected layer(s) to an external location, as one of the supported file formats.

If you export layers flattened, Mari flattens the selected layers into a single layer and exports this to an external location. This does not affect the layers in your current project, only the exported file.

Importing files into Mari to use in the **Layers** palette lets you import the file(s) into an existing layer. This takes the saved texture and imports it over any textures in the existing layer, thus overwriting the pre-existing textures. Alternatively, you can import the file(s) into the layer stack as a new layer. This automatically adds the new layer to the top of the stack, but you can move it to anywhere in the stack that you want.

Export Layers

To export the current selected layer:

1. From the **Layers** menu, select **Export** > **Export Selected Layers**, or right-click the layer(s) in the **Layers** palette and select **Export** > **Export Selected Layers** from the dropdown menu.

   *The **Export** dialog displays.*
2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   Mari exports your textures for the selected layer(s).

To export all the layers in the **Layers** palette:

1. From the **Layers** menu, select **Export** > **Export All Layers**, or right-click in the **Layers** palette and select **Export** > **Export All Layers** from the dropdown menu.

   *The **Export** dialog displays.*
2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   Mari exports your textures for the layer stack.

Export Flattened Layers

To flatten and export the currently selected layers:

1. From the **Layers** menu, select **Export Flattened** > **Export Selected Layers Flattened**, or right-click the layer(s) in the **Layers** palette and select **Export Flattened** > **Export Selected Layers Flattened** from the dropdown menu.

   *The **Export** dialog displays.*
2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   Mari exports your flattened selected layers.

To flatten and export all the layers in a layer stack:

1. From the **Layers** menu, select **Export Flattened** > **Export All Layers Flattened**, or right-click in the **Layers** palette and select **Export Flattened** > **Export All Layers Flattened** from the dropdown menu.

   *The **Export** dialog displays.*
2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   Mari exports your flattened layer stack.

Import Layers

To import textures into the currently selected layer:

1. From the **Layers** menu, select **Import** > **Import into Layer**, or right-click the selected layer in the **Layers** palette and select **Import** > **Import into Layer** from the dropdown menu.

   *The **Import** dialog displays.*

2. Follow the steps in Import Existing Textures to Channels on page 140 before clicking **Import All Patches**.

   Mari imports the textures into the currently selected layer, overwriting any other textures in the layer.

To import textures into the layer stack:

1. From the **Layers** menu, select **Import** > **Import into Layer Stack**, or right-click in the **Layers** palette and select **Import** > **Import into Layer Stack** from the dropdown menu.

   *The **Import** dialog displays.*

2. Follow the steps in Import Existing Textures to Channels on page 140 before clicking **Import All Patches**.

   Mari imports the textures into the layer stack as a new layer that appears at the top of the stack.

NOTE: Importing a PSD file into a layer stack potentially may display a dialog regarding layers of the same name. If layers within the **.psd** have the same name as layers within the layer stack, Mari asks if you want to **Update**, **Skip**, or **Create New**. These options allow you to either overwrite the named layer, skip over the layer during import, or create a new layer, for example **New diffuse** if the original layer name was **diffuse**.

NOTE: Take care when editing an exported Mari **.psd** file in Photoshop. Due to the way Mari handles mask stacks and adjustment stacks, a layer's sub-stack could be affected by where new layers are inserted in a layer stack.

For instance, mask or adjustment stacks on an existing layer are shown as separate groups from the layer in Photoshop. Inserting a new layer between the group and the original layer before importing the file back into Mari confuses the layer stack order, causing the mask or adjustment stack to be made a component of the new layer and not the original.

Convert Masks

Convert Alpha Values to a Mask

1. Select the layer on which you want to create a mask.
2. Either:
   - right-click on a layer in the **Layers** palette and select **Layer Mask** > **Add Mask** > **From Alpha**, or
   - with the layer selected, from the **Layers** menu, select **Layer Mask** > **Add Mask** > **From Alpha**.

   Mari adds a mask to the layer. The mask is black and white, with the color at each pixel taken from the alpha value of the corresponding pixel in the original layer (regardless of the actual color of the original pixel).

TIP: To really see the effects of this, your channel should have some transparent areas. If your channel is completely painted, the resulting mask is just white. If necessary, use the **Paint** tool in **Clear** mode to erase some of the paint off your channel.

Layer Types and Examples

Below are descriptions and examples of the different adjustments available in the **Layers** palette.

Examples of each of the filters are applied to the following image, for illustrative purposes:

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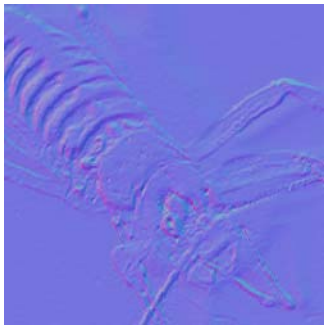
NOTE: Be sure to check for out-of-bounds values when adding adjustment layers. Ensure that your filters are applied correctly by adding a **Clamp** adjustment to fix any values that don't fall between 0 and1.

Type	Description	Settings	Example
Adjustment Layers - Filters			
Brightness	Changes the brightness of the paint on the model. You can also change the contrast at the same time. In a layer stack, the **Brightness** filter is always connected to the hidden transparency layer at the bottom of a layer stack if the filter is also at the bottom of the layer stack. To prevent this from disrupting the transparency layer, avoid placing **Brightness** filters at the bottom of a layer stack.	Adjust the **Brightness** using the entry box or slider.	
Brightness Lookup	Changes the brightness of the paint on the model. You can adjust the brightness using the curve to get a specific brightness value.	Use the **Map** curve to adjust the specific level of brightness.	
Clamp	Clamps color values to lie within the specified upper and lower values.	Set the **Min** value and **Max** value by using the entry box or adjusting the sliders. Select the individual color component to clamp in the **R**, **G**, **B**, and **A** checkboxes.	
Color Balance	Adjusts the intensities of the colors on your model in the highlights, midtones, and shadows.	Set whether to **Preserve Luminosity**, then adjust the **Cyan/Red**, **Magenta/Green**, and **Yellow/Blue** values in the **Highlights**, **Shadows**, and **Midtones**.	

Type	Description	Settings	Example
Color Lookup	Changes the color of the paint on the model.	Use the curves to set the individual **Red**, **Green**, and **Blue** values.	
Color Switch	Turns individual color channels on or off, as well as the alpha channel.	Use the checkboxes to select which color channels display. When Mari applies the filter, it removes any unchecked color channel or the alpha channel from the painting.	
Contrast	Changes the contrast levels on the model.	Select the amount of **Contrast** and specify a **Contrast Pivot** point that you want to adjust values around.	
Copy Channel	Copies the value from one RGB color channel to the other two. The result is a grayscale image with the intensity values from the selected channel.	Select the source channel from the list. When you apply the filter, Mari copies the selected channel over the other two channels.	

Type	Description	Settings	Example
Gamma	Changes the gamma levels on the model.	Select a particular gamma level using either the entry box or the sliders. **Invert** reverses the gamma conversion. That is, a higher setting for **Gamma** results in a more washed-out looking image.	
Grade	Changes the overall color grade of the black and white points, and allows you to adjust the gain and gamma of the paint on the model.	Adjust the **Blackpoint** to allow you to change the depth of the darkest point in the paint. The **Whitepoint** allows you to increase the brightest point in the paint. **Lift, Gain, Multiply**, and **Gamma** all modify the specified aspects of the paint to change the overall texture; while, **Offset** changes the black and white points as one.	
HSL	Changes the hue, saturation, and lightness of the colors on the model.	Change the hue of the colors by setting the value for **Hue**. Adjusting the slider moves the colors around the color wheel. The rotation value is the degree around the color wheel that each color shifts, between 0 and 360 (adjusts the slider between -180 and 180). The **Saturation** slider adjusts the intensity of the colors in the image data. Select a multiplier from 0 to 1, where .50 is the original saturation value. You can also set the **Lightness** value the same way.	

Type	Description	Settings	Example
HSV	Changes the hue, saturation, and value of the colors on the model.	Change the hue of the colors by setting the value for **Hue**. Adjusting the slider moves the colors around the color wheel. The rotation value is the degree around the color wheel that each color shifts (adjusts the slider between 0 and 1). The **Saturation** slider adjusts the intensity of the colors in the image data. Select a multiplier from 0 to 10, where 1.00 is the original saturation value. You can also set the **Value** the same way.	
Height As Normal	Interprets the texture as height data, then computes the normals from the height map and converts the normals to a **Diffuse** RGB color. This is useful for baking normal maps from height maps.	**Bump Weight** adjusts how much bump is applied. Lower values are smaller; higher values produce larger and more obvious displacement.	
Hue Shift	Changes the hue of the colors on the model. Set the value for **Hue** by adjusting the slider. This moves the colors around the color wheel.	Select the overall hue. The rotation value for the color wheel is the degree around the color wheel that each color shifts, between -180 and 180.	

Type	Description	Settings	Example
Invert	Inverts the colors or the alpha in the layers lower in the layer stack. Invert replaces colors with their "opposite" in the color chart. For example, a color with a float value of 0.3 is replaced by a color with a float value 0.7.	Set whether to invert the **R**, **G**, **B**, or **A** channels individually.	
Levels	Changes the color levels in the paint. You can change the white, midtone and black points for each color channel or all together.	Set the: • Color Component - to adjust the specific color channel (**Red**, **Green**, or **Blue**). • **WhiteOut** - how strongly to output the white in the filtered image. Higher values show the entire white output; lower values show decreasing amounts. • **BlackOut** - how strongly to output the black in the filtered image. Higher values show the entire black output; lower values show decreasing amounts. • **White** - the upper limit of displayed color intensity. Areas with a value higher than this are mapped to 1 (white). • **Mid** - the middle point between white and black. Mari remaps the values so that this is the middle of the range between the white point and black point. Moving this pushes the values towards that end of the spectrum. • **Black** - the lower limit of displayed color intensity. Areas with a value lower than this are mapped to 0 (black).	

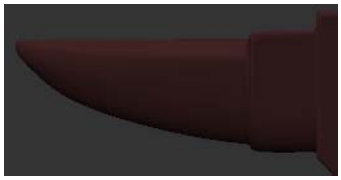
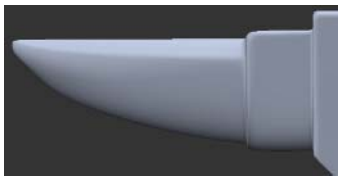
Type	Description	Settings	Example
Luminosity	Outputs just the luminosity value of each pixel. That is, it outputs a gray-scale image based on the brightness of each of the pixels in the original image. Layer masking, projection masks, and masks on projectors are all hardwired to use the red color component. If you want to use another component for your mask value, the **Luminosity** adjustment layer allows you to convert an RGB input to a greyscale output.	None.	
Premultiply Alpha	Either pre- or post-multiplies the alpha in the selected image. If you are painting using an image without pre-multiplied alpha onto one with it, use this filter to perform the pre-multiplication, so the images match and you avoid lines around the outside of the patch. Post-multiply works the same, but in reverse: it removes pre-multiplication to match images that do not have pre-multiplied alpha.	If the **Unpremultiply** box is checked, this acts in reverse (that is, removes pre-multiplied alpha).	
Saturation	Changes the intensity of the colors in the image data.	The **Saturation** slider adjusts the intensity of the colors in the image data. Select a multiplier from 0 to 10, where 1.00 is the original saturation value.	
Scale	Directly modifies the overall scale of the color values for each channel individually.	Adjusting the sliders for **R**, **G**, **B**, and **A** allows you to specify the exact level of scale for each channel, between 0 and 2.	

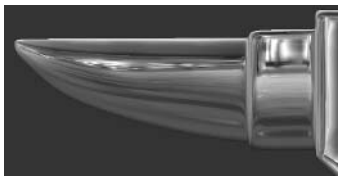
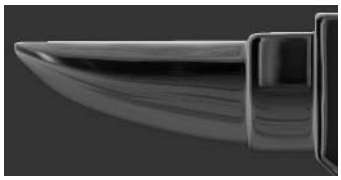
Type	Description	Settings	Example
Set Value	Changes the values of specific RGBA channels.	Selecting **Red**, **Green**, **Blue**, or **Alpha** from the **Channel** drop-down menu allows you to adjust the slider (from 0-1) to change the value of the specific color channel.	
Shuffle	Shuffles the RGBA channels so that any of them can be replaced by another color channel. Layer masking, projection masks, and masks on projectors are all hardwired to use the red color component. If you want to use another color component for your mask value, the **Shuffle** adjustment layer allows you to change the RGBA components so that any can be replaced by another.	Change the channels of **R**, **G**, **B**, or **A** to affect the overall color of the paint on the model.	
Tangent To Screen	Sets up a **Tangent To Screen** adjustment to be used for Vector Brushing. This adjustment is automatically created when creating default vector shaders.	Suppress the blue value from the color-encoded vectors in screen space by ticking the **Suppress-Blue** checkbox.	

Type	Description	Settings	Example
Tangent To World	Sets up a **Tangent to World** adjustment to be used for Vector Brushing. This adjustment is automatically created when creating default vector shaders.	Suppress the blue value from the color-encoded vectors in the world space by ticking the **SuppressBlue** checkbox.	
sRGB2Linear	Applies an sRGB to linear colorspace conversion.	Checking **Invert** applies a linear to sRGB colorspace conversion.	

Below are descriptions and examples of the different procedurals available in the **Layers** palette.

Examples of each of the procedurals are applied to the following image, for illustrative purposes:

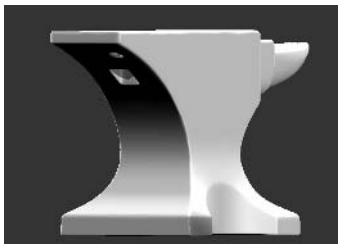
Type	Description	Settings	Example	
Procedural Layers - Basic				
Color	Applies the selected color to the rest of the paint on the model.	Changing the **Blend Mode** and **Amount** allows you to adjust how the color is applied, and how strongly, to the model. **Color** allows you to select the color from the HSV swatch palette.	Procedural color set to burgundy: 	Color procedural (**Screen** blend):
Constant	Generates a constant number across **RGB** or **RGBA** components that may be relied upon for mathematical operations.	The **Constant** slider ranges from 0 to 10,000, and defaults to 1.000 when reset. **Components** may be set to either **RGB** or **RGBA**.	Constant procedural (**Multiply** blend):	
Vector	Applies RGBA values to a vector (XYZW) map to produce a specific diffuse color that represents a vector field.	The **X**, **Y**, **Z**, and **W** fields correspond to R, G, B, and A respectively to give a specific vector in a diffuse image.	Vector procedural with XYZW values adjusted: 	Vector procedural (**Multiply** blend):

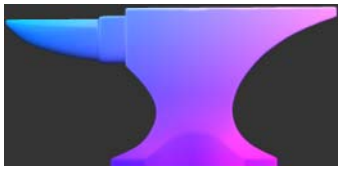
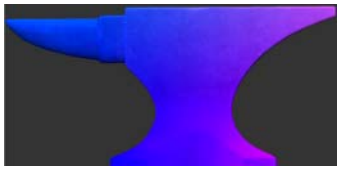
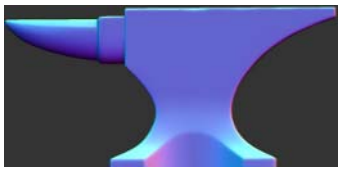
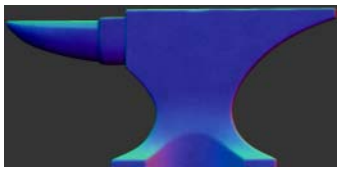
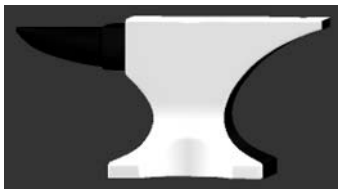
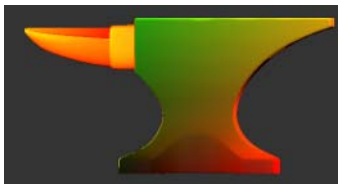
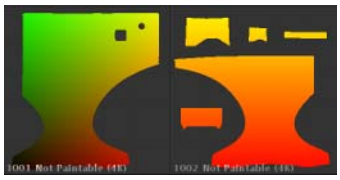
Type	Description	Settings	Example	
Procedural Layers - Environment				
Cube Map	Simulates a shiny reflective surface using a cubic environment map as the input. This layer cannot be cached or baked, and is for display purposes only.	• **Cubic Image -** the location of the cube map. • **Falloff Start -** controls where the cubic image starts. • **Falloff End -** controls where the cubic image ends.	Cube Map procedural (**Luminance** blend): 	Cube Map procedural (**Luminance** blend):
Sphere Map	Simulates a shiny reflective surface using a spherical environment map as the input. This layer cannot be cached or baked, and is for display purposes only.	• **Sphere Map** — the location of the environment map. • **Falloff Start** - controls where the spherical image starts. • **Falloff End** - controls where the spherical image ends.	Sphere Map procedural (**Luminance** blend): 	Sphere Map procedural (**Luminance** blend):

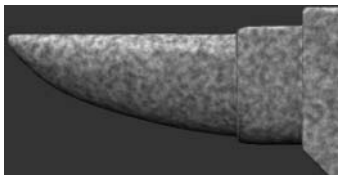
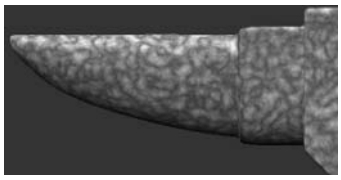
Type	Description	Settings	Example	
Cube Map Projector	Uses a cubic image (in a **.dds** file format) as a texture to project onto the model. This layer cannot be cached or baked, and is for display purposes only.	• **Cubic Image** - the filepath to the cubic image to use for projection. • **Cull Backfaces** - when the checkbox is ticked, it ensures that projection does not affect areas facing away from the camera. • Offset **X**, **Y**, and **Z** - the offset of the projection image on the X, Y, and Z axes. • Rotation **X**, **Y**, and **Z** - the rotation of the projection image on the X, Y, and Z axes. • Edge Falloff **Start** and **End** - modifies how far away the falloff starts or ends. • Edge Falloff **Curve** - allows you to adjust the otherwise linear shape of the falloff to your desired shape. • Distance Falloff **Start** and **End** - adjust the start and end radial distance from the camera. From 0-100, where 100 represents straight-on projection. • Distance Falloff **Curve** - allows you to adjust the otherwise linear shape of the falloff to your desired shape.		

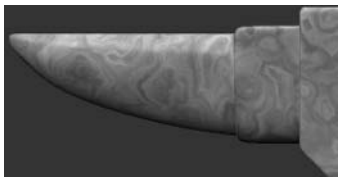
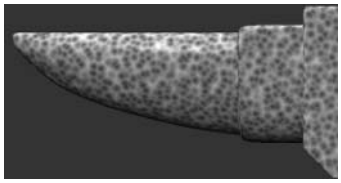
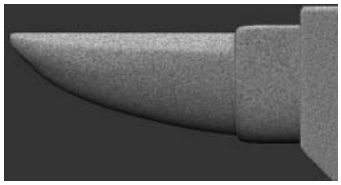
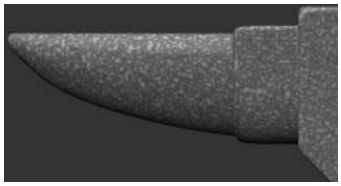
Type	Description	Settings	Example	
Sphere Map Projector	Uses a spherical image of any file type as a texture to project onto the model. This layer cannot be cached or baked, and is for display purposes only.	• **Cull Backfaces** - when the checkbox is ticked, it ensures that projection does not affect areas facing away from the camera. • **Spherical Image** - the filepath to the spherical image to use for projection. • Offset **X**, **Y**, and **Z** - the offset of the projection image on the X, Y, and Z axes. • Rotation **X**, **Y**, and **Z** - the rotation of the projection image on the X, Y, and Z axes. • Edge Falloff **Start** and **End** - modifies how far away the falloff starts or ends. • Edge Falloff **Curve** - allows you to adjust the otherwise linear shape of the falloff to your desired shape. • Distance Falloff **Start** and **End** - adjust the start and end radial distance from the camera. From 0-100, where 100 represents straight-on projection. • Distance Falloff **Curve** - allows you to adjust the otherwise linear shape of the falloff to your desired shape.		

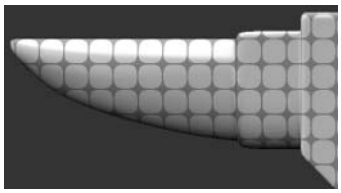
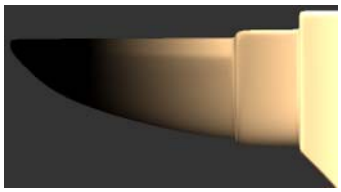
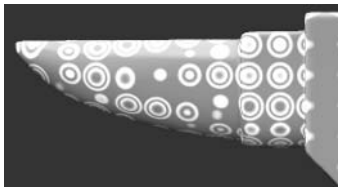
Type	Description	Settings	Example	
Triplanar Projection	Uses three different images to project onto the surface of your model from three different directions (Top, Front, and Right). Each of the parameters listed (other than **World Scale**) are for each of these three directions.	• **World Scale** - overall scale control for the image projection. • **Image** - the images you want to project onto each of the three directions. • **Repeat** - frequency that the image is repeated across your model. • **Angle** - the rotation angle of the image on your model. • **U Offset** - how much the image on the model is offset by on the U axis. • **V Offset** - how much the image on the model is offset by on the V axis. • **U Scale** - how much the image on the model is stretched or contracted on the U axis. • **V Scale** - how much the image on the model is stretched or contracted on the V axis. • **Falloff Start** - controls where the image projection starts on the model. • **Falloff End** - controls where the image projection ends on the model. • **Falloff** - controls the falloff of the image projection between the start and end values		

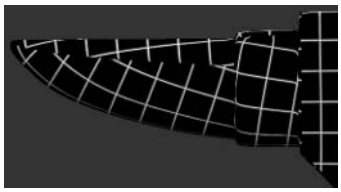
Type	Description	Settings	Example
Procedural Layers - Geometry			
Ambient Occlusion	Applies an ambient occlusion shading to the surface. This overrides Mari's default ambient occlusion shader, allowing you to change the details. For example, you can edit the channel to use as an ambient occlusion map. If you want to save the default ambient occlusion data for the project as a channel, you can bake the ambient occlusion from the default shader. You can then edit this baked channel as you want. **Note:** This overrides the ambient occlusion shading Mari applies by default. This means that if you just bake out the ambient occlusion and then use this as the input to this shader, you see no difference (you're applying the ambient occlusion that Mari would apply anyway). Try changing the ambient occlusion value under the Lighting component of the shader, or edit the ambient occlusion mask channel.	None.	Ambient Occlusion procedural: 

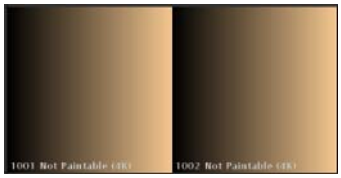
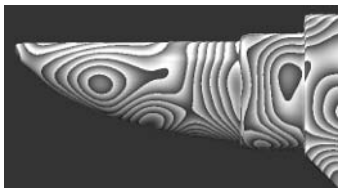
Type	Description	Settings	Example	
Position	Displays the graphic representation of the surface positions (XYZ as RGB).	None.	Position procedural (**Normal** blend): 	Position procedural (**Normal** blend): 
Surface Normal	Converts the present surface normals to a **Diffuse** RGB color. This is useful for baking out normal maps from the bump channel.	None.	Surface Normal procedural (**Normal** blend): 	Surface Normal procedural (**Normal** blend): 
UDIM Mask	Masks out all other UDIMs on a model, except for the selected UIDIM.	The **UDIM** selector allows you to select which UDIM you can paint on and masks out all others.	UDIM Mask procedural: 	
UV	Converts the UV to a color, based on the UDIM values. Useful for debugging UV layouts.	None.	UV procedural: 	UV procedural in UV view: 

Type	Description	Settings	Example	
Procedural Layers - Fractal				
Cloud	Blends seamless 3D noise in a cloud pattern with the shaded surface, using the specified **Blend Mode**. Note: If you are accustomed to using **Fractal Noise** from previous versions of Mari, you can still affect fractal properties such as **Contrast** by adding a **Contrast** adjustment to the **Cloud** procedural.	You can control the look of the cloud pattern by adjusting the **Size** and **Roughness** of the pattern, as well as the pattern offset for the X, Y, and Z values. **Color A** and **Color B** allows you to set the cloud pattern colors used on the model.	Cloud procedural: 	Cloud procedural over layer:
Turbulence	Blends seamless 3D noise in a turbulence pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the turbulence pattern by adjusting the **Size** and **Roughness**. **Color A** and **Color B** allows you to set the turbulence pattern colors used on the model.	Turbulence procedural: 	Turbulence procedural over layer:
Procedural Layers - Misc				
Flow	Displays an image onto the model's surface and uses vector data to animate it flowing. Note: if painting in the **Clear** blending mode, the **Speed** attribute is removed in that area. The vector inspector directional markers are still shown on the model. This concerns how the **Flow** procedural handles the alpha component.	• **Animated** - Enables or disables the animation. • **Time Offset** - controls the flow over time. • **Speed** - controls the sensitivity of **Time Offset**, which affects the speed of flow. • **Tile Image** - the image used on the model for flow. • **Repeat** - sets the repetition value of the tiled image.	In the example below, the **Flow** procedural would animate the molten liquid so that it appeared to moving across the surface of the texture: 	

Type	Description	Settings	Example	
Oil	Blends seamless 3D noise in an oil pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the oil pattern by adjusting the **Size** and the **Organicness** or **Roughness** qualities. **Color A** and **Color B** allows you to set the oil pattern colors used on the model.	Oil procedural: 	Oil procedural over layer:
Procedural Layers - Noise				
Cellular	Blends seamless 3D noise in a cellular pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the cellular pattern by adjusting the **Size** and **Type** of cells to use. Additionally, you can specify the **Distance method** used to achieve a specific look. **Color A** and **Color B** allows you to set the cellular pattern colors used on the model.	Cellular procedural: 	Cellular procedural over layer:
Perlin	Blends seamless 3D noise in a perlin pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the perlin pattern by adjusting the **Size** and color. **Color A** and **Color B** allows you to set the perlin pattern colors used on the model.	Perlin procedural: 	Perlin procedural over layer:
Squiggle	Blends seamless 3D noise in a squiggle pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the squiggle pattern by adjusting the **Size** and color. **Color A** and **Color B** allows you to set the squiggle pattern colors used on the model.	Squiggle procedural: 	Squiggle procedural over layer:

Type	Description	Settings	Example	
Procedural Layers - Pattern				
Cube	Blends a seamless cubic pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the cubes by adjusting the **Repeat** pattern and **Gap** spacing. **Falloff** and **Roundness** give you even more aspects to fine-tune the pattern. **Color A** and **Color B** allows you to set the cube pattern colors used on the model.	Cube procedural: 	Cube procedural over layer:
Object Space Linear Gradient	A procedural version of the **Gradient** tool. This behaves the same as **Gradient** without painting the gradient onto the model.	Adjust the gradient **Start** and **End** points to determine where **Color A** and **Color B** are on the object. Use the **Map** to fine-tune the gradient as a color curve. Rotation **X**, **Y**, and **Z** points adjust the gradient along the X, Y, or Z axes.	Object Space Linear Gradient procedural: 	Object Space Linear Gradient procedural over layer:
Sphere	Blends a seamless spherical pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the spheres by adjusting the **Size** and **Falloff** of the pattern. **Color A** and **Color B** allows you to set the sphere pattern colors used on the model.	Sphere procedural: 	Sphere procedural over layer:

Type	Description	Settings	Example	
Tiled	Lets you select an image to tile across the surface of your model. This layer is disabled for Ptex channels.	• **Tile Image** — the location of the image you want to tile across the surface of your model. • **Rotation Angle (Degrees) —** the angle (in degrees) that the image is rotated by. • **U Offset —** how much the image is offset by on the U axis. • **V Offset —** how much the image is offset by on the V axis. • **U Repeat** — the frequency at which the image is repeated on the U axis. • **V Repeat** — the frequency at which the image is repeated on the V axis. • **Mirror U —** check to mirror the image on the U axis. • **Mirror V —** check to mirror the image on the V axis.	Tiled image: 	Tiled Image over layer:
UV Grid	Blends a seamless UV grid pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the UV grid by adjusting the **Color** and **Thickness** of the pattern, as well as the level of **Repeat.**	UV Grid procedural: 	UV Grid procedural over layer:

Type	Description	Settings	Example	
UV Linear Gradient	A procedural version of the **Gradient** tool for use in UV space. Behaves the same as **Gradient** without painting the gradient onto the model.	Adjust the gradient **Start** and **End** points to determine where **Color A** and **Color B** are on the object. Use the **Map** to fine-tune the gradient as a color curve. Adjust the **Angle** of the gradient and how much you want the gradient to be allowed to **Repeat**. Repeating the gradient does so by tiling.	UV Linear Gradient in the UV tab (without UV image rendering): 	UV Linear Gradient in the UV tab (with UV image rendering):
Procedural Layers - Plant				
Wood	Blends seamless 3D noise in a wood grain pattern with the shaded surface, using the specified **Blend Mode**.	You can control the look of the wood pattern by adjusting the **Size** of the pattern and of the bands, as well as the **Roughness** of the pattern. The offset can be adjusted in **X**, **Y**, and **Z** space. Additionally, **Color A** and **Color B** allows you to set the wood pattern colors used on the model.	Wood procedural: 	Wood procedural over layer:

22 CHANNELS

Mari supports multiple channels. New projects start with a single channel. You can add as many additional channels as you need. A single project can hold all the channel data required for the model — diffuse, dirt, specular, luminescence, displacement, and so on.

Each object in a Mari project has its own set of channels. See Multiple Objects for details on working with multiple objects.

Different Ways to Create Channels

When you create a channel, you set the color depth and patch size. You can change both of these after creation. If channels are resized after creation, Mari automatically resizes all the layers in the channel's layer stack. Channels are either color or scalar. Channels can be created:

- using the settings for existing or recently-created channels as a template.
- in bulk, using Mari's inbuilt presets, optionally importing textures into the channel at the same time.
- from a preset size, color depth, and type.
- entirely custom and *ad hoc.*
- by copying a layer to a new channel (see Layers on page 222 for details).
- by sharing a layer as a new channel (see Layers on page 222 for details).

Presets and Templates

Mari includes channel presets. These are sets of the "standard" channels required to paint various types of assets — for example, the channels required for a vehicle or a digital double. You can use these presets to create a group of channels at once. If you already have some existing textures for the new channels, you can automatically load these into the new channels as they are created.

TIP: You can customize the channel presets functions by writing your own channel preset and channel template files, to create custom presets and templates. For more information, refer to Create Multiple Channels from Presets on page 270 and the chapter on Extending Mari on page 350.

Flatten a Channel's Layer Stack

Channels with large layer stacks or complex groups of layers, adjustments and procedurals can be flattened into a single base layer to save space and simplify channel organization. Flattening layers does not affect the final output, as the texture from the accumulated layers is not changed, only combined into a single layer.

If you are considering flattening the layer stack for a channel so that you can save space when exporting the channel, please bear in mind that it is possible to flatten channels on export. Flattening a channel on export does not affect the layer stack in your project, but combines the layers into a single base layer in the exported file.

HDR Channels

The dynamic range of luminance in the real world is much greater than the range that is usually displayed on a screen. Low dynamic range (8-bit) color values can represent RGB levels only within the range of 0 (black) to 1 (white). In Mari, using 16-bit or 32-bit color values, you can clone from, or paint through, images outside of the 0 to 1 range.

For details on creating, and working with, channels that support HDR images, see Create and Delete Individual Channels.

Snapshots

Mari lets you create incremental copies of your textures as you paint. These copies, or snapshots, save the current state of either a single channel, or all channels in a project. Snapshots are useful for:

- Keeping multiple versions of a texture while trying out new ideas.
- Maintaining a development history between sessions, and having the option to undo mistakes.

Once a snapshot is taken, it is added to the **Snapshots** palette where you can see a list of existing snapshots and options for managing them.

Export and Import

Exporting channels to save work to an external source, or to pass on to the next stage of your pipeline is possible on both an individual and collective channel basis. Importing channels also allows you to import textures that have already been worked on or that come from another source. For

channels with large layer stacks, you can also opt to flatten layers before export to save space and organize finished work.

NOTE: Exporting channels flattened does not flatten the layer stack in your current project; only the layer stack in the exported file. For this reason, you won't need to worry about changing the work in your current project, but can save time and space when exporting files.

In Export and Import Channels below, you can find steps on how to export or import channels and associated layers. For more information on exporting and importing, see the Exporting and Importing Textures chapter in the User Guide.

Edit Paint on Your Channels

The paint in your channels can be edited or transformed, much the same as with patches. Where the transform functions differ is in how they change the paint on the model. Patches are very specific and only transform paint on the selected UV patch. Channels, on the other hand, can include paint across many patches and faces in their layer stacks. In this way, transforming a channel can affect a larger amount of paint across a greater part of a model, depending on how extensive the paint in the selected channel is.

Convert Channels and Shaders

For more information on the conversion functionality in the **Channels** palette and menu, please refer to the Project Conversion chapter.

Steps for Managing Channels

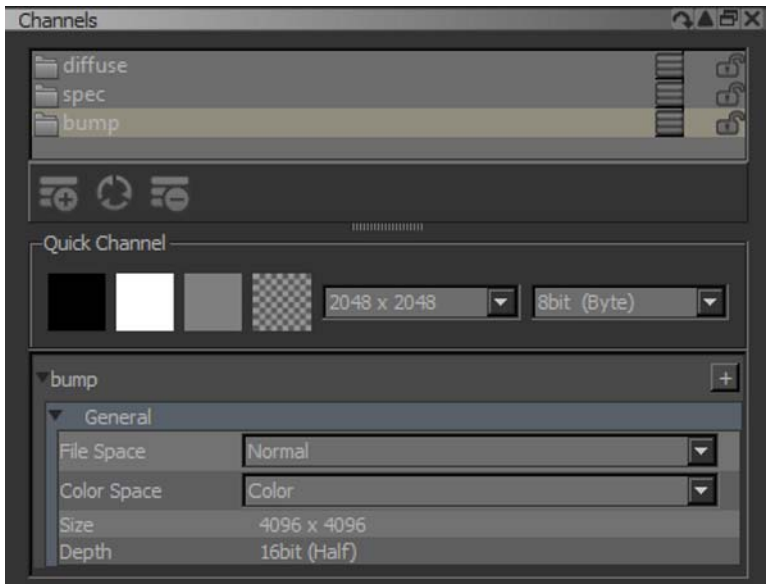
To manage the channels in your Mari project, follow these steps:

1. Create and Delete Individual Channels
2. Flatten Channels
3. Create Multiple Channels from Presets
4. Set and Change Channel Properties
5. Set and Change Channel Properties
6. Take and Manage Channel Snapshots
7. Share Channels
8. Lock and Unlock Channels
9. Export and Import Channels

Create and Delete Individual Channels

1. Start Mari and open your project.
2. To open the **Channels** palette:
   - right-click on the toolbar, and select **Channels** from the dropdown menu, or
   - from the **View** menu, select **Palettes** > **Channels**.

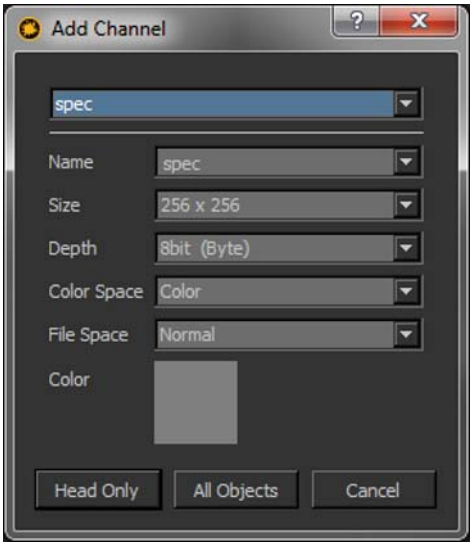
   *The **Channels** palette displays, showing the channels in the current project, a quick channel creation bar, and channel attributes in the bottom pane.*



NOTE: By default, a channel named "diffuse" is created in the **Channels** palette when you start up a new project.

3. To add a single channel:
   - right-click in the **Channels** palette, and select **Add Channel**,
   - click the button, or
   - from the **Channels** menu, select **Add Channel**.

   *The **Add Channel** dialog box displays.*



NOTE: If you are adding channels in a project with more than one object, instead of the **Ok** button, there are two buttons in the **Add Channel** dialog. You can opt to either add a channel to only the selected object or to all objects in the project, or cancel.

4. The dropdown list at the top shows the names of channels that you've created recently. Select one from the list.

   The **Name**, **Size**, **Depth**, and **Color Space** populate automatically.

TIP: If you have never created a project or channel, the dropdown is empty. In this case, give the channel the name "Diffuse" and leave all the other values at their defaults.

5. As needed, you can change:
   - **Name** — the name to identify the channel (which you can change later).
   - **Size** — the patch size for the new channel.
   - **Depth** — the color depth (8, 16, or 32-bit).

- **ColorSpace** — color or scalar.

TIP: Scalar channels store absolute color values (for example, for painting masks). These channels do not have a color space LUT applied when displayed in Mari. However, this setting does not affect exporting. Mari always exports the colors precisely as painted, regardless of whether the channel is set to **Color** or **Scalar**.

6. If you intend on cloning from, or painting through, either 16-bit or 32-bit images, the **Depth** needs to be set to either **16bit (Half)** or **32bit (Float)**, respectively. In addition, the color depth of the paint buffer needs to match the depth of the channel.

   Furthermore, if you do not want the range of 16-bit or 32-bit images clamped to values between 0 and 1, you need to uncheck the **Clamp** checkbox under the **Paint Buffer** settings in the **Painting** palette.
7. If you want, select the initial **Color** for the channel.

TIP: You can paint the channel a different flat color if you want. With the patches and paintable layer selected, click on the **Fill Foreground**, **Fill Background**, or **Fill Transparent** options in the **Patches** menu. Click on the **Color** swatch to select a new fill color from the color picker.

8. Click **Ok** to add the channel to the object. If you have more than one object in the project, you can add the channel to the current object or all objects in the project.

   *Mari creates your new channel, and displays it in the **Channels** palette. When first created, channels are a flat color (as selected in the **Add Channel** dialog).*

NOTE: If you have already created a channel with a given name and attempt to create a new channel with the same name, Mari increments the name to differentiate between the original and new channel. For instance, if you already have a "diffuse" channel and create another channel named "diffuse", Mari automatically gives it the name "diffuse1".

9. To create a copy of a channel, either:
   - from the **Channels** menu, select **Duplicate Channel**, or
   - press **Alt**+drag and drop the channel.

   Mari creates your new channel as a copy of the original — including the layers, but not all the paint in those layers.

10. To delete a channel:
    - right-click on the channel in the **Channels** palette, and select **Remove Channel**,
    - with the channel selected, click , or
    - from the **Channels** menu, select **Remove Channel**.

    If you have other objects in the project that have a channel with the same name, you have the option of removing the channels from only the selected object, or all objects in the project.

EXPERIMENT: With a sample project loaded, try this:

- Create a channel called "TEST", with features: RGBA, bit, and color.
- Then change its color.
- Duplicate it.
- Then delete both new channels.

Flatten Channels

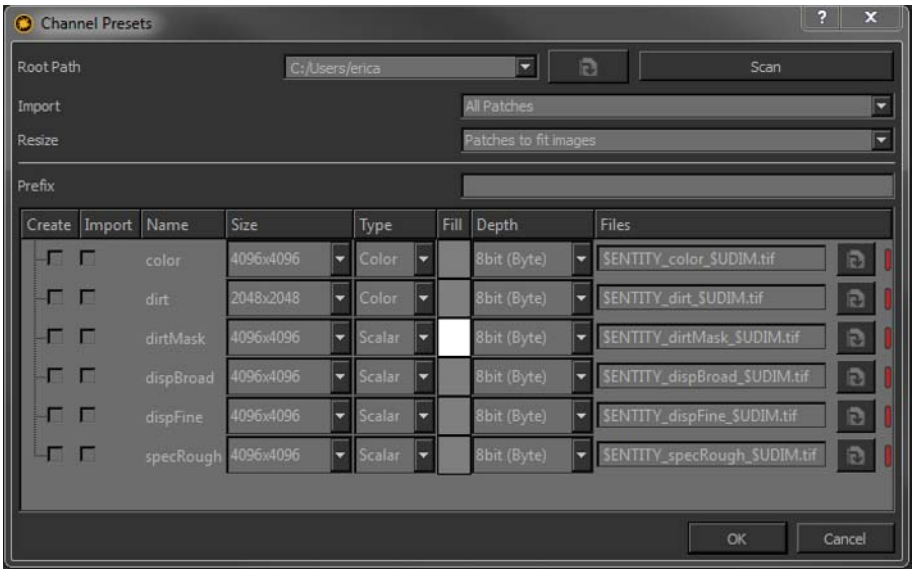
To flatten the selected channel, right-click in the **Channels** palette and select **Flatten**, or from the **Channels** menu, select **Flatten**.

A progress bar displays showing the time left until the channel has finished being flattened.

Create Multiple Channels from Presets

1. To create multiple channels from presets:
    - right-click in the **Channels** palette, and select **Channel Presets**, or
    - from the **Channels** menu, select **Channel Presets**.

    *The **Channel Presets** dialog opens.*



2. The **Root Path** is the base directory for your Mari project. Mari looks here for textures to import when creating the channels. If the textures are in a different directory, change the **Root Path** to point to the appropriate directory, or use the button to display an **Open** dialog to find the right directory.
3. If you want to import existing textures into the channels as you create them, select whether to import **All Patches** or only the **Selected Patches**.
4. If you want to import existing textures, select in **Resize** how Mari should deal with patch/image size mismatches (for example, when trying to import a 2048x2048 image into a 1024x1024 patch). This can be either:
   - Patches to fit images — for example, Mari would automatically resize a 1024x1024 patch to 2048x2048 to fit the image.
   - Images to fit patches — for example, Mari would automatically resize a 2048x2048 image to 1024x1024 before importing it onto the patch.
5. Enter in a **Prefix** to assign a designation to the channels. This allows you to organize them according to categories in your list.
6. Select the channels to create and import from the list by clicking in the boxes. You can either click to check the boxes individually, or right-click the list and select **Add Custom**, **Create All**, **Create None**, **Import Existing**, or **Import None**.
7. You can change any selected channel's **Size**, **Type**, **Fill**, **Depth**, or **Files**.

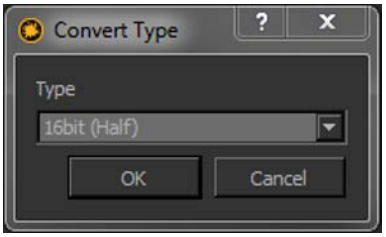
8. If you want to import textures listed for the channel, check that Mari has found them (as indicated by a green bar or a number listing the number of textures found for the model). If Mari hasn't found them (as indicated by a red bar), you can click to open an **Open** dialog box and find the texture files.
9. Once you are happy with the channels and textures selected, click **OK**.
   Mari creates the channels, and imports any selected textures.

TIP: Depending on the number of channels and the size of the textures, the import could take a long time. Consider taking a little break!

Set and Change Channel Properties

1. To change the color depth of an existing channel, either:
   - right-click in the **Channels** palette, and select **Convert Channel** from the dropdown menu,
   - with the channel selected, click , or
   - from the **Channels** menu, select **Convert Channel**.

   *The **Convert Channel** dialog box displays.*



2. Select the new **Type** (color depth) and click **OK**.

Take and Manage Channel Snapshots

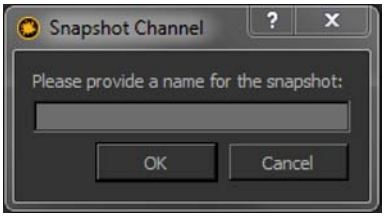
You can take snapshots of the current channel or all channels in a project.

Snapshot Current Channel

1. To take a snapshot of the current channel, either:
   - select **Channels** > **Snapshots** > **Snapshot Current Channel**, or

- from the **Snapshots** palette, with **Channels** set to **Current**, click New.

*The **Snapshot Channel** dialog box displays.*

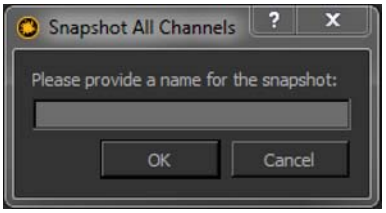


2. Enter a name for the snapshot and click **OK**.

Snapshot all Channels

1. To take a snapshot of all channels in the project, either:
   - select **Channels** > **Snapshots** > **Snapshot All Channels**, or
   - from the **Snapshots** palette, with **Channels** set to **All**, click New.

   *The **Snapshot All Channels** dialog box displays.*



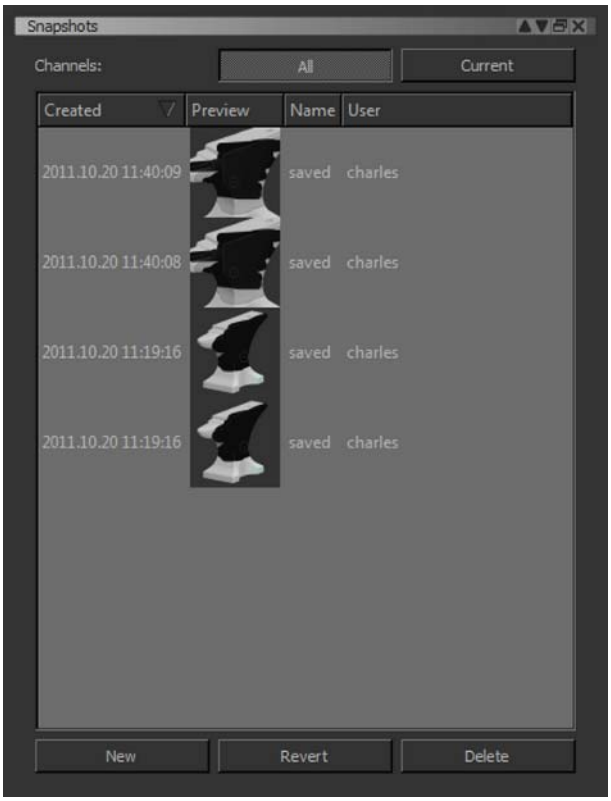
2. Enter a name for the snapshot and click **OK**.

NOTE: Before a snapshot is taken you need to bake or clear the paint buffer. If you have not done this already, a dialog displays asking you to do so.

Use the Snapshots Palette

Once taken, snapshots are added to the **Snapshots** palette. To open the **Snapshots** palette:

- right-click on the toolbar, and select **Snapshots** from the menu,
- from the **View** menu, select **Palettes** > **Snapshots**, or
- from the **Channels** menus, select **Snapshots** > **Manage Snapshots**.



*The **Snapshots** palette displays, showing the existing snapshots for the current channel and for the entire project. Information about the snapshot, such as when it was taken and by which user, along with a thumbnail preview, is also displayed.*

There are a number of options available for managing existing snapshots. From the **Snapshots** palette you can create **New** snapshots, **Extract**, **Revert**, or **Delete** snapshots.

To Extract a Snapshot into a New Channel:

1. With the **Current** button active, select a snapshot and click Extract.

   *The **Extract Snapshot** dialog displays.*
2. Enter a name for the new channel and click **OK**.

   Mari creates a new channel with the given name.

To Load an Existing Snapshot:

Select the snapshot and click Revert.

Mari loads the selected snapshot into the current channel.

To Delete a Snapshot:

1. Select a snapshot and click Delete.

   *The **Delete Snapshot** dialog displays, asking you to confirm.*
2. Click **OK**.

   *The snapshot disappears from the **Snapshots** palette.*

Autosnapshots

When saving a project, Mari automatically takes a snapshot of all available channels and adds it to the **Snapshots** palette. This feature is disabled by default but can be managed in the **Mari Preferences** dialog.

To Manage Autosnapshots:

1. Click **Edit** > **Preferences**.

   *The **Mari Preferences** dialog displays.*
2. From the dropdown menu under **Data** > **Channels** > **Autosnapshot** select whether autosnapshots are:
   - **Disabled**,
   - **Enabled with Limit**, or
   - **Enabled – Unlimited.**
3. When **Enabled with Limit** is selected, Mari limits the number of autosnapshots that are stored in the **Snapshots** palette to the number specified by the **Autosnapshot Limit**. If the number of autosnapshots stored exceeds this limit, the oldest autosnapshot is removed from the palette.

NOTE: The **Autosnapshot Limit** does not affect the number of regular channel snapshots that can be stored in the **Snapshots** palette.

Share Channels

Unlike the layer sharing functionality in the **Layers** menu and palette, channel sharing doesn't have a menu option in either the context menu or **Channels** menu. Sharing channels is different from sharing layers, in that the functionality is much more limited. Channels can be, however, be shared into

the layer stack of other layers. Follow the steps below to share channels into layers.

To share a channel into the layer stack of another channel in the **Channels** palette:

1. Select the channel (channel A), press **Ctrl**/**Cmd**+**Shift** and drag the channel you want to share over another channel in the **Channels** palette (channel B).

   Channel B becomes highlighted, to show that it is now the current selected channel.
2. Don't drop channel A on top of channel B. Once channel B becomes highlighted, drag channel A into the layer stack in the **Layers** palette.

   Channel A is now shared and appears in channel B's layer stack as a layer of the same name. Both the shared channel and layer display linked icons *in the palette.*

TIP: It is much easier to share channels into a layer stack if both the **Channels** and **Layers** palettes are open, not only simultaneously, but side by side or near each other in your palette configuration.

Lock and Unlock Channels

1. To lock the current channel:
   - with the channel selected, from the **Channels** menu, select **Lock Channel**,
   - from the **Channels** palette, right-click on the channel and select **Lock Channel** from the dropdown menu, or
   - from the **Channels** palette, click on the lock icon next to the channel you want to lock.

   The current channel is locked.

*The channel's listing in the **Channels** palette changes to show the "closed lock" icon* *.*

NOTE: If you attempt to paint on the canvas when a channel is locked, the paint shows up in the paint buffer. When you attempt to bake, the paint buffer is cleared without baking the paint down into the locked channel. If you didn't want the paint buffer to be cleared, simply undo the bake.

2. To lock all channels:
   - from the **Channels** menu, select **Lock All Channels**, or
   - from the **Channels** palette, right-click on the channel and select **Lock All Channels** from the dropdown menu.

   *All channels in the **Channels** palette are locked.*

3. To unlock the current channel:
   - from the **Channels** menu, select **Unlock Channel**,
   - from the **Channels** palette, right-click on the channel and select **Unlock Channel** from the dropdown menu, or

- from the **Channels** palette, click on the lock icon next to the channel you want to unlock.

*Mari unlocks the current channel and changes its listing in the **Channels** palette back to the "open lock" icon.*

4. To unlock all channels:
   - from the **Channels** menu, select **Unlock All Channels**, or
   - from the **Channels** menu, select **Unlock All Channels**.

   *All channels in the **Channels** palette are unlocked.*

NOTE: Please be aware that if you have used the **Lock All** or **Unlock All** functions from the dropdown menu on the canvas, this does not affect the lock state of the channels. However, **Lock Everything** and **Unlock Entire Object** applies to all objects, patches, and faces, and channels.

Export and Import Channels

You can export channels with all layers together in a single file, either in a multi-layered format, such as PSD or PSB, with each layer separate in a non-layered format, such as TIF, or with the layers all flattened together. You can also export the current channel, all channels, or the channels for all objects in your project.

Importing channels is done by importing the textures into the layer stack or into a new channel.

Export Channels

To export the currently selected channel:

1. From the **Channels** menu, select **Export** > **Export Current Channel**, or right-click the channel in the **Channels** palette and select **Export** > **Export Current Channel** from the dropdown menu.

   *The **Export** dialog displays.*

2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   Mari exports your textures for the selected channel.

To export all the channels in the **Channels** palette:

1. From the **Channels** menu, select **Export** > **Export All Channels**, or right-click in the **Channels** palette and select **Export** > **Export All Channels** from the dropdown menu.

   *The **Export** dialog displays.*

2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   *Mari exports your textures for all channels in the **Channels** palette.*

To export all the channels from all the objects of your project:

1. From the **Channels** menu, select **Export** > **Export Everything**, or right-click in the **Channels** palette and select **Export** > **Export Everything** from the dropdown menu.

   *The **Export** dialog displays.*

2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   Mari exports your textures for all objects.

Export Flattened Channels

To export the currently selected channel with flattened layers:

1. From the **Channels** menu, select **Export Flattened** > **Export Current Channel Flattened**, or right-click the channel in the **Channels** palette and select **Export Flattened** > **Export Current Channel Flattened** from the dropdown menu.

   *The **Export** dialog displays.*

2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   Mari exports your flattened textures for the selected channel.

To export all the channels in the **Channels** palette with flattened layers:

1. From the **Channels** menu, select **Export Flattened** > **Export All Channels Flattened**, or right-click in the **Channels** palette and select **Export Flattened** > **Export All Channels Flattened** from the dropdown menu.

   *The **Export** dialog displays.*

2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   *Mari exports your flattened textures for all channels in the **Channels** palette.*

To export all the channels, from all the objects in your project, with flattened layers:

1. From the **Channels** menu, select **Export Flattened** > **Export Everything Flattened**, or right-click in the **Channels** palette and select **Export Flattened** > **Export Everything Flattened** from the dropdown menu.

   *The **Export** dialog displays.*

2. Follow the steps in Export Textures from Channels on page 145 before clicking **Export All Patches**.

   Mari exports your flattened textures for all objects.

Import Channels

To import textures into the layer stack of the currently selected channel:

1. From the **Channels** menu, select **Import** > **Import into Layer Stack**, or right-click channel in the **Channels** palette and select **Import** > **Import into Layer Stack** from the dropdown menu.

   *The **Import** dialog displays.*

2. Follow the steps in Import Existing Textures to Channels on page 140 before clicking **Import All Patches**.

   Mari imports the textures into the layer stack of your currently selected channel.

To import textures into a new channel:

1. From the **Channels** menu, select **Import** > **Import into New Channel**, or right-click in the **Channels** palette and select **Import** > **Import into New Channel** from the dropdown menu.

   *The **Add Channel** dialog displays.*

2. Set the options for your new channel and assign it a name. Click **OK**.

   *The **Import** dialog displays.*

3. Follow the steps in Import Existing Textures to Channels on page 140 before clicking **Import All Patches**.

   Mari imports the textures as a new channel.

23 SHADERS

Shaders control how Mari displays the model under certain, user-specified lighting conditions. Mari uses shaders to specify how different channels behave in the lighting module and how the paint on the model reacts to light. Mari *always* uses a shader to generate the surface displayed on screen.

The shaders are also highly dependent on the channels and layers in a project, and you can view current paint layers, targets, and channels specifically in the **Shaders** palette.

For more information on how shaders, channels, and layers integrate with one another, please refer to the Layers Overview in this guide.

There is no default shader for new projects but adding a new shader is quick and simple, and the default channel can be plugged into the shader immediately to set up your project. Once you create channels and assign them to the fields in the shader components, you can build up complex textures on your model.

Color channel, plus...

displacement channel, plus...

specular channel, equals...

...this. Here the shader is pulling in all three channels to make a surface that gives a preview of what the final render may look like.

This lets you, for example, build a shader so you can paint onto the displacement or specular channels while getting a real-time view of how your changes affect the final render.

TIP: Shaders *only* control how Mari displays the model's surface. They do not affect the contents of the channels in your project.

Shaders include:

- basic lighting details, including ambient, diffuse, and specular light intensities.
- a method for quickly viewing paint in your current channel, layer, layer stack, or on your current paint target.

Mari generates the shaded surface by going through the components in the current shader. Each component takes an input from a channel and is adjusted according to relevant component sliders. These components are then added to the current surface. The final shaded surface as you see it on screen is the final result of these components.

For example, you could set up a shader with the following:

1. Create the initial shaded surface from the diffuse channel and set this in your shader's **Diffuse Color** component.
2. Display specular or displacement previews using designated channels as the inputs, and adjust the sliders to give the shaded surface the desired look.
3. Adjust ambient light or apply environment images to further build up the preview of your final rendered image.

As with channels, you set up shaders individually for Multiple Objects.

Shaders and Lights

In Mari, shaders and lights are related - they both control how your project appears on screen, but neither affects the actual data in the channels.

- Shaders do include some basic lighting information, but mostly they specify what to show on the surface of the model. For example, shaders may include specular information, which describes how the surface interacts with the lights in your project.
- Lights provide control on how your project is lit on the canvas. You can set up four individual lights, each with its own color, intensity, and direction, by adjusting the settings in the **Lights** palette.

Default Shaders

In any project, Mari has four default shaders that you start with before adding any custom shaders. These default shaders are:

- **Current Channel** - displays the paint in your selected channel.
- **Current Layer and Below** - displays the paint in your selected sub-stack (such as a mask or adjustment stack) up to the selected layer. If you don't have a sub-stack selected, it shows the parent stack up to the selected layer.
- **Current Layer** - displays the paintable paint and masks in your selected layer.
- **Current Paint Target** - displays the paint in your selected layer, including any mask or mask stack, adjustment, filter or groups associated with the layer.

These shaders are also found on the **Default Shaders** toolbar and allow you to switch between each shader with a single click. If you want to see how your paint looks for a single layer, then compare it when added to the rest of the layer stack, switching between the **Current Layer** and **Current Layer and Below** views can assist you.

Diffuse and Specular Settings

Shaders are comprised of two categories: **Diffuse** and **Specular**. With the exception of **Flat** and **Standard Lighting**, all shaders consist of components from both these categories. When creating a custom shader, the **Diffuse** options are:

- Lambertian, and
- Minnaert.

When creating a custom shader, the **Specular** options are:

- Phong,
- Cook Torrance,
- Beckman, and
- Blinn.

These options determine the type of diffuse and specular lighting used for the shader, as well as which set of shader inputs are available to you.

NOTE: By default, the **Phong**, **Cook Torrance**, **Beckman**, and **Blinn** shaders, listed in the **Add New Shader** dropdown menu, use the Lambertian diffuse option. To add a shader with the Minnaert diffuse option, select **Choose Diffuse and Specular** from the dropdown menu.

Once you have set up the shader, you can still opt to change the lighting on the model by changing the lights in the **Lighting** toolbar, in the **Lights** palette, or in the **Shading** menu.

Ambient Occlusion

Ambient occlusion can be set as a shader component input for all of the custom-created shaders. Using a component input for the ambient occlusion allows you to create your own occlusion map in a separate channel and plugging this channel into the shader input.

If you don't want to create a channel specifically for ambient occlusion, you can opt to calculate the ambient occlusion for each individual object in your project. For more information, please refer to Ambient Occlusion on page 336 and Calculating Ambient Occlusion on page 340.

Shader Limits

Most shaders do not require texture slots, but if you exceed the amount of texture slots available you may encounter a rendering error. If this occurs, there are a number of causes that may have contributed to the error. To free up texture slots, try:

- turning off features that require extra texture units, such as painting masks in the **Projection** palette,
- turning off any filter previews that may be active,
- flattening or caching layers in long or complex layer stacks,
- changing the inputs on the current shader to use fewer texture slots.

NOTE: Even if there are remaining texture slots available, active features such as depth projection, paint masks, and shadows may not respect the texture slot limit if more expensive shaders components are in use. You can turn off these features to free up more texture slots. See About Masking on page 70 and Object Shadows on page 336 for more information.

Shading and Channels

Using too many custom shaders can make it hard to remember which channels are being used in which shader inputs. Mari has a few default shaders that show the contents of the current channel, layer, or paint target, you can always switch back to these to check your work in isolation.

TIP: A useful way to keep track of which shader you're editing is to add it to the Heads-Up Display. From the **Edit** menu, select **HUD Manager**. Under **Project**, put a check in the box next to **Current Shader**. Mari now shows the name of the shader you are currently painting as part of the background information on the canvas. For more information, see the Configuring the User Interface chapter.

Shaders on Multiple Channels

If you want to copy a shader you've created for one object in your project to use on another object, you can use the keyboard shortcuts or the options in the context menu to cut, copy, and paste shaders between objects. Shaders are exclusive to each object, as are channels and layers. The only way to duplicate a shader for use on another object, is to cut or copy and paste it into the **Shaders** palette for each object in your project.

Steps for Using Shaders

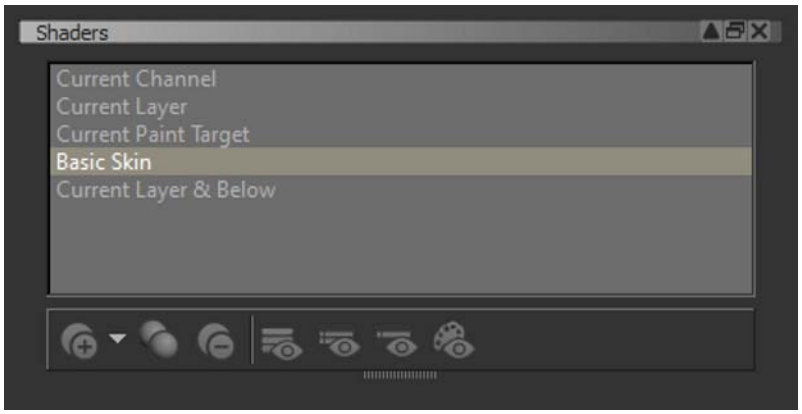
To manage the shaders in your Mari project, follow these steps:

1. Open the Shaders Palette
2. Create a Custom Shader
3. Set Shader Details
4. Remove a Shader

Open the Shaders Palette

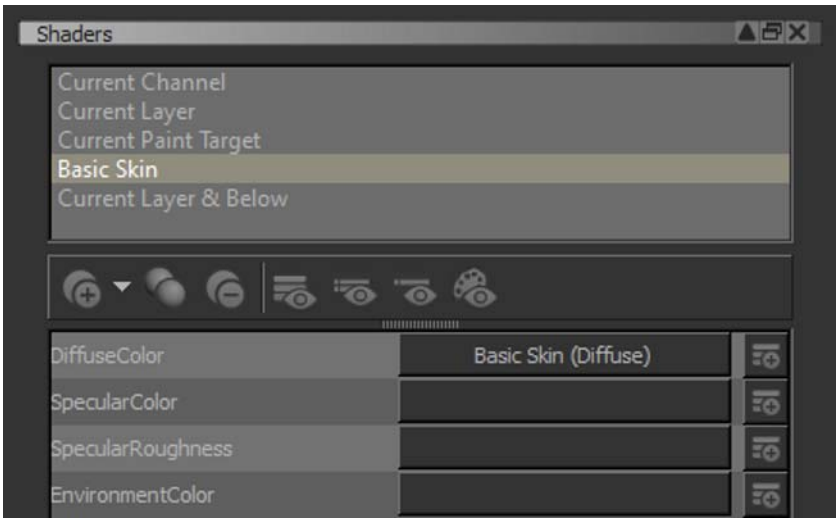
1. Start Mari and open your project.
2. Open the **Shaders** palette:
   - right-click on the toolbar, and select **Shaders** from the dropdown menu, or
   - from the **View** menu, select **Palettes** > **Shaders**.

   *The **Shaders** palette displays, showing the default shaders and any shaders you've already set up for your current project.*



3. The default shaders in the list are:
   - **Current Channel**,
   - **Current Layer and Below**,
   - **Current Layer**, and
   - **Current Paint Target**.

   When you select a shader, the bottom of the palette shows the details, as shown in the example image below.



4. The shader components that are shown in the bottom pane of the palette differ depending on what shader is selected.

Create a Custom Shader

1. To add a new shader, either:
   - right-click on an empty space in the **Shaders** palette,
   - select **Add New Shader** from the **Shading** menu, or
   - click the icon in the **Shaders** palette.
2. Select from the shaders listed in the dropdown menu, or select **Choose Diffuse and Specular** to manually set the diffuse and specular options for your shader.

   The new shader appears in the list.

TIP: You can also duplicate an existing shader by selecting **Duplicate Shader** from the **Shading** menu or the right-click menu in the **Shaders** palette. The default shaders cannot be duplicated.

3. To duplicate or copy a shader, either:
   - right-click on the shader and select **Duplicate Shader** from the drop-down menu,
   - select **Duplicate Shader** from the **Shading** menu,
   - click the icon in the **Shaders** palette, or
   - select the shader and use the **Ctrl**/**Cmd**+**C** shortcut to copy and **Ctrl**/**Cmd**+**V** shortcut to paste.

   A copy of the shader appears with the same name as the original but also a number to differentiate between original and copy.
4. You can give the shader a new name by double-clicking it in the list and typing the new name.

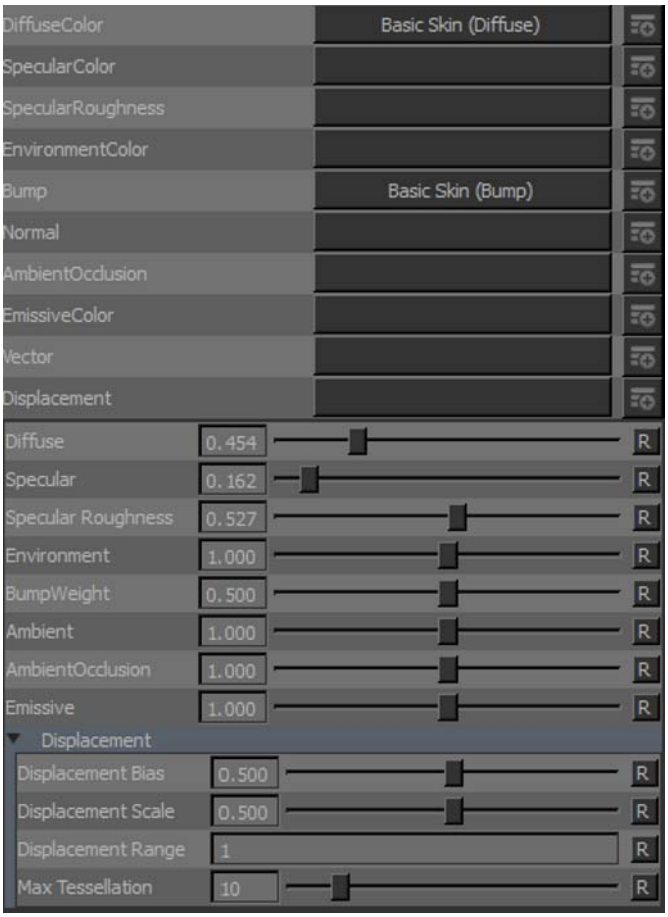
TIP: You can set a keyboard shortcut for the shader by right-clicking it and selecting **Assign Shortcut** from the dropdown menu. See the chapter on Using Shortcuts on page 25 for details.

TIP: You can right-click any of the shaders, or within the shader dialog, to access the dropdown menu for more shader options. Right-clicking an existing shader also selects it.

Set Shader Details

1. Select the shader you want to customize from the list at the top of the **Shaders** palette.

   The bottom of the palette displays that shader's details.



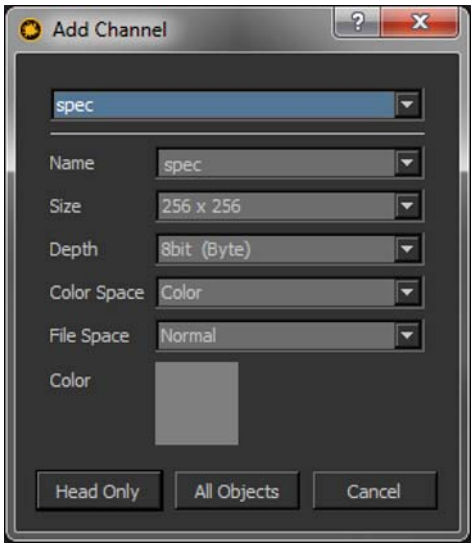
2. You can build up your shader by assigning channels to the various shader component inputs in the bottom pane of the palette.

   To assign a channel to an input, click on the dropdown menu and select a channel from the list.

3. If you haven't created a channel for a designated input yet, you can create channels from the **Shaders** palette.

   To create a new channel, click the icon next to the input for which you want to use the channel.

*The **Add Channel** dialog box displays.*



4. Enter a **Name** for the channel (recent names are available in the dropdown list). Select the size, depth, color space, and file space settings for your channel and click **OK**.

   Mari adds the channel to your shader and automatically makes it the active channel for the designated input.

TIP: To learn more about each of the settings in the **Add Channel** dialog, refer to the Add Channel Dialog Box chapter in the *Mari Reference Guide*.

5. Once you've set up the inputs of each of the shader components you want to use, you can fine-tune these settings using the sliders in the bottom pane of the palette.

   If you prefer, you can fine-tune the slider settings using the entry box instead.

EXPERIMENT: Since the shaders don't affect the content of the channels, you can safely play around without worrying about overwriting anything. Try building the example below. Download the blacksmith sample project from the Mari web site, if you haven't already. Try:

- Creating a new shader.
- Setting the **Diffuse Color** shader component to the **Base Skin (Diffuse)** channel and adjusting the **Diffuse** and **Specular** sliders.
- Creating another, different shader and set the **Diffuse Color** shader component to **Base Skin (Diffuse)** again.

How does changing the **Diffuse** and **Specular** sliders affect the model on this shader type.

Remove a Shader

1. To remove a shader:
   - right-click on the shader and select **Remove Shader** from the dropdown menu,
   - select **Remove Shader** from the **Shading** menu, or
   - click the icon in the **Shaders** palette.

   *The shader is removed from the **Shaders** palette.*

NOTE: The default shaders cannot be removed from the **Shaders** palette.

2. You can temporarily see your model as it appears in other shaders by simply selecting one of the default shaders or custom-created shaders. Selecting the shader displays the model as it appears with that shader's specific settings.
3. In all the custom shaders, controls for **Ambient** light do not correspond to a particular channel input, but to the entire model. **Ambient Occlusion** can also be selected from a channel, or created based on ambient occlusion calculation.

   For more information on these shader controls, refer to the Shaders Palette chapter in the Mari *Reference Guide*.

24 PTEX

Ptex (Per-face Texturing) is a texture mapping system developed by Walt Disney Animation Studios as an alternative to traditional methods of texture mapping. Ptex addresses various issues associated with traditional texture mapping by eliminating the need for artists to manually create UV maps.

With Ptex, each face of a geometry has its own unique texture. This allows for the possibility of dynamically changing the resolution of textures on individual groups of faces.

Ptex files contain the per-face texture and face/edge adjacency data along with the geometry metadata, which can be useful for previewing textures and checking whether they are valid for a given geometry.

Ptex Support in Mari

UV patches are 2D textures mapped onto regions of 3D geometry according to UV maps created by the artist. In addition to working with traditional UV maps, Mari also supports Ptex. With Ptex, UV patches are no longer a valid concept since there are no explicit UVs associated with the model. As a result, UV patches have been replaced with a UV atlas of Ptex faces.

When a new Mari project loads a UV-less **.obj** file, or a **.ptx** (Ptex) file containing geometry, every face of the geometry has a texture assigned to it, and in turn, every texture is assigned to an unused region of a UV atlas.

The packing of these face textures occurs in order of descending size, and because of this, adjacent faces with differing texture resolutions may not be spatially coherent in the UV atlas. Therefore, painting in the UV view does not make logical sense.

Currently, Ptex support in Mari includes:

- starting a new project with either a UV-less **.obj**, or a **.ptx** file (containing geometry metadata)
- optionally assigning each surface defined in the **.obj** file its own Ptex layout
- polygons of arbitrary size and shape in **.obj** files
- specifying uniform, or worldspace texel density texture resolutions of faces
- painting onto Ptex geometry in 3D views

- resizing selected Ptex face textures from 1x1 (2x2 for triangles) all the way up to 8192x8192
- creating new channels that share Ptex face texture resolutions
- exporting a channel to a **.ptx** file, with the option to include geometry metadata and face/edge adjacency information
- importing **.ptx** files into channels that are topologically equivalent
- preserving paint in multiple Ptex geometries, when creating new geometry versions from **.obj** files, provided they are topologically equivalent
- Python bindings for Ptex project creation, per face operations, and import/export functionality. Refer to the Python HTML documentation within **Python** > **API** for further information
- allowing face texture resizing and data format conversion on import.

Limitations of Mari's GPU Previews with Ptex

Mari's implementation of Ptex face texture storage is targeted at the flexibility of face resizing and the rendering preview performance of the GPU. Unlike UV maps, the locality of faces in 3D space is not necessarily maintained in the Ptex texture storage. As a result of this implementation, when GPU operations require sampling across faces and adjacent faces reside in texture memory, preview artifacts may be observed.

For example, shaders that use a relatively large sample kernel may encounter some preview rendering artifacts when unexpected face textures are sampled.

Artifacts may also be observed when navigating a scene due to the blending of face textures in generated mip-mapped textures that are used to improve GPU performance. This may be more apparent when lots of small face textures are used.

NOTE: These artifacts only affect GPU accelerated previews, and do not appear in exported texture data files.

Ptex Modelling Requirements in Mari

Mari supports both quad and triangular face textures, which are exposed by the Ptex file format. All meshes use quad face textures, including mixed meshes; while wholly triangular meshes use triangular face textures. Quad textures are natively supported in graphics hardware. However, triangular textures are not supported in the current generation of graphics hardware.

Mari's canvas preview of triangular textures uses the system described for GL displays at http://ptex.us/tritex.html.

Though Mari supports both types of face textures, Ptex dictates that the dimensions of a triangular face must be equal. Due to this restriction to triangular textures, if they are applied to polygons with an aspect ratio significantly different to one, the texture appears blurred or smeared. When triangular textures are stored in packed format, GPU renderers can only display half of the texels, resulting in Mari filling in the other half of the texture with data that it is not representable in the display.

NOTE: Some renderers, such as RenderMan, read all texels and, thus, can render triangular texels.

TIP: For more information regarding packed format and triangular textures, please refer to http://ptex.us/tritex.html.

For low-frequency images, the even and odd texels are very similar in color, and the Ptex packing of triangular textures suggests that a simple mirror of texels can be used to fill the other half of the texture when exporting to Ptex. Mari implements this mirroring. For high-frequency images, however, this mirroring is incorrect and visual artifacts appear in software renderers using the exported Ptex file.

With the restrictions of triangular textures, we highly recommend not modelling with only triangular faces. Quad face textures do not have the same triangular face equality restrictions and are a preferable option for use in Mari.

Minimum Face Size

Within **Preferences**, it is possible to set the **Minimum Size** for face textures via **Ptex > Face Textures | Minimum Size**. The default quadrangular texture is 1 and the default triangular texture is 2. This represents the absolute minimum face texture size that Mari can restrict sizing operations to.

Paint Preservation

Geometry versions from **.obj** files can be added to a Ptex project, provided all the versions are topologically equivalent, that is, they have the same number of faces with the same shape, so that the model does not change. This preserves the paint that has already been applied to the existing version.

Steps for Using Ptex

To use Ptex in Mari, follow these steps:

1. Create a New Project
2. Set the Ptex face Texture Options
3. Manage Ptex Faces
4. Export a Ptex Channel or Layer
5. Import a Ptex Channel or Layer
6. Paint Preservation with Multiple Ptex Geometries

Create a New Project

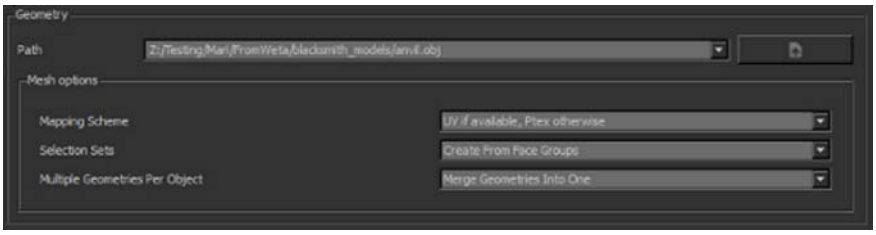
Multiple files can be used to create a project in the Ptex workflow. If this is the case, it is recorded in the dialog's history as a set of files instead of only one file.

To create a new project, using either one file or a set of files, follow the steps below:

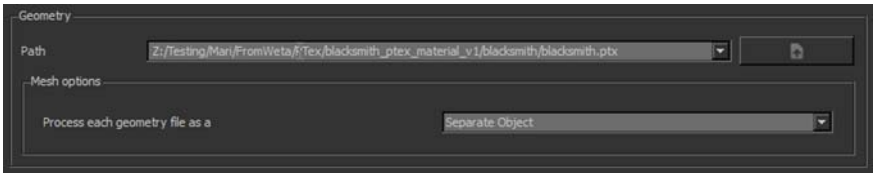
1. Start Mari and select **File** > **New**.

   *The **New Project** dialog box displays.*
2. Enter a name for your project and the location of the geometry you want to work on.
3. You have the option to load either **.ptx** files or **.obj** files. If you choose to load an **.obj** file, the **Mesh Options** panel displays with options for setting the **Mapping Scheme** for the project, using **Selection Sets**, and working with **Multiple Geometries Per Object**.
   - **Mapping Scheme**: If there is a UV map available, and you would like to use it, select **UV if available, Ptex otherwise**.If you prefer to use Ptex, select **Force Ptex**. This option loads the selected geometry and replaces the existing UV map with a Ptex map.
   - **Selection Sets:** If you want to select a specific object group in the geometry while you work, this option allows you to set up selection sets using **Create From Face Groups** during project creation.
   - **Multiple Geometries Per Object:** If your **.obj** consists of multiple geometries, you have the option to **Merge Geometries Into One**, which is the default behavior, or **Create Separate Geometries (Ptex Only)**.

If you select **Merge Geometries Into One**, Mari combines the individual geometries into a single geometry, while selecting **Create Separate Geometries (Ptex Only)** creates individual geometries.



New Project dialog: **.obj** mesh options.



New Project dialog: **.ptx** mesh options.

4. If you choose to load a **.ptx** file, the **Mesh Options** only provide the option for selecting **Separate Object** or **Separate geometry in one Object** for the **Process each geometry file** field.

   If you are importing more than one Ptex file, this option allows you to specify whether you prefer for each separate file to constitute a separate object or separate geometries within a single object.

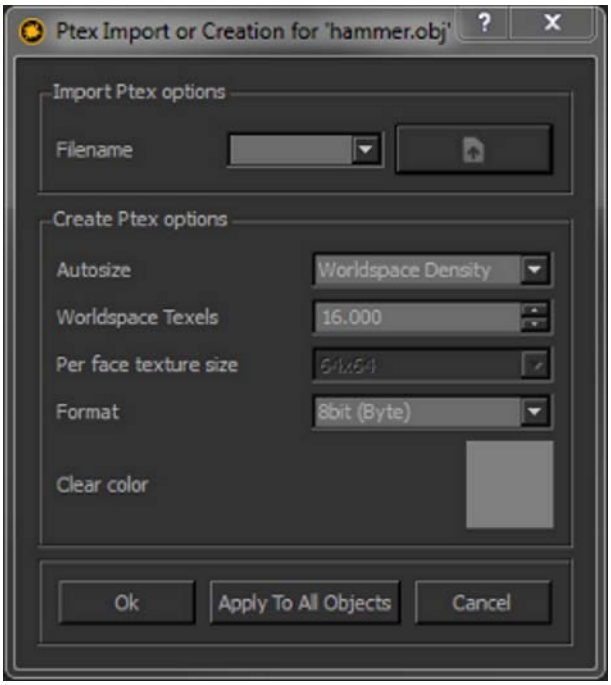
NOTE: Even if you select **Create Separate Geometries (Ptex Only)**, Mari only displays a single object on the canvas. However, when you export a channel you have the option to export individual **.ptx** files for each geometry.

For Ptex projects, the channel setup and texture import section of the **New Project** dialog can be ignored. A single channel named **Ptex** is created by default, you can create additional channels once the project has loaded.

5. Click **OK**.

Set the Ptex face Texture Options

If you use an **.obj** file to create a new project, and the file does not have a UV map assigned (or you selected **Force Ptex** as the **Mapping Scheme**), the **Ptex Import or Creation** dialog box displays once the project is created.



You can also manage Ptex face textures by accessing the **Preferences** menu.

Import Ptex Options

If you have a topologically matching **.ptx** file for the **.obj**, you can import it using the **Import Ptex options** field. However, if you don't have matching texture sizes, it can be resized upon import from the **Ptex Texture Import** dialog.

Create Ptex Options

If you don't have a matching Ptex file for the **.obj**:

1. Under **Create Ptex options**, you can select constant colored textures for each face, whose resolutions are based on either:
   - **Uniform Face Size** - for face sizes that are equal and determined by the resolution set in the **Per face texture size** dropdown menu, or
   - **Worldspace Density** - for a given number of texels per unit of world space, where small faces have smaller textures and large faces have larger textures. You can set the number of texels in the **Worldspace Texels** field.

NOTE: Please note that texture quality may be affected when painting across adjacent faces if the faces are spatially different in size.

2. Set the bit depth of the Ptex image data by clicking on the **Format** dropdown menu. You can set this to **Byte**, **Half** or **Float**.
3. Click **OK**.

Manage Ptex Faces

Once you have created the project and set the face texture options, a toolbar displays with a number of options for managing Ptex faces within your project.

NOTE: When managing Ptex faces, please be aware that all image channels in your project share the same face texture resolutions.

With the Ptex toolbar you can:

- – double the selected face resolution
- – halve the selected face resolution
- – set the world space face resolution for the selected face
- – set the face resolution for the selected face
- – fill the selected faces with the foreground color
- – fill the selected faces with the background color.

NOTE: When adjusting the resolution of Ptex models, quad faces are limited to resolutions between 1x1 and 8kx8k, while triangular faces are limited to resolutions between 2x2 and 8kx8k.

You may notice a slight pause after adjusting the resolution of a selected face. This happens while Mari regenerates the texture's proxy on the CPU.

TIP: These options are also available in the menu bar under **Ptex**.

Export a Ptex Channel or Layer

1. To export a **.ptx** channel, select:
   - **Channels** > **Export** > **Export Current Channel**, or
   - right-click on a channel and select **Export** > **Export Current Channel**.

NOTE: If you want to export more than the current channel, select **Export** > **Export All Channels** or **Export** > **Export Everything** from the **Channels** menu or right-click menu.

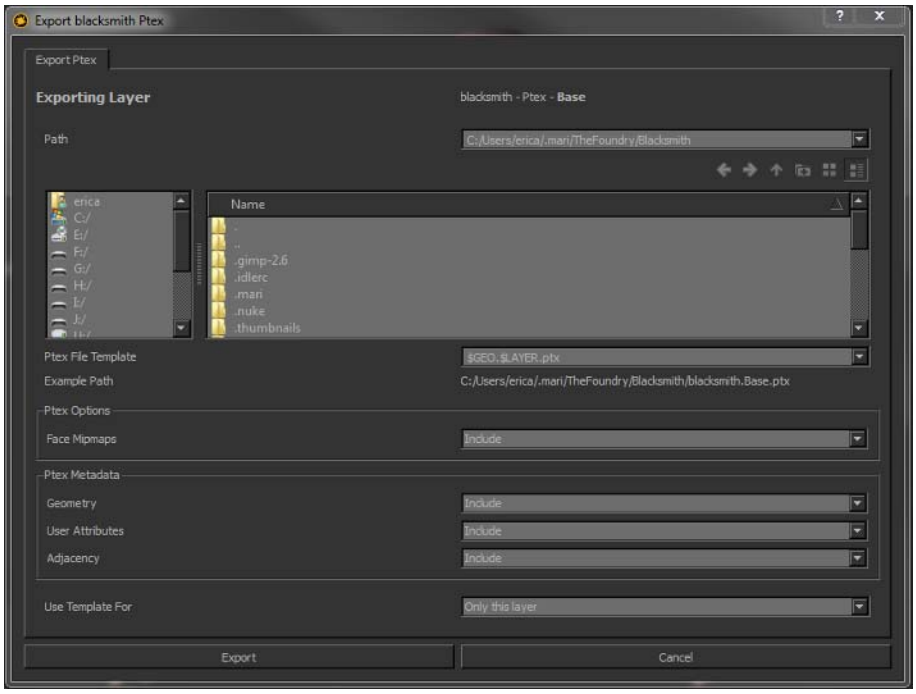
Alternatively, you can also export channels in a flattened format to save space when exporting. To export flattened channels, navigate to **Export Flattened** in the **Channels** menu or right-click to find the same three options for flattened channels.

2. To export a **.ptx** layer, select layers and navigate to:
   - **Layers** > **Export** > **Export Selected Layers**, or
   - right-click on a layer and select **Export** > **Export Selected Layers**.

NOTE: If you want to export more than the selected layers, select **Export** > **Export All Layers** from the **Layers** menu or right-click menu.

Alternatively, you can also export layers in a flattened format to save space when exporting. To export flattened layers, navigate to **Export Flattened** in the **Layers** menu or right-click to find the same two options for flattened layers.

*The **Export** dialog displays.*



3. Enter the Ptex export path in the **Path** field or manually browse to the location.
4. Set the **Ptex File Template** for Mari to use when generating the Ptex filename. You can edit this line manually. As you edit, you'll see the **Example Path** update with an example **.ptx** filename. You can use any combination of the following variables (which Mari replaces with the appropriate values when it exports the files):
   - **$ENTITY** - exports a single **.ptx** file, where the object name is part of the filename.
   - **$CHANNEL** - exports a single **.ptx** file, where the channel name is part of the filename.
   - **$GEO** - exports multiple **.ptx** files, where the individual geometry names is part of the filename
   - **$LAYER** - exports multiple **.ptx** files, where the layer name is part of the filename.

EXPERIMENT: Experiment with the different **Ptex File Template** variables, and see how the **Example Path** changes to show how Mari generates exported filenames.

5. In the **Ptex Options** panel set whether Mari includes or excludes **Face Mipmaps**.

6. In the **Ptex Metadata** panel set whether Mari includes or excludes the following information with the file when exporting:
   - **Geometry**
   - **User Attributes**
   - **Adjacency**
7. Set the **Use Template For** field to determine if the template above is used for **Only this layer** or **Everything**.
8. Click **Export**.

   *Mari exports your textures to disk in **.ptx** format.*

Import a Ptex Channel or Layer

1. To import a **.ptx** file to a channel, select:
   - **Channels** > **Import** > **Import into Layer Stack**, or
   - right-click on a channel and select **Import** > **Import into Layer Stack**.

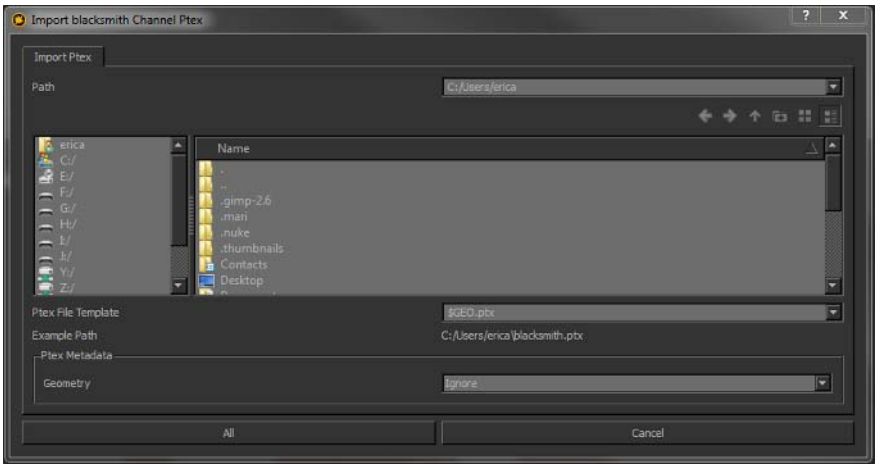
NOTE: If you want to import into a new channel instead of the current layer stack, select **Import** > **Import into New Channel** from the **Channels** menu or right-click menu.

2. To import a **.ptx** layer, select layers to import into and navigate to:
   - **Layers** > **Import** > **Import into Layer**, or
   - right-click on a layer and select **Import** > **Import into Layer.**

NOTE: If you want to import into the layer stack as a new layer, select **Import** > **Import into Layer Stack** from the **Layers** menu or right-click menu.

NOTE: Ensure that you don't import textures into a layer you want to preserve current textures on, as importing into a layer updated the previous paint.

*The **Import** dialog displays.*



3. Enter the Ptex import path in the **Path** field or manually browse to the location.
4. You can manually select the Ptex files to import or you can set the **Ptex File Template** to automatically search for Ptex files that match the object, channel or geometry variables. You can edit this line manually. As you edit, you'll see the **Example Path** update with an example **.ptx** filename. You can use any combination of the following variables:
   - **$ENTITY** - imports a **.ptx** file, where the object name is part of the filename.
   - **$CHANNEL** - imports a **.ptx** file, where the channel name is part of the filename.
   - **$GEO** - imports **.ptx** files, where the individual geometry names are part of the filename.
   - **$LAYER** - imports **.ptx** files, where the layer name is part of the filename.
5. In the **Ptex Metadata** field you can set whether Mari should:
   - **Ignore** the geometry metadata, or
   - **Import as New Version**.
6. Click **Import**.

   Mari imports the images.

NOTE: If you are attempting to import geometry with degenerate faces into a Ptex project, Mari removes these faces on import. A warning dialog displays notifying you of this occurrence.

NOTE: For more information on importing or exporting channels or layers, refer to the chapters on Channels on page 264 and Layers on page 222 .

To import a texture to a channel from multiple **.ptx** files, where multiple geometries are in an object, follow the steps below.

1. Select:
   - **Channels** > **Import** > **Import into Layer Stack**,
   - **Channels** > **Import** > **Import into New Channel,** or
   - Right-click on a layer in the **Layers** palette and select **Import** > **Import into Layer**.

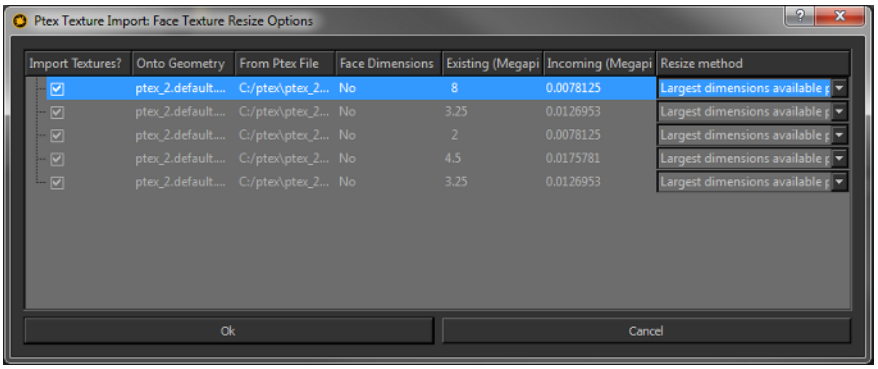
   *The **Import** dialog displays.*
2. Enter the **.ptx** file import path in the **Path** field or manually browse to the location.

   The same **$ENTITY**, **$CHANNEL**, and **$GEO** environment variables are displayed, as described above, and displays an **Example Path** below the dropdown menu.
3. Click **All**.

   The **Ptex Texture Import: Face Texture Resize Options** dialog displays.

   If the face dimensions of the incoming import match, it displays the information, but no further action is required.

   If the face dimensions of the incoming import do not match, a **resize method** dropdown menu is listed. The options available are:
   - **Resize incoming faces to existing dimensions-** the imported texture sizes are changed to match those of the existing textures.
   - **Resize existing faces to incoming dimensions-** the existing textures are changed to match those of the incoming import.
   - **Largest dimensions available per face-** whichever texture is the largest, whether existing or incoming import, this is the texture size used. This is the default option when resizing is necessary.



4. Click **Ok**.

Mari imports the textures and loads them into the selected channel.

NOTE: The resize options are applied per face of the geometry.

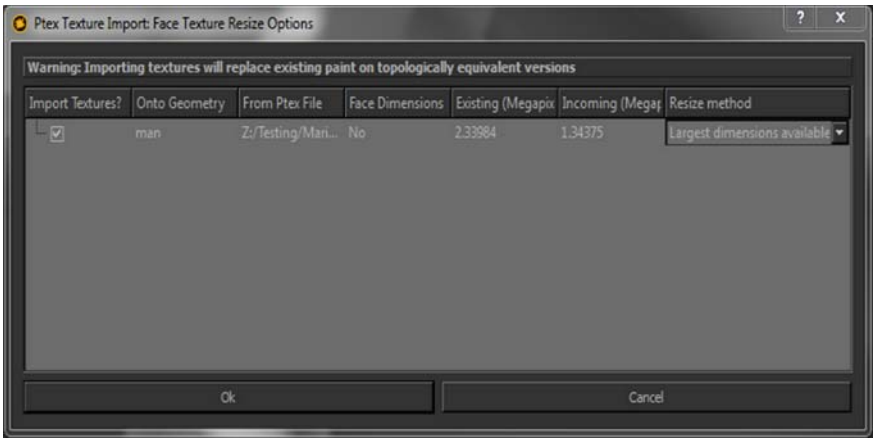
The **Ptex Texture Import: Face Texture Resize Options** dialog is also displayed when importing new geometry versions from **.ptx** files.

Paint Preservation with Multiple Ptex Geometries

Though **.obj** files can be added to Ptex projects with topologically equivalent versions – that is to say, versions that have the same number of faces, with the same shapes – there are caveats to the functionality:

- If the **.obj** file contains multiple geometry groups within it and the project has been created to treat these as separate geometries within a file, the **.obj** file can still be used as a version with fewer groups. These are matched and the paint preserved.
- If more than one geometry is topologically equivalent, then a match for their **.obj** file group names are used to attempt to distinguish between them.
- If an **.obj** file with a previously unknown group is used as a version, a new Ptex texture space is allocated to these new geometries.
- If there are fewer geometry groups in the new version than in the existing geometry, the extra geometries are hidden.

Any topological changes to geometries added as a version, such as a change to the model shape or size, do not transfer existing paint. If a **.ptx** file is imported as an object version over **.obj** geometry, any paint that has been applied is overwritten by the incoming version. A warning message on the **Ptex Texture Import: Face Texture Resize Options** dialog alerts you to the risk of losing existing paint on topologically equivalent versions, as shown in the example below.


Ptex Texture Import: Face Texture Resize Options
Warning: Importing textures will replace existing paint on topologically equivalent versions
Import Textures?
Onto Geometry
From Ptex File
Face Dimensions
Existing (Megapix
Incoming (Megap
Resize method
man
Z:/Testing/Mari...
No
2.33984
1.34375
Largest dimensions available
Ok
Cancel

25 Filtering Images and Paint

Mari includes a set of filters you can use to transform the paint on your model. You can apply filters to:

- paint in the current channel,
- only the current unbaked paint (the contents of the paint buffer), or
- an image within the **Image Manager**.

Unlike adjustment filters, the **Filters** accessed from the menubar apply a transformation to the paint or image on the paint buffer, the current paint target, or selected patches on the paint target. Though many of the filters available are the same or similar, those in the **Filters** menu do not affect the layer stack beyond what you choose to apply the filter to. In addition, you can preview your changes on the canvas before applying them.

There are many filters to choose from, and a complete list is provided in Available Filters on page 309, but a brief example of the filters Mari can apply are:

- Blurs to the painting,
- Inverted colors,
- Changes to hue, saturation, or value,
- Removal of specific color channels,
- Application of color correction, and
- Added noise.

Every filter has the option to use a mask to control what part of the painting it affects. Depending on what you are applying the filter to, you can mask specific channels or apply an image from the **Image Manager** to create a mask.

Some filters do not require any configuration. For example, the **Edge Detect** filter has no user-configurable settings. Other filters provide a wide range of configuration options, including the ability to create, manage and load preset filters. For example, the **Color Curves** filter gives you very fine control over the contents of the RGB color components.

As well as using Mari's pre-defined filters to edit the paint on a the paint target or in the paint buffer, you can use them as part of a custom color profile. These filters only affect how the colors display on-screen (rather than actually changing the painting itself). See Managing Colors in Mari for details on setting up custom color profiles.

To make it easier, Mari provides an interactive preview of each filter. As you change the settings for the filter, the main canvas updates to show a preview of how the filter looks.

TIP: Filter previews are not available for scalar channels.

Steps for Using Filters

To use filters in Mari, follow this step:

1. Select and Apply Your Filter

This tutorial also includes a reference table of Available Filters.

Select and Apply Your Filter

1. Start Mari and open your project.
2. For best results from the filter preview, set the lighting to flat, so the effects from the filter aren't lost in the effects of the lighting.
3. If you plan to apply a filter to the contents of a specific channel, make sure it is selected in the **Channels** palette, and that you select the **Current Paint Target** option.
4. If you plan to apply a filter to an image, open it from the **Image Manager** by double-clicking on the image before selecting the filter from the **Filters** menu.

NOTE: A preview window for the image opens when you double-click it in the **Image Manager**.

5. If you plan to mask an area of the **Current Paint Target** using the **Marquee Select** tool, draw the area you want to mask.

NOTE: Using a **Marquee Selection** as a mask is only possible when applying a filter to the **Current Paint Target**.

6. Select the filter you want from the **Filters** menu (see the table of Available Filters on page 309).

   The dialog box for your selected filter displays.

*Each filter has a different dialog box, with applicable **Options**.*

7. Select **Options** for the filter.

   If you've already created a preset, select it from the dropdown menu to load it. If you want to save your current options as a preset, click + to enter a preset name. You can always delete this by selecting ×.

8. Select whether the filter should be applied to:
   - everything on the **Current Paint Target** (not including any unbaked paint in the buffer),
   - only the **Current Painting** (that is, the unbaked paint in the buffer), or
   - the **Selected Images** (in the **Image Manager**).
9. Select whether to use a **Mask**:
   - If you're applying the filter to the **Current Paint Target**, you can use the any channel in the project as a mask.
   - If you're applying the filter to the **Current Painting**, you can use the **Marquee Selection** tool to draw an area that you want to mask. This area should be drawn before selecting the filter.

     Alternatively, you can use an image from the **Image Manager**.
   - If you're applying the filter to **Selected Images**, you can use any image in the **Image Manager** as a mask.

NOTE: If you choose to use a channel or an image from the **Image Manager** as a mask, an **Invert** checkbox and a **Mask Curve** editor displays. For more information on using these, see the next section on Available Filters.

10. Toggle the **Preview** switch to see the filter's effects before applying them.

TIP: Click on the control to toggle the filter on/off while you watch the effects.

The preview always displays on the whole model – even if you have the filter set to apply to the **Current Painting** or **Selected Images**.

11. Click **Apply**.

NOTE: If you want a filter to apply only to a specific layer or layers of a channel, consider using the adjustment filters in the Layers palette. For more information on adjustment filters and how these work on individual layers, see Layer Types and Examples on page 243.

EXPERIMENT: The best way to get a feel for what the individual filters do is to play around with the options with the filter preview on. Take a few minutes to review details of the various Available Filters. Try applying some of them to a channel. You don't actually have to save the filtered effect — turn the **Preview** option on, see how it looks, and then **Cancel** to reject the changes.

Available Filters

We mentioned previously that an **Invert** checkbox and a **Mask Curve** editor displays in certain situations. These options are universal to all filter operations that use a channel or an image from the **Image Manager** as a mask.

The **Invert** checkbox decides whether Mari inverts the input from the mask. If this is selected, the mask data is black on white rather than white on black.

The **Mask Curve** editor sets how the channel masking works. The x axis is the color of the source pixel (black to the left and white to the right). The y axis is how paintable the target pixel is. By default, the curve runs from the bottom left up to the top right. This means that black pixels are totally masked, white pixels are totally paintable, and there's a constant curve between the two. Use this if you want to change what pixel values are masked.

The following table describes and shows examples of each of the filters that come with Mari, applied to the following image:

Filter	Description	Options	Example
Invert	Inverts the colors in the selection. Replaces colors with their "opposite" in the color chart. For example, replaces a color with a float value of 0.3 with a color with float value 0.7.	You can set whether to invert the Alpha channel as well as the colors.	
Luminosity	Outputs just the luminosity value of each pixel in the selection. That is, it outputs a greyscale image based on the brightness of each of the pixels in the original image.	None.	

Filter	Description	Options	Example
Blur	Applies a standard blur to the selection.	You can select the blur radius — the number of pixels Mari uses when calculating the blur value for each pixel. The higher the radius, the more blurred the results. If you use a larger blur radius, you may get slight lines on the boundaries between patches. This is an artifact of the way that Mari handles the edges of patches.	
Soften Blur	Applies a subtle softening blur. This is a quick, predefined blur filter. If you need more control over the degree or type of blurring, use either the standard **Blur** or **Gaussian Blur** filters.	None.	
Gaussian Blur	Applies a Gaussian blur. Compared to the standard **Blur** filter, this gives you much finer control over the degree of blurring, and the option of using much higher blur values.	You can set both the **Radius** and the **Amount**. The higher the radius, the more blurred the results. Amount defines how much to mix the blurred result with the original. If you use a larger blur radius, you may get slight lines on the boundaries between patches. This is an artifact of the way that Mari handles the edges of patches.	
Gamma	Changes the gamma levels in the selection.	**Do Inverse** reverses the gamma conversion. That is, a higher setting for **Gamma** results in a more washed-out looking image. Selecting **Use default gamma** disables the other controls and uses your default setting for gamma (as set in the **Painting** tab of the **Mari Preferences** dialog box, accessible from the **Edit** menu). Otherwise, select a particular gamma level.	

Filter	Description	Options	Example
sRGB To Linear	Applies an sRGB to linear colorspace conversion.	Checking **Invert** applies a linear to sRGB colorspace conversion.	
Hue	Changes the hue, saturation, and value of the colors on the model.	To change the hue of the colors, set the value for **Hue**. This moves the colors around the color wheel. The rotation value is the degree around the color wheel that each color shifts, between 0 and 360 (which both correspond to the original colors). The options to change the **Saturation** are: • **Saturation** — how large the saturation is. Select a multiplier from 0 to 2, where 1.00 is the original saturation value. • **Offset** — an offset value to add to the initial saturation value, before applying the scale. You can also edit the **Saturation** curve. This controls how the filter translates current saturation values to new values. For each input value along the bottom of the graph, the output value is set from the position of the line above that point. Edit the curve by: • pulling the anchor points • clicking between anchor points to add a new point • right-clicking to select from a set of preset values. You can edit the **Scale**, **Offset** and **Value** curve for the value of the colors in the same way.	

Filter	Description	Options	Example
Brightness	Changes the brightness of the paint on the model, either overall or for specific channels. You can also change the contrast at the same time.	You can either change the brightness of all color channels at once, or one-by-one. Changing the main **Brightness** control changes (overwrites) any changes you make to brightness values for individual color channels.	
Contrast	Changes the contrast of the paint.	You can select the amount of contrast using the slider.	
Clamp	Clamps color values to lie within the specified upper and lower values.	You can set the **Upper Value** and **Lower Value** by adjusting the sliders or entering values in the entry boxes. Select the individual **Color Component** to clamp in the dropdown menu.	

Filter	Description	Options	Example
Levels	Changes the color levels in the paint. You can change the white, midtone and black points for each color channel or all together.	As you change the settings, the display at the top of the dialog box updates to show the current white point, midtone, and black point. You can set the: • **Color Component** - whether this is affecting the overall **Value** of the color, or the specific color channel (**Red**, **Green**, or **Blue**). • **White Point** - the upper limit of displayed color intensity. Areas with a value higher than this are mapped to 1 (white). • **Midtone** - the middle point between white and black. Mari remaps the values so that this is the middle of the range between the white point and black point. Moving this pushes the values towards that end of the spectrum. • **Black Point** - the lower limit of displayed color intensity. Areas with a value lower than this are mapped to 0 (black). • **White Output Level** - how strongly to output the white in the filtered image. Higher values show the entire white output, lower values show decreasing amounts. • **Black Output Level** - how strongly to output the black in the filtered image. Higher values show the entire black output, lower values show decreasing amounts.	
Color Curves	Changes the color curve for each color channel (RGB) in the painting.	You can also edit each color curve, controlling how each color channel appears on screen. This controls how the filter translates current color values to new values. For each input value along the bottom of the graph, the output value is set from the position of the line above that point. Edit the curve by: • pulling the anchor points • clicking between anchor points to add a new anchor point • right-clicking to select from a set of preset values.	

Filter	Description	Options	Example
Color Switches	Turns individual color channels on or off.	Use the checkboxes to select which color channels display. When Mari applies the filter, it removes any unchecked color channels from the painting.	
Tone Mapping	Varies the "exposure" of the painting.	You can set the: • **White Point** — the upper limit of displayed color intensity; any colors of greater intensity map to white. • **Exposure** — lower exposures give darker images; higher exposures give lighter ones.	
Copy Channel	Copies the value from one RGB color channel to the other two. The result is a greyscale image with the intensity values from the selected channel.	Select the source channel from the list. When you apply the filter, Mari copies the selected channel over the other two channels.	

Filter	Description	Options	Example
Premultiply Alpha	Either pre- or post-multiplies the alpha in the selected image. If you are painting using an image without pre-multiplied alpha onto one with it, use this filter to perform the pre-multiplication, so the images match and you avoid lines around the outside of the patch. (Post-multiply works the same, but in reverse (removes pre-multiplication to match images that do not have pre-multiplied alpha).	If the **Postmultiply** box is checked, this acts in reverse (that is, removes pre-multiplied alpha).	
Edge Detect	Finds "edges" (transitions between colors) in the image and heightens them.	None.	
Emboss	Applies an "emboss" effect, so that textures look "raised" on the surface.	None.	

Filter	Description	Options	Example
Sharpen	Removes 'fuzziness' and clarifies detail in the image.	You can set the amount of sharpening. Higher values mean more sharpening, while a value of 0.00 is the picture without the filter applied.	
High Pass	Removes low frequency information from the image while maintaining higher frequency detail. This can be useful for quickly creating specular maps where only the higher frequency image highlights are maintained.	You can set the kernel size (the amount of filtering) by adjusting the **Radius**. If you use a large radius, you may get slight lines on the boundaries between patches. This is an artifact of the way that Mari handles patch edges. This filter is not supported with Ptex channels.	
Color Correction	Applies a colorspace correction to the current channel or painting.	You have the option to use Mari's default **Configuration File** or a custom one. Set the colorspace of the current channel or painting in the **Input ColorSpace** dropdown. Set the colorspace correction to apply to the current channel or painting in the **Output ColorSpace** dropdown.	
Add Noise	Applies noise to the current channel or painting.	Use the **Amount** slider to adjust how much noise is applied and select the component you want to affect from the **Color Component** dropdown. For additive grayscale noise, that modifies the intensity while retaining the original color, check the **Grayscale** checkbox. You can regenerate the noise using different random samples by dragging on the **Seed** slider. Adjust the size of the noise applied by dragging on the **Size** slider.	

26 PROJECTORS

In Mari, **projectors** store the specific camera details of a particular view — the rotation, zoom, and orientation of the view, plus the current paintable area, the painting mode, and mask settings. Think of this as being like a bookmark for the exact view you currently have in Mari.

You can use a projector to take "snapshots" of your paint buffer, work on them externally, and then project the changes back onto your model. For example, you can use projectors to easily flip back and forth between Mari and Photoshop®, editing a texture in Photoshop®, then projecting it back onto your model and checking it in Mari.

Once you have created a projector, you can use it to project and unproject on and off the image:

- **Unproject** takes everything visible from the paint buffer and saves it as a file.
- **Project** reads a file and projects it back onto the model.

Unprojecting takes the surface currently visible in Mari and exports it to a file. This includes everything on the surface, just as it appears onscreen — it's like taking a snapshot of the model as you can see it right now. So a particular unprojected file could include parts of several meshes. Once you have unprojected to a file, you can edit the file in your paint editor of choice.

When you're happy with the file, you can then flip back to Mari and project it back onto the view. By restoring the original projector, you can be sure that you're looking at the exact same view as the snapshot was originally taken from. When you select the projector and click **Import** (to the buffer) or **Project** (import and bake), Mari projects the file onto the model in the correct place.

So, once you've set up a particular projector, you can quickly flip between Mari and another editor. You only need to set the target and source files for unproject/project once, and then it's just a click to move back and forth between Mari and your external editor.

To make it easier when you're working on projects with multiple channels, there is also a batch mode for unproject. This lets you unproject multiple channels at once.

And to make it even easier to quickly project and unproject, there are Quick modes for both. These project and unproject from the current view, without you having to create a specific projector.

There is also support for unprojecting to a layered **.psd** file. As with the standard project and unproject features, you can quickly unproject to a layered **.psd** file without having to create a projector.

In addition, you can also project on to models using **.fbx** files created by 3rd party software such as Maya. Importing the model, cameras, and textures enables you to quickly create textured models using Mari projectors.

TIP: If you only require a single camera view point, use the **Camera** > **Load Camera** option from the Mari menubar.

Projectors also allow you to export a **turntable** view of your model. The turntable takes the model as you can see it through the current shader, and creates a series of images showing the model rotating through an axis. You can include custom text or thumbnails of reference images in the turntable. You can create:

- **Render turntables** — this exports a single channel, and lets you pick the shader and lighting to use.
- **Diagnostic turntables** — these export a set of channels, using the default shader and flat lighting, to help you check the current look.

The **Projectors** palette shows the projectors currently defined for the project.

Steps for Using Projectors

To use projectors in Mari, follow these steps:

1. Set the View
2. Create the Projector
3. Unproject from Your Projector
4. Edit the File(s) Externally
5. Project the File(s) Back onto the Model
6. Use the Quick Project Functions
7. Project onto a Model Using .fbx Files
8. Generate a Turntable from a Projector
9. Save, Load, and Delete Projectors

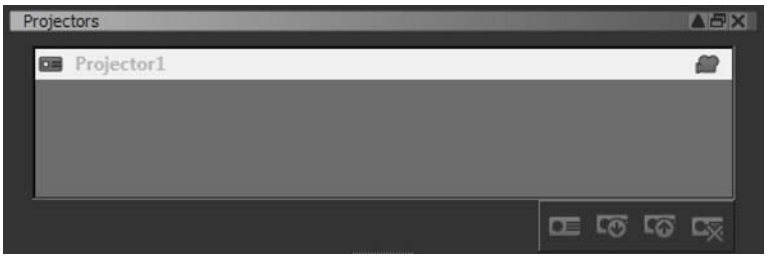
Set the View

1. Start Mari and open your project.
2. Adjust the view how you'd like it. The projector takes snapshots of the contents of the paint buffer, exactly as they appear onscreen, so:
   - switch to your preferred camera view (UV, orthographic, or perspective)
   - rotate, spin, and zoom the model so you can see the area you need to work on
   - resize the paint buffer (if necessary) to focus in on the specific area you want to work on
   - set the paint blending mode you want
   - turn on any masking (edge masking, channel masking, etc.) that you need.

Create the Projector

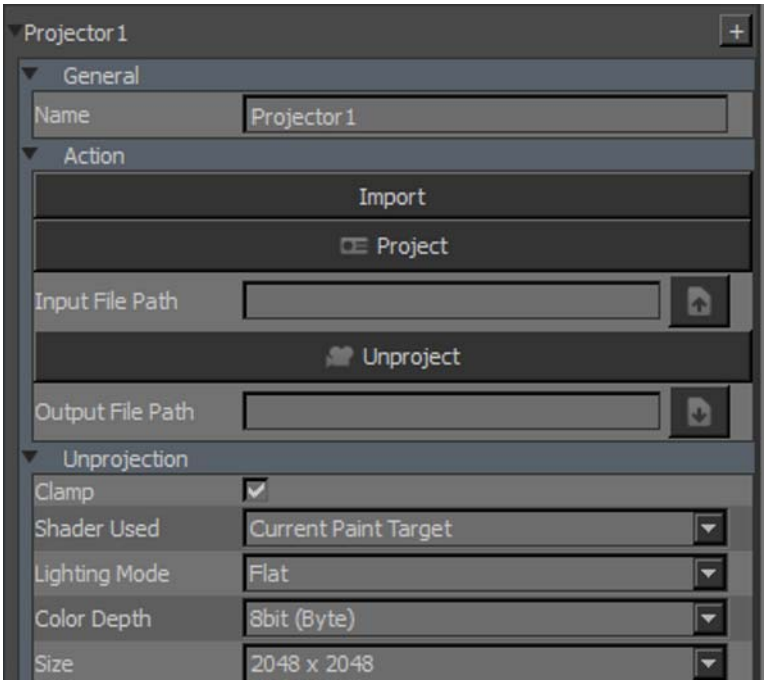
1. In the **Projectors** palette, either:
   - right-click and select **Create Projector** from the dropdown menu, or
   - click the button at the bottom of the projectors list.

   The new projector displays.



2. To rename the projector, double-click on its name in the list and enter the new name.
3. Click to select your new projector.

   *The bottom half of the **Projectors** palette displays details of the projector.*



4. The settings in the **Unprojection** section control how the projector takes screen snapshots.
   - If **Clamp** is checked, Mari restricts the range of the image to values between 0 and 1.
   - The **Shader Used** defaults to **Current Paint Target**, but you can change this to determine which shader you want to unproject.
   - The **Lighting Mode** defaults to **Flat**, but you can change this.
   - You can set the **Color Depth** and the image **Size** — these default to the settings of your paint buffer when you create the projector.

5. Set the **Output File Path**, to specify where the projector saves the image. You can either:
   - type this directly, or
   - click the button.

   *The **Save File** dialog box opens, allowing you to set the location for the saved files.*
6. Navigate to where you want to save the projector, type in the filename, and click **Save**.

TIP: If you want to take shots of multiple channels using this projector, include $CHANNEL in the filename. When Mari saves the files the projector produces, it replaces this variable with the channel name for each.

Mari sets the file type (from the listed possibilities) by the file extension you include.

7. Set the **Input File Path**, to specify where the projector looks for updated images to load. As with the output file path, you can type this directly or click to select from the **Pick Path** dialog box.

   You can also include $CHANNEL in the input file path.

TIP: Decide whether you want to use the same file for output and input, or use separate files. This depends on how you prefer to work. For example, you may prefer to export to **.tif**, edit the file and save the changes as a **.png** for re-import. Or you may prefer to use the same **.tif** file for both output and input.

TIP: Don't change the settings for **Transformation** or **Perspective**. These show the details of the paint buffer and perspective camera settings when the projector was created (including, for perspective cameras, field of vision and clipping planes).

If absolutely necessary, you can edit these, but it's usually easier to just set the main view to your desired settings and create a new camera.

8. To switch to the view from another projector, either:
   - right-click on the projector in the **Projectors** palette and select **Make Projector Current**, or
   - double-click on the projector in the **Projectors** palette.

   The view switches back to how it was when you created the projector, including any masking you had set and the **Painting Mode** that was in

use. The name of the projector in use appears on the current tab in the canvas.

TIP: You can also adjust projection mask properties in the **Projectors** palette. Note that if you adjust these properties, you need to click the **Update Only Masks From Projector** button to see the effect of your changes in the canvas. When you do, the equivalent projection mask properties in the **Projection** palette are also updated.

Similarly, you can adjust other global properties such as the **Painting Mode** or **Projection** behavior in the **Projectors** palette. If you do, click **Update Global Settings From Projector** to update the equivalent global properties (including masks) in the **Projection** palette.

TIP: Masks on projectors are hardwired to use the red color component. If you want to use another color component for your mask value, the **Shuffle** adjustment layer allows you to change the RGBA components so that any can be replaced by another.

Additionally, the **Luminosity** adjustment layer allows you to convert an RGB input to a grayscale output.

Unproject from Your Projector

1. To save a copy of the model as it appears onscreen, either:
   - right-click the projector in the **Projectors** palette, and select **Unproject**, or
   - click the **Unproject** button in the projector details, or
   - click the button to the right of the projector.

   *The snapshot saves to the filename specified as the **Output File Path**. If you have not specified an output file path, the **Pick Path** dialog displays, so you can set where the file should go.*
2. Mari projects your image in the background. You cannot edit the files until the projection is complete. While the projection is still taking place, Mari shows a running man icon at the bottom right of the main window. Click this icon to see a progress box.

Edit the File(s) Externally

In your preferred editor, open the file and edit it as required.

If you edit the whole snapshot and then project it all back onto your model in Mari, you may get some artifacts. Typically, you may see a black line at the "edges" where the projected image wraps around the surface.

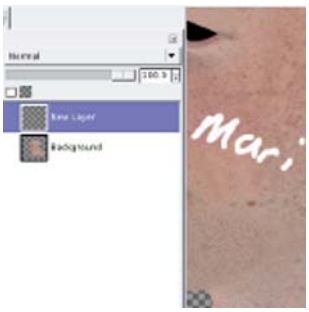
The original view in Mari, as the projector grabs it.

We edit the whole snapshot, even though we only want to change one small section.

Projected back onto the model, and rotated to show the blurring where the projected image "wraps" around the surface at the nose and cheek.

To avoid this:

- *Set your projectors up so they face straight onto the area you're working on.*
- *When editing the projected image, work on a different layer, only using the areas on the snapshot that you want to change.*



This time, we've created a new layer in the snapshot. We're only making changes on the new layer.

Now we're happy with our changes, we remove the background layer and save the file.

Now when we project it back onto the model, Mari only adds the "changes" layer. There are no artifacts, and it all looks good.

Project the File(s) Back onto the Model

Back in Mari, click either:

- **Import** — to load the image from the projector file and put it into the paint buffer, or
- **Project** — to load the image and bake it onto the surface.

*Mari loads the updated image from the location set in the **Input File Path** and projects it back onto the model. If you have not specified an input file path, the **Pick Path** dialog displays so you can select the file.*

EXPERIMENT: Using a sample project, try creating a projector, unprojecting, editing the unprojected file in an external program in some obvious way, and then projecting it back onto your model.

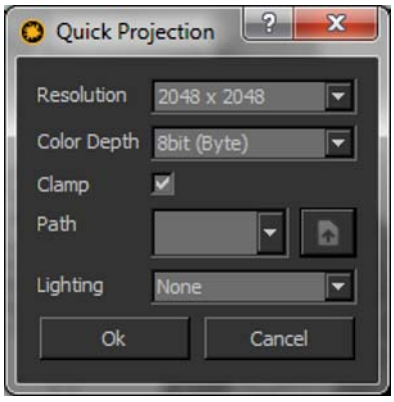
Use the Quick Project Functions

The Quick Project functions provide a fast and simple way to project and unprojected from the current view without having to create a projector first.

TIP: When using quick unproject and quick project, be careful not to change your view! If you need to change your view, create a projector as normal, so you can go back to the view and project correctly.

1. To unproject from the current view (that is, the current camera settings and visible shader), from the **Camera** menu, select **Quick Unproject**.

   *The **Quick Projection** dialog box displays, allowing you to set a resolution and file path for the unprojected image.*



2. Set the details:
   - **Path —** sets the filename and type. You set the image type by typing the image extension (for example, **.tif**, **.exr**, **.psd**, **.png**, **.tga**, and so on).

- **Lighting —** sets whether the lighting information is output along with the paint when you unproject. If it is, whether it's stored as a **Separate File** or — in the case of **.psd** files — an individual **Layer**.

If you have already set the quick projection details, Mari just unprojects and updates the file on disk.

3. You can now edit the unprojected image as normal (see Edit the File(s) Externally).

NOTE: Due to the nature of **.psd** files, the lighting displayed in your external image editor is an approximation of what you see in Mari.

TIP: When unprojecting a separate lighting layer it appears brighter, but when this is multiplied over an unlit pass in an external application, such as Nuke, the lighting appears as expected.

When projecting, you can either:

- project the image only onto the front patches visible in the current view, or
- project through all patches in the current view.

1. To project onto the front of the patches, from the **Camera** menu, select **Quick Project** Front.

To project...	From the Camera menu, select...
onto the front of the patches	**Quick Project Front**
through all the patches	**Quick Project Through**

*Mari loads the updated image from the location set in the **Quick Projection** dialog box and projects it back onto the model.*

2. If you want to change the quick projection settings, you can open the **Quick Projection** dialog box – from the **Camera** menu, select **Quick Projection Settings**.

Project onto a Model Using .fbx Files

To project onto a model using an **.fbx** file, you need the following files created using a 3rd party application:

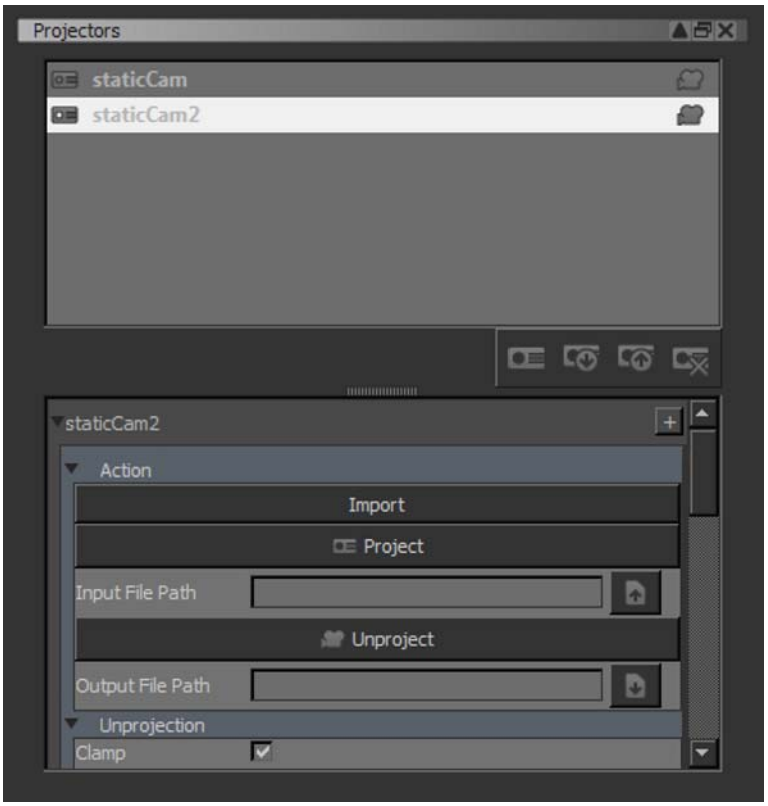
- a 3D model (**.obj** format)
- a camera file (**.fbx** format)
- texture files (**.jpg** format for example)

TIP: To make things easier later on, you should use the same naming convention for the camera and texture files when you create them.

1. Start Mari and import your model file.
2. In the **Projectors** palette either:
   • right-click and select **Load Projector**, or
   • click .
   *The **Load Projector** dialog box displays.*
3. Locate the **.fbx** file associated with your model and click **Open**.

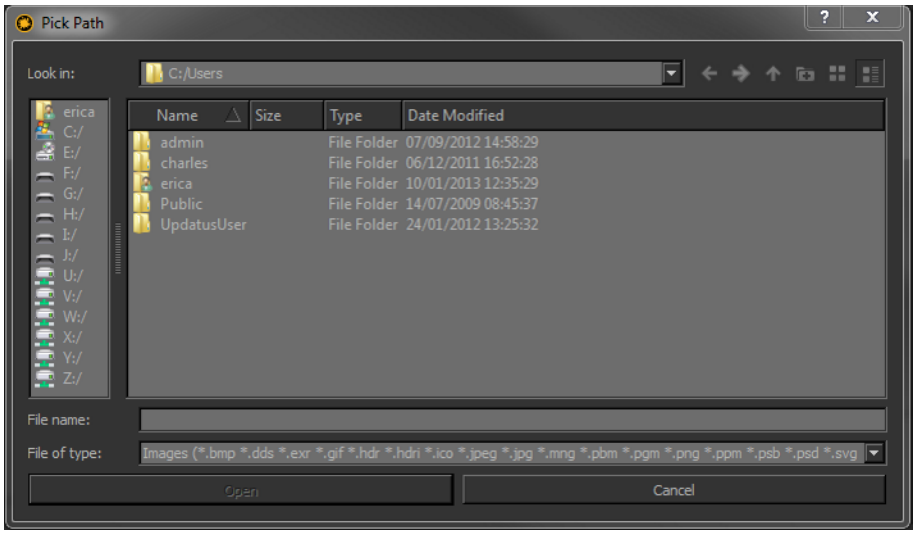
*The **Select Entity** dialog box displays.*

4. Click **Select All** to highlight all the cameras, then click **Import**.
   *Mari imports the camera data from the **.fbx** file and creates a corresponding number of projectors in the **Projectors** palette.*



You can click on the individual projectors in the **Projectors** palette to view the camera angles that you imported.

5. Select a projector in the **Projectors** palette and either:
   - enter the location of the associated texture file in the **Path** > **Input File Path** field, or
   - click to browse for the file location.
6. Select the required file and click **Open**.



You can set the other Projector attributes in the same way as described in Create the Projector on page 320.

7. In **Projectors** > **Action**, select either:
   - **Import** - to load the texture from the projector into the paint buffer, or
   - **Project** - to load the texture and bake it onto the surface.

   Mari projects the texture onto the model as specified.

   Once the texture is loaded, you should be able to tell immediately if you've loaded the wrong texture — simply change the file location in **Projectors** > **Input File Path** if this is the case.
8. Repeat steps 5 and 6 for all the imported projectors to complete the process.
9. Once you're happy with the results, you can export your work as described in Export Textures from Channels, Generate a Turntable from a Projector, or Save, Load, and Delete Projectors in the same way as regular projectors.

NOTE: It's worth mentioning that projection using **.fbx** files is not fool-proof and some extra texturing inevitably is required.

You can reduce the extra work needed by using more camera angles when creating the **.fbx** file.

EXPERIMENT: Try:

- Loading some textures through the wrong projector. Can you see that the image is incorrect?
- Loading textures in a different order. Notice how the textures overlay each other?

Generate a Turntable from a Projector

Mari lets you generate two kinds of turntables:

- **Render turntables** — this exports the current channel, using a selected shader.
- **Diagnostic turntables** — these export a set of channels, with flat lighting for each one, using Mari's default shader.

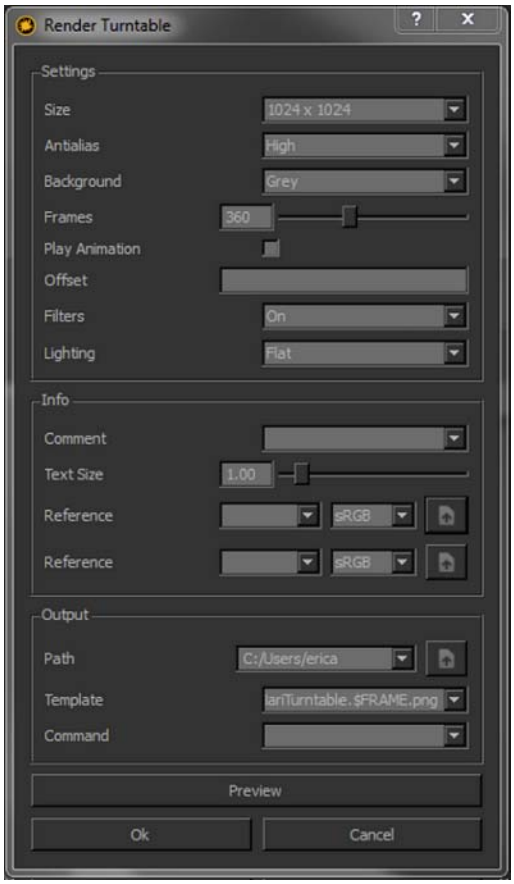
TIP: Turntables always rotate around the center of your current view. That is, the axis for a turntable is a line straight up the middle of the screen in the current view. This is in the center of the visible portion of the model.

You can zoom in on a particular part of a model and create a turntable that focuses on just that part of the model.

Generating a Render Turntable

1. Right-click on the projector and select **Render Turntable** from the drop-down menu.

   *The **Render Turntable** dialog box displays.*



2. Set the basic image details:
   - **size** of the generated images
   - the amount to **Antialias** the images.
   - **background** for the images — either grey, transparent or the current background in Mari.
   - the number of **Frames** to generate — that is, how many images should be in the sequence.
3. If you are using animated models or textures and want to render the turntable with the animation, check **Play Animation**. This disables the **Frames** control above because the frame range is taken from the **Play Controls** palette.
4. If you are combining multiple turntables, select an **Offset**. This lets you chain together sequences, by offsetting the image numbers.

   For example, with an offset of 0, the first image is MariTurntable_1.jpg. With an offset of 360, the first image is MariTurntable_361.jpg. You can use this to generate one sequence of frames for one axis, then move your model around and make another set of frames for another axis.

5. By default, the turntable images use the Example LUT (and any other visual filters you have applied to the view). If you want to create the images without a LUT, set the **Filters** to **Off**.
6. Pick the **Lighting** for the turntable images. You can pick **Flat**, **Basic**, or **Full** lighting.
7. You can also include reference images and text in the turntable images. If you want to include any other information in the turntable files, enter the details:
   - You can set a **Comment** (and change the **Text Size**) — Mari includes this at the bottom of the turntable.
   - You can also select up to two **Reference** images — Mari includes these to the left of your model. Specify the colorspace for each image (sRGB or Linear).
8. Set the **Path** where Mari should create the images, and set the **Template** for the filenames.

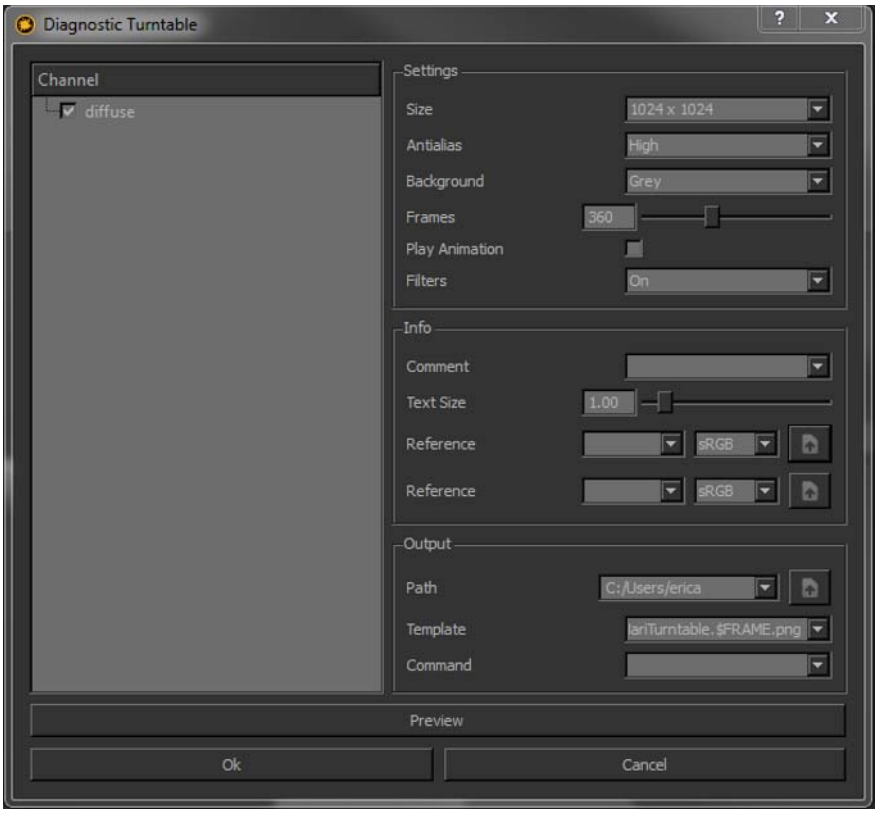
   *This must include the $FRAME variable, so Mari assigns the frame numbers correctly to the files. Mari can export turntables as either **.tif**, **.png**, **.jpg**, or **.tga** files — change the file extension in the **Template** to set the file type.*
9. Finally, you can enter any shell **Command** that you want Mari to run on the files once it finishes creating them.
10. If you want to check the placement of your reference images and comment text, click **Preview**. This generates the first image of the turntable so you can check the appearance.
11. Click **OK**.

    Mari generates a series of images for the turntable.

Generating a Diagnostic Turntable

1. Right-click on the projector and select **Diagnostic Turntable** from the dropdown menu.

   *The **Diagnostic Turntable** dialog box displays.*



2. In the **Channel** section of the dialog box, click to uncheck any channels you do not want to generate turntables for.
3. If you are using animated models or textures and want to render the turntable with the animation, check **Play Animation**. This disables the **Frames** control above because the frame range is taken from the **Play Controls** palette.
4. Set the other details for the turntable(s) to generate. The properties for diagnostic turntables are the same as for Generating a Render Turntable, except:
   - You cannot set an offset.
   - You cannot set the shader or lighting to use – all images use the default shader and flat lighting.

   In addition, you should ensure that the **Template** includes:
   - The $FRAME (%FRAME on Windows) variable, so Mari assigns the frame numbers correctly to the files.
   - The $CHANNEL (%CHANNEL on Windows) variable, so Mari includes the channel in the filename. If this is not present, and you export multiple channels, the later channels overwrite the earlier ones.
5. Click **OK**.

Mari generates a series of images for the turntable, once per channel. Generating turntables for a large number of channels takes a while. Mari shows the progress in the status bar at the bottom right:

Save, Load, and Delete Projectors

1. To save a projector to disk, in the **Projectors** palette, either:
   - right-click on an existing projector and select **Save Projector** from the dropdown menu, or
   - click on the button.

   *Mari displays a **Save** dialog box, for you to select a location on disk and set the projector's name.*
2. To save all the projectors in the project as a single file, right-click in the **Projectors** palette and select **Save All Projectors**.

   *Mari displays a **Save** dialog box, for you to select a location on disk and set the file name.*
3. To load a saved projector file, in the **Projectors** palette, either:
   - right-click and select **Load Projector** from the dropdown menu, or
   - click on the button.

   *Mari displays an **Open** dialog box, for you to find the projector file. This can be for a single or multiple projectors.*
4. To delete a projector, either:
   - in the **Projectors** palette, right-click on the projector and select **Remove Projector** from the dropdown menu, or
   - click on the button.

   Mari removes the selected projector.

27 Multiple Objects

Mari allows you to load multiple objects into a scene and paint them at the same time. This lets you paint objects in context – for example, you can paint all the elements of a character's costume by loading them up onto the character. You can show and hide objects, so you can easily switch between working only viewing a single object, and seeing how it fits with the other objects.

You can load multiple copies of a single object into the project. This allows you to, for example, build up a road scene with twenty sections of pavement, two lamp posts and a fire hydrant from three basic models (pavement section, lamp post, and hydrant).

When you create a project, you must load in an object. Once you've created the project, you can add more objects to it.

Initial project, with only the blacksmith torso model.

With other objects loaded.

If a project has two or more objects, you can remove objects from it. All projects must have at least one object.

Removing an object from a project has no effect on the source file for the object.

The objects within a project are listed in the **Objects** palette.

Channels and Shaders

Each object in the project has its own set of channels. When you add channels, you have the option to apply the action to all objects in your project.

When you add a new object, Mari creates a single channel, **diffuse**, to hold the diffuse color. You can add more channels as you would normally.

Similarly, each object has its own shaders. As with channels, there are default shaders but you must set up your custom shaders separately for each object. If you want to copy shaders from the **Shaders** palette of another object, use the **Ctrl/Cmd+C** and **Ctrl/Cmd+V** shortcuts to copy the shader and paste it into the **Shaders** palette for the current object.

Versioning

Objects within your project are versioned. If the source file for the model changes, you can load a new version of the file – Mari updates the model in your project, and keeps all the textures you've painted on it.

When you add a new version of a model, Mari assumes that the patch numbering hasn't changed, and projects the existing textures over the updated geometry. Whenever you add a new version of an object, check any textures you've already painted, especially if the patch numbering has changed.

Ambient Occlusion

Mari does not automatically calculate the ambient occlusion for objects. This is because ambient occlusion can take a long time to calculate for complex objects, and it is not required unless you are using ambient occlusion for masking or shading.

If you need ambient occlusion for an object, you must calculate it separately for each object.

Object Shadows

Each object in your scene casts shadows if depth projection is not disabled under **Preferences**. To display shadows, you must enable at least one light to cast shadows by checking the **Render Shadows** box in the **Lights** palette before adjusting the settings in the **Objects** palette. If this is not selected, objects with **Cast Shadows** enabled still don't appear to be casting shadows.

Shadows can be toggled on or off in the display by selecting the **Shadows** button in the **Lighting** toolbar.

If **Depth Projections** have been enabled in the **Preferences**, there are two related options that can be set to customize the shadow settings. **Depth Projection Resolution** and **Depth Projection texture Array Size** control the texture resolution and shadow coverage.

Both these options are dependent on the graphics card. Mari automatically attempts to set this option at the resolution that works best for your setup. If there aren't sufficient graphics memory resources, Mari degrades the quality of the shadows so as to use fewer resources until shadows can be rendered.

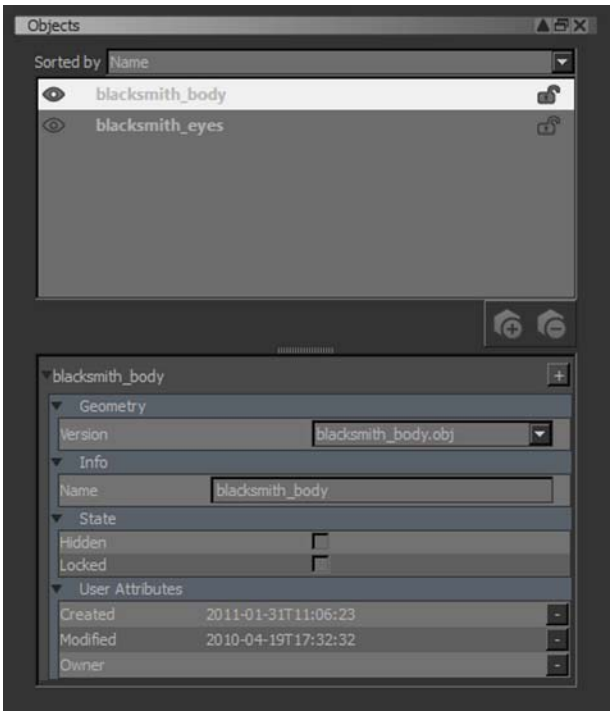
Steps for Working with Multiple Objects:

Working with multiple objects involves:

1. Adding and Removing Objects
2. Moving, Viewing, and Locking Objects
3. Adding and Removing Object Versions
4. Calculating Ambient Occlusion
5. Shadow Settings

Adding and Removing Objects

1. Start Mari and open your project.
2. Open the **Objects** palette.
   This displays all the objects in your project.



3. To add a new object, click the button.

   *The **Add Objects** dialog box displays, allowing you to select the new object file to add.*

4. Select the file to add and click **OK**.

   *Mari adds the new object to your project. Your new object has a single channel, **Diffuse** (to hold the diffuse color). You probably want to add additional channels (see Create and Delete Individual Channels).*

   You can add a file that already exists in your project. In this case, the new object is added as a second instance of the same file, and is initially on top of the first instance. To move it, see Moving, Viewing, and Locking Objects.

5. To remove an existing object, select it in the list and click the button.

   Mari asks you to confirm the deletion.

6. Click **Yes** to remove the object.

   You can remove any object from a project, as long as there is at least one object remaining afterwards.

Moving, Viewing, and Locking Objects

You can move objects around on your Mari canvas. For example, you might have added an object which has appeared on top of an existing object (where the objects appear depends on the configuration of the model file).

1. To move an object, select the **Pan Object** tool.
2. Click and drag to move the object. It's that simple.

Initial state.

Apron moved to the left.

Clicking on an object selects it. You can then configure and edit it (for example, to change to paint on a different channel).

3. The **Objects** palette lets you show/hide and lock/unlock the object:

- To show or hide an object, click .
- To lock or unlock an object, click .

4. If you move the object accidentally, or want to reset the object back to its original position, **Shift**-click to reset the object, or press the apostrophe key (') on the keyboard to reset all objects.

TIP: You can also use the **Pan Object** tool to move lights around (see Configure the Lighting).

Adding and Removing Object Versions

All objects start with an initial version. You can add and remove versions, as long as at least one version of the object remains. Mari does not enforce

any other restrictions – for example, if an object has three versions, you can delete any of the three versions.

TIP: Mari does not restrict what you can add as a new version (as we have no way of knowing what kinds of changes to the models you may need to make as you develop the asset!). As a result, you can add **any** object file as a new version of an existing file – so be careful that you don't add the wrong file by mistake.

To add a new version to an existing object:

1. Right-click on the object in the **Objects** palette, and select **Add Version** from the dropdown menu.

   *The **Add Version** dialog box displays.*

2. Select the file for the updated object and click **Open**.

   Mari adds the new version to the object's history and updates the display to show the new version.

TIP: Check any existing paint on the object, as it may have been distorted by the move to the new mesh.

Calculating Ambient Occlusion

To calculate the ambient occlusion for an object:

1. Select the object in the **Objects** palette.
2. Either:
   - from the **Objects** menu, select **Ambient Occlusion**, or
   - right-click on the object in the **Objects** palette and select **Ambient Occlusion** from the dropdown menu.

   Mari calculates the ambient occlusion for the object(s) in the current project. Depending on the size and complexity of your model, this may be a good time to take a break.

Shadow Settings

To allow your model to cast shadows:

1. Select the object in the **Objects** palette.
2. Under **Rendering**, enable **Cast Shadows.**

   Each object in your scene has the setting **Cast Shadows**.

   Selecting this checkbox casts shadows from your models onto other objects in the scene, based on your current lighting setup.

3. If you want to turn off shadows, toggle the **Shadows** button in the **Lighting** toolbar.

NOTE: Using variance maps allow the shadow edges to be smoothed out, but may sometimes cause rendering artifacts. To prevent these artifacts from occurring, disable the **Use Variance Maths** checkbox under **Preferences** > **GPU** > **Depth Projection**.

28 Painting Animated Objects

As well as static model files, Mari can import models that include animation data. This allows you to create a project based on an animated object, so you can check how your textures work as the model moves.

This support for animation lets you:

- Paint models in context — you can check how the textures look through the full range of motion.
- Paint specific textures tied into frame ranges. Imagine that in frame 37 of a sequence, a bullet ricochets off your giant robot. Mari lets you open the model, move to frame 37, and edit the relevant texture layers to show the chipped paint and the displacement from the impact. You can adjust and export texture layers frame by frame.

Keyframes

Keyframes define when the texture changes within a sequence. When you create a keyframe, Mari remembers what textures you've got on your model. Then:

- Any textures you add earlier in the sequence disappear when Mari reaches the keyframe.
- Any textures you add after the keyframe appear once Mari reaches the keyframe.
- When you export your textures, you can export a separate version of each patch for each keyframe.

Keyframes divide the sequence into parts. You can paint in any frame within a part, and that paint appears from the previous keyframe until the next keyframe.

The first frame of animation is always treated as a keyframe.

Example

For example, we're painting an object with a 12-frame animation. We have some existing paint. Here, the existing paint shows throughout the entire animation sequence:

1 - KEYFRAME	2	3	4
5	**6**	**7**	**8**
9	**10**	**11**	**12**

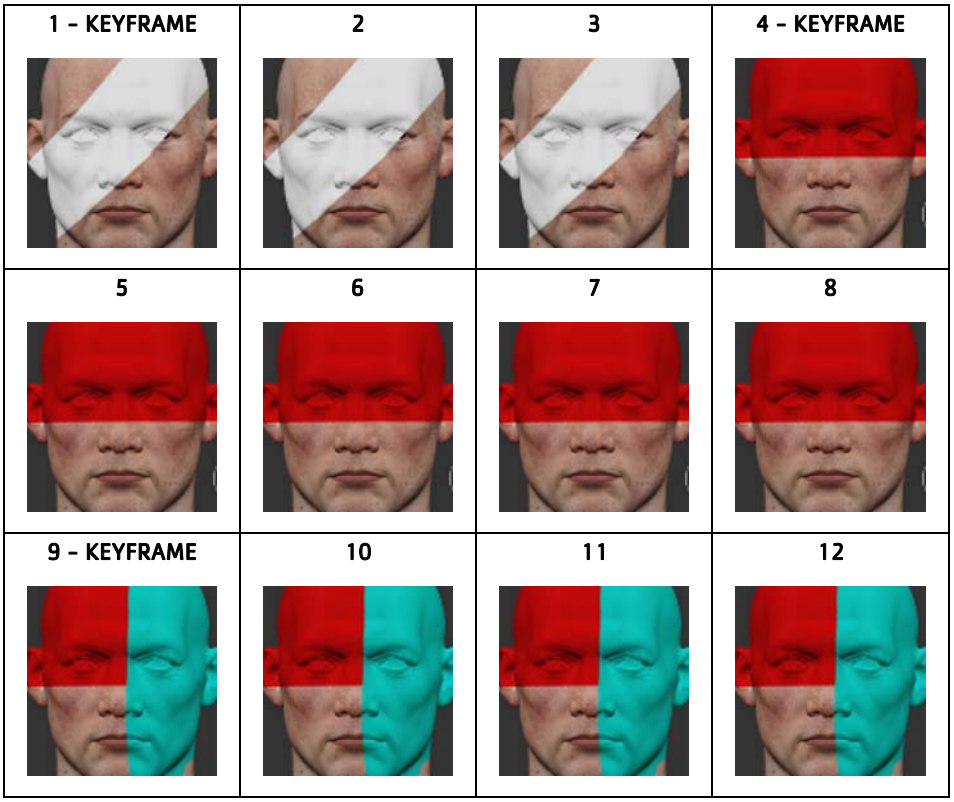
Now we set a keyframe at frame 4, and paint on frame 3 and frame 6. In this case:

- The paint on frame 3 appears from frames 1-3.
- The paint on frame 6 appears from frames 4-12.

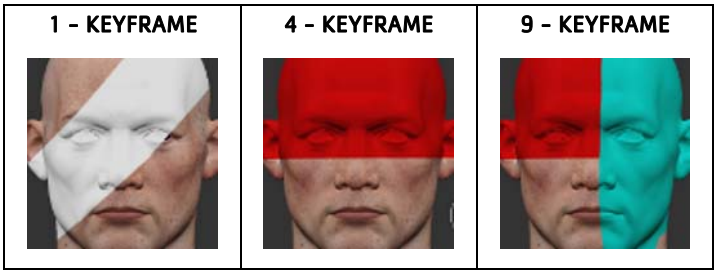
1 - KEYFRAME	2	3	4 - KEYFRAME
5	**6**	**7**	**8**
9	**10**	**11**	**12**

If we add another keyframe at frame 9 and paint on frame 10:

- The existing paint between frames 4 and 12 continues to display in that frame range, as it was in place before we added the new keyframe.
- The paint on frame 10 appears from frame 9 to 12:



When we export the layer, each patch has three versions — one per keyframe.



Steps for Working with Animated Objects

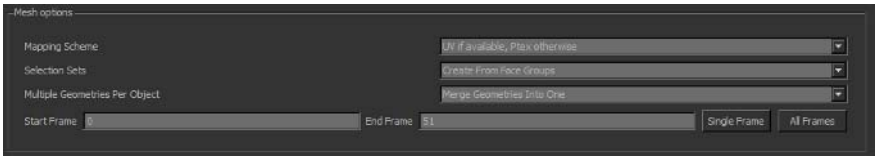
To use animated objects in your Mari project, follow these steps:

- Loading Animated Objects
- Playing Animation
- Painting Animated Textures
- Exporting Animated Textures

Loading Animated Objects

To load your animated object:

1. Select an animated **.obj** file sequence, and either:
   - create a new project with the file, or
   - add the object to an existing project.
2. On the **Mesh Options** tab, a new section displays, letting you set which frames to import.



In addition to the three mesh options offered when opening a new project, you can select:

- **Start Frame –** the first frame of the range that you want to import.
- **End Frame** — the last frame of the range that you want to import.
- **Single Frame** — set the controls so as to only import the first frame in the animation.
- **All Frames** — set the controls to import all the frames within the animation.

3. Finish creating the project or adding the new object as normal.

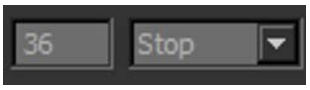
Playing Animation

To play back animation:

1. If it's not displayed, open the **Play Controls** palette.

2. Set the desired frame range in the boxes at the top of the palette. This lets you play only a subset of the animation.

3. To skip to a particular frame, type the frame in the frame box.



4. Set the playback mode in the dropdown.

   This can be:

   - **Loop** — keep looping through the animation (start to finish).
   - **Bounce** — keep looping back and forth through the animation (start to finish, then backwards back to the start).
   - **Stop** — play the animation once and stop.

5. Use the play controls to play through the animation:

Button	Effect	Shortcut key
	Move back one frame.	**Ctrl/Cmd+Left**
	Move back to the first frame.	**Ctrl/Cmd+Down**
No button	Move to the last frame.	**Ctrl/Cmd+Up**
	Play forward.	None.
	Stop playing.	None.
	Move forward one frame	**Ctrl/Cmd+Right**

   You can also pull the timeline control back and forth to move through frames:

Painting Animated Textures

Before you paint the animated textures, make sure you've painted all the non-animated elements of your textures. Any paint you add after you've inserted a keyframe only appears in one part of the animation (see the example above).

Once you've got your initial texture set, you can set keyframes.

Setting Keyframes

To set a keyframe:

1. Move to the frame that you want to set as your keyframe.
2. Click or press **Ctrl**/**Cmd**+**K** to set a keyframe.

   The new keyframe displays as a square in the keyframe timeline.

3. You can remove keyframes by selecting the keyframe in the timeline and clicking .

   Removing a keyframe also removes any paint for that keyframe. Be careful when removing keyframes if you've done any painting!

Painting the Textures

To paint a texture within a section of animation:

1. Move to a frame somewhere within the section of animation you want to paint.

   It doesn't matter which frame within the section you move to – the paint displays until the next keyframe.
2. Paint your textures as normal.

   Bear in mind that:

   - *Any textures you paint within one section disappear when you reach the next keyframe.*
   - *You can paint, then add another keyframe, to "build up" an animated texture (see the Example above for an explanation).*

Exporting Animated Textures

When you export an animated texture, Mari exports a separate file for each patch, for each keyframe. For example, a model with 20 patches painted as an animation with 3 keyframes gives 60 files when you export it.

To export an animated texture:

1. Open the **Export** dialog box as normal (from the **Layers** menu, select **Export**).
2. Set the export details as normal, except:
   - Include the $FRAME keyword in your **Template** — Mari replaces this with the frame number of the keyframe for the exported textures, padded out to five digits. For example, if you are exporting a layer called **color**, with keyframes at 9 and 6, then using an export **Template** of $FRAME_$LAYER.$UDIM.tif gives the following files for patch 0001: 00001_color.0001.tif, 00009_color.0001.tif, and 00016_color.00001.tif.
   - If you want to export only the textures for a particular frame range (which can include multiple keyframes), enter the range in the **Frame Range** field at the bottom of the **Export Layer** dialog box.

3. Click **All** or **Modified Only** as usual to start the export.

   Mari exports the files, creating a file for each patch/keyframe combination.

29 Extending Mari

You can add your own custom attributes to objects in Mari, as well as edit configuration files. In particular, you can specify sets of:

- keyboard shortcuts – Using a shortcut configuration file has the same effect as changing each shortcut individually in the **Manage Keyboard Shortcuts** dialog box, but lets you change all of them, as a single, consistent set. You can then also share a set of shortcuts with other users.
- channel presets – Using a channel preset configuration file, you can specify categories of preset channels (for example, for different types of assets), to display in the **Add Multiple Channels** dialog box when you create channels for a project in bulk.
- channel templates – Using a channel template configuration file, you can specify the filename formats to use in the **Add Multiple Channels** dialog box. These control the filenames that Mari looks for when importing textures into new channels.

You can also configure Mari using environment variables.

About Custom Attributes

You can attach custom attributes to most objects in Mari (such as channels, models, projectors and lights). Rather than information that Mari needs, this is information that can be useful for yourself or other users of the project to know. For example, you can add the assigned owner of the model as a custom attribute attached to the model.

You can choose to add custom attributes for the current session only or save them as part of the project so that they persist when you quit and relaunch Mari.

About Custom Shortcuts

Three types of keyboard shortcuts are available in Mari:

- The **default set** of shortcuts – that come with the application, as listed under **Help** > **Shortcuts**.
- A **custom set** of shortcuts – defined in a shortcut configuration file. This is a text file, called **Shortcuts.conf**, containing a list of one or more Mari actions and their shortcuts. Mari looks for this file in the following sub-directory of your home directory:
    - **.config/TheFoundry** (on Linux),

- **.mari\TheFoundry** (on Windows), or
- **.conf/TheFoundry** (on Mac).

NOTE: If there is no custom shortcut file, Mari uses the defaults. Configuration file shortcuts override default shortcuts.

- **GUI shortcut** – defined within the GUI, in the **Manage Keyboard Shortcuts** dialog box, for specific actions or project items. You do this by selecting **Edit** > **Keyboard Shortcuts**, or right clicking on a project item (channels, patches, shaders, lights, projectors, and things in shelves), or sets of those items, by selecting **Assign Shortcut** from the dropdown menu. *GUI shortcuts override default and configuration file shortcuts*.

So Mari accepts the default keyboard shortcuts for an action... unless that action is also specified in a shortcut configuration file, in which case Mari uses your custom shortcuts... unless you've overridden any of them in the GUI with individual custom shortcuts.

TIP: If you are distributing a custom shortcuts file to multiple users, be aware that any individual custom shortcuts they apply override your shortcuts file.

The **Shortcuts.conf** file does not have to list all possible Mari actions. You can set up a shortcut for any Mari action, but you can only assign shortcuts to project items (channels, patches, shaders, lights, projectors, and things in shelves), or sets of those items, from within the Mari GUI (not from within a customization file).

About Custom Channel Presets

You can add channels in bulk to a Mari project, using the **Channels** > **Channel Presets** option. This opens a dialog box, **Add Multiple Channels**, where you can select to create a set of channels in a project and optionally to also import existing textures. In the **Add Multiple Channels** dialog box, you can select a **Category**, which represents a preset bundle of channels. For example, if you select the "Vehicles" category, you get a list of standard channels for painting a vehicle.

Mari comes with several default categories, stored in a channel preset file. If you want, you can replace the defaults with your own customized channel preset categories. Mari custom channel presets files are **XML** files with an **.mtd** extension. Mari looks for them by default in the following sub-directory of your home directory:

- **.config/TheFoundry** (on Linux),
- **.mari\TheFoundry** (on Windows), or

- **.conf/TheFoundry** (on Mac).

You can select a different channel presets directory on the **Paths** tab of the **Mari Preferences** dialog box.

TIP: If you use a customized channel preset file, Mari ignores its default channel presets. Only the channels in your custom preset file are available.

About Custom Channel Templates

When you're adding channels in bulk through the **Add Multiple Channels** dialog box, you can select to import existing textures into the channels as Mari creates them. Mari looks for existing textures on disk. If it finds these textures, you can import them as the channels are created. The channel template controls the format of the filenames that Mari looks for. For example, one channel template is **$PATH/$SHOT/color$SHOT_color.$UDIM.tif**.

Mari comes with several default channel templates. If you want, you can add your own channel template files. Channel template files are straight text files, with an **.mtt** extension. Mari looks for them in the same directories as channel preset files.

About Environment Variables

Environment variables are named variables used to store a value, such as a specific file path. They are used to dynamically configure Mari's behavior when Mari is launched. For example, Mari uses the information stored in them to define where to place certain files.

You can:

- Set environment variables that Mari recognizes.
- Create your own environment variables that Mari looks for when importing images.
- Use environment variables to override any entry in the **Mari.conf** file. This file contains all user settings that are not project specific.

Steps for Using Custom Attributes

To use custom attributes in Mari, follow these steps:

1. Add Custom Attributes to Objects
2. Remove Custom Attributes from Objects

Steps for Customizing Mari

To customize your installation of Mari, follow these steps:

1. Review the Custom Shortcut File Format
2. Define Custom Shortcuts
3. Review the Custom Channel-Preset File Format
4. Define Custom Channel Presets
5. Review the Custom Channel Template File Format
6. Define Custom Channel Templates

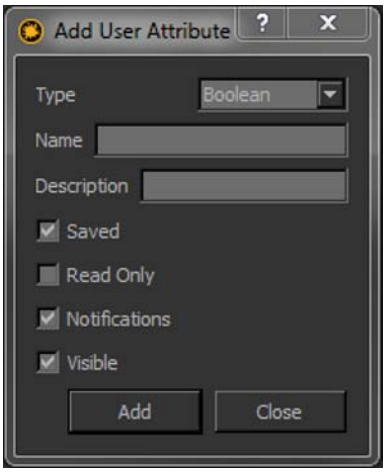
Steps for Setting Environment Variables

You can set all the environment variables mentioned in this chapter in the same manner. To do so, follow these steps:

1. Choose an Environment Variable to Set
2. Set the Environment Variable
3. Check That the Variable Now Exists

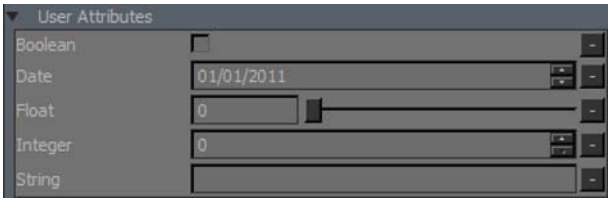
Add Custom Attributes to Objects

1. Start Mari and open your project.
2. Open a palette where you want to add custom attributes (for example, the **Channels**, **Objects**, or **Projectors** palette).
3. Select the object you want to add custom attributes to and click the + button. You may need to scroll right in the palette to see this button.
   *The **Add User Attribute** dialog displays.*



4. Set the following:

- **Type** — whether the attribute's value is an on/off setting (**Boolean**), a date (**Date**), a floating point number (**Float**), an integer number (**Integer**), or a text string (**String**).



- **Name** — the name of the attribute. Unless you uncheck **Visible** below, this name appears under **User Attributes** in the palette (in the below example, the name is **MyAttribute**). Note that the name should only include alphanumeric characters and cannot include spaces.

- **Description** — an optional description of the attribute. This appears in a tooltip if you hover the mouse over the attribute in the palette.
- **Saved** — if this is on, the attribute persists when you quit and relaunch Mari. If this is off, the attribute is only added to the current session of Mari.
- **Read Only** — if this is on, users cannot modify the attribute's value. If this is off, the value is shown in the palette where users can adjust it.
- **Visible** — if this is on, the attribute appears in the palette. If this is off, you cannot see the attribute.

NOTE: The above settings cannot be edited later. If you want to change them, you need to remove the attribute and create a new one.

5. Click **Add**.
6. If necessary, edit the attribute's value in the palette.

Remove Custom Attributes from Objects

1. Start Mari and open your project.
2. Open a palette where you want to remove a custom attribute from (for example, the **Channels**, **Objects**, or **Projectors** palette).
3. To remove the attribute, click the button next to it in the palette.

   Mari prompts you to confirm that you want to remove the attribute.
4. Click **Remove**.

Review the Custom Shortcut File Format

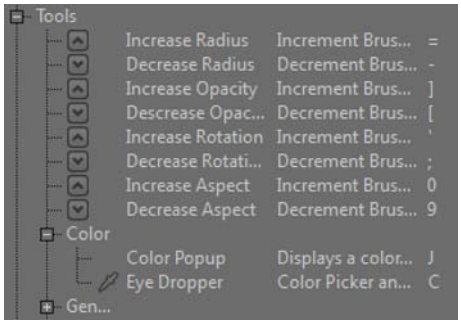
1. Read through the following information about the required format of a Mari custom shortcuts file.
2. Study the example default shortcuts file.

Text File: <action>=<key(s)>

A default (**DefaultShortcuts.conf**) or custom (**Shortcuts.conf**) shortcuts configuration file is a text file that starts with **[Shortcuts]** and then lists Mari actions and their shortcut keys, one per line. The actions are the same as what you find in the **Manage Keyboard Shortcuts** dialog box in Mari, with the hierarchies spelled out, separated by a backslash (\), and with "%20" for spaces. After each action is an equal sign (=) and then the key or key combination. For key combinations, you use one or more modifier" keys, like **Ctrl**/**Cmd** or **Alt** with a plus sign (+) between each.

For example, below are some shortcuts in the **Manage Keyboard Shortcuts**

dialog box alongside their listings in the default shortcuts configuration file.

GUI dialog box entries	Configuration file listings
	[Shortcuts] ... Mari\Tools\Increase%20Radius="=" Mari\Tools\Decrease%20Radius=- Mari\Tools\Increase%20Opacity=] Mari\Tools\Descrease%20Opacity=[Mari\Tools\Increase%20Rotation=' Mari\Tools\Decrease%20Rotation=";" Mari\Tools\Increase%20Aspect=0 \Mari\Tools\Decrease%20Aspect=9 ... Mari\Tools\Color\Eye%20Dropper=C Mari\Tools\Color\Color%20Popup=j ... Mari\Tools\Toggle%20Brushes=N

TIP: Case is not important. The lines **Mari\Tools\General\Transform%20Paint=M** and **Mari\Tools\General\Transform%20Paint=m** have the same meaning. If you want to set a shortcut key to only the uppercase version of a character, include **Shift** in the key sequence. For example: **Mari\Tools\General\Transform%20Paint=Shift+M** only invokes the **Transform Paint** tool when you hold down both **Shift** and **M** at the same time.

Using Modifier Keys

Some modifier keys can only be used as part of key combinations — you cannot assign a shortcut to the **Ctrl/Cmd** key by itself, for example. This table lists the special keys available, the text strings to use for them in **Shortcuts.conf**, and whether the key can be used on its own.

Key	Text string in file	Can be used by itself?
Ctrl/Cmd	Ctrl	No
Shift	Shift	No
Alt (not Alt Gr)	Alt	No

Key	Text string in file	Can be used by itself?
(or **Windows** key) **Cmd** key for Mac	Meta	No
Escape	Esc	Yes
Caps Lock	CapsLock	Yes
Space	Space	Yes
F1 – F12	F1 – F12	Yes
Scroll Lock	ScrollLock	Yes
Pause	Pause	Yes
Insert	Ins	Yes
Left Arrow	Left	Yes
Right Arrow	Right	Yes
Up Arrow	Up	Yes
Down Arrow	Down	Yes
Home	Home	Yes
End	End	Yes
Page Up	PgUp	Yes
Page Down	PgDown	Yes
Number Lock	NumLock	Yes
Backslash	\\	Yes

TIP: You can use **** (backslash) as a shortcut, but as it is used as a directory separator in the action part of the line, you must use a double backslash to make it clear that you are actually assigning the key rather than indicating a directory.

Example: DefaultShortcuts.conf

The default shortcuts file, **DefaultShortcuts.conf**, is included in the following sub-directory of the Mari application directory:

- **Media/Settings** (on Linux),
- **Bundle\Media\Settings** (on Windows), or
- **Media/Settings** (on Mac).

We recommend you create your custom shortcuts by copying this file and editing it, rather than starting from scratch.

NOTE: If you are using a Mac, you need to replace all references of **Ctrl** in the table below to **Cmd** for it to work correctly in Mari.

```
[Shortcuts]
Mari\Tools\General\Select=S
Mari\Tools\General\Scrub=Shift+?
Mari\Tools\General\Mouse%20Gestures=\\
Mari\Tools\General\Hide%20Widgets=/
Mari\Tools\General\Transform%20Paint=M
Mari\Tools\Default%20Brushes\Paint=P
Mari\Tools\Default%20Brushes\Paint%20Through=U
Mari\Tools\Default%20Brushes\Eraser=E
Mari\Tools\Image\Marquee=M
Mari\Canvas\Bake=B
Mari\Tools\Camera\Rotate=Alt+
Mari\Tools\Camera\Zoom=Alt+Ctrl+
Mari\Tools\Camera\Pan=Alt+Shift+
Mari\Tools\Camera\Spin=Ctrl+R
Mari\Canvas\Camera\Focus=F
Mari\Tools\Color\Eye%20Dropper=C
Mari\Tools\Color\Color%20Popup=j
Mari\Tools\General\Shelf%20Popup=k
Mari\Tools\General\Image%20Popup=l
Mari\Tools\General\Pie%20Selector=F9
Mari\Animation\Start%20/%20Stop%20Animation=Space
Mari\Animation\Step%20Forwards=Ctrl+Right
Mari\Animation\Step%20backwards=Ctrl+Left
Mari\Animation\Add%20Keyframe=Ctrl+K
Mari\Animation\Rewind%20Animation=Ctrl+Down
Mari\Animation\Fastforward%20Animation=Ctrl+Up
```

```
Mari\Canvas\Camera\Camera%20Left=1
Mari\Canvas\Camera\Camera%20Right=2
Mari\Canvas\Camera\Camera%20Top=3
Mari\Canvas\Camera\Camera%20Bottom=4
Mari\Canvas\Camera\Camera%20Front=5
Mari\Canvas\Camera\Camera%20Rear=6
Mari\Canvas\Bake=B
Mari\Onscreen%20Controls\Adjust%20Radius=R
Mari\Onscreen%20Controls\Adjust%20Rotation=W
Mari\Onscreen%20Controls\Adjust%20Squish=Q
Mari\Onscreen%20Controls\Adjust%20Opacity=O
Mari\Actions\Quit=Ctrl+Q
Mari\Actions\Undo=Ctrl+Z
Mari\Actions\Redo=Ctrl+Y
Mari\Actions\Previous%20View="Ctrl+,"
Mari\Actions\Next%20View=Ctrl+.
Mari\Actions\Hide%20Palettes=Home
Mari\Project\Open=Ctrl+O
Mari\Project\Save%20As=Ctrl+Shift+S
Mari\Project\Save=Ctrl+S
Mari\Project\New=Ctrl+N
Mari\Project\Close=Ctrl+W
Mari\Project\Lighting\Flat=F1
Mari\Project\Lighting\Basic=F2
Mari\Project\Lighting\Full=F3
Mari\Palettes\Colors=F6
Mari\Palettes\Tools=F7
Mari\Palettes\Brushes=F8
Mari\Canvas\Camera\View All=A
Mari\Painter\Swap%20foreground%20and%20background=X
Mari\Project\Project%20Explorer\Quick%20Paste=Ctrl+V
Mari\Project\Project%20Explorer\Quick%20Copy=Ctrl+C
```

```
Mari\Project\Project%20Explorer\Select Invert=Ctrl+I
Mari\Project\Project%20Explorer\Select All=Ctrl+A
Mari\Project\Project%20Explorer\Select None=Ctrl+E
Mari\Project\Project%20Explorer\Toggle%20Hidden=Ctrl+H
Mari\Project\Project%20Explorer\Hide%20Selected=H
Mari\Project\Project%20Explorer\Hide%20Unselected=Shift+H
Mari\Project\Project%20Explorer\Show%20All=Ctrl+Shift+H
Mari\Painter\Paint%20Mask=Q
Mari\Painter\Toggle%20Edge%20Mask=G
Mari\Painter\Toggle%20Show%20Painting=.
Mari\Painter\Show%20Paintable=
Mari\Projection\Toggle%20Mask%20Preview%20Enabled=","
Mari\Painter\Invert=Shift+I
Mari\Channels\Toggle%20Channels=T
Mari\Channels\Next%20Channel=PgDown
Mari\Channels\Previous%20Channel=PgUp
Mari\Tools\Toggle%20Brushes=N
Mari\Tools\Decrease%20Aspect=9
Mari\Tools\Decrease%20Radius=-
Mari\Tools\Decrease%20Rotation=";"
Mari\Tools\Descrease%20Opacity=[
Mari\Tools\Increase%20Aspect=0
Mari\Tools\Increase%20Opacity=]
Mari\Tools\Increase%20Radius="="
Mari\Tools\Increase%20Rotation='
Mari\Project\Project%20Explorer\Shader%201=Ctrl+1
Mari\Project\Project%20Explorer\Shader%202=Ctrl+2
Mari\Project\Project%20Explorer\Shader%203=Ctrl+3
Mari\Project\Project%20Explorer\Shader%204=Ctrl+4
Mari\Painter\Set%20Colors%20to%20Black%20And%20White=D
```

Define Custom Shortcuts

To create a Mari shortcut customization file:

1. Copy the Mari default shortcuts file, **DefaultShortcuts.conf**, from the following sub-directory of the Mari application directory:
   - **Media/Settings** (on Linux),
   - **Bundle\Media\Settings** (on Windows), or
   - **Media/Settings** (on Mac).
2. Rename the file as a custom shortcuts file: **Shortcuts.conf**.
3. Edit the file, replacing the defaults with your custom shortcuts.
4. Save the file in the following sub-directory of your home directory:
   - **.config/TheFoundry** (on Linux),
   - **.mari\TheFoundry** (on Windows), or
   - **.conf/TheFoundry** (on Mac).

TIP: If you set an illegal key combination in the **Shortcuts.conf** file, Mari ignores the line. For example, the following lines would be ignored:

Mari\Tools\General\Select=Tab (you cannot use tab as part of a shortcut)

Mari\Tools\General\Transform%20Paint=Altw (needs a **+** between the two characters).

If the same function key is assigned to more than one function, Mari ignores both settings and uses the defaults. If a function is assigned to more than one key combination, Mari uses the defaults.

Review the Custom Channel-Preset File Format

1. Read through the following information about the required format of a Mari custom presets file.
2. Study the example default presets file.

XML File: Header, Details, Closing Blocks

Channel preset files are **XML** files with a **.mtd** extension. Each file can hold as many channels as you want, divided into categories. The files can have any name you want, as long as they have the extension **.mtd**. Mari picks up the settings from all **.mtd** files present, so you can use multiple files. For example, you could use one local **.mtd** file for the user's specific channel presets and one on a network drive for the group's presets.

Each file must have a **header** block, one **details** block per channel, and a

closing block. Below are examples of each type of block, with values you need to change **bolded** and explained in a table below.

Header Block

This must be the first thing in the file.

```
<!DOCTYPE MariML>
<Mari Version="2" >
<MriSerializableObject Type="MriSerializableObject" >
<objectName Type="QString" ></objectName>
<selected Type="bool" >false</selected>
<m_Channels Size="1" Type="MriChannelInfo"
ContainerType="QVector">
```

You must set the following values:

Setting	Meaning	Example value
m_Channels Size	Number of channels in this preset file.	1

Details Blocks

You need one details block for each channel. Separate the blocks with a blank line.

```
<MriChannelInfo Type="MriChannelInfo" >
<objectName Type="QString" ></objectName>
<selected Type="bool" >false</selected>
<channelName Type="QString" >My Custom Channel</
channelName>
<fileFormat Type="QString" ></fileFormat>
<path Type="QString" ></path>
<scalar Type="bool" >false</scalar>
<width Type="int" >4096</width>
<height Type="int" >4096</height>
<channels Type="QString" >RGB</channels>
<depth Type="QString" >Byte</depth>
<color Type="MriColor" >(0.5,0.5,0.5,1)</color>
<category Type="QString" >Custom</category>
</MriChannelInfo>
```

You must set the following values:

Setting	Meaning	Example value
channelName	Name for the channel to create.	My Custom Channel1
scalar	Whether the channel is color or scalar. This is a Boolean; true means a scalar channel, false means color.	false
width	Width of patches in the channel. Must hatch the heightType.	4096
height	Height of patches in the channel. Must match the widthType.	4096
channels	The color channels for the new channel. Must be one of: RGBA RGB 1 2	RGB
depth	Color depth for the channel. Must be one of: Byte Half Float	Byte
color	Default color for the new channel. This is the color that Mari fills the channel with when created. This must be entered as a floating value, with values from 0 to 1 for the Red, Green, Blue and Alpha.	0.5,0.5,0.5,1
category	The category for the channel. When the user selects this category in the Channel Presets dialog, this channel appears in the list.	Custom

TIP: If the width and height are greater than a project's maximum resolution, Mari creates the channel at the project's maximum resolution.

Closing Block

This must be the last thing in the file.

```
</m_Channels>
</MriSerializableObject>
</Mari>
```

Example: DefaultChannels.mtd

The default channel presets file is included in Mari in the Media/Settings directory (**DefaultChannels.mtd**). We recommend you create your custom channels file by copying this and editing it, rather than starting from scratch.

```
<!DOCTYPE MariML>
<Mari Version="2" >
 <MriSerializableObject Type="MriSerializableObject" >
  <objectName Type="QString" ></objectName>
  <selected Type="bool" >false</selected>
  <m_Channels Size="23" Type="MriChannelInfo"
ContainerType="QVector" >

   <MriChannelInfo Type="MriChannelInfo" >
    <objectName Type="QString" ></objectName>
    <selected Type="bool" >false</selected>
    <channelName Type="QString" >color</channelName>
    <fileFormat Type="QString" ></fileFormat>
    <path Type="QString" ></path>
    <scalar Type="bool" >false</scalar>
    <width Type="int" >4096</width>
    <height Type="int" >4096</height>
    <channels Type="QString" >RGB</channels>
    <depth Type="QString" >Byte</depth>
    <color Type="MriColor" >(0.5,0.5,0.5,1)</color>
    <category Type="QString" ></category>
   </MriChannelInfo>
```

```
<MriChannelInfo Type="MriChannelInfo" >
 <objectName Type="QString" ></objectName>
 <selected Type="bool" >false</selected>
 <channelName Type="QString" >specRough</channelName>
 <fileFormat Type="QString" ></fileFormat>
 <path Type="QString" ></path>
 <scalar Type="bool" >true</scalar>
 <width Type="int" >4096</width>
 <height Type="int" >4096</height>
 <channels Type="QString" >RGB</channels>
 <depth Type="QString" >Byte</depth>
 <color Type="MriColor" >(0.5,0.5,0.5,1)</color>
 <category Type="QString" ></category>
</MriChannelInfo>

<MriChannelInfo Type="MriChannelInfo" >
 <objectName Type="QString" ></objectName>
 <selected Type="bool" >false</selected>
 <channelName Type="QString" >dispFine</channelName>
 <fileFormat Type="QString" ></fileFormat>
 <path Type="QString" ></path>
 <scalar Type="bool" >true</scalar>
 <width Type="int" >4096</width>
 <height Type="int" >4096</height>
 <channels Type="QString" >RGB</channels>
 <depth Type="QString" >Byte</depth>
 <color Type="MriColor" >(0.5,0.5,0.5,1)</color>
 <category Type="QString" ></category>
</MriChannelInfo>

<MriChannelInfo Type="MriChannelInfo" >
```

```
 <objectName Type="QString" ></objectName>
 <selected Type="bool" >false</selected>
 <channelName Type="QString" >dispBroad</channelName>
 <fileFormat Type="QString" ></fileFormat>
 <path Type="QString" ></path>
 <scalar Type="bool" >true</scalar>
 <width Type="int" >4096</width>
 <height Type="int" >4096</height>
 <channels Type="QString" >RGB</channels>
 <depth Type="QString" >Byte</depth>
 <color Type="MriColor" >(0.5,0.5,0.5,1)</color>
 <category Type="QString" ></category>
</MriChannelInfo>

<MriChannelInfo Type="MriChannelInfo" >
 <objectName Type="QString" ></objectName>
 <selected Type="bool" >false</selected>
 <channelName Type="QString" >dirt</channelName>
 <fileFormat Type="QString" ></fileFormat>
 <path Type="QString" ></path>
 <scalar Type="bool" >false</scalar>
 <width Type="int" >2048</width>
 <height Type="int" >2048</height>
 <channels Type="QString" >RGB</channels>
 <depth Type="QString" >Byte</depth>
 <color Type="MriColor" >(0.5,0.5,0.5,1)</color>
 <category Type="QString" ></category>
</MriChannelInfo>

<MriChannelInfo Type="MriChannelInfo" >
 <objectName Type="QString" ></objectName>
 <selected Type="bool" >false</selected>
```

```
    <channelName Type="QString" >dirtMask</channelName>
    <fileFormat Type="QString" ></fileFormat>
    <path Type="QString" ></path>
    <scalar Type="bool" >true</scalar>
    <width Type="int" >4096</width>
    <height Type="int" >4096</height>
    <channels Type="QString" >RGB</channels>
    <depth Type="QString" >Byte</depth>
    <color Type="MriColor" >(1,1,1,1)</color>
    <category Type="QString" ></category>
   </MriChannelInfo>

  </m_Channels>
 </MriSerializableObject>
</Mari>
```

Define Custom Channel Presets

To create a Mari custom channel presets file:

1. Copy the Mari default channel presets file, **DefaultChannels.mtd**, from the following sub-directory of the Mari application directory:
   - **Media/Settings** (on Linux),
   - **Bundle\Media\Settings** (on Windows), or
   - **Media/Settings** (on Mac).
2. Rename the file to something descriptive, but keep the **.mtd** extension.
3. Edit the file, replacing the key values.
4. Save the file in the following sub-directory of your home directory:
   - **.config/TheFoundry** (on Linux),
   - **.mari\TheFoundry** (on Windows), or
   - **.conf/TheFoundry** (on Mac).

   This is also the directory specified on the **Channels** tab of the **Mari Preferences** dialog box.

Review the Custom Channel Template File Format

1. Read through the following information about the required format of a Mari custom presets file.
2. Study the example default channel template file.

Text File: <name>="<format>"

A default (**DefaultTemplates.mtt**) or custom (**<filename>.mtt**) channel templates file is a text file that starts with **[Templates]]** and then lists channel templates and their file formats.

Each line is a channel template. The name is listed on the left, and the format in quotes on the right. The format can include the following variables, and on Linux they are preceded with the dollar sign (**$**) while on Windows they're preceded with the percent sign (**%**):

Variable	Description
Any of the user's environment variables **except** PATH	These are taken from the shell from which the user opened Mari. Note that PATH here has a specific meaning - it is not the user's standard PATH.
PATH	The project's root path, as set in the **Root Path** field of the **Add Multiple Channels** dialog box. This overrides the normal PATH variable from the user's original shell.
PREFIX	The filename prefix, as set in the **Prefix** field of the **Add Multiple Channels** dialog box.
CHANNEL	Name of the individual channel.
UDIM	Udim number for each individual patch.

Example File: DefaultTemplates.mtt

On Linux:

```
[Templates]
Default="$TEXTURE_HERO_DIR/tif/$SHOT/$CHANNEL/
$SHOT_$CHANNEL_$UDIM.tif"
```

On Windows:

```
[Templates]
Default="%TEXTURE_HERO_DIR/tif/%SHOT/%CHANNEL/
%SHOT_%CHANNEL_&UDIM.tif"
```

Define Custom Channel Templates

To create a Mari custom channel templates file:

1. Copy the Mari default channel templates file, **DefaultTemplates.mtt**, from the following sub-directory of the Mari application directory:
   - **Media/Settings** (on Linux),
   - **Bundle\Media\Settings** (on Windows), or
   - **Media/Settings** (on Mac).
2. Rename the file to something descriptive, but keep the **.mtt** extension.
3. Edit the file, replacing the key values.
4. Save the file in the following sub-directory of your home directory:
   - **.config/TheFoundry** (on Linux),
   - **.mari\TheFoundry** (on Windows), or
   - **.conf/TheFoundry** (on Mac).

   This is also the directory specified on the **Channels** tab of the **Mari Preferences** dialog box.

Choose an Environment Variable to Set

1. Read through the following information on Mari environment variables and how you can use them.
2. Select an environment variable you want to set.

Environment Variables That Mari Recognizes

This table lists the environment variables Mari recognizes.

Environment variable	Description	Example value
MARI_CACHE	The location(s) of the Mari cache files. This can be just one directory or several (to make caching faster). You should separate multiple path entries by a **:** (colon) on Linux and Mac, or a **;** (semi-colon) on Windows. Cache directories must be permanent directories and not temporary locations as they contain important project file information. If this variable is not set, Mari prompts you where to store the cache files when you first launch it. Note that when you set this environment variable, Mari takes its value and stores it in the **CacheLocations.ini** file (by default found in the **.config/TheFoundry** sub-directory of your home directory on Linux and Mac, or the **.mari\TheFoundry** sub-directory on Windows). Be cautious of changing this. The set of cache locations must not be changed after project creation; doing so results in project corruption. For more information please read the chapter on Installation and Launch in the *Getting Started Guide*.	**On Linux**: /user/[MyPath]/Mari-Cache **On Windows**: C:\[MyPath]\MariCache **On Mac:** /user/[MyPath]/Mari-Cache
MARI_DEFAULT_ARCHIVE_PATH	The default path to load and save project archives.	
MARI_DEFAULT_CAMERA_PATH	The default path to load and save cameras and projectors.	
MARI_DEFAULT_EXPORT_PATH	The default path to export textures to.	
MARI_DEFAULT_GEOMETRY_PATH	The default path to load geometry from.	
MARI_DEFAULT_IMAGE PATH	The default path to load and save reference images.	
MARI_DEFAULT_IMPORT_PATH	The default path to import textures from.	
MARI_DEFAULT_RENDER_PATH	The default path to save renders such as turntables.	

Environment variable	Description	Example value
MARI_DEFAULT_SHELF_PATH	The default path to load and save shelf files.	
MARI_LOG_FILE	The name and location of the Mari log file. If this variable is not set, the log is saved to: • **MariLog.txt** in the **/home/[Username]/Mari/Logs** directory on Linux and Mac, or • **MariLog.txt** in the **C:\Users\[Username]\Documents\Mari\Logs** directory on Windows.	**On Linux**: /user/Mari/MyLog.txt **On Windows**: C:\TEMP\MyLog.txt **On Mac:** /user/Mari/MyLog.txt
MARI_NAMEDFILEIMPORT_SEQUENCELIMIT	The maximum number of patches objects are allowed to have for the **Named Files** tab to appear on the **Import Channel** and **Export Channel** dialogs. By default, the **Named Files** tab does not appear if you have more than 20 patches in your object, but you can change this using the **Patch Cutoff** preference. You can use the **Named Files** tab to import or export individual files rather than a sequence of patches with the udim number (1001, 1002, etc.) in the file names.	30
MARI_SCRIPT_PATH	A list of paths to run scripts from.	**~/Mari/Scripts** on Linux and Mac, or **C:\Users\username\Documents\Mari\Scripts** on Windows
MARI_USER_PATH	Root of the default user path.	**~/Mari** on Linux and Mac, or **C:\Users\username\Documents\Mari** on Windows.

Environment variable	Description	Example value
MARI_WORKING_DIR	The location of temporary Mari files, such as crash logs. If this variable is not set, the files are saved to the same path as the log file.	• **MariLog.txt** in the **/home/[Username]/Mari/Logs** directory on Linux and Mac, or • **MariLog.txt** in the **C:\Users\[Username]\Documents\Mari\Logs** directory on Windows.
XDG_CONFIG_HOME	The location of the directory where the Mari configuration files are stored. If you're on Windows, you can't change this directory, and the **Mari.ini** file can only be stored in the default location: **[drive letter]:\Users\[user]\.mari\TheFoundry**.	**On Linux and Mac**: /SharedDisk/Mari

Image Importing

You can set environment variables that Mari looks for when importing images. You can call these variables anything, and as long as you precede the variable name in the image import path with **$** on Linux and Mac, or **%** on Windows. Mari replaces that part of the path with the value of the environment variable. For example:

On Linux and Mac, if the import path is **$SHOW_BASE_DIR/Images/$SHOT**, **$SHOW_BASE_DIR** and **$SHOT** is replaced by the values of the environment variables **SHOW_BASE_DIR** and **SHOT**.

On Windows, if the import path is **%SHOW_BASE_DIR%/Images/%SHOT%**, **%SHOW_BASE_DIR** and **%SHOT** is replaced by the values of the environment variables **SHOW_BASE_DIR** and **SHOT**.

Overriding Mari Configuration File

You can also use environment variables to override any setting in the Mari configuration file named **Mari.conf** (on Linux and Mac) or **Mari.ini** (on Windows). This file contains all user settings that are not project specific. By default, you can find it in the following sub-directory of your home directory:

- **.config/TheFoundry** (on Linux),
- **.mari\TheFoundry** (on Windows), or

- **.conf/TheFoundry** (on Mac).

Here's a short example of what you may find the Mari configuration file:

```
[HUD]
Canvas_fps_hudVisibility=2
Canvas_triangleCount_hudVisibility=2
Project_currentObjectName_hudVisibility=2
Project_currentChannelName_hudVisibility=2

[Application]
ThreadCount=5
```

To override a setting in the Mari configuration file, you need to set an environment variable of the format **MARI_<Group>_<Name>**. So, for example, if you wanted to override the application thread count setting in the above example file and set it to two rather than five, you could set **MARI_APPLICATION_THREADCOUNT** to 2.

Set the Environment Variable

On Linux

1. The procedure for setting an environment variable depends on what your default shell is. To get the name of the shell you are using, launch a shell and enter **echo $SHELL**.

   This returns the type of shell you are using.
2. Depending on the output of the previous step, do one of the following:
   - If your shell is a **csh** or **tcsh** shell, add the following command to the **.cshrc** or **.tcshrc** file in your home directory: **setenv VARIABLE value**. Replace **VARIABLE** with the name of the environment variable and **value** with the value you want to give it, for example:

     setenv MARI_CACHE /User/Temp/Mari
   - If your shell is a **bash** or **ksh** shell, add the following command to the **.bashrc** or **.kshrc** file in your home directory: **export VARIABLE=value**. Replace **VARIABLE** with the name of the environment variable and **value** with the value you want to give it, for example:

     export MARI_CACHE=/User/Temp/Mari

For a list of the environment variables that Mari understands, see Environment Variables That Mari Recognizes.

On Windows

1. Right-click on **My Computer** and select **Properties**.
2. In the **System** window click on **Advanced system settings** in the left pane.
3. Go to the **Advanced** tab.
4. Click the **Environment Variables** button.

   *The **Environment Variables** dialog opens.*
5. Click the **New** button under either **User variables** or **System variables**, depending on whether you want to set the variable for the current user or all users. To set environment variables for all users, you need to have administrator privileges.
6. In the **Variable name** field, enter the name of the environment variable you want to set. For a list of the environment variables Mari understands, see Environment Variables That Mari Recognizes.
7. In the **Variable value** field, enter the value for the variable. The value can be a directory path, for example.
8. Click **OK**.

On Mac

1. The procedure for setting an environment variable depends on what your default terminal is. To get the name of the terminal type you are using, launch the terminal and enter **echo $SHELL**.

   This returns the type of terminal you are using.
2. Depending on the output of the previous step, do one of the following:
   - If your terminal is a **csh** or **tcsh** terminal, add the following command to the **.cshrc** or **.tcshrc** file in your home directory: **setenv VARIABLE value**. Replace **VARIABLE** with the name of the environment variable and **value** with the value you want to give it, for example:

     setenv MARI_CACHE /User/Temp/Mari
   - If your terminal is a **bash** or **ksh** terminal, add the following command to the **.bashrc** or **.kshrc** file in your home directory: **export VARIABLE=value**. Replace **VARIABLE** with the name of the environment variable and **value** with the value you want to give it, for example:

     export MARI_CACHE=/User/Temp/Mari

For a list of the environment variables that Mari understands, see Environment Variables That Mari Recognizes.

Check That the Variable Now Exists

On Linux

1. Launch a shell, if you don't have one open already.
2. Enter **echo $VARIABLE**. Replace **VARIABLE** with the name of the environment variable you set earlier. For example, to check if MARI_CACHE is set, enter **echo $MARI_CACHE**.

   If the variable is set, its value is displayed in the shell window.

On Windows

1. Select **Start** > **All Programs** > **Accessories** > **Command Prompt**.
2. In the command window that opens, enter **echo %VARIABLE%**. Replace **VARIABLE** with the name of the environment variable you set earlier. For example, to check if MARI_CACHE is set, enter **echo %MARI_CACHE%**.

   If the variable is set, its value is displayed in the command window.

On Mac

1. Launch a terminal, if you don't have one open already.
2. Enter **echo $VARIABLE**. Replace **VARIABLE** with the name of the environment variable you set earlier. For example, to check if MARI_CACHE is set, enter **echo $MARI_CACHE**.

If the variable is set, its value is displayed in the terminal window.

APPENDIX A: SHORTCUTS

Keyboard Shortcuts

Keyboard Shortcuts			
Painting		**Selection**	
Bake	**B**	Quick Copy	**Ctrl/Cmd+C**
Bake and Clear	**Ctrl/Cmd+Shift+B**	Quick Paste	**Ctrl/Cmd+V**
Undo	**Ctrl/Cmd+Z**	Select	**S**
Redo	**Ctrl/Cmd+Y**	Select All	**Ctrl/Cmd+A**
Toggle Painting	**.**	Select None	**Ctrl/Cmd+E**
Paint	**P**	Hide Selected	**H**
Paint Through	**U**	Hide Unselected	**Shift+H**
Eraser	**E**	Show All	**Ctrl/Cmd+Shift+H**
Toggle Mask Preview	**,**	Clear Marquee Selection	**Ctrl/Cmd+D**
Toggle Edge Mask	**G**	Invert	**Ctrl/Cmd+I**
Toggle Masking	**Ctrl/Cmd+M**		
Color Picker Menu	**J**		
Shelf Menu	**K**		
Image Manager Menu	**L**		
Pie Menu	**F9**		
Zoom Paint Buffer	**Z**		
Clear Paint Buffer	**Ctrl/Cmd+Shift+C**		
Next Blend Mode	**Shift+)**		
Previous Blend Mode	**Shift+ (**		
Last Blend Mode	**Ctrl/Cmd+9**		
Reset Blend Mode	**Ctrl/Cmd+0**		
Clear Blend Mode	**Shift+Backspace**		

Keyboard Shortcuts			
Brush		**Tools**	
Adjust Radius	**R**	Transform	**M**
Rotation	**W**	Mouse Gestures	****
Squish	**Q**	Hide/Show Widgets	**/**
Toggle Brushes	**N**	Color Picker and Pixel Analyzer	**C**
Adjust Opacity	**O**	Toggle Vector Inspector	**Shift+I**
Increase/Decrease Aspect Ratio	**0 / 9**	Modify Vector Inspector	**V**
Increase/Decrease Opacity	**[/]**		
Increase/Decrease Radius	**= / -**		
Increase/Decrease Rotation	**' / ;**		

Keyboard Shortcuts			
Camera		**View**	
Focus on Cursor Position	**F**	Go to Next Tab	**Ctrl/Cmd+Tab**
Camera View Presets	**1,2,3,4,5,6**	Go to Previous Tab	**Ctrl/Cmd+Shift+Back Tab**
Focus on Selection	**A**	Full Screen	**Ctrl/Cmd+Shift+F**
View All	**Shift+A**	Previous View	**Ctrl/Cmd+ ,**
Ortho Camera	**F10**	Next View	**Ctrl/Cmd+ .**
Perspective Camera	**F11**	Show Console	**Alt+Ctrl/Cmd+P**
UV Camera	**F12**	Toggle Cursor Type	**F5**

Keyboard Shortcuts			
Animation		**Project**	
Move Forward One Frame	**Ctrl/Cmd+Right**	New	**Ctrl/Cmd+N**
Move Backward One frame	**Ctrl/Cmd+Left**	Save	**Ctrl/Cmd+S**
Fast Forward	**Ctrl/Cmd+Up**	Close	**Ctrl/Cmd+W**
Rewind	**Ctrl/Cmd+Down**		

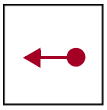
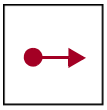
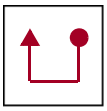
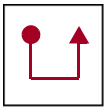
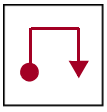
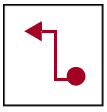
Keyboard Shortcuts			
Add keyframe	**Ctrl/Cmd+K**		
Scrub Animation	**Shift+?**		

Keyboard Shortcuts			
General		**Channels**	
Quit	**Ctrl/Cmd+Q**	Channel Menu	**I**
Toggle Palettes	**Home**	Bake on New Layer	**Ctrl/Cmd+B**
Toggle Tool Properties Palette	**F7**	Duplicate	**Alt**+drag and drop
Toggle Brush Editor Palette	**F8**		
Toggle Wireframe View	**Shift+W**		
Take Screenshot	**Ctrl/Cmd+Shift+Print**		

Keyboard Shortcuts			
Lighting		**Color**	
Flat	**F1**	Swap Foreground and Background	**X**
Basic	**F2**	Set to Black & White	**D**
Full	**F3**		

Keyboard Shortcuts			
Navigation		**UV View Presets**	
Orbit	**Alt+Left button**	Reset Model to Default	**1**
Pan	**Alt+Shift+Left button** or **Alt+Middle button**	Rotate 90 degrees counter-clockwise	**2**
Roll	**Ctrl/Cmd+R+Left button**	Rotate 180 degrees counter-clockwise	**3**
Zoom	**Alt+Ctrl/Cmd+Left button** or **Alt+Right button**	Rotate 270 degrees counter-clockwise	**4**

Mouse Gestures

Mouse gestures	
Hold down \ and draw...	
 Undo	 Redo
Clear Painting	Bake
Previous Channel	Next Channel
Toggle Last 2 Channels	Paint Tool
 Paint Through Tool	Selection Tool
Erase Tool	Show Palettes
Increase Brush Radius	Decrease Brush Radius
Hide Unselected	Hide Selected
 Show All	 View All
 Toggle Brush Tip	

APPENDIX B: FREQUENTLY ASKED QUESTIONS

Frequently Asked Questions

This appendix lists some of the most common questions about Mari. If your question isn't answered here, review the documentation and the release notes or contact The Foundry customer support for help.

I can't see or bake what I've painted.

There can be several reasons for this:

- **Paint Opacity** has been set to 0 in the **Projection** palette.
- A mask is preventing paint from appearing. Check if any of the masks are enabled in the **Projection** palette.
- **Project On** has been set to **SelectedOnly** in the **Projection** palette, but you haven't selected any objects, patches, or faces. Either select the areas where you want paint to appear or set **Project On** to **All**.
- The paint is on objects, patches or faces that have been locked. To unlock them, click **Selection** > **Unlock Selected**, **Unlock All**, or **Unlock Entire Object**.
- The paint blending mode (**Painting Mode** in the **Projection** palette) has been set to a mode that does nothing to your textures. For example, if your texture is white, the paint is red and **Painting Mode** has been set to **Hue**, the paint is not visible.
- **Brush Opacity** has been set to **0** in the **Brush Editor** palette.
- **Brush Flow** has been set to **0** in the **Brush Editor** palette.
- The paint buffer has been moved off the screen. To reset the buffer to its defaults, click **Reset** under **Paint Buffer** in the **Painting** palette.

My object has disappeared from the canvas.

The object may have been moved off the screen. Try pressing **A** or **F** to bring it back.

Mari's bake behavior seems strange.

In the **Projection** palette, you can set whether Mari bakes automatically when you change the view, and whether the buffer clears automatically once you bake. Set **Bake Behavior** to:

- **AutoBakeAndClear** – Mari automatically bakes and clears the buffer when you move the model.
- **Manual** – You have to bake manually; and when you do, the paint stays in the paint buffer until you manually clear it.
- **ClearOnly** – You have to bake manually; and when you do, the paint buffer clears automatically.

Mari seems slow when using the Clone Stamp tool.

When cloning from a particular channel, the **Clone Stamp** tool takes a "snapshot" of that channel as it appears on the screen and uses that as the source. As a result, the resolution of the cloned texture can

depend on the current display resolution within Mari. Higher display resolutions produce better cloning results, but can dramatically slow Mari's performance.

Increasing the Paint Buffer Size or Virtual Texture Size can affect Mari's performance.

Increasing the **Buffer Size** or the **Virtual Texture Size**, even when your graphics card supports large textures, can slow Mari's performance. Adjust the **Buffer Size** under **Paint Buffer** in the **Painting** palette, and the **Virtual Texture Size** in the **Mari Preferences** dialog under **Data** > **Graphics Card**.

Displacement preview performance seems slow.

If you have allocated a channel to be used in a **Displacement** shader component, the **Virtual Texture Type** under **Edit** > **Preferences** > **GPU** > **Virtual Texture**, should be set to at least **Half** for more precise displacement. In addition, the channel containing the displacement map should be set to at least **16-bit**. Please note that using values higher than these may reduce preview performance.

Mari keeps highlighting anything I've selected with a selection color. How can I turn this off?

You can configure the way Mari highlights selected areas. Right-click on the canvas and select **Display Properties**. Under **Selection**, adjust **Fill Render** and **Outline Render**.

I can't find a Save As option.

Mari currently has no **Save As** functionality. You can, however, duplicate your project by right-clicking on it in the **Projects** view and selecting **Copy**.

If you want to pass your project on to another user, you can also select the project in the **Projects** view and click **Archive**. This creates an archive (a **.mra** file) that contains your project and all the textures and models associated with it.

If you use **.** (full stop) to separate parts of the file name (for example, "test.file"), Mari does not add the file extension **.mra** automatically. This allows you to use a different extension if desired. However, in most cases you most likely want to add the **.mra** extension to ensure the file is clear.

I want to bake what I've painted, but I can't find the bake button.

The bake button sits at the bottom right of the workspace. It only appears when you have unbaked paint in the paint buffer.

You can also press **B** to bake.

Clicking on another application caused the floating palettes in Mari to disappear.

This is not a problem in Mari but caused by your Linux window behavior settings. To fix this on KDE 4, for example, you can:

1. Go to **Settings** > **System Settings** > **Window Behavior** > **Advanced**.

2. Uncheck **Hide utility windows for inactive applications**.

I am having problems with my wacom tablet.

We have found that these links have been useful in solving the problems for some of our users:
https://help.ubuntu.com/community/Wacom
http://linuxwacom.sourceforge.net/

On Linux, pressing the Ctrl/Cmd, Alt, or (Windows) shortcut key doesn't do what it should. Instead, it does something else, like moves the entire Mari window.

This is usually not a problem in Mari but caused by your Linux window manager, which is using one of these keys as a global shortcut. Depending on your window manager, you may be able to block the global shortcut, or at least select which of the three keys is used as the global shortcut. For example, if the Mari shortcuts you often use require you to press the **Alt** key, you can set the global shortcut to be the **Windows** key instead. This way, the Mari shortcuts that don't work are limited to those that require the **Windows** key.

To block the global shortcut on a per-application basis (that is, for Mari only) on KDE 4, for example, you can:

1. Right-click on the Mari title bar and select **Advanced** > **Special Window Settings**. This may open an information dialog where you need to click **OK**.
2. Go to the **Window** tab.
3. Click the **Detect Window Properties** button and then click on the Mari window.
4. Make sure that **Use whole window class** and **Match also window title** are checked and click **OK**.
5. Go to the **Workarounds** tab.
6. Check **Block global shortcuts**, select **Force** from the dropdown menu, and enable the checkbox on the right. Click **OK**.

To select which key is used as the global shortcut, again on KDE 4, you can:

1. Go to **Settings** > **System Settings** > **Window Behavior** > **Window Actions**.
2. Under **Inner Window**, set **Modifier** to the shortcut key you need the least in Mari or other applications you use (for example, the **Windows** key).

   This allows you to use the other two keys (in this case, **Ctrl**/**Cmd** and **Alt**) in Mari.

On Windows, pressing the Windows shortcut key should open the Start menu. This doesn't happen when Mari has focus. Why is that?

This is because the **Windows** key is a shortcut key in Mari. Whenever Mari has focus, the **Windows** key is reserved for Mari, so that you can use all the Mari shortcuts.

If you need to access the **Start** menu, you can either click it manually or move focus to another application and then press the **Windows** key.

Pressing the Alt Gr key does not trigger the same shortcuts as the Alt key. Why is that?

The **Alt Gr** key is defined differently on the Windows and Linux operating systems. Due to this, Mari cannot determine what the **Alt Gr** key is intended to be linked to. If a shortcut lists the **Alt** key as part of the controls, this does not include **Alt Gr** as an alternative. For this reason, it is advisable to avoid using the **Alt Gr** key in your custom shortcuts.

On Windows, I've removed a drive from Mari's file browser bookmarks. How do I get it back? Is it possible to delete a drive from the bookmarks permanently?

All logical drives that Windows can see are automatically added to Mari's file browser bookmarks when you start Mari. You can remove these while Mari is running, but the only way to get them to reappear is to relaunch Mari. At present, you can't delete a drive from the bookmarks permanently – it always reappears when you relaunch Mari.

Mari also automatically adds mapped network drives to its bookmarks. You should not disconnect a network drive while Mari is running and then attempt to reference files from that drive in Mari, as that may result in undefined behavior.

APPENDIX C: THIRD PARTY LICENSES

Third Party Licenses

This appendix lists third party libraries used in Mari, along with their licenses.

Library	Description	Licence
argparse	Parser for command-line options, arguments and sub-commands	Copyright 2008 Larry Gritz and the other authors and contributors. All Rights Reserved. Based on BSD-licensed software Copyright 2004 NVIDIA Corp. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met: * Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer. * Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution. * Neither the name of the software's owners nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission. THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. (This is the Modified BSD License)
Autodesk FBX	File Format Support	This software contains Autodesk® FBX® code developed by Autodesk, Inc. Copyright 2008 Autodesk, Inc. All rights, reserved. Such code is provided "as is" and Autodesk, Inc. disclaims any and all warranties, whether express or implied, including without limitation the implied warranties of merchantability, fitness for a particular purpose or non-infringement of third party rights. In no event shall Autodesk, Inc. be liable for any direct, indirect, incidental, special, exemplary, or consequential damages (including, but not limited to, procurement of substitute goods or services; loss of use, data, or profits; or business interruption) however caused and on any theory of liability, whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of such code.

Library	Description	Licence
Curl 7.21.1	URL transfer library	Copyright (c) 1996 - 2010, Daniel Stenberg, <daniel@haxx.se>. All rights reserved. Permission to use, copy, modify, and distribute this software for any purpose with or without fee is hereby granted, provided that the above copyright notice and this permission notice appear in all copies. THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OF THIRD PARTY RIGHTS. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE. Except as contained in this notice, the name of a copyright holder shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization of the copyright holder.
EdenCGL	Object file loader	Copyright (c) 2001-2008, Philip Lamb, phil@eden.net.nz. Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at http://www.apache.org/licenses/LICENSE-2.0 Unless required by applicable law or agreed to in writing, software distributed under the License is distributed on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied. See the License for the specific language governing permissions and limitations under the License.
Expat	XML parser	Copyright © 1998, 1999, 2000 Thai Open Source Software Center Ltd and Clark Cooper Copyright © 2001, 2002, 2003, 2004, 2005, 2006 Expat maintainers. Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions: The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software. THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Library	Description	Licence
FBO	Frame buffer object library	Copyright (c) 2005, Aaron Lefohn (lefohn@cs.ucdavis.edu) Adam Moerschell (atmoerschell@ucdavis.edu) All rights reserved. This software is licensed under the BSD open-source license. See http://www.open-source.org/licenses/bsd-license.php for more detail. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met: Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution. Neither the name of the University of Californa, Davis nor the names of the contributors may be used to endorse or promote products derived from this software without specific prior written permission. THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
FreeType	Font support	Portions of this software are copyright © 2008 The FreeType Project (www.freetype.org). All rights reserved.

Library	Description	Licence
GLEW	OpenGL support	The OpenGL Extension Wrangler Library Copyright © 2002-2008, Milan Ikits <milan ikits@ieee.org> Copyright © 2002-2008, Marcelo E. Magallon <mmagallo@debian.org> Copyright © 2002, Lev Povalahev All rights reserved. Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met: • Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimer. • Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimer in the documentation and/or other materials provided with the distribution. • The name of the author may be used to endorse or promote products derived from this software without specific prior written permission. THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
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Library	Description	Licence
GLSL Cellular Noise	2D and 3D Cellular Noise	Copyright (c) 2011 by Stefan Gustavson <stefan.gustavson@liu.se> Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions: The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software. THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
GLSL Perlin Noise	Perlin noise library	2D, 3D and 4D Perlin noise, classic and simplex, in a GLSL fragment shader. Classic noise is implemented by the functions: • float noise(vec2 P) • float noise(vec3 P) • float noise(vec4 P) Simplex noise is implemented by the functions: • float snoise(vec2 P) • float snoise(vec3 P) • float snoise(vec4 P) Author: Stefan Gustavson ITN-LiTH (stegu@itn.liu.se) 2004-12-05 You may use, modify and redistribute this code free of charge, provided that my name and this notice appears intact.

Library	Description	Licence
GLSL Classical (Perlin) and Simplex Noise	Perlin and Simplex noise library	Copyright (C) 2011 by Ashima Arts (Simplex noise) Copyright (C) 2011 by Stefan Gustavson (Classic noise) Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions: The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software. THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
GTS	Triangulated surface library	This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version. This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details. To see the GNU Lesser General Public License, go to http://www.gnu.org/licenses/ or /Media/Help/CopyrightNotices in the Mari application directory.
IJG JPEG	File format support	This software is based in part on the work of the Independent JPEG Group.
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